# COURSES
## OF STUDY

1989-1990

CORNELL
UNIVERSITY

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## 1989-1990

**Cornell University**

**(USPS 132-860)**

Volume 81 of the series Cornell University consists of nine catalogs, of which this is number three, dated July 15, 1989. Issued once in February, once in March, three times in July, three times in August, and once in September. Published by the Office of Publications Services, East Hill Plaza, Ithaca, New York 14850-2805.

Second-class postage paid at Ithaca, New York.

*Postmaster:* Send address changes to "Cornell University," Vice President for Academic Programs, 309 Day Hall, Ithaca, NY 14853-2801.

# Cornell University Calendar 1989–90

## Fall Semester

| | |
|---|---|
| Friday, August 25 | Residence halls open |
| Sunday, August 27 | New-student orientation begins |
| Tuesday–Wednesday, August 29–30 | Registration–Course exchange |
| Thursday, August 31 | Instruction begins, 7:30 a.m. |
| | Add/drop/change period begins |
| Wednesday, September 6 | Physical education classes begin |
| Friday, September 22 | Last day of add/drop/change period |
| Friday–Sunday, September 22–24 | New-Student Parents' Weekend |
| Saturday, October 7 | Fall recess: instruction suspended, 1:10 p.m. |
| Wednesday, October 11 | Instruction resumes, 7:30 a.m. |
| Wednesday–Wednesday, October 25–November 8 | Pre–course enrollment for spring 1990 |
| Saturday, October 14 | Homecoming Weekend |
| Wednesday, November 22 | Thanksgiving recess: instruction suspended, 1:10 p.m. |
| Monday, November 27 | Instruction resumes, 7:30 a.m. |
| Saturday, December 9 | Instruction ends, 1:10 p.m. |
| Sunday–Wednesday, December 10–13 | Study period |
| Thursday, December 14 | Final examinations begin |
| Saturday, December 23 | Final examinations end |
| Sunday, December 24 | Residence halls close |

## Winter Session

Variable periods between Tuesday, December 26, and Friday, January 19

## Spring Semester

| | |
|---|---|
| Sunday, January 14 | Residence halls open for continuing students |
| Tuesday, January 16 | Residence halls open for new students |
| Thursday–Friday, January 18–19 | Registration–Course exchange |
| Monday, January 22 | Instruction begins, 7:30 a.m. |
| | Add/drop/change period begins |
| Monday, February 5 | Physical education classes begin |
| Friday, February 16 | Last day of add/drop/change period |
| Saturday, March 17 | Spring recess: instruction suspended, 1:10 p.m. |
| Monday, March 26 | Instruction resumes, 7:30 a.m. |
| Wednesday–Wednesday, March 28–April 11 | Pre–course enrollment for fall 1990 |
| Saturday, May 5 | Instruction ends, 1:10 p.m. |
| Sunday–Wednesday, May 6–9 | Study period |
| Thursday, May 10 | Final examinations begin |
| Saturday, May 19 | Final examinations end |
| | Residence halls close (students who are graduating may stay through Commencement Day) |
| Sunday–Saturday, May 20–26 | Senior Week |
| Sunday, May 27 | Commencement |

## Summer Session 1990

| | |
|---|---|
| Three-Week Session | Wednesday, May 30–Friday, June 22 |
| Eight-Week Session | Monday, June 11–Tuesday, August 7 |
| Six-Week Session | Monday, June 25–Tuesday, August 7 |

The dates shown in this calendar are subject to change at any time by official action of Cornell University.

In this calendar, the university has scheduled classes, laboratories, and examinations on religious holidays. It is the intent of the university that students who miss those activities because of religious observances be given adequate opportunity to make up the missed work.

The Law School and College of Veterinary Medicine calendars differ in a number of ways from the university calendar. Please consult the catalogs of those colleges for details.

The courses and curricula described in this catalog, and the teaching personnel listed herein, are subject to change at any time by official action of Cornell University.

The rules and regulations stated in this catalog are for information only and in no way constitute a contract between the student and Cornell University. The university reserves the right to change any regulation or requirement at any time.

**This catalog was produced by Media Services at Cornell University.**

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## University Administration

**Frank H. T. Rhodes**, president
**Robert Barker**, senior provost and chief operating officer
**Malden C. Nesheim**, provost
**G. Tom Shires**, provost for medical affairs
**James E. Morley, Jr.**, senior vice president
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**vacant**, vice president for finance and treasurer
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**vacant**, vice president for planning and budgeting
**Larry I. Palmer**, vice president for academic programs
**Richard M. Ramin**, vice president for public affairs
**Walter J. Relihan, Jr.**, university counsel and secretary of the corporation
**James A. Sanderson**, chief investment officer
**Joycelyn R. Hart**, associate vice president for human relations
**Walter R. Lynn**, dean of the University Faculty

**Abbreviations used in this catalog:**

| | | | |
|---|---|---|---|
| M | Monday | S-U | Satisfactory-Unsatisfactory |
| T | Tuesday | disc | discussion |
| W | Wednesday | lab | laboratory |
| R | Thursday | lec | lecture |
| F | Friday | rec | recitation |
| S | Saturday | sec | section |

Courses with names and descriptions enclosed in brackets—[ ]—are not offered 1989–90.

## Introduction

*Courses of Study* contains information primarily concerned with academic resources and procedures, college and department programs, interdisciplinary programs, and undergraduate and graduate course offerings of the university. Not included in this publication is information concerning the Medical College and the Graduate School of Medical Sciences, located in New York City. Information about other important areas is available from other offices of the university or is included in publications distributed to students. The following is a list of offices and information sources for specific information:

*Undergraduate admissions.* Information pertinent to prospective applicants is available from the Undergraduate Admissions Office, 410 Thurston Avenue, Ithaca, New York 14850-9988 (telephone: 607/255-5241).

*Graduate School.* Information pertaining to admission to the Graduate School may be obtained by contacting the Graduate School, 100 Sage Graduate Center, Ithaca, New York 14853-6201 (telephone: 607/255-4884).

*Law School.* Admission information for the Law School is available from the Law School, Myron Taylor Hall, Ithaca, New York 14853-4901 (telephone: 607/255-5141).

*Samuel Curtis Johnson Graduate School of Management.* Information is available from the Office of Admissions, 315 Malott Hall, Ithaca, New York 14853-4201 (telephone: 607/255-2327).

*College of Veterinary Medicine.* Admission information is available from the Admissions Office, Schurman Hall, Ithaca, New York 14853-6401 (telephone: 607/253-3000).

*Medical College and Graduate School of Medical Sciences.* Information regarding admissions is available from the Office of Admissions, 1300 York Avenue, New York, New York 10021 (telephone: 212/472-5673).

*Financial aid, loans, and student employment.* Information is available from the Office of Financial Aid, 203 Day Hall, Ithaca, New York 14853-2801 (telephone: 607/255-5145).

*Student accounts.* Information on Cornell-Card, a student charge card, and payment of bills is available by contacting the Office of the Bursar, 260 Day Hall, Ithaca, New York 14853-2801 (telephone: 607/255-2336).

*Dining and residence halls.* Information is sent to matriculating students and is available from Cornell Dining, 1140 North Balch Hall, Ithaca, New York 14853-1401, and the Department of Residence Life, 2117 North Balch Hall, Ithaca, New York 14853-1401.

*Student responsibility and regulations.* The *Campus Code of Conduct* describes the regulations and policies for maintaining public order on campus. Other statements of student responsibility are set forth in *Policies and Procedures for Faculty, Staff and Students. Policies and Procedures* contains the Code of Academic Integrity, the university policy on student records, information on the university judicial system, library and motor vehicle regulations, and statements of other policies and procedures. Both publications are available for viewing on CUINFO, the university's electronic information system, and in print at the various university libraries, the Office of the Dean of Students, the Office of the Dean of the University Faculty, the Office of University Counsel, the Office of the Judicial Administrator, and the college offices.

*Health services.* University Health Services provides comprehensive medical and psychological care at the Gannett Health Center, 10 Central Avenue, Ithaca, New York 14853-3101 (telephone: 607/255-4082), adjacent to Willard Straight Hall. Information may be obtained by writing or visiting the center.

## The University

Cornell University is a community set among the lakes and hills of central New York and lying within the boundaries of the city of Ithaca, New York. Two men were the university's creators: Ezra Cornell and Andrew Dickson White. Cornell had begun his career as a carpenter wandering in search of work. White, the younger, was well educated, a member of America's cultural aristocracy. Cornell came to Ithaca in 1828, worked hard, sometimes failed, more often succeeded, and succeeded to the extent that in the middle 1850s he went out into the American business world. There he met Morse, the inventor of the telegraph, became his partner, and was himself soon a wealthy man.

This success led him to the New York State Senate. White, a fellow senator, joined Cornell in discussing their common interest in higher education. They studied the Morrill Act of 1862, which gave land grants to the states as a means of financing state universities, and they saw here the opportunity to launch their own plan for a university. Cornell pledged half a million dollars as more financial support and a large part of his farm in Ithaca as a university campus. Cornell University was born. The first building, Morrill Hall, opened its doors in 1868.

From the beginning the university had two obligations. The first was to offer scholarships to New York State residents; the land-grant money made that necessary. In doing this, Cornell University acted as a public institution. And, as a private institution, it served all comers who could qualify for admission.

What should it teach? White, trained in the classical tradition of the older colleges and universities, wanted to teach philosophy, literature, government, history, and the sciences in a contemporary setting, shall we say, in terms of their usefulness to persons going out into the professions and business. Cornell put his wishes in a phrase that has become the university's motto: "I would found an institution where any person can find instruction in any subject."

White was the university's first president. He had assembled a faculty of distinguished scholars from the United States, Canada, and Great Britain, many of whom, including a prominent Oxford professor, came to Cornell because they regarded the university's approach to education as pioneering, lively, and suited to the needs of the time. What more appropriate than that, in this spirit of pioneering, Cornell should admit its first female students in 1870.

In the last quarter of the nineteenth century the university grew rapidly and began to assume the shape it has today. As it rose to take its place among the so-called Ivy League universities, Cornell had a unique structure, part private and part public; part supported by private funds, part by grants from New York

State. On the one hand were the endowed colleges: arts and sciences, engineering, law, and architecture; on the other were state-supported, or statutory, colleges: veterinary, agriculture, and home economics.

The university drew strength from its two groups of colleges. A single administration, a single president, a single board of trustees presided over the affairs of all; a single body, the University Faculty, directed educational policy. The needs of the endowed colleges called for the services of physicists, chemists, mathematicians, economists, historians, philosophers, biologists, lawyers. The needs of the statutory colleges called for many persons who had similar training but whose study of mankind and other animals and of plants followed a different path from that of the scholars in the endowed colleges. But this was for the good. The two groups of scholars had common ground for discussion. Out of diversity they could build unity.

By the early twentieth century Cornell was well on the way to greatness. President White had served as America's ambassador to Russia and to Germany. Jacob Gould Schurman, a later president, was to be ambassador to Germany and to China. To the university's faculty came scholars from many countries, as teachers and as students. To join Cornell's undergraduates and graduate students came men and women from all over the world, with the result that the university became what it is today, one of the most cosmopolitan in the United States.

The student population grew from the five to six thousand of the early twentieth century to its present figure of about eighteen thousand; the faculty from about two hundred to the present two thousand. More persons to study, to carry on research, and to teach meant more classrooms and laboratories, more libraries and dormitories, more places for worship and social centers, more playing fields and swimming pools. Buildings and places for outdoor recreation grew up on Ezra Cornell's farm, with a massive art gallery on the very spot where he once stood to admire Cayuga Lake and the city of Ithaca.

This growth of faculty, students, and the facilities they needed led to great specialization in the university's schools and colleges. The engineering college divided into many parts, such as mechanical, electrical, and chemical, and among the biological sciences there were similar divisions. Among the endowed colleges a School of Hotel Administration appeared, and a Graduate School of Business and Public Administration, now called the Samuel Curtis Johnson Graduate School of Management. Among the statutory colleges the College of Agriculture took a new title, the College of Agriculture and Life Sciences. So did the College of Home Economics; it became the College of Human Ecology. The Veterinary College became the College of Veterinary Medicine. And there was a new school, the School of Industrial and Labor Relations. The process of expansion carried beyond Ithaca. A vast medical school arose in New York City; an agricultural experiment station at Geneva, New York; a marine laboratory off the New England coast; and a government study center at Washington, D.C. More remote is the National Astronomy and Ionosphere Center in Puerto Rico, which has the world's largest radio-radar telescope.

Cornell University has come to be a place of learning whose scholars and students have reached out into every aspect of human affairs, into all forms of study relating to our planet, and to the limits of the universe as humankind knows them. Behind this achievement lie more than a century of steady, solid growth, the enterprise of hundreds of thousands of students, the dedication of thousands of professors, the skill of administrators, the wisdom of trustees.

The vast range of knowledge and experience assembled at Cornell gives to student and professor a sense of security. The security comes from being heir to a century of Cornell's history and of having available in libraries and art galleries and concert halls the words of wise men and the creations of artists. And more than security. To the student, what could be more stimulating than to know that he or she has joined a community that affords infinite opportunity for study, for new friendships, and for association with persons dedicated to the pursuit of knowledge?

Frederick G. Marcham

Goldwin Smith Professor of English History Emeritus

# ACCREDITATION

Cornell University is accredited by the Middle States Association of Colleges and Schools. Requests to review documentation supporting its accreditation should be addressed to the Vice President of Academic Programs, Cornell University, 309 Day Hall, Ithaca, New York 14853-2801.

# INTERDISCIPLINARY SCHOLARSHIP AND RESEARCH

## Humanities

### Society for the Humanities

Founded in 1966 to support research and encourage imaginative teaching in the humanities, the Society for the Humanities is a research institute, a sponsor of interdisciplinary or innovative courses, and a sponsor of lectures, seminars, and conferences on topics of interest to more than one humanities department. Each year it awards six postdoctoral fellowships and four senior fellowships for scholars from the United States and abroad to work at Cornell on a theme selected for the year, such as "Relations between Western and Non-Western Cultures" or "The Humanities and Science: A Reassessment." Cornell University, Andrew D. White House, Ithaca, New York 14853-1101 (telephone: 607/ 255-4086).

### Center for International Studies (CIS)

CIS facilitates cooperation in international work among the independent academic units at Cornell. It encourages and supports international comparative and interdisciplinary research through area studies in China-Japan, Latin America, South Asia, Southeast Asia, Western Societies, and the Soviet Union–Eastern Europe. CIS also supports research in developing countries in cooperation with the International Agriculture Program, the Rural Development Committee, the Institute for African Development, and the International Nutrition programs. CIS is also responsible for expanding study-abroad options for Cornellians and for establishing preprofessional internships overseas. Many other international initiatives are nurtured by the center, bringing the total the center supports to eighteen different international programs.

Cornell University, 170 Uris Hall, Ithaca, New York 14853-7601 (telephone: 607/255-6370).

## Social Sciences

### Africana Studies and Research Center

Since 1969 the Africana Studies and Research Center has offered a unique program that leads to an undergraduate degree through the College of Arts and Sciences and a graduate degree, the Master of Professional Studies (African and Afro-American Studies), through the Graduate School. The curriculum reflects an interdisciplinary approach to the experience of African peoples throughout the world. Areas of interest of the center's faculty include African and Caribbean literature, politics and international relations, African civilizations, African history, Afro-American history, Afro-American literature, Black political sociology, Black psychology, political economy of Black workers, and Swahili, Yoruba, and Ewe languages and literature. The center provides a unified approach to learning based on the recognition that the responsibility of the Black educator is not only to pioneer and develop Black studies as an educational field but also to produce intellectually disciplined, creative, insightful social analysts and to lay the foundation for technically competent professionals. Cornell University, 310 Triphammer Road, Ithaca, New York 14853-2599 (telephone: 607/255-5218).

### Cornell Institute for Social and Economic Research (CISER)

As a coordinating organization capitalizing on Cornell's diverse strengths in the social sciences, CISER seeks to enhance the social science environment by supporting a wide range of research. Through a data archive, an information and referral center, the New York State Information System, a survey research facility, and computing support, CISER fosters collaborative research among over four hundred social science faculty members, as well as interaction between them and public and private agencies and with other social scientists worldwide. Assistance is provided to social scientists who want to identify colleagues on campus with similar research interests. CISER aids in the preparation of proposals, issues publications supporting the Cornell social science community, and organizes seminars and workshops. Cornell University, 391 Uris Hall, Ithaca, New York 14853-7601 (telephone: 607/255-4801).

### Program for Employment and Workplace Systems (PEWS)

A part of the New York State School of Industrial and Labor Relations since 1982, PEWS was established to help companies and unions realize dramatic improvements in performance through the exercise of options not generally explored in collective bargaining and human resource planning. PEWS specializes in organizational and human resource changes and work restructuring. Its interventions have included such innovations

as redesign of work flow and individual jobs; training in quality improvement methods, problem solving and team building, flexible manufacturing approaches, and gainsharing-compensation incentive systems, self-managing work groups; and study-action teams. PEWS also conducts research on labor-management economic development activities and organizes conferences for industries striving to retain their competitive status. PEWS's two locations are at the New York State School of Industrial and Labor Relations, Cornell University, Ithaca, New York 14853-0952 (telephone: 607/255-2125 and 607/255-2074), and NYSSILR, Cornell University, 15 East Twenty-sixth Street, New York, New York 10010 (telephone: 212/340-2811).

## Physical Sciences

### Center for Applied Mathematics (CAM)

CAM brings together graduate students from varied educational backgrounds with strong mathematics components for advanced courses in pure mathematics and thorough grounding in mathematical methods and numerical analysis. Its principal research areas are in analysis, applied logic and theory of computing, discrete and numerical mathematics, information and control theory, mathematical biology, economics, mechanics and dynamics, and probability and statistics. CAM is located at Cornell University, Sage Hall, Ithaca, New York 14853-6201 (telephone: 607/255-4335). A subunit under this program, the Mathematical Sciences Institute, is a national center of excellence for comprehensive integrated fundamental research. With graduate research and a vigorous program of postdoctoral junior and senior visitors as an integral part, this program will conduct research and provide technical and educational assistance to the U.S. Army. Its disciplines will include applied analysis, physical mathematics, numerical methods and computing, statistics, and applied probability. The institute is located at Cornell University, 294 Caldwell Hall, Ithaca, New York 14853-2602 (telephone: 607/ 255-8005).

### Center for Theory and Simulation in Science and Engineering

Supported by the National Science Foundation as one of five National Advanced Scientific Computing Centers, the Theory Center is meeting the computing requirements of today's researchers with the Cornell National Supercomputer Facility, designed in partnership with IBM and New York State. Dedicated to far more than providing cycles on a supermachine, however, the Theory Center encompasses a full research environment, bringing together scientists and engineers in a variety of interdisciplinary projects, as well as researchers from government, industry, and academia. The Theory Center's programs are complemented by a sophisticated graphics laboratory, an advanced high-speed communications network, and a software development effort. Finally, the Theory Center is working to provide for the computing needs of the future: with research on highly parallel machines, mass storage systems, and software productivity tools. The Theory Center has a goal of advancing the technologies and applications of parallel supercomputing to achieve a 1000-fold-per-decade rate of increase in performance in single scientific applications. Cornell University, 265 Olin Hall, Ithaca, New York 14853-5201 (telephone: 607/255-8686).

### National Astronomy and Ionosphere Center (NAIC)

Operated by Cornell University under contract with the National Science Foundation, NAIC is a national research center that supports research programs in radio astronomy, planetary radar astronomy, and atmospheric science. Its main instrument, located near Arecibo, Puerto Rico, is a 305-meter antenna, the world's largest radio-radar telescope. NAIC also operates two remote sites north of the observatory: a 31-meter antenna used for interferometry and the High-Frequency Ionosphere Heating Facility. Associated with the Arecibo telescope is a broad spectrum of observing and data processing equipment that includes receivers, very powerful radar transmitters, and computers. NAIC is headquartered on the Cornell campus in Ithaca, where electronic development laboratories to support Arecibo's research efforts are operated as well. Puerto Rico facilities are operated on an equal, competitive basis for all qualified scientists. Cornell University, 405 Space Sciences Building, Ithaca, New York 14853-6801 (telephone: 607/255-3734).

### Center for Radiophysics and Space Research (CRSR)

Located in Cornell's Space Sciences Building, CRSR conducts research on our solar system, on the stars, on gas and dust in our own Milky Way galaxy, and on the extragalactic universe. The center's observational work is both space based (NASA satellites and space-probes) and ground based, using optical, infrared, and—in collaboration with the National Astronomy and Ionosphere Center—radio telescopes. The center's planetary group manages a planetary image facility (SPIF) and is involved in project GALILEO, an ambitious Jupiter probe. CRSR's Infrared Group was instrumental in the successful launch and operation of a satellite that produced an unprecedented atlas of infrared sources in the sky (IRAS) and is working on an even more ambitious successor (SIRTF). The Theoretical Astrophysics Group specializes in such relativistic phenomena as neutron stars and black holes and, working with Cornell's Theory Center, has pioneered supercomputing applied to astronomical problems. Cornell University, Space Sciences Building, Ithaca, New York 14853-6801 (telephone: 607/255-4341).

### Floyd R. Newman Laboratory of Nuclear Studies (LNS)

One of six major laboratories in the world active in this area, LNS is the center for research in elementary particle and accelerator physics at Cornell. It is the home of CESR, an electron-positron storage ring designed and built by members of the laboratory, which has produced most of our knowledge of the properties of the b quark, the most massive observed quark and the one with the richest structure. About one hundred physicists from ten universities have built and are operating the two experiments at CESR. A $36 million upgrade of the larger experiment is completed. The accelerator group is unique in regularly training graduate students in accelerator physics and has led the development of superconducting radio frequency accelerating cavities, which are expected to play a decisive role in the next generation of accelerators. The theoretical physics group is a leader in the development of supercomputers for research in all theoretical sciences and investigates problems in astrophysics and the structure and dynamics of matter. Cornell University, Wilson Laboratory, Ithaca New York 14853-8001 (telephone: 607/255-4952).

### Laboratory of Atomic and Solid State Physics (LASSP)

LASSP consists of the twenty-four professorial members of the Cornell Department of Physics whose research lies in the general field of condensed-matter physics. Collectively the ten theorists and fourteen experimentalists constitute one of the largest and most distinguished such groups at any university in the world. At any given time there are typically about sixty full-time graduate students, fifteen postdoctoral associates, and ten senior visitors in the laboratory. Activities range over the entire field of condensed-matter physics, from theoretical studies of dynamical systems to experimental studies of new phenomena at the lowest temperatures ever obtained. Cornell University, Clark Hall, Ithaca, New York 14853-2501 (telephone: 607/255-6053).

### Cornell High Energy Synchrotron Source (CHESS)

The CHESS laboratory is a national facility supplying high-energy X-rays called synchrotron radiation to the scientific community. This radiation comes as a by-product of the acceleration of electrons in the CESR storage ring. The laboratory provides experimental time to approximately three hundred scientists each year from universities, national laboratories, industry, and Cornell. CHESS has earned an international reputation for its studies on diffraction phenomena and X-ray optics. Of particular note are the nanosecond time resolved experiments on the surface melting of semiconductors and the first determination of a crystal structure of a mammalian virus (the common cold virus—rhino 15). The laboratory staff conducts research on many aspects of structure determination. Magnetic scattering, surface structures, and deformation and structure of polymers have been some of the important areas. Many unique contributions have come from laboratory staff in the development of X-ray optics and instrumentation for synchrotron radiation studies in condensed-matter science. Cornell University, 227 Clark Hall, Ithaca, New York 14853-2501 (telephone: 607/255-5161), or Cornell University, Wilson Laboratory, Ithaca, New York 14853-8001 (telephone: 607/255-7163).

### Laboratory of Plasma Studies

About forty Cornell faculty members, postdoctoral scientists, and graduate students from four College of Engineering fields are involved in basic physics and applications research in plasma physics, the science of electrically conducting fluids and high-temperature ionized gases, under the auspices of the Laboratory of Plasma Studies. With the largest high-power beam research program of any university in the western world, Cornell has been a leader in this field since 1967. AIthough the best-known impetus for this research is the desire for controlled thermonuclear fusion as a potential source of electric power, plasma physics also underlies many solar, astrophysical, and ionospheric phenomena. The program's specialty has been the physics and technology of high-power electron and ion beams and their applications. Cornell scientists make use of state-of-the-art

pulsed-power accelerators (up to a trillion watts) to produce and study electron and ion beams for application to fusion research, advanced accelerator concepts, and the generation of high-power microwave radiation. The program involves active collaboration between experimentalists and theorists, who must often make extensive use of the most powerful computers available to this country to adequately model an experiment. Cornell University, 379 Upson Hall, Ithaca, New York 14853-7501 (telephone: 607/255-3916).

## Engineering

### Computer Graphics

Originally established through a National Science Foundation grant in 1974, this program has conducted collaborative research in many scientific, design, and engineering disciplines and is one of the most advanced computer graphics laboratories in the United States. Its interdisciplinary research has been dedicated to the development of interactive graphics input and display techniques and their uses in computer-aided design. The laboratory is a leader in developing techniques to generate full-color three-dimensional images of photographic quality. Graphic research investigations include modeling techniques, color science, light reflection models, parallel processing, and display algorithms for realistic image synthesis. Since its inception, research has continually been conducted in engineering mechanics, resulting in a full set of interactive graphic finite-element and boundary-element analysis systems for three-dimensional, time-dependent, nonlinear problems typical in the mechanical, structural, and geotechnical disciplines. Architectural applications, including building design and full-color three-dimensional graphics simulations, are also being developed. The Program of Computer Graphics is responsible for the development of the advanced graphics hardware-software environment surrounding Cornell's supercomputer facility. Digital Equipment Corporation and Hewlett-Packard provide major support for these pioneering efforts. Approximately twenty-five graduate students perform research in the laboratory. Cornell University, 120 Rand Hall, Ithaca, New York 14853-5501 (telephone: 607/255-4880).

### Cornell Ceramics Program

The goals of the Cornell Ceramics Program, which supports research in high-technology ceramics, are threefold: to increase the number of Ph.D.'s, to increase the fundamental understanding in ceramics science, and to bring about increased and more-rapid information exchange with industry. The Cornell Ceramics Program supports research in high-technology ceramics. With assistance from the federal government, industry, and New York State, joint research is conducted on the fundamental aspects of ceramics. The program seeks to expand in those areas where the industrial need is likely to be acute: ceramic thin films and coatings; ceramics for electrical, magnetic, and optical applications; and tough ceramics. Research areas will include studies of colloids, fine powders, whiskers, fibers, composites of ceramics, polymers and metals, ceramic machining, surface chemistry and physics, interfaces, microstructure and defects, multicomponent kinetics, sintering processes, coating technologies, sol-gel behavior, and other areas. Cornell University, 229 Bard Hall, Ithaca, New York 14853-1501 (telephone: 607/ 255-4040).

### Materials Science Center (MSC)

MSC is the central focus of an interdisciplinary materials research community of sixty faculty members in applied physics, chemistry, chemical engineering, geological sciences, materials science and engineering, mechanical and aerospace engineering, electrical engineering, physics, and theoretical and applied mechanics. It directly supports collaborative and individual research projects of its members in such diverse areas of materials science as ceramics, low-temperature behavior of matter, phase transitions, optical phenomena, and surface science. It provides additional support through the operation of a system of central laboratory facilities, offering state-of-the art capabilities in electron microscopy, X-ray analysis, mechanical testing, and single-crystal and thin-film preparation. Cornell University, 627 Clark Hall, Ithaca, New York 14853-2501 (telephone: 607/255-4272).

### National Nanofabrication Facility

The goals for the National Nanofabrication Facility (NNF), as stated in its charter, were to advance the state of the art in submicron fabrication and to train scientists and engineers in this field, to provide a resource for submicron fabrication technology to the scientific community, to encourage innovative research using submicron dimensions in fields other than microelectronics, and to provide microfabrication information and technology transfer to the technical community. A highly successful partnership between the National Science Foundation, U. S. industry, and Cornell University, NNF is the only university facility with a proven processing capability at a quarter-micron and below that is openly available to researchers from industry, universities, and federal laboratories. The nearly one hundred research programs that use the facility originate in at least ten different fields of science—from plant pathology to electrical engineering to astronomy—resulting in over one hundred publications annually and contributing to the award of over forty graduate degrees each year. During the next few years NNF will establish itself as the international leader in fabrication at dimensions from 0.01 to 0.1 m., providing unlimited new research opportunities to researchers throughout the country. Cornell University, Knight Laboratory, Ithaca, New York 14853-5403 (telephone: 607/255-2329).

### Center of Excellence for Microscience and Technology

This Semiconductor Research Corporation–supported program seeks to identify and investigate key technical issues related to the fabrication, modeling, and characterization of microstructures for integrated circuits that support a 0.25 micrometer minimum-feature-size (MFS) design rule. In a typical year twenty-four faculty members in applied and engineering physics, electrical engineering, materials science and engineering, and physics participate and thirty-four graduate students are supported by this program, which represents a balanced effort in the four microstructure sciences areas: integrated device and circuit fabrication, process and materials research, microstructure characterization, and quantum size effects (postshrink) research. Cornell University, 217 Phillips Hall, Ithaca, New York 14853-5401 (telephone: 607/255-8519).

### Cornell University Joint Services Electronics Program (JSEP)

With major funding from the U.S. Department of Defense, JSEP houses one of the world's leading programs in compound semiconductor materials and performs research on the state of the art in microelectronics, electronic, and opto-electronic devices and circuits. It provides support to the research of approximately ten faculty members from the Department of Electrical Engineering in Phillips Hall. The program has resulted in at least fifty advanced degrees in the areas of high-speed devices, opto-electronics, and epitaxial growth. Cornell University, Phillips Hall, Ithaca, New York 14853-5401 (telephone: 607/255-3409).

### Cornell Manufacturing Engineering and Productivity Program (COMEPP)

With thirty faculty members from nine departments in three colleges and support from over fifteen industries, COMEPP explores innovative technologies and procedures to increase productivity, exchanges information with key industries through collaborative research, and develops close working relationships and continuing education programs with company sponsors. In active support of the effort to provide a new breed of engineers with the technical background and vision needed to implement modern manufacturing methods, COMEPP's cross-disciplinary research focuses on such key manufacturing issues as object representation, materials processing, automated manufacture of discrete parts and integrated circuits, robotics, and production management. Cornell University, 254 Olin Hall, Ithaca, New York 14853-5201 (telephone: 607/255-4616).

### Institute for the Study of the Continents (INSTOC)

As an interdisciplinary organization centered in Cornell's engineering college, INSTOC explores and investigates the structure, composition, and evolution of the continents. Based on the premise that the continental crust is the major frontier of modern earth science, it seeks to improve scientific understanding of the earth's major features to find ways for its wise and beneficial use by mankind. It parallels the great institutes of oceanography that have added so much to mankind's understanding of the earth's water-covered areas in the last few decades. One of INSTOC's major projects, the Consortium for Continental Reflection Profiling (COCORP) uses the powerful seismic reflection profiling technique developed by the petroleum industry for the study of the continental crust's entire thickness. Cornell University, 3122 Snee Hall, Ithaca, New York 14853-1504 (telephone: 607/ 255-3474).

## Environmental Research

### Center for Environmental Research (CER)

CER supports a wide variety of teaching, research, and public service activities that address major environmental issues. Over the past several years these have been carried out under four major programs. The Environ-

mental Law and Policy Program promotes research and sponsors symposia and seminars focusing on such issues as science and the courts and environmental regulation. The Ecosystems Research Center is funded by Cornell and the Environmental Protection Agency (EPA). Its basic ecosystems orientation and expertise support EPA's regulatory activities. The Cornell Laboratory for Environmental Applications of Remote Sensing conducts teaching, research, and extension activities on remote sensing techniques. The Water Resources Institute's research and extension efforts focus on problems of surface and groundwater contamination. The Waste Management Institute investigates waste preparation, sorting, reduction, and disposal issues and includes the New York State Solid Waste Combustion Institute. Cornell University, 468 Hollister Hall, Ithaca, New York 14853-3501 (telephone: 607/255-7535).

#### Institute for Comparative and Environmental Toxicology (ICET)

ICET consolidates and stimulates teaching, research, and public service activities related to environmental toxicology—a multidisciplinary science that studies the fate and effects of chemicals on living organisms and natural ecosystems. Established in 1981 as an interdisciplinary, campuswide administrative unit, ICET administers the graduate Field of Environmental Toxicology for some twenty-five graduate students and encourages collaborative interactions with government, industry, and other academic institutions. The institute helps strengthen its approximately thirty faculty members' individual research programs while fostering an interdisciplinary team approach to research problems. To support program activities, ICET seeks and administers government, foundation, and corporate funds. Environmental toxicology at Cornell has grown to encompass the effects of complex pollutants that threaten our natural and industrial resources and call for important responses in the realm of risk management and public policy. ICET is designed to manage the anticipated future growth of environmental toxicology and to enhance Cornell's national leadership position in this important area. Cornell University, 102B Fernow Hall, Ithaca, New York 14853-3001 (telephone: 607/255-2163).

## Biological Sciences

The Corson and Mudd buildings, a complex for biological sciences, house many different controlled environments: cold rooms; chambers controllable for constant light, humidity, and temperature; aviaries; aquarium rooms; rooms for electron microscopy; and anechoic chambers, among other facilities.

#### Biotechnology Program

New York State (through its Science and Technology Foundation), industry, the federal government, and Cornell jointly sponsor this program that provides corporations interested in biotechnology with a window at the forefront of research. A primary goal is the transfer of basic research results and technology to applications that will lead to new products and economic development. Eastman Kodak, General Foods, and Rhone-Poulenc have already pledged substantial funds over a six-year period, and Corning Glass has contributed significantly to the program. Research focuses on molecular aspects of genetics and cell biology with applications to plants, animals, and cell production. The Biotechnology Program is also designated as a Center of Excellence in Biotechnology by the government. Cornell University, Box 547, Baker Laboratory, Ithaca, New York 14853-1301 (telephone: 607/255-2300).

#### Boyce Thompson Institute for Plant Research (BTI)

In state-of-the-art laboratories, twenty greenhouses, controlled environment chambers, and a twenty-acre experimental farm at the outskirts of Cornell's Ithaca campus, this private, independent, nonprofit corporation seeks to increase understanding of plant growth and development and to contribute knowledge essential for maintaining environmental quality. BTI's Biological Control Program centers on microbial insect diseases. Its research is in the isolation, identification, and characterization of pathogenic organisms and naturally occurring chemicals for use in the biological control of important insect pests. Behavior-regulating plant constituents are identified and environmental effects on host-plant qualities studied to determine how plant diseases can control insect pests that damage crops. The Environmental Biology Program seeks to determine the effects of such pollutants as acid rain, fluorides, ozone, nitrogen compounds, and PCBs on vegetation. Its scientists also study the interaction of atmospheric pollutants with insects and diseases. The Nitrogen and Crop Yields program concentrates mainly on basic studies of the physiological and genetic relationships in nitrogen fixation and on techniques to improve the genetic capabilities of nitrogen-fixing bacteria with program areas in disease tolerance, disease organism physiology, chemical characterization of fungal toxins, seed physiology, salinity, and drought tolerance. The Plant Stress Program increases understanding of those stress-related phenomena in plants that are associated with environmental conditions or disease development. Boyce Thompson Institute for Plant Research, Cornell University, Tower Road, Ithaca, New York 14853-1801 (telephone: 607/257-2030).

#### Laboratory of Ornithology

This unique Cornell department is located a short distance from the main Ithaca campus in scenic Sapsucker Woods. It acts as an interface between professional ornithologists and the amateur birding community. The laboratory conducts research on bird populations through its Cooperative Research Program and on acoustic communication through the Library of Natural Sounds. Birders gather data that form the research base for the laboratory's programs. In addition, the laboratory publishes a magazine, the *Living Bird Quarterly*, for its ten thousand members. Laboratory of Ornithology, Cornell University, Sapsucker Woods, Ithaca, New York 14850-1999 (telephone: 607/255-4783).

#### Shoals Marine Laboratory

Other renowned off-campus facilities include Shoals Marine Laboratory, a marine biology research and teaching laboratory six miles off the Maine and New Hampshire coasts.

## Agriculture

Bradfield Hall houses computers, radar, and other specialized equipment used in making up-to-the-minute weather forecasts. The insect collection, newly housed in Comstock Hall, contains more than four million specimens, making it one of the largest university insect collections anywhere. Liberty Hyde Bailey Hortorium is the world's leading center for the study of palms, a plant family second only to grasses in economic importance. The Department of Food Science operates a full-scale dairy plant and a salesroom.

The new Comstock Hall provides modern facilities for the Department of Entomology, Media Services, and teaching in the biological sciences.

The departments of Plant Breeding, Plant Pathology, Floriculture and Ornamental Horticulture, and Vegetable Crops; the Section of Plant Biology, housed in the Plant Science Building, Guterman Laboratories, and Bradfield Hall; the Boyce Thompson Institute for Plant Research which is housed in facilities on Tower Road; and the Agricultural Experiment Station at Geneva give the university the largest concentration of plant scientists in the world.

Cornell's unique location, on Cayuga Lake and between Cascadilla and Fall creeks, offers many opportunities to explore ecology and aquatic science. The Fisheries and Ecotoxicology laboratories and experimental ponds are located near the campus; an additional one hundred ponds are located near the Tompkins County Airport. A major toxicology facility, the Equine Drug Testing Laboratory of the New York State School of Veterinary Medicine, is also situated near the airport, about three miles from campus. Twenty-five miles away the four-thousand-acre Arnot Forest serves as an outdoor laboratory in wildlife and forestry for the Department of Natural Resources, which also operates a two-hundred-acre maple sugar and forestry extension field station at Lake Placid and the Cornell Biological Field Station at Shackelton Point on Oneida Lake, near Syracuse. The latter not only provides excellent facilities for fisheries and aquatic science research and teaching but also includes four hundred acres of meadows and forest for terrestrial ecology and conservation studies.

The Animal Science Teaching and Research Center was established in 1973 on twenty-five hundred acres of fertile valley and hillside land in Harford, about fifteen miles from campus. It now houses some 760 head of dairy cattle, 300 beef cattle, 400 sheep, and an aquaculture facility for brook trout. About one thousand acres of corn and grasses are planted and harvested each year.

A new Large Animal Research and Teaching Unit on campus greatly expands the research on, and teaching of, metabolic control of growth and lactation in large animals.

The orchard laboratory conducts research on fruit crops; the popular salesroom may be reached by campus bus.

#### Agricultural Experiment Stations at Cornell University

Initiated through the Hatch Act of 1887, which established federal funding for agricultural research, the experiment stations provide the fundamental knowledge and research base to

sustain agriculture and food production throughout New York State and to contribute the state's share to the national agricultural research program. At the Cornell University agricultural experiment station research ranges from the basic sciences represented by modern biotechnology to more-applied agricultural research areas in plant, animal, physical, and social sciences. Total research support exceeds $48 million from the state of New York, Federal Formula Funds, USDA special and competitive grants, federal agencies, private industry, foundations, and gifts. The equivalent of three hundred full-time researchers work on over nine hundred active projects in the diverse areas of soils, water, and forestry; crops; animals; economics and agricultural policy; people and social institutions; food and human nutrition; and biotechnology. The New York State Agricultural Experiment Station in Geneva, New York, contains the most all-inclusive apple orchard in the United States, with over one thousand varieties, and is over a century old. In addition to developing sixty-five new apple varieties, researchers have produced experimental wines from grapes grown in the station's own vineyards, which are now widely grown by New York State's farm wineries. The station's work also extends to growing techniques, plant disease, pests and pesticides, and many other areas. The mechanical grape harvester, for example, which can pick 95 percent of all grapes, was designed here in cooperation with agricultural engineers. The activities of Cornell's agricultural experiment stations are coordinated by Cornell's Office for Research, in the New York State College of Agriculture and Life Sciences, 292 Roberts Hall, Cornell University, Ithaca, New York 14853-5901 (telephone: 255-5420). The Geneva experiment station can be reached by calling the director's office at 315/787-2211 or writing to the New York State Agricultural Experiment Station, Geneva, New York 14456 (or Box 15, Cornell University, Roberts Hall, Ithaca, New York 14853-5901).

#### Long Island Horticultural Research Laboratory (LIHRL)

The laboratory is a unit of Cornell University that serves the research needs of Long Island horticultural enterprises and provides extension information through close ties with local cooperative extension associations. It is located at Riverhead, New York, in the major agricultural area of Long Island. The facility houses individuals from the Departments of Entomology, Floriculture and Ornamental Horticulture, Plant Pathology, and Vegetable Crops at Ithaca and the Horticultural Sciences and Integrated Pest Management units at Geneva. The staff at LIHRL is only a part of Cornell's total program to serve the needs of Long Island agriculture. The facilities are available and are used by numerous individuals stationed at Ithaca and Geneva to carry out programs important to Long Island and the Northeast. Long Island Horticultural Research Laboratory, 39 Sound Avenue, Riverhead, New York 11901 (telephone: 516/727-3596).

### Nutritional Science

#### Institute of Food Science

The program's faculty participants deal with all facets of food processing, formulation, packaging, safety, and nutrient content. This strong, diverse research program includes both basic and applied disciplines. It encompasses all major commodities of plant, animal, avian, and marine origin. Multidisciplinary research programs exist in the following areas: biochemistry and flavor chemistry; food microbiology, safety, and biotechnology; computer modeling, structure-function relationship and physical properties research with emphasis on polysaccharides, proteins, and lipid components of food; and food engineering, with emphasis on thermal processing, separation processes, computer-integrated controls, packaging, and storage capability. Strong complementary programs are available in nutrition research and food marketing. The institute has two large modern research facilities, computers, and two modern excellent pilot plant facilities capable of handling (processing, packaging, storage evaluation) all types of food products from fluid to dried materials. Cornell University, 116 Stocking Hall, Ithaca, New York 14853-7201 (telephone: 607/255-7916).

### Veterinary Medicine

#### James A. Baker Institute for Animal Health

The institute conducts research on agents that cause disease in domestic animals. Its aims are to increase knowledge about the nature of diseases and the means by which they are spread and to develop methods of controlling their spread. The staff includes specialists in molecular biology, virology, bacteriology, parasitology, immunology, biochemistry, and genetics. Noted for leadership in canine research, the institute's Cornell Research Laboratory for Diseases of Dogs has been directly or indirectly involved in the development of almost every vaccine for the prevention of infectious diseases in dogs. James A. Baker Institute for Animal Health, Cornell University, Snyder Hill Road, Ithaca, New York 14853-6401 (telephone: 607/277-2772).

## Use of Animals for Courses

The Cornell University Institutional Animal Care and Use Committee has made the following statement on the use of animals for courses: "In certain courses the use of vertebrate animals serves as an invaluable aid in instruction. It is recognized, however, that some students have ethical objections to the use of vertebrate animals in this manner. Courses that use vertebrate animals are identified as such in the course descriptions. Students who have concerns about the use of animals in these courses should consult the course instructor for more information about the precise ways in which the animals are used. A set of university guidelines on the use of vertebrate animals in teaching for faculty and students is available from departments in which the courses are offered. A student who is reluctant to voice his or her concerns about animal use in a particular course, or who thinks these concerns have not received proper attention, may seek assistance from the director of the Cornell Center for Research Animal Resources."

# Division of Unclassified Students

The Division of Unclassified Students (DUS) assists Cornell undergraduates in transferring between colleges of the university when direct internal transfer is not possible. The division also serves as a counseling agency for students whose academic and career goals have changed. Such students are advised about alternatives within the Cornell system.

To apply to the division, students must

1) Make an appointment for an interview in DUS (telephone: 255-4386)
2) Complete the DUS application form and return it to the division office, 158 Olin Hall
3) Submit application for transfer coupons to their college registrar, requesting transfer to DUS

Candidates are admitted to the division when, in the judgment of the DUS Administrative Committee, there is reasonable evidence that a transfer can be accomplished and that the proposed program is consistent with the student's stated objectives. Students are admitted for one semester but may be allowed to continue in the division for a second term if that is necessary and the student is making progress toward transfer.

# Business and Preprofessional Study

## UNDERGRADUATE BUSINESS STUDY

Undergraduate preparation for business is found in many schools and colleges at Cornell. Students most frequently take courses in more than one area, as well as in related fields, to construct a program to suit their interests and career objectives. Each of the following areas provides a different focus for application and use of business study and training, and students should consider carefully the implications of each program when making a choice. (Graduate study is available in the Johnson Graduate School of Management as well as in graduate fields following each of the undergraduate options.)

The areas most often pursued include applied economics and business management (College of Agriculture and Life Sciences), economics (College of Arts and Sciences), engineering, hotel administration, consumer economics and housing (College of Human Ecology), and industrial and labor relations.

**Applied economics and business management.** This program is designed to prepare students for a career in business or in public service. Emphasis is placed on the application of economic theory and management principles. Students are required to satisfy the distribution requirements of the College of Agriculture and Life Sciences, which include courses in the social sciences and humanities. Four areas of specialization are available: agricultural and applied economics, business management and marketing, farm business management and finance, and food industry management.

**Economics.** This program provides a broad view of that social science concerned with the description and analysis of the production, distribution, and consumption of goods and services, the understanding of monetary systems, and the comprehension of economic theories and models. It is viewed more often as preprofessional than as training for immediate practice in business or economics.

**Engineering.** This area provides much of the management personnel of modern industry. Engineers frequently climb the ladders of technological management that lead to more general management responsibilities; more than half of the management-level personnel of major corporations such as General Electric, Xerox, IBM, and Du Pont have engineering degrees. In addition to becoming managers by being effective technical supervisors, many students enter engineering explicitly anticipating graduate business education, judging that an engineering background is particularly appropriate for management in a technology-oriented society.

**Hotel administration.** The undergraduate program in hotel administration prepares individuals to be mid- to upper-level managers and entrepreneurs for the hospitality industry (lodging, food service, and travel) and allied fields. Instruction is provided in the areas of administration and general management, human-resources management, accounting and financial management, food and beverage management, law, properties management, communication, science and technology, economics, and marketing.

**Consumer economics and housing.** Study in the department develops an understanding of the market economy from both buyers' and sellers' perspectives. The focus is on the economic behavior and welfare of consumers in the private, public, and mixed sectors of the economy. An understanding of economics, sociology, and government policy provides the basis for an analysis of consumers' rights and responsibilities.

**Industrial and labor relations** focuses on the interactions among human beings, organizations, and institutions. It encompasses not only the relationships between employer and employee but the political, economic, social, and psychological factors that affect those relationships. It includes the study of the hiring, training, and motivating of individual workers; negotiation and conflict resolution; and the economic and technological changes that affect the jobs that people perform. Finally, it embraces the many regulations and regulatory agencies created by our society to protect and help both employer and employed.

### Related Areas

Courses in areas directly related to these business programs are found in many of the university departments. For example, quantitative methods may be studied in the departments of Mathematics and Computer Science, and courses in public administration are found in the departments of Government, and City and Regional Planning. There are additional programs that allow students with an interest in business to focus on a particular geographic area. Examples are the Latin American Studies Program, the South Asia Program, and the Africana Studies and Research Center. Such interdisciplinary programs as the Program on Science, Technology, and Society and the various programs in international agriculture provide additional opportunities for study of interest to business students.

### Combined Degree Programs

Because Cornell has the Samuel Curtis Johnson Graduate School of Management, special opportunities exist for highly qualified undergraduates to combine their undergraduate programs with graduate study in that school. Students in the double-registrant program generally receive a bachelor's degree after four years of study and a Master of Business Administration (M.B.A.) degree after the fifth year of study, rather than the usual sixth year. Students in all Cornell undergraduate colleges and schools are eligible to explore this option. There is also a program with the College of Engineering that allows qualified students to earn a B.S., M.B.A., and Master of Engineering degree in six years. Admission to these combined degree programs is limited to particularly promising applicants. Careful planning is required for successful integration of the work in the two schools.

# SELECTED BUSINESS AND MANAGEMENT COURSES

### Accounting

| | |
|---|---|
| Ag Ec 221 | Financial Accounting |
| Ag Ec 323 | Managerial Accounting |
| H Adm 120 | Basic Principles of Accounting and Financial Management |
| H Adm 220 | Managerial Accounting |
| H Adm 221 | Financial Accounting |
| JGSM NBA 500 | Intermediate Accounting |
| JGSM NBA 501 | Advanced Accounting |
| JGSM NBA 505 | Auditing |
| OR&IE 350 | Cost Accounting Analysis and Control |

### Communications

| | |
|---|---|
| Comm 201 | Oral Communication |
| Comm 204 | Effective Listening |
| Comm 272 | Principles of Public Relations and Advertising |
| Comm 301 | Business and Professional Speaking |
| Comm 372 | Advanced Advertising |
| H Adm 165 | Introduction to Writing for Business |
| H Adm 265 | Effective Oral Communication |
| H Adm 364 | Advanced Business Writing |

### Computing

| | |
|---|---|
| Ag Ec 412 | Introduction to Mathematical Programming |
| Ag Ec 418 | Information Systems and Decision Analysis |
| Ag En 204 | Introduction to Computer Uses |
| CS 100 | Introduction to Computer Programming |
| CS 101 | The Computer Age |
| CS 102 | Introduction to Microcomputer Applications |
| Educ 247 | Instructional Applications of the Microcomputer |
| H Adm 174 | Information Systems |
| H Adm 274 | Hotel Computing Applications |
| H Adm 374 | End-User Business Computing Tools |

### Economics

| | |
|---|---|
| Ag Ec 332 | Economics of the Public Sector |
| Ag Ec 452 | Resource Economics |
| CEE 321 | Microeconomic Analysis |
| CEH 310 | Intermediate Microeconomics |
| CEH 355 | Wealth and Income |
| Econ 101 | Introductory Microeconomics |
| Econ 102 | Introductory Macroeconomics |
| Econ 301 | Economics of Market Failure |
| Econ 313 | Intermediate Microeconomic Theory |
| Econ 317 | Intermediate Mathematical Economics I |
| Econ 318 | Intermediate Mathematical Economics II |
| Econ 338 | Macroeconomic Policy |
| Econ 341 | Labor Economics |
| Econ 342 | Problems in Labor Economics (also I&LR 343) |
| Econ 351 | Industrial Organization |
| Econ 358 | Current Economic Issues |
| I&LR 240 | Economics of Wages and Employment |
| I&LR 340 | Economic Security |
| I&LR 440 | Economics of Fringe Benefits |

### Entrepreneurship

| | |
|---|---|
| Ag Ec 341 | Personal Enterprise and Small Business Management |
| Ag Ec 445 | Counseling Small Business |
| JGSM NBA 300 | Entrepreneurship and Enterprise |

### Finance

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|---|---|
| Ag Ec 324 | Financial Management |
| Ag Ec 405 | Farm Finance |
| Ag Ec 407 | Advanced Agricultural Finance Seminar |
| Ag Ec 411 | Financial Management in Farming |
| CEH 315 | Personal Financial Management |
| Econ 331 | Money and Credit |
| Econ 333 | Theory and Practice of Asset Markets |
| Econ 336 | Public Finance: Resource Allocation |
| H Adm 125 | Finance |
| H Adm 222 | Hospitality Financial Management |
| H Adm 322 | Investment Management |
| H Adm 326 | Corporate Finance |
| OR&IE 451 | Economic Analysis of Engineering and Management |

### International Business

| | |
|---|---|
| Ag Ec 150 | Economics of Agricultural Geography |
| Ag Ec 643 | Export Marketing |
| Econ 102 | Introductory Macroeconomics |
| Econ 314 | Intermediate Macroeconomics Theory |
| Econ 325 | Economic History of Latin America |
| Econ 329 | Eastern Europe Today: Economics, Government, Culture (also Government 326 and Russian 329) |
| Econ 330 | The Soviet Union: Politics, Economics, and Culture (also Government 330 and Russian 330) |
| Econ 338 | Macroeconomic Policy |
| Econ 366 | The Economy of the Soviet Union |
| Econ 369 | Selected Topics in Socialist Economies: China |
| Econ 561 | International Trade Theory and Policy |
| Econ 562 | International Monetary Theory and Policy |
| Govt 354 | America in the World Economy |
| Japan 141–142 | Introductory Japanese for Business Purposes |
| Japan 241–242 | Intermediate Japanese for Business Purposes |
| NES 463 | International Trade, Market, and Politics in the Ancient Near East |

### Law, Regulation, and Ethics

| | |
|---|---|
| Ag Ec 320 | Business Law |
| Ag Ec 321 | Law of Business Associations |
| Ag Ec 322 | Taxation in Business and Personal Decision Making |
| Ag Ec 252 | Natural Resource and Environmental Economics |
| Ag Ec 420 | Advanced Business Law |
| Ag Ec 422 | Estate Planning |
| CEH 430 | The Economics of Consumer Policy |
| CEH 465 | Economics of Consumer Law |
| Comm 428 | Communication Law |
| Econ 302 | The Impact and Control of Technological Change |
| Econ 304 | Economics and the Law |
| Econ 308 | Economic Analysis of Government (also Civil and Environmental Engineering 322) |
| Econ 552 | Public Regulation of Business |
| Econ 554 | Economics of Regulation |
| Educ 477 | Law and Educational Policy |
| Govt 389 | International Law |
| H Adm 283 | Law of Securities Regulation |
| H Adm 385 | Law of Business I |
| H Adm 422 | Taxation and Management Decisions |
| I&LR 201 | Labor Relations Law and Legislation |
| I&LR 330 | Comparative Industrial Relations Systems: Western Europe |
| I&LR 331 | Comparative Industrial Relations Systems: Non-Western Countries |

### Management

| | |
|---|---|
| Ag Ec 220 | Introduction to Business Management |
| Ag Ec 302 | Farm Business Management |
| Ag Ec 402 | Advanced Farm Business Management |
| Ag Ec 424 | Business Policy |
| Ag Ec 426 | Cooperative Strategies |
| Ag Ec 443 | Food Industry Management |
| CRP 545 | Introduction to Public Policy Analysis and Management |
| Econ 326 | History of American Business Enterprise |
| H Adm 103 | Principles of Management |
| H Adm 401 | Seminar in Management Principles |
| JGSM NBA 573 | The Professional Manager at Work |
| Soc 328 | Sociology of Work |

### Manufacturing

| | |
|---|---|
| Econ 302 | The Impact and Control of Technological Change |
| OR&IE 410 | Industrial Systems Analysis |
| OR&IE 421 | Production Planning and Control |

### Marketing

| | |
|---|---|
| Ag Ec 240 | Marketing |
| Ag Ec 342 | Marketing Management |
| Ag Ec 346 | Dairy Markets and Policy |
| Ag Ec 347 | Marketing Fruits, Vegetables, and Ornamental Products |
| Ag Ec 448 | Food Merchandising |
| Ag Ec 449 | Applications in Strategic Marketing |
| CEH 233 | Marketing and the Consumer |
| CEH 431 | Consumer Behavior |
| CEH 432 | Economic Organization of the Marketplace |
| H Adm 243 | Principles of Marketing |

### Personnel and Human Resource Management

| | |
|---|---|
| CEE 325 | Social Implications of Technology |
| CEH 411 | Time as a Human Resource |
| CEH 418 | Work and Human Development |
| Econ 381 | Economics of Participation and Workers' Management |
| Econ 382 | The Practice and Implementation of Self-Management |
| H Adm 211 | The Management of Human Resources |
| H Adm 212 | Human Relations Skills |

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|---|---|
| H Adm 311 | Union-Management Relations in Private Industry: A Survey |
| H Adm 313 | Training for the Hospitality Industry |
| H Adm 414 | Organizational Behavior and Small-Group Processes |
| H Adm 513 | Situational Leadership and Organizational Behavior |
| I&LR 120 | Introduction to Macro Organizational Behavior and Analysis |
| I&LR 121 | Introduction to Micro Organizational Behavior and Analysis |
| I&LR 222 | Studies in Organizational Behavior: Regulating the Corporation |
| I&LR 260 | Personnel Management |
| I&LR 320 | Psychology of Industrial Engineering |
| I&LR 326 | Sociology of Occupations |
| I&LR 327 | Psychology of Industrial Conflict |
| I&LR 360 | Human Resource Economics and Public Policy |
| I&LR 361 | Effective Supervision |
| I&LR 366 | Women at Work |
| I&LR 370 | The Study of Work Motivation |
| I&LR 373 | Organizational Behavior Simulations |
| I&LR 374 | Technology and the Worker |
| I&LR 404 | Contract Administration |
| I&LR 420 | Group Processes |
| I&LR 425 | Sociology of Industrial Conflict |
| I&LR 461 | Human Resource Managment (I&LR 200 Collective Bargaining) |
| Psych 206 | Psychology in Business and Industry (also Hotel 314) |

**Quantitative Decisions and Decision Science**

| | |
|---|---|
| Ag Ec 310 | Introductory Statistics |
| Ag Ec 408 | Seminar in Farm Business Decision Making |
| Ag Ec 410 | Business Statistics |
| Ag Ec 418 | Information Systems and Business Analysis |
| CEE 304 | Uncertainty Analysis in Engineering |
| CEE 323 | Engineering Economics |
| Econ 320 | Introduction to Econometrics |
| Econ 520 | Quantitative Methods |
| CEH 332 | Consumer Decision Making |
| OR&IE 270 | Basic Engineering Probability and Statistics |

Real Estate

| | |
|---|---|
| Ag Ec 406 | Farm and Rural Real Estate Appraisal |
| CRP 654 | Real Estate Development I: Advanced Analysis and Critique |
| CRP 655 | Real Estate Development II: Advanced Analysis and Critique |
| CRP 664 | Economics and Financing of Neighborhood Conservation and Preservation |
| H Adm 323 | Real Estate Finance |
| H Adm 350 | Personal Real Estate Investment |

**Transportation**

| | |
|---|---|
| CEE 361 | Introduction to Transportation Engineering |
| CEE 660 | Transportation Planning and Policy |

## PRELAW STUDY

Law schools do not prescribe any particular prelaw program, nor do they require any specific undergraduate courses as do medical schools. Law touches nearly every phase of human activity, and there is practically no subject that cannot be considered of value to the lawyer. Therefore, no undergraduate course of study is totally inappropriate. Students contemplating legal careers should be guided by certain principles, however, when selecting college courses.

1. Interest encourages scholarship, and students will derive the greatest benefit from those studies that stimulate their interest.
2. Of first importance to the lawyer is the ability to express thoughts clearly and cogently in both speech and writing. Freshman writing seminars, required of nearly all Cornell freshmen, are designed to develop these skills. English literature and composition, and communication courses, also serve this purpose. Logic and mathematics develop exactness of thought. Also of value are economics, history, government, and sociology, because of their close relation to law and their influence on its development and ethics, and philosophy, because of the influence of philosophic reasoning on legal reasoning and jurisprudence. Psychology leads to an understanding of human nature and mental behavior. Some knowledge of the principles of accounting and of the sciences such as chemistry, physics, biology, and engineering is recommended and will prove of practical value to the lawyer in general practice in the modern world.
3. Cultural subjects, though they may have no direct bearing on law or a legal career, will expand students' interests; help cultivate a wider appreciation of literature, art, and music; and make better-educated and well-rounded persons.
4. Certain subjects are especially useful in specialized legal careers. For some, a broad scientific background—for example, in agriculture, chemistry, physics, or engineering—when coupled with training in law, may furnish qualifications necessary for specialized work with the government, for counseling certain types of businesses, or for a career as a patent lawyer. A business background may be helpful for those planning to specialize in corporate or tax practice. Students who anticipate practice involving labor law and legislation might consider undergraduate study in the School of Industrial and Labor Relations. Whatever course of study is chosen, the important goals are to acquire perspective, social awareness, and a critical cast of mind; to develop the ability to think logically and analytically; and to express thoughts clearly and forcefully. These are the crucial tools for a sound legal education and a successful career.

   The presence of the Cornell Law School on campus provides the opportunity for a limited number of highly qualified undergraduates registered in the College of Arts and Sciences at the university to be admitted to the Law School. At the time of entry they must have completed 105 of the 120 credits required for the Bachelor of Arts degree, including 92 credits of course work in the College of Arts and Sciences.

   It may be possible for exceptionally well-qualified students in other Cornell undergraduate colleges to arrange to enter the Law School after three years. The College of Human Ecology offers a program in which students spend their fourth year at the Law School. In addition, members of the Cornell Law School faculty often offer undergraduate courses such as Nature, Functions, and Limits of Law, which are open to all undergraduates.

## PREMEDICAL STUDY

Medical and dental schools while not requiring or recommending any particular major course of study, do require that a particular selection of undergraduate courses be completed. These courses usually include general chemistry and organic chemistry, biology, physics, and a year of English composition (or a freshman writing seminar). In addition, many medical schools require or recommend at least one advanced biological science course, such as genetics, embryology, histology, or physiology.

There is no major program that is the best for those considering medical or dental school, and students are therefore encouraged to pursue their own intellectual interests. Students are more likely to succeed at, and benefit from, subjects that interest and stimulate them, and there is no evidence that medical colleges give special consideration to any particular undergraduate training beyond completion of the required courses. In the past, successful Cornell applicants to medical and dental schools have come from the Colleges of Arts and Sciences, Agriculture and Life Sciences, Human Ecology, and Engineering. The appropriate choice depends to a great extent on the student's other interests.

Qualified students in the Colleges of Agriculture and Life Sciences, Arts and Sciences, and Human Ecology may apply for acceptance into a double registration program arranged between Cornell University and Cornell University Medical College in New York City. This program allows registered students to save one year in pursuit of the bachelor's and M.D. degrees. Further information about this program is available from the Health Careers Program office at the Career Center, Cornell University, 203 Barnes Hall, Ithaca, New York, 14853-1601.

## PREVETERINARY STUDY

There is no specific preveterinary program at Cornell, and students interested in veterinary medicine as a career should select a major area for study that fits their interests while at the same time meeting the entrance requirements for veterinary college as listed below. Most preveterinary students at Cornell are enrolled in the College of Agriculture and Life Sciences, which offers several applied science majors, including animal science, that can lead to related careers if the student is not accepted into veterinary college. Some enter other divisions of the university, especially the College of Arts and Sciences, because of secondary interests or the desire for a broad liberal arts curriculum.

The college-level prerequisite courses for admission to the New York State College of Veterinary Medicine at Cornell are English composition, biology or zoology, physics, inorganic chemistry, organic chemistry, biochemistry, and microbiology. All science courses must include a laboratory. These requirements, necessary for admission to the New York State College of Veterinary Medicine at Cornell, may vary slightly at other veterinary colleges.

For information on additional preparation, including work experience and necessary examinations, students should consult the brochure, *Admission to the New York State College of Veterinary Medicine*, obtained by writing to the Office of Admissions, New York State College of Veterinary Medicine, Cornell University, C117 Schurman Hall, Ithaca, New York 14853-6401. Information on the Guaranteed Admissions Program is available from the same address.

Qualified students in the College of Agriculture and Life Sciences may apply for acceptance in a double-registration program arranged between Cornell University and the New York State College of Veterinary Medicine at Cornell. This program allows registered students to save one year in pursuit of the bachelor's and D.V.M. degrees. Further information about this program is available from the Health Careers Program office at the Career Center, Cornell University, 203 Barnes Hall, Ithaca, New York 14853-1601.

# Interdisciplinary Centers and Programs

## AFRICANA STUDIES AND RESEARCH CENTER

For information about the programs and courses offered by the center, see the section "Special Programs and Interdisciplinary Studies" in the course listings for the College of Arts and Sciences.

### Faculty Roster

Adams, Anne, Ph.D., U. of Michigan, Ann Arbor. Asst. Prof., Africana Studies and Research Center

Appiah, Anthony, Ph.D., U. of Cambridge (England). Assoc. Prof., Africana Studies/Philosophy

Cross, William E., Ph.D., Princeton U. Assoc. Prof., Africana Studies and Research Center

Edmondson, Locksley G., Ph.D., Queens U. (Canada). Prof., Africana Studies and Research Center

Fraser, Gertrude, Ph.D., Johns Hopkins U. Asst. Prof., Africana Studies/Womens' Studies

Gates, Henry L., Ph. D. Cambridge U. (England). W. E. B. DuBois Prof. English/Africana Studies/Comparative Literature

Harris, Robert L., Ph.D., Northwestern U. Assoc. Prof., Africana Studies and Research Center

Soyinka, Wole, B.A., Leeds U. (England). Goldwin Smith Prof., Africana Studies/Theatre Arts

Turner, James E., Ph.D, Union Grad. Sch. at Antioch Coll. Assoc. Prof., Africana Studies and Research Center

Williams, Marvin, M.P.S., M.F.A., Cornell U. Lecturer, Africana Studies and Research Center

#### Adjunct Faculty

Ajayi, Folabo, Ph.D., U. of Ife (Nigeria). Visiting Asst. Prof., Africana Studies and Research Center

Branch, William B., M.F.A., Columbia U. Adjunct Prof., Africana Studies and Research Center

Nanji, Abdul, M.A., SUNY. Adjunct Instructor, Africana Studies and Research Center

## ANDREW D. WHITE PROFESSORS-AT-LARGE

Urie Bronfenbrenner, chair, G60e Van Rensselaer Hall

The program has its origins in Cornell's early history. Andrew D. White, the first president of Cornell University, inaugurated the position of nonresident professor, to be held by eminent visiting scholars who would periodically visit the university to supplement the activities of the permanent university faculty. Professors-at-large, who serve for a six-year term, are full members of the faculty when in residence.

#### Term Ending in 1989

Cox, David R., statistician. Imperial College of Science and Technology, London

Dover, Sir Kenneth, classicist. Former president, Corpus Christi College, Oxford

Szarkowski, John, curator and historian of photography. The Museum of Modern Art, New York

Woolhouse, Harold W., biologist. John Innis Institute, Norwich, and University of East Anglia

#### Term Ending in 1990

Heilbron, John L., historian of science. University of California, Berkeley

Lewis, Bernard, Islamicist. Princeton University

Welty, Eudora, novelist and short story writer

#### Term Ending in 1991

Marshall, Geoffrey, political theorist. Queen's College, Oxford

Rutter, Michael, psychiatrist. Institute of Psychiatry, University of London

Southwood, Sir Richard, biologist. Linacre Professor of Zoology, Oxford

#### Term Ending in 1992

Choay, Françoise, historian of architecture and city planning. Institut d'Urbanisme, University of Paris Vlll

Mazrui, Ali A., Africanist, political scientist. University of Michigan and University of Jos, Nigeria

Thorne, Kip, astrophysicist. California Institute of Technology

#### Term Ending in 1993

Allegre, Claude J., geological scientist. University of Paris

Billington, David, civil engineer. Princeton University

Wehner, Rudinger, zoologist and behavioral neurophysiologist. University of Zurich

## ASIAN AMERICAN STUDIES PROGRAM

The Asian American Studies Program is a university-wide program within the College of Arts and Sciences. Its aim is to promote teaching, research, and cultural activities related to Americans of Asian heritage. The program functions as a teaching and resource center to serve the educational needs of the general Cornell community as well as those of the Asian American community. It is intercollegiate in nature with links to all the schools and colleges of the university.

### Teaching

The teaching program offers a number of broad basic courses dealing with the Asian American experience that are offered in any of the participating colleges, depending on content and faculty affiliation. It encourages the incorporation of more specific Asian American content into the mainstream curriculum of the university by providing financial resources and substantive support to faculty members interested in developing new courses and adding pertinent materials to existing courses. The Course Development Grants Program has been established for this purpose. The staff in the program will work toward establishing one or more academic concentrations in the future.

### Research

The research program encourages and stimulates research on Asian American topics by functioning as a resource and activity center for its affiliated members as well as the general Cornell community. It sponsors activities designed to facilitate dialogue and interchange among faculty from a variety of disciplines and strives to promote collaborative research among its members. To this end the Research Grants Program has been instituted to provide seed money to faculty and students for research on Asian American topics.

### Art and Culture

The third dimension of the program is to foster and promote Asian American culture and art. The program functions as a resource center and a place for social interaction among Asian American students and members of the Cornell community. In this capacity the program sponsors events aimed not simply at enhancing Asian American students' sense of identity but also at developing an appreciation for the creative aspects of the heritage of Asian Americans among all members of the Cornell community.

### Affiliated Faculty

Lee C. Lee, director (human development and family studies); M. L. Barnett (rural sociology and Asian studies), T. Chaloemtiarana (Southeast Asia Program), P. Chi (consumer economics and housing), M. C. Chou (Asian studies), B. deBary (Asian studies), J. C. T. Huang (modern languages and linguistics), J. V. Koschmann (history), L. C. Lee (human development and family studies), D. R. McCann (Asian studies), T. L. Mei (Asian studies), V. Nee (sociology), R. E. Ripple (education), N. Sakai (Asian studies), P. S. Sangren (anthropology), C. L. Shih (modern languages and linguistics), R. J. Smith (anthropology), M. W. Young (history of art)

### Courses

Asian American Studies 110 Introduction to Asian American Studies

Asian American Studies 262 Asian American Literature (also English 262)

Asian American Studies 435 Asian Americans: Images and Stereotypes in Film (also Theatre Arts 435)

Asian American Studies 610 Asian Americans, Civil Rights and the Law (also Law 610)

## COGNITIVE STUDIES

Frank Keil, Department of Psychology, and Sally McConnell-Ginet, Department of Modern Languages and Linguistics, codirectors

Sue Wurster, cognitive studies coordinator, 225 Uris Hall (telephone: 255-6431)

Cognitive studies is a new and rapidly growing field of study that focuses on the nature and representation of knowledge. It approaches the study of perception, action, language, and thinking from several perspectives—theoretical, experimental, and computational—with the aim of gaining a better understanding of human cognition and the nature of intelligent systems. The comparison between human and artificial intelligence is an important theme, as is the nature of mental representations and their acquisition and use. Cognitive studies has drawn primarily from the disciplines of computer science, linguistics, philosophy, and psychology. In the College of Arts and Sciences the field of cognitive studies is primarily represented by faculty in these departments, as well as in mathematics. It is also represented by faculty in the Department of Human Development and Family Studies (College of Human Ecology), in the Section of Neurobiology and Behavior (Division of Biological Sciences), in the Department of Education (College of Agriculture and Life Sciences), and in the Johnson Graduate School of Management.

### Undergraduate Programs

An undergraduate concentration in cognitive studies in the College of Arts and Sciences provides a framework for the design of structured, individualized programs of study in this growing interdisciplinary field. Such programs of study are intended to serve as complements to intensive course work in a single discipline as represented in an individual department. For further information on the undergraduate program, see "Cognitive Studies Concentration" in the College of Arts and Sciences section.

### Graduate Programs

At the graduate level Cornell offers a graduate field minor in cognitive studies. Cornell's unique program of graduate training, which seeks to tailor an optimal program of study and research for each student, fosters highly interdisciplinary committees. It is the norm for students interested in cognitive studies to have faculty members from such departments as Philosophy, Computer Science, Modern Languages and Linguistics, and Psychology on common committees. For further information on the graduate Field of Cognitive Studies, contact Barbara Lust, graduate faculty representative, NG28 Van Rensselaer Hall (telephone: 607/255-0829).

### Courses

Courses from across the university that are relevant to the Cognitive Studies program are listed in this catalog under Arts and Sciences in the section "Special Programs and Interdisciplinary Studies."

## COMMON LEARNING COURSES

The objective of Common Learning courses is to enable students to acquire new knowledge about problems of significance to contemporary society and to examine these problems from a variety of intellectual perspectives. This dual objective implies challenging students to learn to define problems, gather relevant evidence, organize and interrelate materials, and present findings and conclusions both orally and in writing. The findings should include a systematic evaluation of alternative solutions, including assessment of their social and ethical implications. At every stage of the inquiry, course activities are expected to adhere to the canons of evidence and reason.

Common Learning courses are open only to juniors and seniors but will include students from a diversity of majors and a range of schools and colleges. Class size normally does not exceed twenty students. The limitation on class size and the diversity of students should encourage undergraduates with different training and interests to exchange knowledge with each other as well as with the professor responsible for the course. Courses are designed and taught by a single member of the faculty, although consultation with, and course participation by, colleagues in other disciplines are expected and encouraged. Titles of courses given to date are listed below. Some of these may be offered again in 1989–90 along with other new courses. For titles and descriptions of courses to be given in 1989–90, consult the office of the vice president for academic programs, 309 Day Hall.

### Courses

The Conflict between Science and Religion (History 448)
The Course of Science (Astronomy 315)
The Global City: People, Production, and Planning in Third World Metropolises (City and Regional Planning 377)
Health and Disease (German Literature 327, Biology and Society 327, and Psychology 387)
The Herodotean Moment: The Uses and Abuses of "Western Civilization" (History 454 and Government 454)
Human Development in Postindustrialized Societies (Human Development and Family Studies 485 and Psychology 485)
Income Distribution and Economic Justice (Economics 303)
The Power of Nationalism: Expressions of National Feelings in Politics, Music, and Literature (Russian Literature 390)
Rhythms: Their Significance in Biology, Psychology, Anthropology, Music, and Other Studies (Music 312)
Science and the Computer (Computer Science 405)
Science, Risk, and Public Policy (Engineering 400 and Economics 358)
Science, Technology, and the American Economy (Industrial and Labor Relations 451)
Signs and Communication (Comparative Literature 408 and Linguistics 408)
Teaching and Learning: Ideas of Education in the Western Tradition (Comparative Literature 387, Government 405, and Russian Literature 387)
Telling Lives: Narrative as a Basic Way of Representing Experience (English 475)
Work, Identity, and the Nature of American Community (Industrial and Labor Relations 683)

## CORNELL-IN-WASHINGTON PROGRAM

Cornell-in-Washington is a program of instruction, research, and externships in the nation's capital. The program is open to qualified juniors, seniors, and graduate students from all participating colleges, schools, and divisions of the university. Full academic credit can be earned for the semester. Programs are offered in public policy and architecture. Public policy students enroll in Government 500 (Human Development and Family Studies 404), which involves a major research study carried out in conjunction with an externship. Students may work as externs with congressional committee offices,

executive-branch agencies, interest groups, research institutions and other organizations involved in the political process and public policy. Students also select one or two other seminars from such fields as government, history, economics, human development and family studies, architectural history, natural resources, and sociology. A description of the architecture program may be found in the College of Architecture, Art, and Planning section. All seminars are taught by Cornell faculty and carry appropriate credit toward fulfillment of major, distribution, and other academic requirements.

A limited number of apartments may be rented at the Cornell Center 2148 O St., NW, Washington, D.C. 20037. All are fully furnished (except for dishes, linens, and bedding) and reasonably priced by Washington standards.

Further information concerning externships, courses, and other features of the program may be obtained from the Cornell-in-Washington office at 101 McGraw Hall (telephone: 255-4090) or by contacting the Cornell Center in Washington, 2148 O St., NW, Washington, D.C. 20037 (telephone: 202/466-2184).

## CENTER FOR ENVIRONMENTAL RESEARCH

Simon A. Levin, director, Corson Hall, 255-4617

The Center for Environmental Research is a campuswide center that promotes and coordinates a comprehensive program of interdisciplinary research, teaching, and outreach activities on environmental issues. CER's seven major programs are (1) the Ecosystems Research Center (ERC), an Environmental Protection Agency–designated center of excellence in ecosystems science; (2) the Cornell Laboratory for Environmental Applications of Remote Sensing (CLEARS), which conducts teaching, research, and outreach activities on remote sensing and resource inventory and analysis; (3) the Water Resources Institute, which conducts research and public service activities related to water quality and supply; (4) the Waste Management Institute and the New York State Solid Waste Combustion Institute, an independent entity located at Cornell's Waste Management Institute, which conduct research and outreach on waste-management issues; (5) the Environmental Policy Program, which addresses the policy aspects of issues such as biotechnology, hazardous waste management, and regulation of toxic substances; (6) the Global Environment Program, which conducts research on environmental problems at the global scale such as climate change, stratospheric ozone depletion, and trans-boundary air pollution; and (7) the Biological Resources Program, which coordinates and conducts research activities relevant to the conservation, regulation, and management of biological resources.

### Courses

Although CER does not engage in teaching, courses relevant to the programs are offered in appropriate departments: (1) ecosystems science through the Section of Ecology and Systematics and the Department of Natural Resources; (2) remote sensing through the departments of Environmental Engineering and Agronomy; (3) water resources primarily through the departments of Agricultural Engineering, Agronomy, and Environmental Engineering; (4) waste management primarily through the departments of Environmental Engineering, Agricultural Engineering, and Agricultural Economics; (5) environmental policy through Toxicology, Natural Resources, and City and Regional Planning; (6) and biological resources through the Division of Biological Sciences.

Material relevant to global environmental issues is covered by courses in several departments, including Environmental Engineering, Mechanical and Aerospace Engineering, Agricultural Engineering, Geology, Natural Resources, Rural Sociology, Agricultural Economics, and the Section of Ecology and Systematics.

Because courses relating to environmental policy are not indexed by that title, representative courses are listed below that should be of interest to those who would like to study environmental policy.

Religion, Ethics, and the Environment (Natural Resources 407)
Policy, Planning and Administration (Natural Resources 608)
Seminar in Environmental Values (Natural Resources 611)
Environmental Policy (Natural Resources 661)
Legal Aspects of Land-Use Planning (City and Regional Planning 653)
Land Resources Protection Law (City and Regional Planning 656)
Public Policy and Preservation Planning (City and Regional Planning 665)
Environmental Politics (City and Regional Planning 480)
Environmental Law, Policy, and Management (City and Regional Planning 686)
Environmental Ethics (Philosophy 246 and Biological Sciences 206)
Economic Analysis of Government (Civil and Environmental Engineering 322 and Economics 308)
Environmental Law I (Civil and Environmental Engineering 525 and Toxicology 625)
Risk Management of Toxic Chemicals (Biological Sciences 659)

## HISPANIC AMERICAN STUDIES PROGRAM

Vernon M. Briggs, acting director, 292 Caldwell Hall (telephone: 255-3197)

Irma Almirall-Padamsee, associate director

The Hispanic American Studies Program is an interdisciplinary academic program that focuses on the contributions, concerns, and welfare of those persons of Hispanic origin who reside in the United States. It includes support for historical, linguistic, literary, social, economic, and political studies of this diverse group of Americans. To this end the program objectives are (1) to expand the available course curriculum by providing both undergraduate and graduate courses pertaining to Hispanic American subject matters; (2) to enlarge the size of the Hispanic American faculty at Cornell through permanent appointments and visiting appointments; and (3) to enhance the Hispanic American academic environment on campus through support of such activities as lectures, conferences, seminars, exhibits, and research activities.

## PROGRAM IN THE HISTORY AND PHILOSOPHY OF SCIENCE AND TECHNOLOGY

L. Pearce Williams, director

The Program in the History and Philosophy of Science and Technology is an interdisciplinary academic unit dedicated to providing links between the sciences, engineering, and the humanities. It offers an undergraduate concentration and a graduate field program leading to both the M.A. and Ph.D. degrees. Faculty are drawn from diverse departments, disciplines, and colleges.

### Undergraduate Concentration

The basic aim of the concentration is to expose science students to the philosophical and historical foundations of their sciences and students of the humanities to the development of the sciences and their effects on the modern world. The history and philosophy of science and technology provide the meeting point of these two aims. Students concentrating in this area must complete the following courses or arrange with their adviser in the program a comparable set of courses.

1) History 281–282, Science in Western Civilization (Peter Dear, history), or History 287–288, History of Biology in Relation to Culture (Will Provine, history and biological sciences)
2) Philosophy 381, Philosophy of Science (Richard Boyd, philosophy)
3) Engineering 250, Technology in Western Society (Ronald Kline, electrical engineering), or History 433, From Squanto to Biotechnology: The History of the Agricultural Sciences (Margaret Rossiter, history)
4) One seminar or other advanced course drawn from the list on file in the program office

Students majoring in the humanities are strongly urged either to deepen their knowledge of science by taking a second course in the science they took to fulfill the science requirement, or to broaden their knowledge by taking a second introductory course in another science.

### Graduate Studies

Graduate students in the field are encouraged to work closely with scientists, engineers, and humanists. Although the Field of the History and Philosophy of Science and Technology has no specific course requirements, each student working toward the Ph.D. degree will be expected to show proficiency equivalent to

1) four graduate-level semester-long courses in the branch of science or engineering of prime importance to subsequent thesis work,
2) four semester-long courses in history, and
3) four semester-long courses in philosophy.

History and philosophy courses in various specialties are frequently offered by other departments in addition to those of history and philosophy.

## CENTER FOR INTERNATIONAL STUDIES

The Center for International Studies (CIS) was established in 1961 to encourage, coordinate, and support comparative and interdisciplinary research on international subjects. In a mutually dependent world, international problems require interdisciplinary collaboration, and the CIS coordinates and assists such collaborative efforts both on campus and in the field. Charged with the responsibility of furthering international and comparative research and teaching—involving efforts in almost every unit of the university—over the past three decades, the CIS has evolved into an administrative focus for more than twenty international programs.

The Center for International Studies at Cornell is one of the largest and most diverse in the United States. Currently it oversees five Title VI National Resource Centers (East Asia, Latin American Studies, South Asia, Southeast Asia, and Western Societies), as well as sixteen topical programs and the university study-abroad program. Over 300 faculty voluntarily collaborate in the center's programs and well over 300 graduate students are involved directly in its international programs. Undergraduate concentrations in International Relations and Modern European Societies serve 285 students.

Cornell is committed to the application and expansion of its resources to study the global community in all its complexity. These resources include a faculty of preeminent scholars and teachers, excellent research facilities, ability to teach forty-five languages, and a library system with more than 2,500,000 volumes on topics related to international and comparative studies.

As the world changes, Cornell's international programs change to study those developments. In addition to area studies, these programs focus on topics as varied and vital as international competitiveness, agriculture, nutrition, population, law, planning, politics, economics, and world peace. These areas and topics change as interest, demand, and potential warrant. As one program gains enough momentum and recognition to attract its own resources, the center applies its resources to another pilot activity that brings faculty and students together across customary professional and departmental boundaries.

In addition, CIS was recently given responsibility by the university to redesign and expand foreign study options for Cornellians, which has resulted in our Cornell Abroad Program. The center also encourages international research and travel by students through its annual Travel Grant Program.

Although the center has both an endowment and an appropriation from the university to support interdisciplinary international studies, Cornell monies are only a fraction of the total funds involved in international studies at Cornell. Programs seek funding from foundations, the federal government, alumni, and international agencies, a process that the center assists with as necessary. When particular programs are in a low budget cycle, rather than allowing them to lapse, the center continues to support those that show promise to keep the voluntary faculty groups operating together until new outside funding can be acquired.

For additional information on current programs, publications, and courses, contact

Director
Center for International Studies
Cornell University
170 Uris Hall
Ithaca, New York 14853-7601
USA 607/255-6370

### CIS Area Programs and Topical Studies Programs

**Center for International Studies**
Davydd J. Greenwood, Director
Gilbert Levine, Acting Director
John M. Kubiak, Executive Director
170 Uris Hall
(607) 255-6370

*Area Studies Programs*

**East Asia Program**
(Formerly China-Japan Program)
Karen Brasell, Director
J. Victor Koschmann, Acting Director
140 Uris Hall

**Committee on Soviet Studies**
Michael Scammell, Chair
194 Goldwin Smith Hall

**Latin American Studies Program**
Billie Jean Isbell, Director
190 Uris Hall

**South Asia Program**
Norman T. Uphoff, Director
170 Uris Hall

**Southeast Asia Program**
Benedict Anderson, Director
120 Uris Hall

**Western Societies Program**
Sander Gilman, Director
130 Uris Hall

**Institute for African Development**
David Lewis, Director
203 West Sibley Hall

*Topical Studies Programs*

**Program in Competitiveness**
Davydd J. Greenwood, Director
170 Uris Hall

**International Agriculture**
Walter Coward, Director
350 Caldwell Hall

**International Legal Studies**
Alfred C. Aman, Director
309 Myron Taylor Hall

**International Political Economy**
Peter Katzenstein, Director
B-7 McGraw Hall

**Population and Development Program**
J. Mayone Stycos, Director
372 Uris Hall

**International Studies in Planning**
Porus Olpadwala, Director
209 West Sibley Hall

**Peace Studies Program**
R. Ned Lebow, Director
180 Uris Hall

**Program in International Nutrition**
Michael Latham, Director
127 Savage Hall

**Program on Comparative Economic Development**
Gary Fields, Acting Director
486 Uris Hall

**Rural Development Committee**
Norman T. Uphoff, Chair
170E Uris Hall

**International Development and Women**
Lourdes Beneria, Director
332 Uris Hall

**Food and Nutrition Policy Program**
Per Pinstrup-Andersen, Director
305 Savage Hall

Current programs coordinated by the Center for International Studies include the following:

**Master of Professional Studies in International Development**
Norman Uphoff, Field Representative
170E Uris Hall

A program intended for midcareer practitioners is sponsored by the center and leads to a Master of Professional Studies in International Development. Interested individuals should apply through the Graduate School.

**Program on International Relations**
Peter Katzenstein
Walter S. Carpenter Professor of International Studies
160 Uris Hall

Undergraduates interested in an international relations concentration should see Professor Katzenstein.

## CENTER FOR APPLIED MATHEMATICS

The Center for Applied Mathematics administers a broadly based interdepartmental graduate program that provides opportunities for study and research over a wide range of the mathematical sciences. This program is based on a solid foundation in analysis, algebra, and methods of applied mathematics. The remainder of the graduate student's program is designed by the student and his or her Special Committee. For detailed information on opportunities for graduate study in applied mathematics, students should contact the director of the Center for Applied Mathematics, Sage Hall.

There is no special undergraduate degree program in applied mathematics Undergraduate students interested in an application-oriented program in mathematics may select an appropriate program in the Department of Mathematics, the Department of Computer Science, or some department of the College of Engineering.

Graduate students in the center take courses related to their program of study that are offered by various departments. Below are listed selected courses in applied mathematics in the main areas of research interest of the center's members. Detailed descriptions of these courses can be found in the listings of the individual departments (Abbreviations: Bio S = Biological Sciences, Chem E = Chemical Engineering, CS = Computer Science, EE = Electrical Engineering, M&AE = Mechanical

and Aerospace Engineering, OR&IE = Operations Research and Industrial Engineering, and T&AM = Theoretical and Applied Mechanics.)

## Selected Applied Mathematics Courses

### Basic Graduate Courses in Applied Mathematics (and Analysis)

Math 413–414 Introduction to Analysis
Math 433–434 Introduction to Algebra
Math 511–512 Real and Complex Analysis
Math 521 Measure Theory and Lebesgue Integration
Math 522 Applied Functional Analysis
Math 531–532 Algebra
Math 551 Introductory Algebraic Topology
Math 515–516 Mathematical Methods in Physics
T&AM 612–613 Methods of Applied Mathematics

### Analysis (and Differential Equations)

Math 517–518 (also Math 427) Ordinary Differential Equations
Math 519–520 (also Math 428) Partial Differential Equations
Math 552 Differentiable Manifolds
Math 611–612 Seminar in Analysis
Math 613 Functional Analysis
Math 615 Fourier Analysis
Math 622 Riemann Surfaces
Math 623 Several Complex Variables
Math 627–628 Seminar in Partial Differential Equations

### Logic and Theory of Computing

CS 682 Theory of Computing
CS 715 Seminar in Programming Refinement Logics
Math 581 Logic
Math 681–682 Seminar in Logic
Math 683 Model Theory
Math 684 Recursion Theory
Math 685 Metamathematics
Math 687 Set Theory
Math 688 Topics in Applied Logic

### Discrete and Numerical Mathematics

CS 621 Matrix Computations
CS 622 Numerical Optimization and Nonlinear Algebraic Equations
CS 681 Analysis of Algorithms
CS 721–722 Advanced Topics in Numerical Analysis
CS 729 Seminar in Numerical Analysis
Math 425 Numerical Solution of Differential Equations
Math 627–628 Seminar in Partial Differential Equations
Math 655 (also CS 655) Mathematical Foundations for Computer Modeling and Simulation
OR&IE 627 Dynamic Programming
OR&IE 630–631 Mathematical Programming I and II
OR&IE 632 Nonlinear Programming
OR&IE 633 Graph Theory and Network Flows
OR&IE 634 Combinatorial Optimization
OR&IE 636 Integer Programming
OR&IE 639 Convex Analysis

### Information Communication and Control Theory

EE 411 Random Signals in Communications and Signal Processing
EE 425 Digital Signal Processing
EE 468 Communication Theory
EE 521 Theory of Linear Systems
EE 522 Theory of Nonlinear Systems
EE 526 Advanced Signal Processing
EE 561 Error Control Codes
EE 562 Fundamental Information Theory
EE 567 Digital Communication
EE 573 Estimation and Control in Discrete Linear Systems
EE 574 Optimal Control and Estimation for Continuous Systems

### Mathematical Biology

Bio S 662 Mathematical Ecology

### Mathematical Economics

Econ 519 Econometrics I
Econ 520 Econometrics II
Econ 610 Stochastic Economics: Concepts and Techniques
Econ 617–618 Mathematical Economics
Econ 619–620 Advanced Topics in Econometrics

### Mechanics and Dynamics

Chem E 731 Advanced Fluid Mechanics and Heat Transfer
Chem E 734 Fluid Mechanics in Suspensions
Chem E 751 Mathematical Methods of Chemical Engineering Analysis
Chem E 753 Analysis of Nonlinear Engineering Systems: Stability, Bifurcation, and Continuation
EE 681 (also A&EP 761 ) Kinetic Theory
M&AE 601 Foundations of Fluid Dynamics and Aerodynamics
M&AE 602 Incompressible Aerodynamics
M&AE 603 Compressible Aerodynamics
M&AE 704 Viscous Flows
M&AE 732 Analysis of Turbulent Flows
M&AE 733 Stability of Fluid Flow
M&AE 734 Turbulence and Turbulent Flow
M&AE 736 Computational Aerodynamics
M&AE 737 Computational Fluid Mechanics and Heat Transfer
T&AM 570 Intermediate Dynamics
T&AM 671 Advanced Dynamics
T&AM 672 Celestial Mechanics (also Astro 579)
T&AM 673 Mechanics of the Solar System (also Astro 571)
T&AM 675 Nonlinear Vibrations
T&AM 751 Continuum Mechanics and Thermodynamics
T&AM 752 Nonlinear Elasticity
T&AM 776 Qualitative Theory of Dynamical Systems

### Probability and Statistics

EE 562 Fundamental Information Theory
EE 563 Communication Networks
EE 564 Decision Making and Estimation
EE 566 Queuing Networks
EE 664 Foundations of Inference and Decision Making
Math 571–572 Probability Theory
Math 573 Experimental Design and Multivariate Analysis
Math 574 Probability and Statistics
Math 575 Sequential Analysis, Multiple Decision Problems
Math 577 Nonparametric Statistics
Math 670 Topics in Statistics
Math 674 Multivariate Analysis
Math 675 Statistical Decision Theory
Math 677–678 Stochastic Processes
OR&IE 660 Applied Probability
OR&IE 661 Applied Stochastic Processes
OR&IE 670 Statistical Principles
OR&IE 671 Intermediate Applied Statistics
OR&IE 674 Design of Experiments
OR&IE 675 Statistical Analysis of Discrete Data
OR&IE 676 Statistical Analysis of Life Data

### Theoretical/Mathematical Physics/Chemistry

Chem 792 Molecular Collision Theory
Phys 553–554 (Astro 509-510) General Relativity
Phys 572 Quantum Mechanics I
Phys 574 Quantum Mechanics II
Phys 561 Classical Electrodynamics
Phys 562 (Chem 796) Statistical Mechanics
Phys 563 Statistical Physics
Phys 651 Advanced Quantum Mechanics
Phys 652 Quantum Field Theory

# PROGRAM ON SCIENCE, TECHNOLOGY, AND SOCIETY

Sheila Jasanoff, director
632 Clark Hall, 255-3810

The Program on Science, Technology, and Society (STS) is an academic unit that engages in teaching and research concerning the interaction of science and technology with social and political institutions. The program's activities can be divided into four areas: social relations of science and technology; science, technology, and public policy; ethics and values in science and technology; and biology and society. The core faculty of STS is drawn from the social sciences, the humanities, law, biological sciences, and engineering. In cooperation with faculty in other Cornell departments and centers, the STS Program administers two undergraduate curricular offerings: a concentration in Science, Technology, and Society and a major in Biology and Society. The program does not currently enroll students for advanced degrees. However, advanced degree candidates enrolled in established graduate programs at Cornell may work with STS faculty on the interrelations of science, technology, and society.

## Graduate Studies

STS does not enroll students for advanced degrees. Rather, the program cooperates with departments in the various colleges to facilitate teaching and research on STS issues. Faculty members affiliated with the STS program are also members of graduate fields of study such as city and regional planning, ecology, engineering, government, philosophy, sociology, and environmental toxicology. It is possible to undertake research and course work in the area of science, technology, and society in one of the aforementioned fields, as well as in others. A minor concentration in science and technology policy is available in the graduate minor field of public policy and in the Master of Professional Studies (International Development) degree. It is also possible to select a public policy concentration in the environmental toxicology minor. Further information about these graduate programs may be obtained by contacting the Graduate School.

## Undergraduate Studies

Information concerning the STS program, including a list of STS-related courses offered throughout the university and information concerning individual courses of study, may be obtained from the STS program office, 632

Clark Hall (telephone: 255-3810), or the Biology and Society office, 275 Clark Hall (telephone: 255-6042).

## Science, Technology, and Society Concentration

Sheila Jasanoff, director; Walter R. Lynn, Civil and Environmental Engineering; June Fessenden MacDonald, Biochemistry; Dorothy Nelkin, Sociology; Alison Power, Ecology and Systematics; Milton Wachsberg, Philosophy.

The undergraduate concentration in Science, Technology, and Society (STS) is designed for students who wish to engage in a systematic, interdisciplinary exploration of the role of science and technology in modern societies. The concentration is intended for students with varied academic interests and career goals. It offers majors in the natural sciences and engineering an opportunity to explore the social, political, and ethical implications of their selected fields of specialization. At the same time, it offers students majoring in the humanities and social sciences a chance to study the processes, products, and impacts of science and technology from varied disciplinary perspectives. Drawing on course offerings in several departments, programs, and colleges, the STS concentration permits students to develop an individualized program of study closely related to their major field. STS courses are organized under four major headings: social relations of science and technology; science, technology, and public policy; ethics and values in science and technology; and biology, medicine, and society.

To satisfy the requirements for the STS concentration, students must complete a minimum of four courses selected from the following list. At least one course should be chosen from the list of core courses. The remaining three courses should be chosen in consultation with an STS faculty adviser and must be drawn from at least two of the areas described below.

Interested students may obtain further information about advisers and courses by contacting the STS main office, 632 Clark Hall, 255-3810.

### STS Core Courses

Govt 407 Law, Science, and Public Values
Hist 281–282 Science in Western Civilization
Hist 380 Social History of Western Technology
Soc 355 Social and Political Studies of Science
Soc 515 The Politics of Technical Decisions

### Social Relations of Science and Technology

BioSci 202 History of Biology
Comm 360 Science Writing for Public Information
Comm 626 Impact of Communication Technologies
Engr 101 The Computer Age
Engr 250 Technology in Western Society
Engr 292 The Electrical and Electronic Revolutions
Hist 287 Evolution
Hist 686 Historiography of Science and Technology
Hist 481 History of Modern Physics
ILR 626 Science and Innovation in Industry
Nat Res 331 Beyond the Year 2000
Physics 206 War and Peace in a Nuclear Age
Psych 277 Psychology of Sex Roles
Rur Soc 208 Appropriate Social Technologies
Rur Soc 324 Environment and Society

### Science, Technology, and Public Policy

Bio&Sci 406 Senior Seminar: Biotechnology and Law
Bio&Sci 426 Medicine and the Law
CEE 598 Decision Making in Engineering Systems
Econ 302 The Impact and Control of Technological Change
Engr 400 Science, Risk, and Public Policy
Govt 381 The Politics of Defense Spending
ILR 374 Technology and the Worker

### Ethics and Values in Science and Technology

Biochem 751 Professional Responsibilities of Toxicologists
BioSci 205 Ethics and Medicine
BioSci 206 Environmental Ethics
Engr 360 Ethical Issues in Engineering
HSS 600.7 Professional Ethics and Public Policy
NatRes 407 Religion, Ethics, and the Environment
Phil 381 Philosophy of Science: Knowledge and Objectivity

### Biology, Medicine, and Society

Bio&Soc 232 Recombinant DNA Technology and Its Applications
BioSci 301 Biology and Society: The Biocultural Perspective
BioSci 469 Food, Agriculture, and Society
Bio&Soc 386 Culture and Human Disease
Entomol 370 Pesticides and the Environment
Gen&Dev 482 Human Genetics and Society
NatRes 401 Environmental and Natural Resources Policies
Psych 387 Health and Diseases

## Biology and Society Major

The Biology and Society major is designed for students who desire strong training in biology and who also wish to acquire a background in the social, political, and ethical dimensions of the biological sciences. Many of the most critical problems of our time—food and population, genetic engineering and new medical technologies, drug abuse and testing for drugs, the AIDS epidemic, and environmental degradation—are innately biological or have an irreducible biological component. At the same time, each is inherently a social concern whose resolution involves complex relations between biological and sociocultural forces. The Biology and Society major is intended to provide students the technical knowledge and analytical skills they need to systematically address these and many other social-biological issues.

The undergraduate curriculum in biology and society is a major in the College of Arts and Sciences and in the College of Human Ecology. It is also offered as an optional curriculum for undergraduates entering the General Studies Program of the New York State College of Agriculture and Life Sciences. Information and application materials may be obtained from the Biology and Society office, 275 Clark Hall (255-6042).

## Biology and Society Courses

### Freshman Writing Seminars

In the Company of Animals (Biology and Society 103)
Ecosystems and Ego Systems (Biology and Society 104)
Living on the Land (Biology and Society 108)
Women and Nature (Biology and Society 109 and English 106.5)
Writing as a Naturalist (Biology and Society 113 and English 113)
The American Way (Biology and Society 115)

### Foundation Courses

Ethics and Health Care (Biology and Society 205, Biological Sciences 205, and Philosophy 245)
Ethics and the Environment (Biology and Society 206, Biological Sciences 206, and Philosophy 246)
History of Biology (Biology and Society 288, History 288, and Biological Sciences 202)

### Core Courses

Science and Human Nature (Philosophy 286)
Biology and Society I: The Biocultural Perspective (Biology and Society 301, Biological Sciences 301, and Anthropology 301)

### Issues

Recombinant DNA Technology and Its Applications (Biology and Society 232 and Biological Sciences 232)
Medicine and Civilization (Biology and Society 322)
Human Growth and Development: Biological and Social Psychological Considerations (Biology and Society 347, Human Development and Family Studies 347, and Nutritional Sciences 347)
Law, Science, and Public Values (Biology and Society 407 and Government 407)
Food, Agriculture, and Society (Biology and Society 469 and Biological Sciences 469)
Medicine and the Law (Biology and Society 426)
Undergraduate Seminar in Biology and Society (Biology and Society 400)
The Politics of Technical Decisions I (Biology and Society 415, Sociology 515, City and Regional Planning 541, and Government 628)

### Senior Seminars

Human Fertility in Developing Nations (Biology and Society 404 and Rural Sociology 408)
Biotechnology and Law (Biology and Society 406)
Population Policies (Biology and Society 414 and Rural Sociology 418)
Medical Service Issues in Health Administration (Biology and Society 428 and Human Service Studies 628)
Social and Political Studies of Science (Biology and Society 442, Sociology 355, and City and Regional Planning 442)
Biotechnology: Bench to Bedside (Biology and Society 433 and Biological Sciences 433)
Biotechnology Transfer and Agriculture (Biology and Society 434 and Biological Sciences 434)
AIDS and Society (Biology and Society 451)
Risk Management of Toxic Chemicals (Biology and Society 459 and Toxicology 659)
Environmental Policy (Biology and Society 461 and Biological Sciences 661)
Human Development in Postindustrialized Societies (Biology and Society 485 and Human Development and Family Studies 485)

**Other Biology and Society Courses**

Biology and Society: Preparation for Research (Biology and Society 300)
Independent Study (Biology and Society 375)
Honors Project (Biology and Society 499)

**Other Courses by STS Faculty**

The Politics of Technical Decisions II (Sociology 516, City and Regional Planning 542 and Government 629)
Professional Practice (Civil and Environmental Engineering 503)
Professional Responsibilities of Toxicologists (Toxicology 751 and Biological Sciences 751)
Biotechnology Transfer: Professional Issues and Social Concerns (Biological Sciences 755)

## CENTER FOR STATISTICS

The Cornell Center for Statistics coordinates universitywide activities in statistics and probability at the graduate and research level. Students interested in graduate study in probability and statistics can apply to the Field of Statistics or to one of the other graduate fields of study that offer related course work.

Students in the Field of Statistics plan their graduate program with the assistance of their Special Committee. For detailed information on opportunities for graduate study in statistics and probability, students should contact the director of the Statistics Center, 250A Caldwell Hall.

Graduate students can design many different programs within the Field of Statistics. These can be broadly grouped as follows: biometry, biostatistics, economic and social statistics, operations research, probability theory, sampling theory, statistical computing, statistical design, statistical theory, and stochastic processes and their applications.

Below are listed selected courses in probability and statistics of interest to graduate students in the field.

**Economics**

519 Econometrics I
520 Econometrics II
619 Topics in Econometrics I
620 Topics in Econometrics II

**Electrical Engineering**

467 Communication Systems I
561 Error Control Codes
562 Fundamental Information Theory
563 Communication Networks
564 Decision Making and Estimation
566 Queuing Networks
568 Communication Systems II
663 Advanced Topics in Information Theory
664 Foundations of Probability

**Industrial and Labor Relations**

310 Design of Sample Surveys
312 Applied Regression Methods
410 Techniques of Multivariate Analysis
411 Statistical Analysis of Qualitative Data
510–511 Introductory Statistics for the Social Sciences
610 Seminar in Modern Data Analysis
711 Sensitivity Analysis in Linear Regression
712 Theory of Sampling
713 Empirical Processes with a Statistical Application

**Mathematics**

471 Basic Probability
472 Statistics
571–572 Probability Theory
574 Mathematical Statistics
575 Sequential Analysis, Multiple Decision Problems
577 Nonparametric Statistics
670 Topics in Statistics
674 Multivariate Analysis
675 Statistical Decision Theory
677–678 Stochastic Processes

**Operations Research**

561 Queuing Theory and Its Application
562 Inventory Theory
563 Applied Time Series Analysis
565 Statistics for Manufacturing
570 Statistical Methods in Quality and Reliability Control
580 Digital Systems Simulation
630–631 Mathematical Programming I and II
632 Nonlinear Programming
637 Dynamic Programming
645 Game Theory I
652 Advanced Inventory Control
660 Applied Probability
661 Applied Stochastic Processes
662 Advanced Stochastic Processes
663 Time-Series Analysis
664 Deterministic and Stochastic Control
665 Advanced Queuing Theory
670 Applied Statistics
671 Intermediate Applied Statistics
672 Statistical Decision Theory
673 Nonparametric Statistical Analysis
674 Design of Experiments
675 Statistical Analysis of Qualitative Data
676 Statistical Analysis of Life Data
677 Statistical Selection and Ranking Procedures
680 Simulation

**Statistics and Biometry**

408 Theory of Probability
409 Theory of Statistics
417 Matrix Algebra
601–603 Statistical Methods I, II, and III
605 Applied Regression Analysis
606 Sampling Biological Populations
607 Nonparametric and Distribution-Free Statistical Methods
662 Mathematical Ecology
699 Special Problems in Statistics and Biometry
701 Advanced Biometry
717 Linear Models
718 Variance Components
797 Statistical Consulting

## PROGRAM IN COMPARATIVE AND ENVIRONMENTAL TOXICOLOGY

J. W. Gillett, director, 16 Fernow Hall, 255-8008 or 255-2163

The Cornell Program in Comparative and Environmental Toxicology is coordinated and facilitated by the Institute for Comparative and Environmental Toxicology (ICET). ICET serves as a focal point for all research, teaching, and cooperative extension activities in the broad interdisciplinary area of environmental toxicology at Cornell and encourages the development of collaborative programs between faculty members in many university departments.

### Graduate Studies

The major in the graduate Field of Environmental Toxicology promotes training leading to the M.S. or Ph.D. degrees and provides both breadth and depth in environmental toxicology and related disciplines. The program offers a combination of research and didactic training that is designed to prepare students for solving the problems of modern toxicology. Specialization tracks include cellular and biochemical toxicology; nutritional toxicology; ecotoxicology and environmental chemistry; and risk assessment, management, and public policy. Research of the faculty associated with the program is focused on the interactions of drugs, pesticides, and other potentially hazardous environmental agents with a wide variety of living organisms (including humans) and with the ecosystems with which these organisms are associated.

### Courses

Courses in environmental toxicology are cosponsored by the university academic departments and are open to all graduate students and to those undergraduates who have permission of the instructor. The titles and numbers of these courses are listed below, and details of course content are provided elsewhere in the catalog under the listings of the cosponsoring department. Further information concerning the program and the development of new courses may be obtained through the graduate faculty representative, 16 Fernow Hall (telephone: 255-8008).

*Note:* Bracketed courses are not offered 1989–90.

[Tox 370 Pesticides and the Environment (Entomology 370)]
Tox 419 Animal Cytogenetics (Animal Science 419)
Tox 438 Cell Proliferation and Oncogenic Viruses (Biological Sciences 438)
Tox 528 Pharmacology (Veterinary Medicine 528)
Tox 607 Ecotoxicology (Natural Resources 607)
Tox 610 Introductory Chemical and Environmental Toxicology (Food Science 610)
Tox 611 Molecular Toxicology (Nutritional Sciences 611)
Tox 621 Clinical Veterinary Toxicology (Veterinary Medicine 621 )
Tox 626 Environmental Law II (Civil and Environmental Engineering 526)
Tox 627 Regulation of Toxic Substances (Civil and Environmental Engineering 527)
Tox 640 Principles of Toxicological Pathology (Veterinary Medicine 640)
Tox 651 Nutrition and the Chemical Environment (Nutritional Sciences 651 )
[Tox 659 Risk Management of Toxic Chemicals (Biological Sciences 659 and Biology and Society 459)]
[Tox 690 Insect Toxicology and Insecticidal Chemistry (Entomology 690)]
Tox 698 Current Topics in Environmental Toxicology (Nutritional Sciences 700, NatRes 698, Ag & Bio Eng 698)
Tox 702 Seminar in Toxicology (Nutritional Sciences 702)
Tox 751 Professional Responsibilities of Toxicologists (Biological Sciences 751)

Tox 899 Master's Thesis and Research
Tox 999 Doctoral Thesis and Research

## VISUAL STUDIES

Robert Ascher, Department of Anthropology, and Marilyn Rivchin, Department of Theatre Arts, advisers

Visual Studies as a distinct area of intellectual activity comprehends the analysis of visual forms, especially symbolic visual forms, from a range of historical, scientific, sociological, and aesthetic points of view. Images can be analyzed within a variety of contexts and by means of a variety of methods, and their study is therefore ideally conceived of in transdisciplinary terms. And since the creation of images has an important bearing on their analysis, visual studies concerns itself with practice as well as theory.

In addition to the courses listed below, which represent only a sampling of formal curricular offerings pertinent to visual studies, interested students should be aware of the programs and facilities available in the Herbert F. Johnson Museum of Art and the ETV Center of the College of Human Ecology, as well as the frequent showings by Cornell Cinema and Pentangle II.

### Courses

Some of these courses may not be taught in 1989–90. For information about availability consult the appropriate departmental listings.

Asian American Images in Film (Asian Studies 435)
Black Communication Media and Film Workshop (Africana Studies 303)
Cinema to Literature (Italian 399)
Color, Form, Space (Art 110)
Computer Graphics (Architecture 334 and Computer Science 417)
Dance, Theatre and Film of the 1960s (Theatre Arts 400)
Design I and II (Design and Environmental Analysis 101–102)
Documenting the Depression: Film, Literature, and Memory (History 476)
Ethnographic Film (Anthropology 205)
Fiction and Film in France (French 499)
Film and Performance (Theatre Arts 311 )
Freshman Seminar in Visual Analysis (History of Art 103)
Fundamentals of 16-mm Filmmaking (Theatre Arts 377)
History and Theory of Commercial Narrative Film (Theatre Arts 311)
The History of the Book (English 450)
How to Look at Works of Art (History of Art 104)
Image Analysis I (Landforms) and II (Physical Environments) (Civil and Environmental Engineering 613–614)
Impact of Communication Technologies (Communication 626 [643])
Introduction to Film Analysis: Meaning and Value (Theatre Arts 374)
Introduction to Mass Media (Communication 120)
Introductory Photo I (Art 161–162 and Architecture 251)
The Japanese Film (Asian Studies 313)
Literature to Cinema (Italian 390)
Looking at Dance (Theatre Arts 150)
The Medieval Illuminated Book (History of Art 337)
Modern Experimental Optics (Physics 330)
Myth onto Film (Anthropology 653 and Theatre Arts 653)
New German Cinema (German 676)
Perception (Psychology 205)
Photo Communication (Communication 234)
Philosophical Problems of Classical Film (Theatre Arts 476)
Psychology of Visual Communication (Psychology 347)
Public Aesthetics: Art, Video, and Spectacle in the Age of Technology (English 453)
Russian Film of the 1920s and French Film of the 1960s (Theatre Arts 378)
Seminar in Museum Issues (History of Art 407)
Seminar on Ethnographic Film (Anthropology 430)
Spanish Film (Spanish 399)
Theorizing Film: Image—Narration—Psychoanalysis (French 695)
Theory of Design (Design and Environmental Analysis III)
Topics in Recent Film Theory (Theatre Arts 654)
Video Communication (Communication 348)
Vision (Genetics and Development 395)
Visual Anthropology (Anthropology 453)
Visual Communication (Communication 230)
Visual Ideology (German 660 and Theatre Arts 660)
Visual Perception (Psychology 305)
Writing about Film (Theatre Arts 108 and English 108)

## SHOALS MARINE LABORATORY

John B. Heiser, director
G14 Stimson Hall, 255-3717

Seventy-two percent of the earth's surface is covered by the sea; knowledge of the sea is of paramount importance in understanding global environmental phenomena and change. The objective of the Shoals Marine laboratory (SML) is to provide undergraduates, beginning graduate students, and other interested adults a unique opportunity to explore marine sciences in an island setting noted for its biota, geology, and history. SML has established a national reputation for excellence and has become North America's largest marine field station focusing on undergraduate education.

The summer population of Appledore Island is limited to about one hundred people at any one time. Participants and faculty members can literally and figuratively immerse themselves in their explorations, free from distractions common to most academic institutions. Because SML is a residential facility, a sense of community develops that makes courses and seminars at SML outstanding educational and intellectual experiences. Participants learn from and exchange ideas with a wide range of specialists whose primary interests are marine but whose perspectives often differ, providing fertile ground for lively discussions.

Credit courses at Shoals Marine Laboratory are full-time, intensive learning experiences. Courses may be taken sequentially, but not concurrently. A typical day combines lecture sessions, laboratory and field work, field trips to nearby islands and the mainland, and collecting and research excursions aboard the laboratory's 47-foot research vessel, *John M. Kingsbury*. Field experience is an integral component of all courses, using Appledore's extensive intertidal zone, wading bird rookeries, and seabird colonies. Faculty, drawn from Cornell University, the University of New Hampshire, and other leading academic institutions, are selected not only based on their academic excellence, but also based on their teaching ability in the field. In addition, numerous guest lecturers include engineers, coastal planners, lobstermen, fishermen, and specialists from private industry, government, and the academic community.

Refer to "Courses in Marine Science," under the Division of Biological Sciences, for course descriptions. For more information, contact the Cornell Marine Programs Office, G14 Stimson Hall (607) 255–3717.

### Courses

BioSci 204 Biological Illustration
BioSci 306 Marine Microbial Ecology
BioSci 328 Bioclimatology: A Field Introduction
BioSci 329 The Ecology of Animal Behavior
BioSci 364 Field Marine Science
BioSci 365 Underwater Research
BioSci 413 Adaptations of Marine Organisms
BioSci 417 Marine Biology for Teachers
BioSci 449 Marine Botany: The Ecology of Marine Plants
BioSci 468 Marine Plankton Ecology
BioSci 477 Marine Vertebrates
BioSci 489 Ciliophorology
AgEng 420 Marine Pollution
Archae 300 Archaeology of Maritime Communities
Archae 319 Archaeology Underwater
GeoSci 213 Marine and Coastal Geology
NatRes 306 Coastal and Oceanic Law and Policy
NatRes 417 Wetlands Resources
and various non-credit courses

## JOHN S. KNIGHT WRITING PROGRAM

The John S. Knight Writing Program helps to coordinate the teaching of writing for undergraduates in six of the university's schools and colleges (the School of Industrial and Labor Relations and the colleges of Agriculture and Life Sciences; Architecture, Art, and Planning; Arts and Sciences; Engineering; and Human Ecology). The program administers writing seminars for freshmen and upperclass students, tutorial writing classes, and seminars in the teaching of writing. More than twenty-five academic departments participate in the program.

### Advanced Writing Seminars

For upperclass students the program offers three upper-division writing courses, Writing in the Humanities, Writing for Readers/Reading for Writers, and Writing in the Social Sciences. These courses help students write with more confidence and skill in all disciplines while provoking inquiry about the methods and aims of study common to many of them. They may be taken as electives or to fulfill distribution or certain writing requirements.

## Freshman Writing Seminars

For freshmen the program offers the freshman writing seminars—more than 125 different courses in the humanities, social sciences, expressive arts, or sciences. Freshman writing seminars help students write good English prose—prose that, at its best, is characterized by clarity, coherence, intellectual force, and stylistic control. These seminars teach writing within a field while offering freshmen the opportunity to participate in a small seminar. Although they differ widely in content, all seminars adhere to the following guidelines:

1) at least thirty pages of assigned writing
2) at least eight—and, at most, about fourteen—written assignments
3) opportunities for serious revision, not mere editing, of essays (at least some of these revising assignments may satisfy 1 and 2 above)
4) ample classroom time spent on work directly related to writing
5) reading assignments small enough—about one hundred pages a week at most—to permit regular, concentrated work on writing
6) individual conferences

Offerings change from semester to semester. Each term's freshman writing seminars are described in a brochure available from college registrars.

To ensure that students will enjoy the benefits of small writing classes, no freshman writing seminar may comprise more than seventeen students. Instead of pre-enrolling in their writing courses, students request placement in one of five writing seminars by filling out ballots available from their college registrars. Most students receive one of their highest choices. Students may change their writing seminars at the university course exchange or during the add/drop sessions held at the beginning of each semester.

The colleges and the school served by the program accept freshman writing seminars in fulfillment of their individual graduation requirements in categories referred to variously as "freshman writing," "oral and written expression," and the like. The program does not decide whether students may graduate: it makes courses available. Individual colleges and schools administer their own graduation requirements.

Currently most undergraduate students are required to take two freshman writing seminars. Architecture students, however, need only one. Hotel students fulfill their requirement through Hotel Administration 165, which should be taken with Hotel Administration 265 during the first two semesters at Cornell. Agriculture and life sciences students can take freshman writing seminars or choose from among a variety of other courses to fulfill their requirement.

All students who score "4" or "5" on the Princeton Advanced Placement Examination in English receive three credits. Such credits are awarded automatically; no application to the John S. Knight Writing Program or the Department of English is necessary. How these credits may be applied to freshman writing or other distribution requirements depends on the student's college and score. All students who score "5," except architecture and fine arts students, may apply their three credits towards the writing requirements of their college. Of students who score "4," only agriculture and life science students and industrial and labor relations students may apply their three credits toward the writing requirements of their college. *Students should always consult their college registrars to be certain that they understand their writing requirements.*

Students who score "4" or "5" on the Princeton exam, or "700" or better on the English Composition or CEEB tests, may enroll, space permitting, in the following upper-level freshman writing seminars: English 270, 271, 272, and 276.

Although there are no exemptions from college writing requirements, some students may fulfill all or part of their college's writing requirement through transfer credits or writing-course substitutions.

For work done at other institutions to be accepted as equivalent to freshman writing seminars, students should demonstrate that they have done a reasonably equivalent amount of writing in a formal course. (It is not sufficient to write, for example, one thirty-page term paper.) Students in the College of Engineering and the College of Arts and Sciences must file an "application for transfer evaluation" to request writing credit for such courses; students in other colleges should consult their college registrars.

In unusual situations the program recommends that courses taken at Cornell other than freshman writing seminars fulfill the various freshman writing requirements. Upper-division students may also take a writing course other than a freshman writing seminar and petition to have it satisfy part of the requirement. The program advises students about these courses on request. Students must file the "proposal for course substitution" in advance to request writing credit for such courses.

Although Cornell "summer writing program" seminars may fulfill college writing requirements, they do not automatically count toward those requirements. Students who have taken these courses must ask their college registrars to assign the credits in the appropriate categories.

The acting director of the John S. Knight Writing Program is Katherine K. Gottschalk, senior lecturer in English. The program's offices are in 159 Goldwin Smith Hall (telephone: 255-4061).

## Teaching Writing

Each summer and fall, the program offers instruction in the teaching of writing to new staff members in the freshman writing seminars and other interested instructors. Teaching Writing I, offered in conjunction with an apprenticeship in the summer school, is primarily a course for graduate students; the same course is offered alone in the fall as Teaching Writing II. The program also sponsors a summer seminar for faculty members interested in the teaching of writing.

## Writing Workshop

The John S. Knight Writing Program offers Workshops in English Composition for freshmen (or transfer students needing writing credit) through the Writing Workshop. These tutorials in English composition are designed for students who have had little training in composition or who have serious difficulty with writing assignments.

Writing 137 and 138 are graded S-U only, and students receiving a grade of S are normally granted credit toward their college writing requirements. Students who think this course might be appropriate, including non-native speakers of English scoring less than 600 on the Test of English as a Foreign Language (TOEFL), should attend the assessment sessions offered by the Writing Workshop during orientation week each fall. The workshop also offers a walk-in service (see below) to help students with problems in essay writing. The director is Nancy Kaplan, senior lecturer in English; the acting director for the 1989–90 academic year is Joseph Martin. The workshop offices are in 174 Rockefeller Hall (telephone: 255-6349).

## The Walk-In Service

The Walk-In Service, a unit of the Writing Workshop, offers tutoring assistance in writing to any student who needs help with a writing project. The Walk-In Service has tutors available during the academic year in 174 Rockefeller, 340 Goldwin Smith, and north- and west-campus residential areas. The director is Joseph Martin. For information contact the Writing Workshop, 174 Rockefeller Hall, 255–6349.

## The Macintosh Center

The Macintosh Center, housing twenty microcomputers, is a facility supported by the John S. Knight Writing Program for students enrolled in writing courses. The center offers introductory classes on the Macintosh and works closely with many writing instructors to help students learn how to use word processing as an effective writing tool. The coordinator is William Fleischmann; the center is in 340 Goldwin Smith Hall (telephone: 255–8453).

# Advanced Placement of Freshmen

The final decision for awarding advanced placement credit at Cornell rests with each individual college. The appropriate department of instruction within the university sets the standards of achievement that must be met for advanced placement and recommends AP credit for those who meet the standards. This recommendation is almost always based on some examination score. For policies governing advanced placement in a specific college, see the academic information section of that college. Students need not accept advanced placement. They may repeat the course, thereby relinquishing the advanced placement credit.

The Advanced Placement (AP) Program of the College Entrance Examination Board (CEEB) is the best known and most generally used of the programs that provide students with an opportunity to document participation in a college-level curriculum at the secondary level.

**Advanced placement examinations.** Examinations sponsored by the Advanced Placement Program of the College Entrance Examination Board are considered. Entering freshmen should have their scores sent to their college or school office (see the list at the end of this section). Placement and credit on the basis of these examinations will usually be determined during the summer, and students will be notified before course scheduling.

**Departmental advanced standing examinations.** In certain subjects, students may also qualify for advanced placement or credit, or both, on the basis of departmental examinations given on campus during orientation week. A schedule of these examinations will appear in the orientation booklet that will be mailed to entering students in late summer. The departments that award advanced placement and credit on the basis of CEEB Advanced Placement Examinations or departmental examinations are shown below.

**Transfer of credit.** Entering freshmen who have completed college courses for which they want to receive credit toward their Cornell degree should send transcripts and course descriptions to their college or school office (see the list at the end of this section). The award of credit or placement for such courses is determined by the appropriate departments according to individual school and college guidelines. Because policy for using advanced placement credit varies according to each college's or school's professional and academic goals, students should consult their college or school office to determine how they may use such credit.

**Foreign credentials.** Information regarding Cornell's advanced standing policy for foreign credentials may be obtained by contacting the Associate Director of International Admissions, Cornell University, 410 Thurston Avenue, Ithaca, New York 14850-2488, U.S.A. Students holding foreign credentials who feel they may be eligible for advanced standing consideration should contact the International Students and Scholars Office before enrollment for clarification of the advanced standing policy.

**Written inquiries.** Many department, school, and college offices encourage students to contact them with any questions they may have. Addresses given in the following sections may be completed by adding Ithaca, New York 14853.

**Forwarding of scores and transcripts.** Entering freshmen should have their advanced placement test scores sent to their school or college office.

*College of Agriculture and Life Sciences*
M. B. Mullenhoff
192 Roberts Hall

*College of Architecture, Art, and Planning*
Donna Kuhar
B2 West Sibley

*College of Arts and Sciences*
Michele T. Crane
M46 Goldwin Smith Hall

*College of Engineering*
Richard K. Mosher
170 Olin Hall

*School of Hotel Administration*
Mary Milks
138 Statler Hall

*College of Human Ecology*
Joyce H. McAllister
146 Van Rensselaer Hall

*School of Industrial and Labor Relations*
Virginia W. Freeman
101 Ives Hall

## BIOLOGICAL SCIENCES

The Division of Biological Sciences grants advanced placement credits and exemption from introductory biology courses based on superior performance on the CEEB Advanced Placement Examination in biology.

Any student who earns a score of 5 on this examination may elect to receive eight credits and be permitted exemption from all introductory biology courses.

Students not majoring in biological sciences who score a 4 or 5 may receive, respectively, six or eight advanced placement credits. This will satisfy the distribution requirement in biological sciences for students in the College of Human Ecology, half of the distribution requirement in biological sciences for students in the College of Arts and Sciences, and a portion of the group B distribution requirement for students in the College of Agriculture and Life Sciences.

Biological sciences majors who receive a score of 5 may receive eight credits and be exempt from all introductory biology courses or elect to receive four credits and select one of the options allowed for majors with a score of 4. The student receiving a score of 4 must fulfill the introductory biology requirement by taking Biological Sciences 101–102, 101/103, 102/104, or 103–104 (Biological Sciences, Lectures and Laboratory). These students should consult information available in the course office (1140 Comstock Hall) and in the Biology Center (G20 Stimson Hall) to determine which semester to take to complete the introductory biology requirement. For students in doubt, Biological Sciences 101/103 is advised. These students will receive a total of eight introductory biology credits (four advanced placement credits plus four course credits).

## CHEMISTRY

The Department of Chemistry offers two sequences that satisfy prerequisites for further work in the department: Chemistry 207–208, an eight-credit sequence that includes qualitative analysis, and Chemistry 215–216, a nine-credit sequence that includes qualitative and quantitative analysis.

Freshmen may qualify for advanced placement and advanced standing credits in chemistry by satisfactory performance on the CEEB Advanced Placement Examination in chemistry or by passing an advanced standing examination offered by the department. A score of 5 on the CEEB examination entitles a student to eight credits. A score of 3 or 4 qualifies a student for four credits. A score of 3 indicates minimal understanding of principles, and students with a score of 3 who plan to take further work in chemistry are strongly advised to take Chemistry 207. A student may also earn four or eight credits by suitable performance on the departmental examination. To take the departmental examination students must sign up, on the morning of the day of the examination, with Dr. Stanley Marcus, in 156 Baker Laboratory.

The specific course in which a student will register after having received a certain advanced placement standing will be decided by consultation between the student, his or her adviser, and the professors teaching the courses. Students receiving advanced placement who are interested in a major in chemistry or a related science should consider taking Chemistry 215–216 and should consult the Chemistry 215 instructor.

## CLASSICS

For advanced placement and credit in Latin and Greek, students should consult the Department of Classics, Cornell University, 120 Goldwin Smith Hall.

**Latin.** Credit and placement are determined on the basis of a departmental examination. A student who is permitted to register in a 300-level course will be given six advanced placement credits.

**Greek and Modern Greek.** Credit and placement are determined on the basis of a departmental examination.

## COMPUTER SCIENCE

Students who receive a score of 4 or 5 on the CEEB Advanced Placement Examination in computer science will receive four advanced placement credits and may take Computer Science 211, 212, or 222 (provided, in the case of Computer Science 222, the mathematics prerequisites are met). These credits may be used to satisfy the requirement in computer programming for students in the College of Engineering or half the distribution requirement in mathematics for students in the College of Arts and Sciences.

Freshmen may also earn four credits by suitable performance on a departmental examination to be given during orientation week. Students who receive a score of 3 on the CEEB Advanced Placement Examination may choose, at their own risk and in consultation with their advisers, to go directly into a 200-level course without receiving credit for Computer Science 100. These students are strongly urged to take the departmental placement test. To take the departmental examination, students must sign up beforehand in the Undergraduate Office, 303 Upson Hall.

## ECONOMICS

Students with a strong background in introductory economics may, with the consent of the instructor, register for intermediate courses without taking Economics 101–102.

## ENGLISH

The English department will grant 3 credits to students who score 4 or 5 on the CEEB Advanced Placement Examination. The credits are granted automatically: no application to the department is required.

Students who receive scores of 700 or better on the CEEB College Placement Test in English composition, 700 or better on the CEEB College Placement Test in literature, or 4 or 5 on the CEEB Advanced Placement Examination are eligible to enroll, space permitting, in the following English freshman writing seminars: 270, 271, 272.

Advanced placement credits may not be used to fulfill requirements of the English major or distribution requirements of the College of Arts and Sciences.

## GERMAN LITERATURE

The Department of German Studies will grant three credits to students with a score of 4 or 5 on the Advanced Placement Examination.

For information about the College Placement Test, see "Modern Languages," below.

## HISTORY

The Department of History will grant four credits to students who score 4 or 5 on the CEEB Advanced Placement Examination in European history and four credits to those with such scores in the American history examination. Such credits are granted automatically, without application to the department.

These credits may not be used to fulfill requirements of the history major or distribution requirements of the College of Arts and Sciences.

## HISTORY OF ART

The Department of History of Art will grant three credits to students who score 4 or 5 on the CEEB Advanced Placement Examination. Such credits are granted automatically, without application to the department.

These credits may not be used to fulfill requirements of the history of art major or distribution requirements of the College of Arts and Sciences.

## MATHEMATICS

The Cornell calculus sequences discussed below are described under "Basic Sequences" in the Department of Mathematics section of this catalog.

The regular freshman calculus courses at Cornell do not differ substantially from calculus courses given in many high schools, and it is best to avoid repeating material that has already been covered at an appropriate level. Secondary school students who have had the equivalent of at least one semester of analytic geometry and calculus should, if possible, take one of the CEEB's two Advanced Placement Examinations (calculus AB or calculus BC) during their senior year.

The following rules do not apply to students being admitted to the College of Engineering. See the college's brochure for a detailed statement.

Students with a grade of 4 or 5 on the BC examination may take the appropriate third-semester course (Mathematics 213, 221, or 293), but students entering Mathematics 293 may have to make up some material on partial differentiation. Students with a 3 on the BC examination or a 4 or 5 on the AB examination may take the appropriate second-semester course (Mathematics 112, 122, or 192). Students with a 2 on the BC examination or a 3 on the AB examination may take one of the second-semester courses (Mathematics 112 or 192). Advanced placement credit will be awarded appropriately; however, no credit will be granted for a grade of 1 on the BC or 1 or 2 on the AB examination.

A grade of 3 or higher on the BC examination satisfies the distribution requirement in mathematics for students in the College of Arts and Sciences.

Note, however, that the grade of 3 is not sufficient for a full year of advanced placement credit in mathematics.

The placement examination in mathematics is offered at Cornell only during orientation week and should be taken by students who

1) have had at least a semester of calculus but did not take a CEEB Advanced Placement Examination;
2) have received a 2 on the BC examination or a 3 on the AB examination and want to enter the upper sequence; or
3) believe that the placement assigned on the strength of the CEEB Advanced Placement Examination is not high enough in their case.

Students are strongly urged to take the departmental placement test even if they feel that their grasp of the material is uncertain. The grade on this test does not become part of a student's record. No advance registration for the departmental examination is necessary.

## MODERN LANGUAGES

**Language placement tests.** Students who have studied a language for two or more years and want to continue study in that language at Cornell must present the results of a College Placement Test (CPT). Language course placement is made using guidelines that match CPT reading scores with various levels of courses. In cases where no CPT exists for a particular language, the Department of Modern Languages and Linguistics designates a professor to handle placement for that language. Students who have had a year of formal study or substantial informal study since they last took a CPT should take the examination again during orientation week if they plan to continue course work.

**Advanced standing credit.** Advanced standing credit may be entered on a student's record as follows:

1) For high school work, three to six credits may be granted for the equivalent of 200-level courses. Credit is based on performance on the CEEB Advanced Placement Examination, Cornell's Advanced Standing Examination (CASE), or a special departmental examination. To be eligible for Cornell's Advanced Standing Examination, students must have earned a score of 650 or above on the reading section of the College Placement Test (CPT). A student who has received three credits by scoring 4 or 5 on the CEEB Advanced Placement Examination in *languages* is advised to take the Cornell Advanced Standing Examination. Outstanding performance on this examination could provide three additional credits.
2) For formal language work at an accredited college, credit is considered by the department on submission of a transcript and may be entered on the student's Cornell record.
3) Native speakers of languages other than English may, on examination by the appropriate professor, be granted a maximum of six credits if they can demonstrate proficiency equivalent to course work on the 200 level or above at Cornell. Additional credit will be considered only for those who pursue advanced work in their native language.

Information about times and places to take placement tests is available in the orientation booklet, from Academic and Career Counseling Services, and from the Department of Modern Languages and Linguistics. Students must register for the CPT examination at Academic and Career Counseling Services, 203 Barnes Hall, and pay a fee. For more information, see the College of Arts and Sciences section on language course placement, or contact the Department of Modern Languages and Linguistics, Cornell University, 203 Morrill Hall.

## Advanced Placement Program (CEEB) Examinations
## Summary of Credit and Placement

| *Subject* | *Score* | *Advanced Placement Credit* | *Placement* |
|---|---|---|---|
| Arabic | Department of Near Eastern Studies determines credit and placement based on departmental examination. | | |
| Biology‡ | 5 (majors)* | 8 credits or 4 credits | Placement out of all introductory courses. Students may select one of the options allowed for majors with a score of 4. |
| | 4 (majors)* | 4 credits | 4 AP credits awarded after completion of 101–102, 101–103, 102–104, or 103–104. Consult department to determine which semester to take to complete introductory biology. |
| | 5 (nonmajors) | 8 credits | Placement out of all introductory courses. |
| | 4 (nonmajors) | 6 credits | Placement out of 109–110. Does not always satisfy the prerequisite for second- and third-level courses in biology. |
| Chemistry‡ | 5 | 8 credits | Department determines placement. |
| | 3,4 | 4 credits | Department determines placement. |
| Computer science | 4,5 | 4 credits | Department determines placement. |
| Economics | Department determines credit and placement. | | |
| English | 4,5 | 3 credits | |
| French language | 4,5 | 3 credits | Department of Modern Languages and Linguistics determines placement. Students may earn additional credit by taking CASE examination.† |
| French literature | 4,5 | 3 credits (and proficiency) | Department of Romance Studies determines placement. |
| German language | 4,5 | 3 credits | Department of Modern Languages and Linguistics determines placement. Students may earn additional credit by taking CASE examination.† |
| German literature | 4,5 | 3 credits (and proficiency) | Department of German Studies determines placement. |
| American government and politics | 4,5 | 3 credits | Placement out of Government. |
| Greek | Department of Classics determines credit and placement based on departmental examination. | | |
| Hebrew | Department of Near Eastern Studies determines credit and placement based on departmental examination. | | |
| American history | 4,5 | 4 credits | |
| European history | 4,5 | 4 credits | |
| History of art | 4,5 | 3 credits | |
| Italian literature | 4,5 | 3 credits (and proficiency) | Department of Romance Studies determines placement. |
| Latin | 4,5 | Department of Classics determines credit and placement based on departmental examination. | |
| Mathematics BC (excluding engineering students) | 4,5 | 8 credits | Placement out of 111, 112. Permission to take 221, 293, or 213. |
| | 3 | 4 credits | Placement out of 111. No advanced placement credit for students who take 111. Permission to take 112 or 192. |
| Mathematics AB (excluding engineering students) | 4,5 | 4 credits | Placement out of 111. Permission to take 112, 122, or 192. |
| | 3 | 4 credits | Placement out of 111. Permission to take 112 or 192. |
| | 2 | none | Students are strongly urged to take the mathematics placement examination. |
| Music | Department determines credit and placement based on departmental examination. | | |
| Physics B‡ | 4,5 | 8 credits | Placement out of Physics 101–102. |
| | 3 | 4 credits | Placement out of Physics 101. |
| Physics B, and Mathematics BC‡ | 5<br>4,5 | 4 credits in physics | Student may choose placement out of Physics 112 or 207 instead or Physics 101–102. |
| or Mathematics AB‡ | 5 | 4 credits in physics | Student may choose placement out of Physics 112 or 207 instead of Physics 101–102. |
| Physics C—Mechanics‡ | 4,5 | 4 credits | Placement out of Physics 112 or 207. |
| Physics C—Electricity and Magnetism‡ | 5 | Student may choose 4 credits for Physics 208 (or 213) or placement into Physics 217 with no AP credit. For more information, contact department representative. | |
| | 4 | Student may choose 4 credits for Physics 208 or placement into Physics 217 with no AP credit. For more information, contact department representative. | |
| Psychology | 4,5 | 3 credits | |
| Sociology | Department determines credit and placement. | | |
| Spanish language | 4,5 | 3 credits | Department of Modern Languages and Linguistics determines placement. Students may earn additional credit by taking CASE examination.† |
| Spanish literature | 4,5 | 3 credits (and proficiency) | Department of Romance Studies determines placement. |

*Biological sciences majors and other students who expect to take advanced biology courses. These students will receive a total of 8 introductory biology credits (4 advanced placement credits and 4 course credits).
†Cornell Advanced Standing Examination. Contact the Department of Modern Languages and Linguistics, 203 Morrill Hall.
‡In the College of Arts and Sciences, AP credit may be used to satisfy half the distribution requirement in science.

## MUSIC

Advanced placement and credit are awarded only in music theory and only on the basis of a comprehensive examination administered by the Department of Music, normally during orientation week. If special arrangements are made, the examination may be administered at other times during the academic year. All students interested in taking this examination should consult Professor S. Stucky, 218 Lincoln Hall (telephone: 607/255-3423) or Joyce Lindorff, 114 Lincoln Hall (telephone: 607/255-7099). Inquiries may be directed to the Department of Music, Cornell University, 104 Lincoln Hall (telephone: 607/255-4097).

## NEAR EASTERN STUDIES

For advanced placement and credit in Arabic, Hebrew, and Turkish students should consult the Department of Near Eastern Studies, 360 Rockefeller Hall. Advanced placement and credit are determined by departmental examination.

## PHYSICS

Advanced placement and credit are awarded on the basis of the CEEB Advanced Placement Examination in physics (physics B or physics C), certain international examinations, or the departmental examination (which may be taken during orientation week or at other times as arranged). For information about the departmental examination, students should consult Professor R. Cotts, 522 Clark Hall.

**Physics B.** Students earning a score of 4 or 5 may receive eight credits for Physics 101 or 102. Those earning a score of 5 in physics B with a score of 4 or 5 in calculus BC or a score of 5 in calculus AB may choose to accept four credits in Physics 112 or 207 instead of eight credits in Physics 101 and 102. Those earning a score of 3 will receive four credits in Physics 101.

**Physics C.**

1) *C—Mechanics* Students earning a score of 4 or 5 may receive four credits for Physics 112 or 207.
2) *C—Electricity and Magnetism* Students earning a score of 5 will be eligible for four credits for Physics 208 or 213, or for placement into Physics 217 with no AP credit. Students earning a score of 4 will be eligible for four credits for Physics 208 or placement into Physics 217 with no AP credit. Students with scores of 4 or 5 and who have questions may first meet with the department representative, Professor R. Cotts, 522 Clark Hall, for advice on making a selection.

Advanced placement into a next-in-sequence course depends on the completion of the appropriate mathematics prerequisites before enrolling. To qualify for advanced placement credit, it is not necessary to continue the study of physics.

General information and advice may be obtained from Professor R. Cotts, 522 Clark Hall, or from the Department of Physics, Cornell University, 109 Clark Hall.

## PSYCHOLOGY

Students who scored 4 or 5 on the CEEB College-Level Examination Program psychology test may receive three advanced placement credits in psychology. Those interested in taking further courses in psychology should consult a faculty member in the Department of Psychology, Cornell University, 232 Uris Hall.

Advanced placement based on the CEEB test may not be used to satisfy the distribution requirement in the College of Arts and Sciences. Credit toward the requirements of a major in psychology will depend on the recommendation of the student's major adviser.

## ROMANCE STUDIES (FRENCH, ITALIAN, AND SPANISH LITERATURE)

The Department of Romance Studies grants three credits to students with a score of 4 or 5 on the Advanced Placement Examination in French Italian, or Spanish literature or in French or Spanish language.

For information about the College Placement Test, see "Modern Languages," above.

# Cornell Abroad

Cornell Abroad is committed to offering undergraduates a wide variety of academic programs abroad that are intellectually rigorous, academically and socially diverse, and culturally enriching. Study abroad is considered an integral part of the students' formal education, complementing and enhancing their Cornell program of study in Ithaca. Qualified students may study abroad by attending a program sponsored directly by Cornell or another American institution or by enrolling in a foreign university.

## LOCATIONS ABROAD

The university and several colleges at Cornell have established a number of foreign study programs with selected institutions abroad. The aim of these programs is to enable Cornell students to enroll in institutions or programs with which Cornell has established an intellectual partnership. In addition to a challenging course of study at a foreign university, the programs offer the experience of immersion into the foreign life and culture.

## CORNELL PROGRAMS

France
- Université de Paris 7, Paris 1
- Institut d'Études Politiques de Paris (Sciences Po)
- École du Louvre

Italy
- Cornell College of Art and Architecture in Rome

Germany
- Universität Hamburg

Spain
- Universidad de Sevilla (with one month in Madrid)

**Cornell has formal agreements with the following institutions:**

Belgium
- Université Catholique de Louvain (Le Département des Sciences Politiques et Sociales)

Denmark
- International Study Program in Copenhagen (DIS)

Egypt
- American University in Cairo

India
- Delhi University

Israel
- Ben Gurion University
- Haifa University
- Hebrew University of Jerusalem
- Technion (Israel Institute of Technology)
- Tel Aviv University

United Kingdom
- University of Bristol
- Cambridge University
- University of Edinburgh
- University of Manchester
- Oxford University
- University of Sussex
- University of London:
  - King's College
  - Queen Mary College
  - University College
  - Imperial College of Science and Technology
  - London School of Economics and Political Science
  - School of Oriental and African Studies
  - School of Slavonic and East European Studies

**Cornell is a governing member of the following consortia:**

China
- Beijing, Nanjing, and Fudan Universities, Chinese Language and Study Programs, University of International Business and Economics: Chinese Business and Society Program (CIEE)

France
- Université de Paris: Critical Studies Program (CIEE)

Indonesia
- Institut Keguruan Dan Ilmu Pendidikan in Malang (CIEE)

Italy
- Intercollegiate Center for Classical Studies in Rome

Japan
- Kyoto Center for Japanese Studies
- Inter-University Center for Japanese Language Studies

Soviet Union
- Leningrad State University (CIEE)

Sweden
- University of Stockholm

**Cornell is affiliated with the following institutions and consortia:**

Australia
- University of Sydney
- University of New South Wales, Sydney
- Macquarie University, Sydney
- University of Technology, Sydney
- The University of Wollongong, Wollongong

Germany
- Technische Universität Darmstadt

Korea
- Yonsei University, Seoul

Switzerland
- Université de Geneve

**The College of Agriculture and Life Sciences has special arrangements with:**

- Agricultural College of Sweden, Uppsala
- Instituto Tecnologico Y de Estudios Superiores de Monterrey, Mexico
- Trinity College, Dublin, Ireland
- University of Reading, England

In recent years, Cornell students have also studied in other universities in the countries mentioned above as well as one in Argentina, Austria, Brazil, Colombia, Costa Rica, Ecuador, Greece, Honduras, Hungary, Ireland, Jamaica, Kenya, Nepal, New Zealand, Nigeria, the Philippines, Poland, and the West Indies.

## Externally Sponsored Programs or Enrollment in a Foreign University

Undergraduates also apply through Cornell Abroad both to a wide variety of study abroad programs sponsored by other American colleges and to foreign universities. Cornell Abroad forwards all applications to the programs or universities for the students. Those attending programs or universities approved by their Cornell college will remain registered at Cornell, receive credit for approved courses, and remain eligible for financial aid.

## When Students Study Abroad

Cornell students may study abroad their sophomore, junior, or senior year. After weighing a number of considerations, many students find that their junior year is the most satisfactory time to study abroad. Students in the engineering college are encouraged to study abroad their sophomore year, while students in the arts college need special permission to study abroad in their sophomore year. To ensure preparation for the most appropriate program, it is important to begin planning for study abroad early in the freshman year.

## Academic Planning

Cornell Abroad has catalogs, program materials, course syllabi, and program evaluations to help students plan their study abroad. As part of the application process, students consult their academic advisers for assistance in determining the number and kind of credit to be obtained for the kinds of courses they hope to complete abroad. Because many foreign universities do not announce specific courses until late in the summer or just prior to the start of classes, it may be necessary to adjust their final course program after they have arrived at their destination abroad.

## Transfer of Credits and Grades

While policies and procedures vary from one Cornell college to the next, all Cornell colleges regularly accept credits for study abroad, normally 30–36 credits per year or 12–20 per semester when students have taken a full load according to the standards of the foreign institution. After students return, their college reviews their work and makes the final decision concerning transfer of credit. The Cornell transcript will then indicate the courses taken, the credits earned, and the foreign grades received. The grades will normally not be translated into American grades and will not be averaged into the Cornell grade-point average.

## Foreign Language Requirements

Preparation in a foreign language is essential to a successful academic experience abroad in most countries. Many programs abroad require two years or the equivalent of college-level language study. Students should make firm plans for foreign language study early in their freshman year if they would like to study in a country in which English is not the primary language. For students who do not have proficiency in a foreign language, there are still some options outside of English-speaking countries. Cornell Abroad affiliates with programs taught in English in the following countries: Denmark, Egypt, Israel, Italy, Korea, and Sweden. Many students in these programs do not start studying the country's language until they are abroad, but it is desirable to start studying the language at least a year before going abroad, if possible.

## Length of Stay

Where programs allow for a choice, Cornell Abroad strongly encourages students to go abroad for a full academic year rather than a semester. Many foreign universities have year-long courses, so that both the choices of universities and of courses within a particular university can be considerably limited for semester students. Moreover, it takes time to adjust successfully to a different educational system, language, and culture. The full year provides a more complete immersion into the foreign country's academic life and culture.

## Costs and Financial Aid

Program costs vary considerably; in some cases, it costs less to study abroad than it does to stay in Ithaca. When candidates for a Cornell degree study abroad, they pay the tuition of the foreign program or university and the same Cornell University fee that they pay while on campus in Ithaca. In 1989–90, the Cornell fee will be $1,370 per semester. Students in the United Kingdom and Israel will pay an additional fee of $250 for the Cornell Centers there. All students eligible for financial aid in Ithaca are eligible for financial aid abroad. Detailed information on costs and financial aid is available at the Cornell Abroad office.

## Admission and Application Procedure

Applications for admission to Cornell Abroad programs are available at the Cornell Abroad Office, 474 Uris, and the College Study Abroad offices. Students should apply well before the deadline when possible. There can be unexpected delays in gathering application materials and students who apply early have an advantage in such cases. It is sometimes possible to submit an application after the deadline.

October 15, 1989 is the application deadline for spring term 1990 study abroad except in the case of British universities and any external programs that have an earlier deadline. British universities encourage students to apply for the spring semester 1991 by February 15, 1990, although they might consider applications for spring 1990 as late as October 15, 1989.

December 1, 1989 is the application deadline for 1990–91 at Oxford or Cambridge, and January 31, 1990 for the 1990–91 Cornell program in Japan.

February 15, 1990 is the application deadline for studying in 1990–91 in most universities and in the spring semester 1991 at British universities, although British universities sometimes will consider applications for the spring semester as late as October 15 of the previous year.

The application deadline for external programs and direct enrollment in foreign universities varies according to the program. Students should submit complete application materials to Cornell Abroad at least two weeks before the program or university deadline.

### Information Meetings

Cornell Abroad has regular information meetings concerning specific foreign programs and universities. These meetings are advertised in the *Cornell Daily Sun* and on bulletin boards around campus.

### Cornell Abroad Contacts

Dr. Urbain J. DeWinter, director
Ms. Lucy Barcelo, assistant director, 474 Uris Hall

Agriculture and life sciences
Mr. Donald Burgett, 17 Roberts Hall

Architecture, art, and planning
Professor Christian Otto, 140E Sibley Hall

Arts and sciences
Assistant dean Beatrice Rosenberg, 55 Goldwin Smith Hall

Engineering
Associate dean Richard Lance, 219 Kimball Hall

Hotel administration
Professor William Kaven, 300 Statler Hall

Human ecology
Dr. Florence McCarthy, 170 Martha Van Rensselaer Hall

Industrial and labor relations
Ms. Laura Lewis, 101 Ives Hall

## University Registration

University registration is the process by which the university registrar and colleges certify the eligibility of students to enroll in courses and purchase or use a variety of services available at the university, such as CornellCard, Co-op dining, libraries, special bus passes, and housing. University registration includes the issue and validation of the student identification card and the collection of information needed for the student directory and state and federal reports. University registration is based on the student's clearing past and current financial obligations by the date posted on the bursar's bill. ID validation and college registration are held on the dates stated in the university calendar at a time and place announced well in advance of the beginning of each semester.

### REQUIRED IMMUNIZATION

Before registration at the university all students must be prepared to present proof of adequate immunization against diphtheria, tetanus, rubella, measles, and poliomyelitis.

### LATE REGISTRATION

A student clearing his or her financial obligations after the stated date on the bursar's bill is considered late. Late registrants are assessed a finance charge on the bursar's bill.

The university does not permit after-the-fact registration in which persons attend classes and pass courses before seeking to register and receive official course credit.

The university reserves the right to require unauthorized unregistered persons who attend classes or in other ways seek to exercise student privileges to leave the university premises. The university registrar will notify the appropriate college or school about such cases and ask that office to contact the person concerned.

### COURSE ENROLLMENT

Course enrollment for each semester at Cornell takes place partway through the preceding semester. Dates are announced in advance and are usually posted in the school and college offices. Course enrollment generally runs for two weeks. Each college or school notifies students about special procedures. Students are often expected to meet with their advisers during this two-week period to check that the courses they plan to take will ensure satisfactory progress toward a degree. Students complete an optical-mark course enrollment form, then return the form to their college office. Each student is sent a course confirmation statement listing the courses processed from the enrollment form. Class schedules are distributed later by the college offices, often during the same days as university registration.

New students and transfer students are sent course enrollment instructions by their college offices before they arrive on campus. Procedures vary from college to college.

Students who fail to submit a course enrollment form during the designated period may be charged a late fee. The fees are listed in the chart in the following section.

### COURSE DROP/ADD/CHANGE PERIOD

Students may adjust their schedules during drop/ add/change periods. The length of the periods varies according to colleges. A form is completed by the student and signed by both the student's adviser and an appropriate representative of the department offering the course (an instructor, department staff member, or college registrar, depending on the college). The completed and signed form must be returned to the student's college office to be processed. See the chart below for the course drop/add/change fee.

### Late Course Enrollment and Late Drop/ Add/Change Fees

| *Academic Unit* | *Late Course Enrollment Fee* | *Late Course Drop/Add/ Change Fee* |
|---|---|---|
| College of Agriculture and Life Sciences | No fee | No fee |
| College of Architecture, Art, and Planning | $10 | $10* |
| College of Arts and Sciences | $10* | $10* |
| College of Engineering Graduate School | $10 | $10 |
| School of Hotel Administration | No fee | No fee |
| College of Human Ecology | $10 | $10* |
| School of Industrial and Labor Relations | No fee | No fee |
| Johnson Graduate School of Management | $10 | $10 |
| Athletics and physical education | $25 | $25 |
| Summer session and extramural courses | † | † |
| Division of Unclassified Students | No fee | No fee |
| Veterinary medicine | No fee | No fee |

*Consult the college office for special considerations and requirements.

†Consult the Summer Session catalog and the Division of Extramural Study brochure for fees.

# Class Schedules and Attendance

## CLASS ATTENDANCE AND ABSENCES

Students are expected to be present throughout each term at all meetings of courses for which they are registered.

The right to excuse a student from class rests at all times with the faculty member in charge of that class.

All lectures, recitations, and similar exercises start at 8 a.m., 9:05 a.m., 10:10 a.m., 11:15 a.m., 12:20 p.m., 1:25 p.m., 2:30 p.m., or 3:35 p.m. and last fifty minutes, except that on Tuesday and Thursday the first and second, the third and fourth, the fifth and sixth, and the seventh and eighth periods may be combined to allow for longer meeting times.

All laboratories and similar exercises that continue for 1 hour and 55 minutes, 2 hours and 25 minutes, or 3 hours are scheduled as shown below.

**Schedule for Classes Longer than Fifty Minutes**

*1 hour and 55 minutes*

8:00 a.m.–9:55 a.m.

10:10 a.m.–12:05 p.m.

12:20 p.m.–2:15 p.m.

2:30 p.m.–4:25 p.m.

7:30 p.m.–9:25 p.m.

*2 hours and 25 minutes*

7:30 a.m.–9:55 a.m.

10:10 a.m.–12:35 p.m.

2:00 p.m.–4:25 p.m.

7:30 p.m.–9:55 p.m.

*3 hours*

8:00 a.m.–11:00 a.m.

10:10 a.m.–1:10 p.m.

1:25 p.m.–4:25 p.m.

7:30 p.m.–10:30 p.m.

On Monday, Tuesday, Wednesday, and Thursday the hours of 4:25 to 7:30 p.m.; on Friday the hours after 4:25 p.m; on Saturday the hours after 12:05 p m.; and all day Sunday are free from all formal undergraduate class or laboratory exercises.

Evening classes are held only on Monday and Wednesday and only when regularly scheduled and included in written college announcements or when recommended by the Committee on Academic Records and Instruction. Evening lectures, recitations, and similar exercises start at 7:30 and 8:35 p.m.; evening laboratories and similar exercises start at 7:30 p.m.

Evening preliminary examinations that will be given outside of normal class hours may be scheduled on Tuesday and Thursday evenings only, beginning at 7:30 p.m. All such examinations must be scheduled with the Examination and Room Coordinator in the Office of the University Registrar. The dates and times of these examinations are listed in the *Course and Room Roster* for each term.

Any exception to the above regulations, other than those for evening preliminary examinations, will require permission of the dean or director of the college or school offering the course. Exceptions to the regulations on evening preliminary examinations require approval of the dean of the University Faculty. All such exceptions must include provision of special arrangements for the students for whom conflicts are generated by such an exception.

## FINAL EXAMINATIONS

Final examinations for undergraduate courses are scheduled by the Office of the University Registrar. Examinations may be one, two, or two and one-half hours in length at the discretion of the department concerned. Examinations not listed in the registrar's examination schedule will be arranged by the professor in charge and must fall within the announced examination period, except by the express permission of the dean of the faculty in accordance with existing faculty legislation.

## EVENING EXAMINATIONS

Evening examinations, including makeup examinations, may be scheduled only on Tuesday and Thursday evenings and only after 7:30 p.m. *without prior permission* from the Office of the University Faculty. Such prior permission is not, however, required for examinations or makeup examinations involving small numbers of students (generally thirty or less), provided that the scheduled time is acceptable to the students involved and that an alternative time to take the examination is provided for those students who have academic, athletic, or employment conflicts at the time scheduled.

Permission from the Office of the University Faculty to schedule on evenings other than Tuesdays or Thursdays or at a time prior to 7:30 p.m. will be granted only on the following conditions: *(a)* conditions such as the nature of the examination, room availability, a large number of conflicts, etc., justify such scheduling; and *(b)* an alternative time to take the examination *must* be provided for those students who have academic, athletic, or employment conflicts at the time scheduled.

If there is a conflict between an examination listed on the schedule developed at the annual evening prelim scheduling meeting and an examination not on the schedule, the examination on the schedule has priority, and the course not on the schedule *must* provide an alternative time for those students with a conflict. If there is a conflict between examinations, both of which are on the schedule developed at the annual evening prelim scheduling meeting or both of which are not on the schedule, the instructors of the courses involved *must* consult and agree on how to resolve the conflict. Both instructors *must* approach this resolution process with a willingness to provide an alternative or early examination.

Note that instructors holding evening examinations are strongly urged to indicate this in the course descriptions listed in *Courses of Study* and *must* notify students of the dates of such examinations as early as possible in the semester, preferably when the course outline is distributed.

## AUDITING COURSES

Summer school and extramural students may officially register as visitors (auditors) in courses and have this entered on their permanent records if their attendance is reported as satisfactory. Graduate students may register for courses as auditors but will not have the courses listed on their transcripts. Undergraduates may not register to audit courses.

## LEAVES AND WITHDRAWALS

A leave of absence must be requested from the college in which the student is enrolled. A leave of absence is granted for a specified time, after which the student is expected to return to resume course work. The student should inform the college of enrollment of his or her intent to return.

A student may withdraw from the university at the student's discretion. However, a college may withdraw a student who fails to return at the end of a period of authorized leave.

Medical leaves are granted and processed through University Health Services.

## INTERNAL TRANSFERS

Transfer from one undergraduate unit to another is not guaranteed. A student in good standing may apply to transfer from one college to another within the university. It is necessary for an internal transfer to inform the admitting college of the acceptance of admission within seven days of the offer of admission. Students interested in transfer within the university should consult with the appropriate school or college office.

## PRIVACY OF RECORDS

According to federal law, grades are restricted information and may be released only to the student or at the student's written request. Thus grades earned on examinations or in courses may not be posted by name. Posting by student ID number is, however, permissible. Although there is no federal or state legislation that pertains to the manner in which graded work is to be returned to students, the returning of such materials should be handled in such a manner as will preserve the student's privacy.

## COURSE NUMBERING SYSTEM

The course levels have been assigned as follows:

100-level course—introductory course, no prerequisites, open to all qualified students

200-level course—lower-division course, open to freshmen and sophomores, may have prerequisites

300-level course—upper-division course, open to juniors and seniors, prerequisites

400-level course—upper-division course, open to seniors and graduate students, 200- and 300-level course prerequisites or equivalent

500-level course—professional level (e.g., management, law, veterinary medicine)

600-level course—graduate-level course, open to upper-division students

700-level course—graduate-level course

800-level course—master's level, thesis, research

900-level course—doctoral level, thesis, research

## GUIDE TO COURSE LISTINGS

The list of courses that follows is arranged in two broad groups.

Group 1: Divisions that offer both undergraduate- and graduate-level courses

Agriculture and Life Sciences
Architecture, Art, and Planning
Arts and Sciences
Biological Sciences
Engineering
Hotel Administration
Human Ecology
Industrial and Labor Relations
Nutritional Sciences
Officer Education

Group 2: Graduate professional divisions

Law
Management
Veterinary Medicine

There are no courses offered by the Graduate School as a unit; graduate-level courses are contained in the various departments that offer the instruction.

Within each division, courses are generally arranged in alphabetical order by department and in numerical order within the departments. All courses, 0-999 are briefly described for those divisions (group 1) offering instruction to both undergraduate and graduate students. Courses in the graduate professional divisions (group 2) are designated by number and title only.

It is not possible to keep this single-volume course list completely up-to-date. The most current information regarding course schedules, sections, rooms, credits, and registration procedures may be found in the *Course and Time Roster* and the *Course and Room Roster*, each issued twice a year by the Office of the University Registrar. Students are also advised to consult the individual college and department offices for up-to-date course information.

# Grading Guidelines

The official university grading system uses letter grades with pluses and minuses. Passing grades range from A + to D -; F is failing. INC denotes a grade of incomplete, and R is the grade given at the end of the first semester of a year-long course. The grades of INC and R do not have quality-point equivalents attached. These are the quality-point equivalents:

| | | | |
|---|---|---|---|
| A+ =4.3 | B+ =3.3 | C+ =2.3 | D+ =1.3 |
| A =4.0 | B =3.0 | C =2.0 | D =1.0 |
| A– =3.7 | B- =2.7 | C- =1.7 | D- =0.7 |
| | | | F =0.0 |

This is how a term average is computed:

| *Course* | *Grade* | *Quality Points* | | *Credits* | | *Product* |
|---|---|---|---|---|---|---|
| Chemistry 103 | B+ | 3.3 | | 3 | | 9.9 |
| English 151 | C– | 1.7 | | 3 | | 5.1 |
| DEA 145 | B | 3.0 | x | 4 | = | 12.0 |
| CEH 100 | B | 3.0 | | 3 | | 9.0 |
| DEA 111 | C | 2.0 | | 3 | | 6.0 |
| *Total* | | | | 16 | | 42.0 |

To arrive at the term average, add the products (credits x quality points) and divide by the number of credits taken. Here, 42 divided by 16 equals 2.63.

The cumulative average (an average of grades from two or more terms) equals the sum of the products of all the grades at Cornell divided by the total number of credits taken.

## S-U GRADES

On September 6,1972, the University Faculty Council of Representatives passed the following legislation:

"Resolved, that:

A. the S-U system have symbol equivalents which are uniform within the university: "S" means C– or above; "U" means D+, D, D–, or failure.

B. S-U options be chosen by the student during the first three weeks of the term.

C. the Announcements and/or supplementary course registration material describing each course include a description of the course grading options, particularly if the course is graded with an exclusive S-U. Any change in grading options must be announced by the instructor within the first two weeks of the term.

D. course requirements (required reading, term paper, etc.) be the same for students electing S-U grades as for those electing letter grades.

The rules for the S-U option are further defined by each of the Academic Units. They are as follows:

*Agriculture and Life Sciences.* (a) Must have 100 credit hours with A, B, C, D grades. (b) The S-U option is available only in those courses so designated in the course catalog after approval by the Educational Policy Committee. (c) Freshmen may not exercise the S-U option.

*Architecture, Art, and Planning.* (a) All courses specifically required for a degree excluded. Various departments may designate specific required courses where S-U will be permitted. (b) In a course designated as S or U, the entire class is so graded. The instructor must announce this decision within the first two weeks of class. (c) Where the option for S or U exists, both student and instructor must agree on the option. This agreement must be made by the end of the third week of classes on the appropriate form in the College Office. Once agreed upon, this grade option will be used for the final grade.

*Arts and Sciences.* (a) Courses that count toward satisfaction of major requirements should not be taken for an S or U grade unless the department grants permission. (b) Permission of instructor. (c) A minimum of 80 of the 120 hrs. required for the A.B. degree must be in courses for which the student has received letter grades.

*Engineering.* (a) May take one Humanities and Social Sciences, Approved, or Free Elective per term after completing first semester. (b) This option may be elected during Pre-Course Enrollment or with the written permission of the instructor and adviser on an add/drop form in the first 3 weeks of classes. (c) Decision irrevocable after first 3 weeks of term.

*Graduate School.* (a) Seminars and Thesis Research courses are usually graded S/U, and should be registered accordingly or a grade error results at semester's end. Other courses may be registered as S-U only if offered as S-U option.

*Hotel.* (a) Maximum of four free-elective credit hours per term. (b) Exceptions are required hotel courses or elective hotel courses offered only on S-U basis.

*Human Ecology.* (a) Not part of student's major. (b) May be used in the 15 hours required outside the major in Human Ecology courses. (c) Not part of 39 hours required in humanities, natural sciences, and social science. (d) A department may approve S-U grading in specific courses if approved by Educational Policies Committee. (e) Permission of the instructor. (f) Available each of last four terms with a total of four S-U courses during student's college career.

*Industrial and Labor Relations.* (a) This option may be elected, if available in I&LR electives, or in out-of-college electives but not including directed studies. (b) Degree requirements include a minimum of 105 lettergrade (A + to D - ) credits. (c) Student must also be In good academic standing. (d) A "U" is considered the equivalent of an "F" in determining a student's academic status. (e) Limited to two courses per term, not to exceed four hours in any one course.

*Unclassified.* (a) S-U grades permitted only when it is the only option or (b) when specifically approved by an admissions officer in the school or college to which the student plans to transfer.

*Veterinary Medicine.* (a) There are seven courses in the veterinary core curriculum that are offered on an S-U basis only. All other required core courses must be taken for a letter grade. (b) Elective courses for veterinary students may be offered on a S/U basis at the option of the professor."

## INCOMPLETE

The grade of incomplete is appropriate only when two basic conditions are met:

1) the student has a substantial equity at a passing level in the course with respect to work completed, and
2) the student has been prevented by circumstances beyond the student's control, such as illness or family emergency, from completing all of the course requirements on time.

A grade of incomplete may not be given merely because a student fails to complete all course requirements on time. It is not an option that may be elected at the student's own discretion.

While it is the student's responsibility to initiate a request for a grade of incomplete, reasons for requesting one must be acceptable to the instructor, who establishes specific make-up requirements. The instructor has the option of setting a shorter time limit than that allowed by the student's college for completing the course work. Several colleges require that a statement signed by the instructor be on file indicating the reason for the grade of incomplete and the restriction, if any.

It is the responsibility of the student to see that all grades of incomplete are made up within the deadline and that the grade has been properly recorded with the student's college registrar.

## CHANGES IN GRADES

Changes in a grade may be made only if the instructor made an error in assigning the original grade.

## OFFICIAL TRANSCRIPTS

An official transcript is one that bears the official seal of the university and the signature of the university registrar, sent in a sealed envelope directly from the Office of the University Registrar to another institution or agency as directed by the student. Transcripts can be obtained through the Office of the University Registrar, 222 Day Hall.

# University Requirements for Graduation

For degree requirements such as residency, number of credits, distribution of credits, and grade averages, see the individual requirements listed by each college or school or contact the college offices.

## PHYSICAL EDUCATION

All undergraduate students must complete two terms of work in physical education unless exempted from this requirement for medical or other special reasons or by virtue of advanced standing on admission. For transfer students the requirement is reduced by the number of terms satisfactorily completed, not necessarily including physical education, in a college of recognized standing before entering Cornell.

Credit in physical education may be earned by participating in courses offered by the Department of Athletics and Physical Education, participating on an intercollegiate athletic team as a competitor or manager, or performing in the marching band.

Physical education is a requirement of the first two terms at Cornell. Students must register for it in each term, except those in which postponements are granted, until the requirement is satisfied.

Temporary postponements may be granted on the basis of physical disability, schedule conflicts, or excessive work load (employment exceeding twenty hours a week). The Gannett Health Center can provide certifications based on health, and the Financial Aid Office can provide certifications of employment. Students should see the Department of Athletics and Physical Education to establish postponements or waiver of the requirement. Questionable or unusual cases may be resolved by petition to the Faculty Advisory Committee on Athletics and Physical Education.

**Swim test.** All new students who do not pass a basic seventy-five-yard swim test are required to include swimming in their program of physical education unless they are excused by Gannett Health Center. All nonswimmers are required to register in beginning swim classes.

## STUDENT RESPONSIBILITIES

Students are responsible for meeting all requirements for the courses in which they are enrolled, as laid down by the faculty members teaching the courses. It is also the student's responsibility to be aware of the specific major, degree, distribution, college, and graduation requirements for completing his or her chosen program of studies. Students should know how far they have progressed in meeting those requirements at every stage of their academic career.

## STUDENT RECORDS

The university policy on access to and release of student records conforms to the Family Educational Rights and Privacy Act of 1974. See *Policies and Procedures for Students, Faculty and Staff* for details of university policy.

# Bursar Information

## TUITION, FEES, AND EXPENSES

### Tuition for Academic Year 1989-90

**Endowed Divisions**

*Undergraduate*

| | |
|---|---|
| Architecture, Art, and Planning<br>Arts and Sciences<br>Engineering<br>Hotel Administration<br>Unclassified division | $14,000 |

*Graduate*

| | |
|---|---|
| Graduate School (with major chair in an endowed division) | 14,000 |

*Professional*

| | |
|---|---|
| Law School | 14,800 |
| Management | 14,800 |

**Statutory Divisions**

*Undergraduate*

| | |
|---|---|
| Agriculture and Life Sciences<br>Human Ecology<br>Industrial and Labor Relations | |
| New York resident* | 5,570 |
| Nonresident* | 10,040 |

*Graduate*

| | |
|---|---|
| Graduate School (with major chair in agriculture, human ecology, or industrial and labor relations), | 6,460 |
| Graduate School—Veterinary Medicine | 8,000 |

*Professional*

| | |
|---|---|
| Veterinary Medicine | |
| New York resident* | 9,000 |
| Nonresident* | 10,900 |

**Summer Session (1990)**

| | |
|---|---|
| Per credit | $295 |

**Extramural Division**

| | |
|---|---|
| Per credit | $335 |

**Other Tuition and Fees**

In absentia fees

| | |
|---|---|
| Graduate | $200 per term |
| Undergraduate | $15 per term |
| Law and Management | $75 per term |

Excess hours tuition rate for students in statutory units taking extra endowed credits

| | |
|---|---|
| Per credit hour | $336.56 |

*The amount, time, and manner of payment of tuition, fees, or other charges may be changed at any time without notice.*

*Residency status is determined at the time of admission by the college. *Change* in residency status is determined by the bursar.

### Fees and Expenses

Undergraduate applicants to Cornell pay a non-refundable $50 application fee when submitting an application for admission. The graduate application fee is $50.

**Tuition Refund Policy**

Amounts personally paid for tuition may be refunded if the student requests a leave of absence or withdrawal from the office of the dean of his or her college of enrollment. The date of this request will determine the tuition liability for the semester. Students who terminate their registration with the university during a fall or spring semester in this manner will be charged tuition from the university registration day through the date of their request as follows: first six days of the semester (including university registration day), no charge; seventh day of the semester, 10 percent; second week, 20 percent; third week, 30 percent; fourth week, 40 percent; fifth week, 60 percent; sixth week, 80 percent; seventh week to the end of the semester, 100 percent.

**Repayment policy.** Students receiving financial aid from the university who withdraw during a term will have their aid reevaluated, possibly necessitating repayment of a portion of aid received. Repayment to aid accounts depends on the type of aid received, government regulations, and the period of time in attendance. A partial semester will generally count as one of the eight semesters of financial aid eligibility normally allowed a student.

## BILLING AND PAYMENT

### Billing

Tuition and room and board charges will be billed in July and December and must be paid prior to registration. The due date for these semester bills will normally be five to ten working days prior to registration day. All other charges, credits, and payments will appear on monthly statements mailed before the twenty-fifth of every month.

It is possible that some charges will not be listed on the first bill and will appear on a subsequent monthly bill. *A student must be prepared to pay any charges appearing on a subsequent bill even though the student receives a financial aid stipend before the charges are billed.*

All bills are due by the date stated on the bill; all payments must be *received* by that date to avoid *finance charges.* Payments are *not* processed by postmark.

Please inform the Office of the Bursar of any change in billing address. *Address changes made at other offices will not change the billing address.* The address initially used on billing statements will be the home address as listed on each student's application for admission.

### Payments

An individual who has outstanding indebtedness to the university will not be allowed to register or reregister in the university, receive a transcript of record, have academic credits certified, be granted a leave of absence, or have a degree conferred. If students' bills show a previous unpaid balance, they must arrange for payment by August 11 if they plan to register for the fall semester. University policy precludes the use of any current financial aid for payment of past-due charges.

The Office of the Bursar acts as a clearinghouse for student charges and credits that are placed directly on a student's bill by several departments and offices of the university. *Since the Office of the Bursar does not have detailed records concerning many items that appear on a bill, students should contact the office involved if they have questions.*

For further information, students should contact the Office of the Bursar, Cornell University, 260 Day Hall, Ithaca, New York 14853-2801 (telephone: 607/255-2336).

## ACCIDENT AND SICKNESS INSURANCE

The accident and sickness insurance charge on the July billing statement is for insurance for hospitalization, surgical fees, and major medical coverage for the period of August 29,1989, through August 28,1990. The cost of this insurance is lower than the average cost of comparable coverage under other group accident and health insurance policies. A brochure is included with the August bill.

For those who do not want medical insurance coverage, a medical insurance waiver form (included with the bursar's statement mailed in mid-July) must be completed and returned no later than the date specified on the waiver form. Waivers cannot be processed after this date. If a waiver form is lost or destroyed, a replacement can be obtained by contacting the Gannett Health Center (telephone: 607/255-6363).

# [1]Code of Academic Integrity

"Principle

Absolute integrity is expected of every Cornell student in all academic undertakings. Integrity entails a firm adherence to a set of values, and the values most essential to an academic community are grounded on the concept of honesty with respect to the intellectual efforts of oneself and others. While both students and faculty of Cornell assume the responsibility of maintaining and furthering these values, this document is concerned specifically with the conduct of students.

A Cornell student's submission of work for academic credit indicates that the work is the student's own. All outside assistance should be acknowledged, and the student's academic position truthfully reported at all times. In addition, Cornell student's have a right to expect academic integrity from each of their peers.

I. Guidelines for Students

A. General Responsibilities

1. A student shall in no way misrepresent his or her work.
2. A student shall in no way fraudulently or unfairly advance his or her academic position.
3. A student shall refuse to be a party to another student's failure to maintain academic integrity.
4. A student shall not in any other manner violate the principle of academic integrity.

B. Examples of Violations

The following actions are examples of activities that violate the Code of Academic Integrity and subject their actors to proceedings under the Code. This is not a definitive list.

1. Knowingly representing the work of others as one's own.
2. Using, obtaining or providing unauthorized assistance on examinations, papers, or any other academic work.
3. Fabricating data in support of laboratory or field work.
4. Forging a signature to certify completion of a course assignment or a recommendation to graduate school.
5. Unfairly advancing one's academic position by hoarding library materials.
6. Misrepresenting one's academic accomplishments.

C. Specific Guidelines for Courses

1. Examinations. During in-class examinations no student may use, give or receive any assistance or information not given in the examination or by the proctor. No student may take an examination for another student. Between the time a take-home examination is distributed and the time it is submitted by the student for grading, the student may not consult with any persons other than the course professor and teaching assistants regarding the examination. The student is responsible for understanding the conditions under which the examination will be taken.
2. Course Assignments. Students are encouraged to discuss the content of a course among themselves and to help each other to master it, but no student should receive help in doing a course assignment that is meant to test what he or she can do without help from others. Representing another's work as one's own is plagiarism and a violation of this Code. If materials are taken from published sources the student must clearly and completely cite the source of such materials. Work submitted by a student and used by a faculty member in the determination of a grade in a course may not be submitted by the student in a second course, unless such submission is approved in advance by the faculty member in the second course. If a student is submitting all or part of the same work simultaneously for the determination of a grade in two or more different courses, all faculty members in the courses involved must approve such submissions
3. Academic Misconduct. A faculty member may impose a grade penalty for any misconduct in the classroom or examination room. Examples of academic misconduct include, but are not limited to, talking during an exam, bringing unauthorized materials into the exam room, and disruptive behavior in the classroom
   a. The faculty member must promptly notify the student of the reason for the imposition of a penalty for academic misconduct and the degree to which his or her grade will be affected.
   b. Academic misconduct is not a violation of academic integrity. The student may, however, seek review by the Academic Integrity Hearing Board on the basis either that the finding of guilt is arbitrary and capricious or that the penalty for academic misconduct is excessive or inappropriate to the circumstances involved.[2]

D. Variances

A faculty member is responsible for informing his or her students and teaching assistants of variances from this Code that apply to work in his or her course. These variances should be clearly stated in writing at the beginning of the course or activity to which they apply.

E. Jurisdiction

The authority to determine whether a specific action shall be treated as a violation of academic integrity lies with the Academic Integrity Hearing Board.

II. Organization and Procedures

A. Students and staff members discovering an apparent violation should report the matter to the faculty member in charge of the course or to the chair of the appropriate Hearing Board. The chair is responsible for ensuring that all members of the school or college know to whom the report should be made.

B. Primary Hearing

1. Primary hearings are to be held by the faculty member unless the penalties available to him or her are inadequate, in which case, he or she may refer the case directly to the Hearing Board.
2. Notification. If, after investigation, possibly including a discussion with the student, a faculty member believes that a student has violated the Code of Academic Integrity, the charge shall include notification of a primary hearing to be held as soon as practical after the alleged infraction has come to the attention of the faculty member, but with at least one week's notice to the student. This notification period may be shortened by the agreement of both parties. The charge shall include notice of the availability of the Judicial Advisor.
3. Composition. At the primary hearing the following shall be present: the faculty member concerned, the student in question, and a third party independent witness. The independent witness shall be a faculty member or a student appointed by the Hearing Board Chair or the chair of the faculty member's department. The student may bring to the hearing an advisor and additional witnesses to testify to his or her innocence.
4. Procedure.
   a. At the primary hearing, the faculty member shall present evidence in support of the charge against the student. The student shall be given the opportunity to respond and, if he or she wishes, to present evidence refuting the charge.
   b. The function of the independent witness is to observe the proceedings impartially, and in the event of an appeal from the judgment of the faculty member, be prepared to testify as to the procedures followed.

c. After hearing the student, the faculty member may either dismiss the charge, or if there is clear and convincing evidence that the student has violated this Code, find the student guilty. If the student is found guilty, the faculty member may impose any suitable grade punishment including failure in the course.[3]

d. A student wishing to seek review of the decision may bring the case before the Academic Integrity Hearing Board of the faculty member's college.

e. A faculty member who gives a penalty for a violation of academic integrity shall immediately report this action and the nature of the violation in writing to the student and to the record-keeper of the faculty member's Academic Integrity Hearing Board. This record-keeper shall then be responsible for its communication to the record-keeper in the student's college.

f. If the student fails to attend the primary hearing without a compelling excuse, the hearing may proceed in his or her absence.

C. College Academic Integrity Hearing Boards

1. Composition. Each college and school in the University, including the Graduate School and the Division of Summer Session, Extramural Study, and Related Programs, shall establish its own Academic Integrity Hearing Board. A model Hearing Board consists of the following:

a. A chair who is a member of the faculty, and, preferably, an experienced Board member, appointed by the dean of the college for a two-year term.

b. Three faculty members elected for three-year terms by the faculty of the college, except that in the case of the Division of Summer Session, Extramural Study, and Related Programs the faculty members shall be appointed by the dean.

c. Three students elected by the student body of the college or appointed by the dean of the college for at least one year, and preferably two-year terms. When possible, student terms should be staggered.

d. A non-voting record-keeper responsible for keeping clear and complete records of the proceedings.

2. Jurisdiction

a. The student may seek review of the decision of the primary hearing if:

1) He or she believes the procedure was improper or unfair.

2) He or she contests the finding of the faculty member.

3) He or she believes the penalty was too strict considering the offense.

b. After holding a primary hearing, the faculty member may bring the case to the Hearing Board if he or she believes a failing grade is too lenient considering the offense.

c. A student found guilty of more than one violation of the Code may be summoned before the college Hearing Board by the dean of his or her college. The Hearing Board may impose an additional penalty for such repeated offenses.

d. The dean of student's college who receives a report that a student has committed a violation of academic integrity while attending another academic institution or while enrolled in a Cornell sponsored off-campus program may, if he or she feels the situation warrants, summon the student to appear before the College Hearing Board.

The Hearing Board may impose any penalty, including an additional penalty, it feels appropriate for the violation involved.

e. The Academic Integrity Hearing Board shall hear all cases that come before it de novo.

While the Hearing Board may recommend an increase in any penalty imposed at the primary hearing, it should consider raising the penalty, if it is the student seeking review, only in the exceptional case.

f. The individual seeking review shall notify the chair of the Hearing Board of the faculty member's college within ten working days of the primary hearing. An exception to this deadline may be granted at the discretion of the chair of the Hearing Board on a showing of good cause.

3. Procedures

a. Each Board shall conform to procedures established by the Faculty Council of Representatives. Any college or school wishing to adopt a Board or procedures varying from this model must receive prior approval from the Dean of Faculty.

b. The Academic Integrity Hearing Board shall convene as soon as practical after notification of a request for review, although seven days notice should be given to all parties if possible. If a grade for the student in the course must be submitted before a case can be decided, the faculty member shall record a grade of incomplete, pending a decision by the Hearing Board.

c. Those present at the Hearing shall be:

1) The student, who has the right to be accompanied by an advisor and/or relevant witnesses,

2) The faculty member, who has the right to bring relevant witnesses,

3) The third party independent witness, if a primary hearing was held,

4) Any other person called by the chalr.

d. Should the student or faculty member fail to appear before the Hearing Board, the Board shall have full authority to proceed in his or her absence.

e. The Board members shall hear all available parties to the dispute and examine all the evidence presented. The Board may solicit outside advice at the discretion of the chair. The chair shall preside over the Hearing to ensure that no party threatens, intimidates, or coerces any of the participants.

f. The student shall have the right to present his or her case and to challenge the charges or the evidence. The student's advisor may assist the student in the presentation and questioning.

g. At least two-thirds of the voting Board members shall be present at every Hearing, including two students and two faculty members. Both parties may agree in writing to waive this quorum. Of those present, a simple majority shall decide the issue. The chair shall vote only in the case of a tie vote. The Board shall find the student guilty only if there is clear and convincing evidence indicating that the student has violated this Code.[4]

h. The chair shall notify each party to the dispute, in writing, of the Board's decision and, if appropriate, the penalty imposed. If the judgment of the faculty member is affirmed by the Board, or if the Board decides a different penalty is warranted, the dean of the faculty member's college and the dean of the student's college shall also receive the report.

i. If the student's college is different from the faculty member's, the chair shall alter the composition of the Board hearing the case by substituting or adding one faculty member and one student from the Hearing Board of the student's college.

4. The Board may act in one or more of the following ways:
   a. Find the student innocent of the charge.
   b. Find the student guilty of the charge and
      1) Recommend to the faculty member that he or she reduce the penalty given.
      2) Affirm the faculty member's decision.
      3) Recommend that the faculty member record a failing grade for the course, or for some portion of it.
      4) Recommend to the dean of the student's college that the student be placed on probation (or the college's equivalent).
      5) Recommend to the dean of the student's college that the student be suspended from the University for a period of time.
      6) Recommend to the dean of the student's college that the words "declared guilty of violation of the Code of Academic Integrity" be recorded on the student's transcript. The Hearing Board may set a date after which the student may petition the Board to have these words deleted from the transcript.
      7) Recommend to the dean of the student's college that the student be expelled from the University.
      8) Recommend to the dean of the student's college any other suitable action, including counseling, community service, or reprimand.
5. The student may seek review of the decision of the Hearing Board to the dean of the student's college within four weeks of the Board's decision. Exceptions to this deadline may be granted by the dean of the student's college on a showing of good cause. The dean may not increase the penalty recommended by the Hearing Board unless the Hearing Board had original jurisdiction in the case. The dean of the student's college should ensure that the recommendation of the Hearing Board is carried out or should give the Hearing Board and the parties a written explanation of why the recommendation was disregarded.
6. Annual Reports. Each college Academic Integrity Hearing Board shall submit a summary report of its proceedings (without identifying any particular student) to the Dean of the Faculty at the end of the academic year. The names of the members of the Board and any significant departures in procedures should be reported as well.
7. The existing school honor codes (as in the College of Veterinary Medicine and the Law School) are not governed by the foregoing legislation, but current versions of these honor codes must be kept on file with the Office of the Dean of Faculty.

   In the case of allegations against a student enrolled in a course subject to a school honor code but registered in another college, all actions beyond the primary hearing revert to the Hearing Board of the student's college.
8. Records of Action
   a. If the student is found guilty, a record of the outcome of the case and the nature of the violation shall be kept by the Hearing Board, and copies shall be sent to the record-keeper in the student's college, if different. Unless the decision provides for notation on the student's transcript, this record shall be disclosed only to deans of colleges or Hearing Boards considering other charges against the same student. A student may waive this right to confidentiality.
   b. If the student is found not guilty by the Hearing Board, all records of the case, including the report of the primary hearing, shall be expunged from the files of the record-keeper."

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[1] Adopted by the Faculty Council of Representatives, May 24, 1976, Records, pp. 4525–27C, Appendix A; March 11, 1981, Records pp. 5298–5303C; May 12, 1982, Records, pp. 5505–06C; April 10, 1985, Records pp. 5991–6002C and May 15, 1985, Records, pp. 6073–84.

[2] "Arbitrary and Capricious" describes actions which have not sound basis in law, facto, or reason or are grounded solely in bad faith or personal desires. A determination is arbitrary and capricious only if it is one no reasonable mind could reach.

[3] "Clear and convincing" as a standard of proof refers to a quantum of evidence beyond a mere preponderance but below that characterized as "beyond a reasonable doubt" and such that it will produce in the mind of the trier of fact a firm belief as to the facts sought to be established.

[4] See the definition at section II.B.4.c.

# NEW YORK STATE COLLEGE OF AGRICULTURE AND LIFE SCIENCES

## ADMINISTRATION

David L. Call, dean

Kenneth E. Wing, associate dean

George J. Conneman, director of academic programs

Elizabeth A. Oltenacu, associate director of academic programs

Brian F. Chabot, acting director of research

David L. Brown, associate director of research

Lucinda A. Noble, director of cooperative extension

R. David Smith, associate director of cooperative extension

E. Walter Coward, Jr., director of international agriculture

### Office of Academic Programs Staff

Student services: Donald Burgett, Patricia Long, Catherine Thompson

Records: Tom Wakula

Registrar: Ruth Stanton

Scheduling: Cathy Place

Admissions: Richard Church, Susan Miller, Nancy Rehkugler, Randy Stewart

Career development: William Alberta, Catherine McCormick-Loerch

### Department Chairs

Agricultural and biological engineering: G. E. Rehkugler, Riley-Robb Hall

Agricultural economics: W. G. Tomek, Warren Hall

Agronomy: R. J. Wagenet, Emerson Hall

Animal science: J. M. Elliot, Morrison Hall

Communication: R. D. Colle, Roberts Hall

Education: R. E. Ripple, Roberts Hall

Entomology: R. A. Morse, Comstock Hall

Floriculture and ornamental horticulture: G. L. Good, Plant Science Building

Food science: R. A. Ledford, Stocking Hall

Microbiology: W. C. Ghiorse, Stocking Hall

Natural resources: J. P. Lassoie, Fernow Hall

Plant breeding and biometry: W. R. Coffman, Emerson Hall

Plant pathology: W. E. Fry, Plant Science Building

Pomology: G. H. Oberly, Plant Science Building

Poultry and avian sciences: R. E. Austic, Rice Hall

Rural sociology: E. C. Erickson. Warren Hall

Vegetable crops: E. E. Ewing, Plant Science Building

### Facilities

The College of Agriculture and Life Sciences is located on the upper campus, up the hill from the central area of Cornell University, on land that was once part of the Ezra Cornell family farm.

Buildings around the area commonly known as the Ag Quad house classrooms, offices, and laboratories. Flanking them are the greenhouses, gardens, and research facilities. Nearby orchards, barns, field plots, forests, and streams extend as far as the Animal Science Teaching Research Center at Harford and the Agricultural Experiment Station at Geneva.

Roberts Hall serves as headquarters for the administrative units, including offices of the deans and directors of academic programs, research, and cooperative extension. Included in the Office of Academic Programs are the director and associate director, the Admissions Office, the Career Development Office, and the Office of Student Services.

Mann Library, with its extensive collections of materials in the agricultural and biological sciences, is at the east end of the Ag Quad. The student lounge and service center, known as the Alfalfa Room, and many of the college classrooms are in Warren Hall. Public computer facilities are available in Warren Hall, in Riley-Robb Hall, and in Mann Library.

## DEGREE PROGRAMS

The College of Agriculture and Life Sciences offers programs leading to the degrees of Bachelor of Science, Master of Science, and Doctor of Philosophy. Professional degrees include the Master of Professional Studies and the Master of Arts in Teaching. Some registered professional licensing and certification programs are also available.

Each curriculum in the college creditable toward a degree is registered with the New York State Education Board and is linked with the national Higher Education General Information Survey (HEGIS) codes for federal and state reporting.

### Graduate Degrees

Graduate study is organized by fields that generally coincide with the academic departments but may draw faculty from several disciplines in the various colleges of the university. The following graduate fields have primary affiliation in Agriculture and Life Sciences. Current graduate field representatives are also listed.

Agriculture [M. P.S. (Agr.)], G. Conneman, Roberts Hall

Agricultural and Biological Engineering, W. Gunkel, Riley-Robb Hall

Agricultural Economics, W. Lesser, Warren Hall

Agronomy, J. Peverly, Bradfield Hall

Animal Breeding, J. Pollak, Morrison Hall

Animal Science, R. Quaas, Morrison Hall

*Biochemistry, Molecular and Cell Biology; A. Bretscher, Biotechnology Building

Biometry, S. Schwager, Warren Hall

*Botany, K. Niklas, Plant Science Building

Communication [M.P.S. (C.A.)], R. Ostman, Roberts Hall

Development Sociology, F. Young, Warren Hall

*Ecology and Evolutionary Biology, P. Marks, Corson Hall

Education [also M.A.T.], H. Wardeberg, Roberts Hall

Entomology, G. Eickwort, Comstock Hall

Environmental Toxicology, J. Fessenden MacDonald, Clark Hall

Floriculture and Ornamental Horticulture, K. Mudge, Plant Science Building

Food Science and Technology, D. Miller, Stocking Hall

*Genetics, C. Aquadro, Biotechnology Building

International Agricultural and Rural Development

[M.P.S. (Agr.)], E. W. Coward, Jr., Caldwell Hall

Landscape Architecture [M.L.A.], L. Mirin, W. Sibley Hall

Microbiology, W. Ghiorse, Stocking Hall

Natural Resources, R. Oglesby, Fernow Hall

*Neurobiology and Behavior, R. Harris-Warrick, Seeley Mudd Hall

Nutrition, B. Lewis, Martha Van Rensselaer Hall

*Physiology, H. Howland, Seeley Mudd Hall

Plant Breeding, E. Earle, Bradfield Hall

Plant Pathology, S. Beer, Plant Science Building

Plant Protection [M.P.S. (Agr.)], G. Bergstrom, Plant Science Building

Pomology, L. Powell, Plant Science Building

Statistics, G. Casella, Warren Hall

Vegetable Crops, P. Ludford, Plant Science Building

*Division of Biological Sciences

## Bachelor of Science Degree

Departments in the College of Agriculture and Life Sciences sponsor study for the B.S. degree in seventeen major fields. To qualify for the degree, students must fulfill requirements established by the faculty of the college and administered through the Office of Academic Programs. The following units offer major fields of study for undergraduates. A faculty advising coordinator is listed for each unit. Students should consult with the faculty coordinator regarding requirements and opportunities for concentrations within the major field.

*Agricultural and Biological Engineering:* G. Rehkugler, 104 Riley-Robb Hall

*Agronomy and Meteorology:* T. Scott, 1001 Bradfield Hall

*Animal Sciences:* D. Hogue, 255 Morrison Hall

*Applied Economics and Business Management:* O. Forker, 254 Warren Hall

*Biological Sciences, Division of:* H. Stinson, 118 Stimson Hall

*Communication:* B. Earle, 307 Roberts Hall

*Education:* H. Wardeberg, 408 Roberts Hall

*Entomology:* B. Peckarsky, 3134 Comstock Hall

*Food Science:* J. Sherbon, 207 Stocking Hall

*Landscape Architecture:* D. Krall, 230 E. Roberts Hall

*Microbiology:* V. Stewart, 412a Stocking Hall

*Natural Resources:* H. Brumsted, 122e Fernow Hall

*Plant Science Units (Plant Biology, Breeding, Pathology/Protection, Floriculture, Pomology, Vegetable Crops):* J. Lorbeer, 424 Plant Science Building

*Rural Sociology:* E. Erickson, 133 Warren Hall

*Statistics and Biometry:* C. McCulloch, 338 Warren Hall

*Special Agricultural Studies (ALS):* D. Burgett, 17 Roberts Hall

## Summary of Basic College Requirements for Graduation

### 1. Credit Hours

a. Minimum: 120
b. Minimum with letter grade: 100
c. Maximum independent study, internships: 15
d. Minimum College of Agriculture and Life Sciences: 55
e. Maximum from endowed colleges without additional charge: 55
f. Maximum transferred in: 60; minimum at Cornell: 60

*Note:* Credits received for physical education and for certain other courses, such as Mathematics 109 and Education 005, do not count toward the 120 hours but are included on the transcript and in the grade-point average.

### 2. Residence

a. Normally, eight full-time semesters
b. Seven semesters, if all other degree requirements are met, with a grade-point average of 2.0
c. Minimum of 12 credits per semester
d. Minimum of two semesters in the College of Agriculture and Life Sciences (residency in the Division of Unclassified Students [DUS] does not count toward residency in the college)
e. Students who have 8 semesters in residence at Cornell, including two in the college, and who have 8 or fewer credits remaining for graduation may petition for approval to complete this work elsewhere.

### 3. Physical Education

a. Completion of university requirement for two terms of work
b. Transfer students may be exempt from part or all of the requirement.

*Note:* Requests for postponement or exemption should be made in writing to the University Faculty Committee on Physical Education. Questions should be referred to Alan Gantert, Teagle Hall (255-4286).

### 4. Grade-Point Average (GPA)

a. Cumulative GPA: 1.7 or above must be maintained
b. Final GPA: 1.7 for a minimum of 12 credits in last term.

*Note:* Only grades earned at Cornell and while registered in the college are included.

### 5. Distribution

The purpose of the distribution requirement is to acquaint students with a broad range of subject matter. Through study of the physical sciences, students develop quantitative and analytic skills based on an understanding of the physical laws governing the universe; through study of the biological sciences, they gain an appreciation of the variability of living organisms. The social sciences and humanities give students perspective on the structure and values of the society in which we live. Through development of written and oral expression skills, students master the essentials of effective communication.

Credits received for independent study, field, teaching, or work experience, and internships cannot be used to fulfill the distribution requirement. Courses judged to be remedial in the discipline such as Education 005, will not be counted.

*Group A: Physical Sciences.* 9 credits of 100- or 200- level courses, in at least two disciplines, including at least one course in chemistry or physics.

Agronomy 131
Astronomy
Chemistry
Geology
*Mathematics (excluding Education 005 and Mathematics 109)
Education 115
Physics

*The college mathematics requirement is described below.

*Group B: Biological Sciences.* 9 credits, including 6 of introductory biological science.

Biological Sciences (except 202, 205, 206, 301)
Animal Sciences 220, 221
Entomology 212
Microbiology
Plant Breeding 225
Plant Pathology 301, 309

*Group C: Social Sciences and Humanities.* 12 credits (6 in each of the following two categories):

*Social Sciences.* 100- or 200-level courses in the following departments (excluding Freshman Seminars):

Archaeology
Anthropology
CEH 110/CEH 111 (cannot receive credit for these courses and Econ 101/Econ 102)
Economics
Government (including Africana Studies 190)
HDFS 150 (cannot receive credit for this course and Soc 243)
Psychology
Sociology (including Rural Sociology)

*Humanities.* 100-, 200-, or 300-level courses in the following departments (excluding Freshman Seminars and language courses):

Africana Studies (humanities and history)
ALS 100 or ALS 318
Asian and Near Eastern Studies
Classics
Comparative Literature
English (literature only)
French, German, Italian, Russian, and Spanish (literature only)
History and History of Art/Architecture
Music and Theatre Arts (theory, literature, and history only)
Philosophy (also Natural Resources 407)

*Group D: Written and Oral Expression.* 9 credits, of which at least 6 must be in written expression, selected from the following:

Freshman Seminars
Communication 161, 201, 350, 352, 360, 363, 365
English 280–281, 288–289, 382–385, 388–389
Hotel Administration 365

### 6. Mathematics

The faculty requires minimum competency in mathematics as a requisite to satisfactory pursuit of a degree. All students must complete, with a passing grade, one course in mathematics as part of the physical sciences requirement. Advanced placement credit in mathematics or transfer credit in a college calculus course may be presented to meet this requirement.

a. The ALS Mathematics Placement test: All entering undergraduates, except those presenting advanced placement or transfer credit in college calculus, must take the test, which is administered free of charge just prior to registration each semester. No student may repeat the placement test. It consists of fifty sample questions from arithmetic, algebra, geometry, trigonometry, and basic calculus. The index score is determined by the number of correct answers minus one quarter of the number of incorrect answers.

b. The index score is used to help students select appropriate courses. If a high index score (currently defined as equal to or greater than 30) is attained, the mathematics requirement in physical sciences is waived. If a low index score (of 12 or less) is attained, the student is to enroll in Education 005 before selecting a mathematics course to fulfill the requirement.

c. When presenting mathematics transfer credit, a student may

1. include precalculus credits along with the calculus credits
2. transfer up to 6 credits to the physical sciences requirement, if the index score is 30 or above
3. *not* transfer any credit to the physical sciences requirement if the index score is from 13 to 20 (credit may, however, be counted toward graduation)
4. *not* transfer any credit in mathematics if the index score is below 13.

**7. Faculty Adviser**

a. Each student is assigned to a faculty adviser soon after being admitted to the college. The faculty adviser will help the student plan a program of study and enroll in courses appropriate to the degree programs offered by the college.

b. Course enrollment each semester should be planned in consultation with the faculty adviser. The signature of the faculty adviser indicates approval of, or at least consent to, the choice of courses made and is required before the course enrollment can be processed.

c. All academic plans, such as acceleration and graduate study, should be made in consultation with the student's faculty adviser. Support of the adviser is essential if a student petitions for an exception to any of the requirements of the college.

**8. Progress toward the Degree**

a. The progress of each student toward meeting the degree requirements is recorded each term in the college registrar's office on a summary of record form.

b. Students who have been in residence for eight semesters and who have met the graduation requirements will be graduated. Students are entitled to attend for the full eight semesters even if they have completed the graduation requirements in fewer semesters. A student who wishes to continue study after graduation must apply for admission as a special student.

c. *Graduation with distinction:* Students who rank in the top 10 percent of the college's graduates on the basis of the GPA for the last 60 credits completed at Cornell will be graduated with distinction.

# STUDENTS

Undergraduate enrollment is approximately 3,000, with about 56 percent in the upper division. Each year about 850 students are graduated, while 650 freshmen and 250 transfer students are enrolled. Members of the faculty of the college serve as chairs of the Special Committees of about 1,000 graduate students.

## Admission

The College Admissions Committee selects applicants who are academically well prepared and appear most likely to profit from the college's various curricula.

Most students come from New York State, but around 25 percent come from other parts of the United States or abroad. About half of the undergraduates are women. Approximately 11 percent are identified as members of minority ethnic groups.

## Transfer Students

Approximately 18 to 20 percent of the ALS undergraduate students are transfers who have taken part of their collegiate work at community colleges, agricultural and technical colleges, or other four-year institutions. Many of them hold an associate degree.

A Cornell student in good standing may apply for *intra-university transfer* to pursue a course of study unavailable in his or her current college. Guidelines are available in the Admissions Office of the College of Agriculture and Life Sciences, 195 Roberts Hall. The procedure includes filing a transfer request and submitting a letter explaining reasons for making the transfer.

Consideration is given to students who have demonstrated an interest in their intended field of study, by taking appropriate prerequisite courses and courses within this area of study. Academic achievement is also considered. Students are seldom allowed to transfer during their freshman year.

In some cases a student may be referred to the Division of Unclassified Students to study for one semester before entering the college. A second semester is considered under unusual circumstances. During this trial semester the student must achieve a predetermined average (usually 2.7) and take approved courses to assure acceptance.

## Special Students

A limited number of non-degree candidates who want to take selected courses in the college are admitted each year. Applicants should submit the standard Cornell application, a resume of their work experience and a list of the courses they want to take. For more information, students should contact the Admissions Office, 195 Roberts Hall.

## Part-time Students

All students in the College of Agriculture and Life Sciences are expected to be enrolled as full-time students in a registered program of study. Part-time students must register in the Division of Summer Session, Extramural Courses, and Related Programs. The Continuing Education Information Service, B-12 Ives Hall, provides information, counseling, and special programs for mature students throughout the university.

## Off-Campus Students

Programs in which students study off campus but enroll for Cornell credit include SEA semester, field study in human ecology or industrial and labor relations, Albany programs, Cornell-in-Washington, student teaching, IPM internship, and clinical microbiology internship. Students intending to receive Cornell credit for work done off campus should inform the college registrar at the time of enrolling for courses to ensure that proper registration will occur.

## Leave of Absence

A student considering taking a leave of absence from the university should contact the Office of Student Services. A petition must be filed when requesting a leave of a semester or more. Students returning from a leave of absence do not need to reapply for admission; they should contact Student Services.

## Withdrawal

A student who finds it necessary to leave the university permanently should file a petition for withdrawal. Such petitions are approved if the student is in good standing. Students who have withdrawn and who later decide to return must apply to the Admissions Office.

## Graduation

Diplomas are prepared by the Office of the University Registrar and distributed to those who have completed the degree requirements and have been approved by the college faculty.

# ADVISING AND COUNSELING SERVICES

Faculty members in the College of Agriculture and Life Sciences recognize that students need information and advice to make intelligent decisions while they are in college. They believe that personal contact on a one-to-one basis is an important way to identify individual differences and needs of students. Faculty members believe that they can and should be an important source of information and advice on both academic and personal matters. Thus they consider advising to be an important and integral part of the undergraduate program.

**The Office of Student Services** has overall responsibility for coordinating the college advising and academic counseling program. Each student enrolled in the college is assigned to a faculty adviser in the major field of study for aid in developing a program of study and to a peer adviser who has volunteered to help with problems of a general nature relating to personal matters and campus life.

Student Services provides a variety of services for undergraduates in the College of Agriculture and Life Sciences. The staff is available to help students with academic, social, and personal concerns. In addition, learning skills information and tutoring is offered, at no charge, by the college's honor society, Ho-Nun-De-Kah. Assistance is also available for students considering submitting petitions for waiver of college regulations.

The office is located on the basement floor of Roberts Hall, Room 17. Appointments are not necessary and questions regarding services and procedures should be directed to Donald Burgett and the Student Services staff.

**Minority students** in the College of Agriculture and Life Sciences receive counseling, tutoring, advising, and referral to agencies that will meet their special needs. The Educational Opportunity Program (EOP) is a state-supported program intended to assist New York State students who meet specific economic and academic criteria set by the State Programs Office and the NYS Board of Regents. Eligible students are accepted during the admissions process.

For further information, please contact Catherine Thompson in 17 Roberts Hall.

**The Office of Career Development** offers a variety of services to all students and alumni of the college. Career development includes self-awareness and assessment, career exploration, decision making, and job search. Services are designed to assist students and alumni with those activities and to help them develop the career planning and job search skills they will find useful as their career paths progress and change.

An active on-campus recruitment program is integrated with the other services provided by the office. Extensive job vacancy files are updated daily and a bulletin of select job listings is published each month. The Career Library contains an extensive collection of current and useful material. The Sigi Plus system is a computer-assisted guidance system that can help in career and educational planning, providing useful information and ideas about work-related interests, skills and values, and occupations and careers. Internships, summer jobs, job search presentations, and assistance with resume writing are other activities of interest.

The office, in conjunction with a network of college faculty members, assists students throughout their undergraduate years. For further information students should contact William Alberta and the staff in 16 Roberts Hall.

**Financial aid** is administered through the university office in Day Hall. Endowment funds and annual donations provide supplemental aid for students in the college who are eligible for aid. Information about these college grants is available from the Office of Academic Programs in Roberts Hall, *after* students have a financial aid package established through the university office in Day Hall. Grants recommended by the college Financial Aid and Scholarship Committee are processed through the university's Office of Financial Aid.

A small loan fund is administered by the college through the Office of Academic Programs to assist students facing short-term emergencies. The loans are interest-free and are usually made for no more than ninety days. For information and an application form students should contact the Office of Academic Programs, 192 Roberts Hall.

### Academic Integrity Policy

The College of Agriculture and Life Sciences faculty, students, and administration support and abide by the university Code of Academic Integrity. Its principle is that absolute integrity is expected of every student in all academic undertakings: students must in no way misrepresent their work, fraudulently or unfairly advance their academic status, or be a party to another student's failure to maintain academic integrity.

The maintenance of an atmosphere of academic honor and the fulfillment of the provisions of the code are the responsibility of the students and the faculty. Therefore, all students and faculty members shall refrain from any action that would violate the basic principles of this code.

1) Students assume responsibility for the content and integrity of the work they submit, such as papers, examinations, or reports.

2) Students are guilty of violating the code if they

- knowingly represent the work of others as their own
- use or obtain unauthorized assistance in any academic work
- give fraudulent assistance to another student
- fabricate data in support of laboratory or field work
- forge a signature to certify completion or approval
- knowingly deprive other students of library resources, laboratory equipment, computer programs, and similar aids
- in any other manner violate the principle of absolute integrity

3) Faculty members assume responsibility to make clear to students and teaching assistants specific regulations that apply to scholarly work in a discipline.

4) Faculty members fulfill their responsibility to

- maintain in all class, laboratory, and examination activities an atmosphere conducive to academic integrity and honor
- make clear the conditions under which examinations are to be given
- make clear the consequences of violating any aspects of the code
- provide opportunities for students to discuss the content of courses with each other and help each other to master that content and distinguish those activities from course assignments that are meant to test what students can do on their own without help from others
- state explicitly the procedures for use of materials taken from published sources and the methods appropriate to a discipline by which students must cite the source of such materials
- approve in advance, in consultation with other faculty members, which work submitted by a student and used by a faculty member to determine a grade in a course may be submitted by that student in a different course
- monitor the work and maintain such records as will support the crucial underpinning of all guidelines: the students' submitted work must be their own and no one else's

Cornell's Code of Academic Integrity spells out how individuals who have allegedly violated Cornell standards for academic integrity are to be confronted and, if found to be in violation of those standards, sanctioned. The code provides for informal resolution of most perceived violations through a primary hearing between the faculty member and the student involved. If necessary, a hearing before a hearing board follows.

The Academic Integrity Hearing Board for the College of Agriculture and Life Sciences consists of three elected faculty members, three elected student members, a chair appointed by the dean, and the coordinator of student services, who serves as a nonvoting record keeper. Professor J. Bugliari is the current chair.

Individuals who observe or are aware of an alleged violation of the code should report the incident to the faculty member in charge of a course or to the chair of the hearing board. General information and details on procedures for suspected violations or hearings are available from the Office of Student Services, 17 Roberts Hall.

## ACADEMIC POLICIES AND PROCEDURES

### Records

**The college registrar** maintains for each student a complete record of academic achievement. A permanent record card is on file for each matriculated student and is updated whenever new information becomes available. Staff members are available in 192 Roberts Hall to consult with students regarding the assignment of credit toward meeting distribution and elective requirements and to verify the official summary of record.

**The Committee on Academic Achievement and Petitions** is a standing committee of six college faculty members and two students. On behalf of the faculty and subject to its review, the committee

- reviews, at the end of each semester and at other times as shall seem appropriate to the committee, the progress of all students not meeting academic requirements
- receives and acts upon petitions from individual students asking for exceptions from particular academic regulations or requirements of the college, or for reconsideration of action previously taken by the committee
- acts upon readmission requests from persons whose previous enrollment was terminated by the committee
- notifies the petitioner in writing of the action taken by the committee

**Good academic standing** means a student is eligible for, or has been allowed to register and enroll in, academic course work for the current semester. Whether an individual student is in good academic standing is determined by the college registrar and the Committee on Academic Achievement and Petitions.

**A petition to be exempt** from a college academic requirement or regulation may be filed by any student who has grounds for exemption. Forms are available in the Office of Student Services, 17 Roberts Hall.

A petition is usually prepared with the assistance of a student's faculty adviser, whose signature is required; it indicates the adviser's awareness of the petition. The adviser's recommendation is helpful to the committee. The committee determines whether there is evidence of mitigating and unforeseen circumstances *beyond the control of the student* that would warrant an exemption or other action.

### Registration Procedures

All students must register with the university and this college at the beginning of each semester. Registration materials are available at a time and place announced each term by the Office of the University Registrar.

### Course Enrollment Procedures

To enroll in courses, students pick up materials from the college Scheduling Office, 192 Roberts Hall; plan a schedule in consultation with their adviser; and return the completed forms to the Scheduling Office for verification and processing. Class lists are generated on the basis of the properly filed course enrollment forms.

To enroll in courses that involve independent study, teaching, or research, a student must file an *independent study statement.* Students who will be studying off campus or abroad should file the *intent to study off campus* form to ensure that proper registration will occur. Both forms are available from the college registrar, 192 Roberts Hall.

Students may enroll again for a course in which they received a grade of F in a previous semester. The grade received the second time will be recorded and both grades calculated as part of their GPA.

Students should *not* enroll again for a course in which they received an incomplete. Work for that course should be completed. The instructor will file a change of grade form. An incomplete not made up by the end of two successive semesters of registration reverts to a failure. In the case of a graduating senior, incompletes revert to failures at the time of graduation.

Students enrolled in a two-semester course will receive an R at the end of the first semester and should enroll again for the same course the second semester. The letter grade will be recorded for the second semester when all work for the course is completed. A note on the transcript will explain the two grades for the same course.

A student is held responsible for and receives a grade for those courses in which he or she enrolls unless the *student* officially changes such enrollment. All changes in courses or credit, grading options, or sections must be made by the student at the Scheduling Office, 192 Roberts Hall, on an official form provided for that purpose.

**Add/Drop/Changes** are made by filing properly signed forms in the Scheduling Office, 192 Roberts Hall. Approval and signature of the faculty adviser and course instructor are required to add or to drop a course.

Students may add courses and change grading options or credit hours where applicable during the first three weeks of the term and may drop courses until the end of the sixth week.

Students wishing to withdraw from a course after the end of the sixth week must petition to the college Committee on Academic Achievement and Petitions. A form is available in 17 Roberts Hall. Requests for course changes are approved only when the members of the committee are convinced that unusual circumstances are clearly *beyond the control of the student.* The committee assumes that students should have been able to make decisions about course content, total work load, and scheduling prior to the end of the sixth week of the semester.

If the petition to drop a course is approved after the end of the eighth week of classes, the course remains on the student's record and a W (for "withdrawal") is recorded on the transcript.

### Grade Reports

Grade reports for the fall term are included in spring term registration materials; grade reports for the spring term are mailed to students at their home addresses unless alternative addresses are reported to the college or university registrar by mid-May.

### Academic Deficiency Policies

At the end of each semester, the Committee on Academic Achievement and Petitions reviews the records of those students who in any respect are failing to meet the academic requirements of the college or who persistently fail to attend classes. In case of students not making satisfactory progress, the committee takes appropriate action, including, but not limited to, issuing warnings to students, suspending them, decreeing that they may not reregister, granting them leaves of absence, and advising them to withdraw.

Specifically, the committee considers as possible cause for action failure to attend and participate in courses on a regular basis or, at the end of any semester, failure to attain one or more of the following:

- semester GPA of at least 1.7
- cumulative GPA of at least 1.7
- satisfactory work in 12 or more credits per semester
- reasonable progress toward completion of distribution requirements
- appropriate completion of college and university requirements

In general terms, regular participation in course work with academic loads at a level sufficient to assure graduation within eight semesters and grades averaging C– (1.7) or higher are prima facie evidence of satisfactory progress.

## HONORS PROGRAM

The Bachelor of Science degree with honors will be conferred upon those students who, in addition to having completed the requirements for the degree of Bachelor of Science, have satisfactorily completed the honors program in their area of major interest and have been recommended for the degree by the honors committee of that area.

An undergraduate wishing to enroll in the honors program must have completed at least 55 credits, at least 30 of the 55 at Cornell. Also, the student must have attained a cumulative grade-point average of at least 3.0 at the time of entry.

Interested students must make written application no later than the end of the third week of the first semester of their senior year, but are encouraged to make arrangements with a faculty member during the second semester of their junior year. An application form is available from the college registrar, 192 Roberts Hall, or from the area committee chair. (Biological sciences students should get applications at 118 Stimson Hall.)

Written approval of the faculty member who will direct the research and of the honors committee in the area is required. After the college registrar verifies the student's grade-point average, the student will be officially enrolled in the honors program.

Academic credit may also be earned by enrolling in an appropriate independent study course. When applying for admission to the program, the student may, if appropriate, submit a budget and a modest request for funds to cover some of the costs the student incurs in doing the research.

The honors committee for each area recommends to the college registrar those students who qualify for honors. Only those who maintain a GPA of at least 3.0 will be graduated with honors.

Students in the College of Agriculture and Life Sciences wishing to participate in the honors program must be accepted in one of the program areas approved by the faculty. Students are not eligible for honors by participating in a program offered by another college or administrative unit.

### Animal Sciences

Faculty committee: J. A. Marsh, chair; H. F. Hintz, R. L. Quaas

The objective of the animal sciences honors program is to provide outstanding undergraduates with the opportunity to pursue supervised independent research and to develop an awareness of the scientific process. It is expected that the research will require significant effort and creative input by the student in its design and execution and in the reporting of the results.

Those students with majors in animal sciences who are interested in doing an honors project should consult with their faculty advisers early in their junior year. All students are expected to meet the college requirements in qualifying for the program and to complete the following:

- Identify a potential honors project sponsor (i.e., a faculty member working in the animal sciences) and secure that faculty member's commitment to sponsor the student in the honors project. That should be accomplished early in the second semester of the junior year.
- Preregister during the spring semester for AS 496, Animal Sciences Honors Seminar, which is offered in the fall semester.
- Register for 3 credit hours of AS 499, Undergraduate Research, for the research project during a semester *prior* to that in which the honors thesis will be completed.

Additional AS 499 credit on other topics may be taken in earlier semesters if the student so desires. AS 499 credit *will not* be given during the last semester of the student's honors project.
- Participate in AS 402, Seminar in Animal Sciences, during the spring semester and report on and discuss the project and results.
- Submit a written thesis to the honors committee and to a selected external reviewer by the scheduled deadline. Specific information regarding deadlines, format, and organization for the thesis will be provided.
- Meet with the honors committee for a short oral defense of the thesis following a review of the thesis by the student's sponsor, the external reviewer, and the honors committee.

Details pertaining to the specific requirements of the program can be obtained from the office of the committee chair, 102 Rice Hall.

## Biological Sciences

Students interested in the honors program in the biological sciences should consult with their faculty advisers early in their junior year. Applications and details pertaining to program requirements may be obtained from the Division Office for Academic Affairs, 118 Stimson Hall. Also see Biological Sciences section in this catalog. Information on faculty research activities is available in the Behrman Biology Center, G20 Stimson Hall.

## Entomology

Faculty committee: W. L. Brown, Jr., chair; D. Pimentel, M. J. Tauber

An honors program in the area of entomology may be pursued by any qualified student in the College of Agriculture and Life Sciences (see the requirements at the beginning of this section). The student need not be specializing in entomology. Insects, because of their variety, small size, and easy availability, are convenient subjects for study in a wide array of problems dealing with living systems. Short life cycles, unique physiologies and developmental patterns, and species with easily managed colony requirements and a wide range of behavioral traits provide the raw material for honors study. Cornell's diverse faculty interests and extensive collections and library in entomology are also major assets if a student selects entomology as the area for honors study.

The honors committee requires that an undergraduate who is interested in embarking upon an honors project proceed with the following steps:

- Discuss the matter with his or her academic adviser, preferably in the junior year, so that a research project can be carefully planned. The possibility of conducting some research during the junior year and/or summer should be discussed.
- Discuss the project with an appropriate faculty member in the Department of Entomology who can serve as a supervisor to oversee the honors research. (The faculty adviser will be of assistance in determining which faculty entomologist might be the best supervisor, the decision being based primarily on available faculty members' areas of expertise.)
- Prepare a brief, tentative plan for the project for discussion and approval of the honors project supervisor. The plan should include a statement of objects or hypotheses, proposed methods for testing hypotheses, needs for laboratory space or shared equipment, and a budget outlining financial support needed for travel and supplies.
- Present a completed application to the chair of the entomology honors committee no later than the end of the third week of the first semester of the senior year. Earlier submission is encouraged.
- Submit a brief progress report, approved by the project supervisor, to the entomology honors committee by midterm of the semester in which the student will complete his or her graduation requirements.
- Present a formal seminar reporting the significant findings of the research to the Department of Entomology (preferably as a Jugatae seminar) in the last semester of the senior year.
- Submit two copies of the final project report (honors thesis) to the chair of the entomology area honors committee no later than two weeks before the last day of classes in the semester in which the student anticipates graduation. The thesis will be reviewed by the faculty honors project supervisor and one other referee from the department honors committee. The committee will return the thesis to the student one week before the last day of classes. If reviewers indicate that changes must be made, the revised thesis should be submitted to the chair no later than the last day of classes.

## Natural Resources

Faculty committee: M. E. Richmond, chair; J. W. Kelley, R. J. McNeil

The honors program in natural resources provides an opportunity for undergraduates to participate in independent research in the areas of fisheries and aquatic science, forest science, wildlife science, ecotoxicology, and conservation. The subject matter and nature of the research experience may be quite varied in this program but require the guidance and supervision of a faculty member with substantial interest or expertise in the problem area chosen.

In addition to meeting requirements of the college, the student is expected to do the following:

- Register for the honors program in the junior year or earlier.
- Select a faculty adviser who will help identify and formulate a research problem.
- Carry out an independent research effort that is original and separate from the work of others who may be investigating similar subjects.
- Describe and summarize the work in the format of a conventional master's thesis or in the form of a scientific paper ready for journal submission. About half of the theses have been published.
- Work closely with at least two faculty or staff members who will agree to serve as readers for the thesis. Provide readers with a copy of the guidelines for evaluation of honors theses, available from the department's honors program committee.

## Nutritional Sciences

Faculty committee: W. J. Arion, chair; C. Campbell, T. C. Campbell

The honors program in nutritional sciences is designed to provide the academically talented undergraduate with the opportunity to become involved in a faculty research program. This program is available to students majoring in general studies with a concentration in nutritional sciences. Students are selected in the spring semester of the sophomore year on the basis of scholastic achievement, cumulative grade point average, and motivation for independent study. Students interested in participating in the honors program should consult their faculty advisers or contact committee chair Professor William J. Arion, 227 Savage Hall, and submit their application to the honors committee.

In addition to meeting requirements of the college, to qualify for graduation with honors, students must:

- Maintain high scholastic achievement.
- Satisfactorily complete the junior seminars, NS 398 and 498. Students are required to complete biochemistry by the end of the first semester of the junior year, and strongly encouraged to complete NS 332, Laboratory Methods in Nutritional Sciences, by the end of the junior year.
- Satisfactorily complete NS 499, Honors Problem, with a minimum of 6 credits, during the senior year. To do so they must (1) attend a one-hour senior seminar, fall and spring, (2) plan and carry out an independent research problem in consultation with a faculty adviser, (3) submit for approval a written thesis to the division honors committee, (4) present a final seminar on their research, and (5) register for honors with the ALS college registrar by the first two weeks of the senior year.

A copy of the honors program guidelines are available in the division's Undergraduate Office, 335 Martha Van Rensselaer Hall, or from the honors chair.

## Physical Sciences

Faculty committee: C. E. McCulloch, chair; G. W. Fick, J.-Y. Parlange, J. W. Sherbon

The honors program in physical sciences provides outstanding students with an opportunity to do independent research under the supervision of a faculty member in the Departments of Agricultural and Biological Engineering, Agronomy, Food Science, or in the Biometrics Unit.

Students must be enrolled in the program for a minimum of two semesters and must also enroll in the appropriate departmental independent study course for a total of at least 6 credits. They must submit a report of their research to the honors committee at least four weeks prior to the end of instruction of the semester in which they expect to graduate.

Details of the program can be obtained from the chair of the physical sciences honors committee.

### Plant Sciences

Faculty committee: M. Petrovic, chair; L. Creasy, R. L. Obendorf, C. Wien, R. P. Korf, S. Zinder

Before acceptance into the program, students must submit to the chair of the plant sciences honors committee a completed application and a one-page tentative project outline by the end of the second week of classes in the first semester of their senior year. The project outline must be approved by the faculty supervisor and should include a clear statement of the objective(s) of the research, methodology, and needs for space, equipment, and supplies (attached budget required). Full committee approval is needed for acceptance into the program.

Completion of the honors program in plant sciences requires two copies of a report of independent research in the honors program to be submitted to the chair of the honors committee before the last day of classes of the semester in which the degree is sought. The report should be written in the format for research publication required by that discipline of plant science in which the student is enrolled. The report must be accompanied by a letter of recommendation from the supervisor of the research, that letter reflecting the supervisor's familiarity with the research and providing an evaluation of the performance and a recommendation for graduation with honors.

The honors committee will review the report, and if a majority of the committee votes favorably, the chair will recommend graduation with honors for that student in a letter to the director of academic programs. One copy of the report will be returned to the student. The other will be shelved in Mann Library.

### Social Sciences

Faculty committee: N. E. Awa, chair; J. M. Conrad, D. B. Gowin, T. A. Hirschl

Honors degrees are awarded in the behavioral and social sciences upon approval of an honors thesis reporting a piece of original research in an appropriate area.

The research should deal with a substantive issue within one of the fields in the behavioral and social sciences. Both the results of the research and the methodology or the argument by which the results were achieved must be reported. Reviews of literature, practical conclusions or applications, or broad characterizations of an area of inquiry may constitute part of the research report but are not themselves sufficient to count as research. While work may originate in prior class work, it is expected that honors will extend it. Students may, however, register for independent study in conjunction with an honors project.

Reports must be written according to the form of any standard journal within the appropriate fields. Four copies of the report should be submitted to the chair of the committee no later than three weeks prior to the last day of classes of the semester for which the degree is sought. A supporting letter from the faculty member supervising the work must also be submitted. Approval of the thesis requires a majority vote of the honors committee.

## INTERCOLLEGE PROGRAMS

The College of Agriculture and Life Sciences *does not* participate in any dual-degree programs. Study for the Bachelor of Science is the only undergraduate degree program offered.

**The College of Veterinary Medicine** may accept students who are then permitted to double-register in their seventh or eighth semester and complete requirements for the Bachelor of Science degree in the College of Agriculture and Life Sciences. Students should consult with the college registrar, 192 Roberts Hall, to assure that degree requirements have been fulfilled.

**Students who have been offered admission to the S. C. Johnson Graduate School of Management** upon completion of the B.S degree in Agriculture and Life Sciences may take a program of management courses in their senior year if it is approved by their college faculty adviser as part of their undergraduate program. In certain cases an "upset" tuition charge, equal to the endowed undergraduate tuition rate, will be applied for undergraduate statutory college students taking excess credit hours from endowed colleges and schools. Inquiries should be directed to the university bursar.

**Students in the Field Program in Agricultural and Biological Engineering** are usually enrolled in the College of Agriculture and Life Sciences during the freshman and sophomore years and jointly enrolled in this college and the College of Engineering in the junior and senior years. Students pay the engineering college tuition in the junior year. The curriculum is accredited by the Accreditation Board for Engineering and Technology. The B.S. degree is awarded in cooperation with the College of Engineering.

**The Program in Landscape Architecture** is cosponsored by the Department of Floriculture and Ornamental Horticulture in the College of Agriculture and Life Sciences and by the College of Architecture, Art, and Planning. The program offers a first professional degree curriculum in landscape architecture at both undergraduate and graduate levels, as well as a graduate second professional degree program.

**The Division of Nutritional Sciences** is an intercollege unit affiliated with the College of Human Ecology and the College of Agriculture and Life Sciences. The undergraduate nutrition major is based in the College of Human Ecology. Students in Agriculture and Life Sciences may study nutrition in areas such as animal sciences, poultry and avian sciences, food-industry management, food science, microbiology, pomology, and vegetable crops. Students may also plan a concentration in biological sciences, option 8, or a concentration in general studies in agriculture to include a human nutrition component.

**The Program on Science, Technology, and Society** is an academic unit that engages in teaching and research involving the interactions of science and technology with social and political institutions. The program draws its students, faculty, and research staff from the various divisions of the university, including the College of Agriculture and Life Sciences. It offers an interdisciplinary undergraduate curriculum in Biology and Society. A concentration in general studies in the agriculture major may be planned in consultation with a faculty adviser to include a biology and society component. Further information, including a list of courses, may be obtained from the program office, 632 Clark Hall.

**The American Indian Program (AIP)** is a multidisciplinary intercollege program with instructional, research, and extension components. The instructional core consists of courses focusing on American Indian life with emphasis on the Iroquois and other Indians of the Northeast. A description of the program and general information is available from the director of the American Indian Program, Caldwell Hall.

**The Comparative and Environmental Toxicology Program** is an interdisciplinary intercollege program with research, teaching, and cooperative extension components coordinated by the Institute for Comparative and Environmental Toxicology (ICET). Courses are cosponsored by academic departments in several colleges of the university. A description of the program and general information is available from the director of the program through the ICET office, N202 Martha Van Rensselaer Hall.

**The Cornell Laboratory of Environmental Applications of Remote Sensing (CLEARS)** is an interdisciplinary intercollege center with teaching, research, and extension components affiliated with the College of Agriculture and Life Sciences and the School of Civil and Environmental Engineering. A description of the program and general information is available from the director through the CLEARS office in Hollister Hall.

## OFF-CAMPUS STUDY PROGRAMS

Study off campus is of two types: (1) credit may be earned at another institution and transferred to Cornell, or (2) credit may be earned in Cornell courses that require off-campus activity.

An Intent to Study Off Campus form should be filed with the college registrar before leaving campus. Tuition may be reduced. In some cases stipends or cost of living allowances are provided. Students should consult with the Office of Financial Aid if receiving financial aid and clear all accounts with the bursar prior to departure.

Students who plan to enroll in courses at another institution in the United States must petition to register for *study in absentia*. Courses should be selected in consultation with the faculty adviser. Approval of the petition, including the list of courses to be taken, guarantees acceptance of transfer credit if grades received are equivalent to C– or better. The petition form is available in the Office of Student Services, 17 Roberts Hall, and should be returned there for consideration by the Committee on Academic Achievement and Petitions.

### Albany Programs

Study off campus in Albany, the New York State capital, provides a unique opportunity to combine career interests with academic and legislative concerns. Students receive an intensive orientation to state government and attend a lecture-seminar program composed of three two-credit components and offered by professors-in-residence. An internship experience, supervised by an internship committee, provides up to six academic credits. Independent study and research courses offered by the various departments in ALS and/or courses offered by academic institutions in the Albany areas may be elected.

Three opportunities are available. The *Assembly Intern Program* provides a placement with a member of staff of the New York State Assembly. The *Senate Assistants Program* has placements with New York State senators and selected staff. The *Albany Semester Program* provides experience with a state agency such as the Departments of Environmental Conservation, Education, or Labor.

Applicants are screened by the ALS Internship Committee in the term prior to assignments. Those accepted should plan a program of study in consultation with their faculty adviser. At least twelve credits must be carried to meet the residence requirement. Seniors should note that the last term average must be 1.7 or above.

All interns will audit the orientation sessions and meet participation requirements in at least two of the lecture-seminar sections. The paper required in each section constitutes an independent study project to be directed and evaluated by a Cornell faculty member in an appropriate discipline. Normally a faculty member will not sponsor more than one of the independent study courses for any one student. To receive academic credit for the internship, students enroll in ALS 400, for an S-U grade only.

Information and applications are available in the Career Development Office, 16 Roberts Hall.

### Cornell-in-Washington

Students in all colleges apply for the Cornell-in-Washington program through the Department of Government, 134 McGraw Hall. ALS students admitted to the program should file the off-campus study form with the college registrar prior to leaving campus. Selection of courses should be made in consultation with an academic faculty adviser to assure that the courses are appropriate for the degree program being pursued. The course enrollment forms should be filed in the office of the college registrar as soon as course selection is completed and approved.

### SEA Semester

The Sea Education Association is a nonprofit educational institution offering ocean-focused academic programs and the opportunity to live, work, and study at sea. Science, the humanities, and practical seamanship are integrated in small, personal classes. The 17-credit program is twelve weeks in length. Six weeks are spent in Woods Hole, the following six weeks are spent on either one of SEA's two sailing vessels: the R/V *Westward*, or the R/V *Corwith Cramer*. For more information, students should contact the Cornell Marine Programs office, G14 Stimson Hall. ALS students should file the intent to study off campus form with the college registrar as early as possible to ensure proper registration and enrollment in courses.

### Shoals Marine Laboratory

The Shoals Marine Laboratory, run cooperatively by Cornell University and the University of New Hampshire, is a seasonal field station located on 95-acre Appledore Island off the coast of Portsmouth, New Hampshire, in the Gulf of Maine. SML offers undergraduate, beginning graduate students, and other interested adults a unique opportunity to study marine science in a setting noted for its biota, geology, and history. Please refer to "Courses in Marine Science," under the section on the Division of Biological Sciences, for a list of courses offered.

For more information, contact the Shoals Marine Laboratory office, G14 Stimson Hall, 607-255-3717.

### Internships

Several departments in the college offer supervised internships for academic credit. Arrangements should be made with the offering department for assignment of a faculty member who will be responsible for placement, for planning the program of work, and for evaluation of student performance.

For internships not governed by an established internship course, the student must enroll in a 497 course for the number of credits to be assigned. If the work is done during the summer, the student must enroll in the Cornell summer session for the agreed-upon credits.

In cases where the work is not done at Cornell, the awarding of credits depends upon a prior contractual arrangement between a Cornell professor and the student. Specific terms for receiving credit and a grade should be recorded, using the Independent Study, Research, Teaching, or Internship form, available in the Scheduling Office, 192 Roberts Hall.

A maximum of 15 of the 120 credits required for the degree may be taken in internships, independent study courses, and undergraduate teaching or research. A maximum of 6 credits per term may be earned in independent study. No more than 6 of the 15 credits allowed for independent study may be awarded for internships consisting of off-campus work experiences that do not have the continued presence of a Cornell faculty member. The 6-credit allotment includes transfer credit and credit for internships in other colleges at Cornell. The 6-credit limit does not apply to secondary, postsecondary, and cooperative extension teaching internships in the Department of Education.

The College of Agriculture and Life Sciences does not offer a field study option. In general, a rather narrow view is taken towards awarding academic credit for work experience, "life" experience, or apprenticeships. Credit will only be assigned or accepted in cases where a professor is directly involved in determining both the course content and in evaluating a student's work. The awarding of credit will not be allowed in cases where a student brings to the college or to a professor a description of a past experience and requests credit.

All students enrolling for an internship must file an independent study, research, teaching, or internship form with the Scheduling Office. If the study is to take place off campus, the Intent to Study Off Campus form should also be filed with the college registrar.

### Overseas Academic Programs

The Cornell Abroad program is open to students in all colleges of the university. Students in the College of Agriculture and Life Sciences should consult with their faculty adviser and the college registrar to ensure that credit received for academic work abroad will meet requirements for graduation. The Office of Student Services, 17 Roberts Hall, has information and application forms.

Cooperative arrangements with the University of Reading, in England, and the University of Dublin, in Ireland, enable the college to endorse several students for a year of study under a tutor in those schools. The Swedish exchange program is operated in cooperation with the Agricultural College of Sweden at Uppsala. The ALS student selected to participate in the Swedish exchange spends the junior year at Uppsala. All essential expenses in Sweden, including a living allowance, are provided by a student group there. Round-trip air transportation must be paid by the student. An exchange student from Uppsala spends a year at Cornell, partially supported by the college and student groups here.

## MAJOR FIELDS OF STUDY

The college curriculum emphasizes the biological and physical sciences and the technology basic to the study of agriculture and life sciences. The sixteen major program areas reflect the departmental academic effort in the college. Faculty curriculum committees in each area identify a sequence of courses appropriate to all students studying in that field. Courses of study are designed to provide systematic development of basic skills and concepts. Opportunity for concentration in an area of particular interest is usually available.

Programs are planned with considerable flexibility, allowing students to prepare for careers, graduate work, professional opportunities, and the responsibilities of educated citizens. Course requirements in each program area are different, but all students must meet minimum distribution requirements of the college.

### Agricultural and Biological Engineering

Agricultural and biological engineering links engineering and technology with the biological, social, environmental, and agricultural sciences. It is the branch of engineering that serves the public sector all the way from the grower to the consumer in addition to contributing to the public interest in other ways. The primary challenge is to apply engineering principles to solve problems in the agricultural and food industries. Applications involve production, processing, distribution, cost, environmental quality, safety, and computer utilization. An increasingly important and emerging aspect of

the field is the engineering activity related to biotechnology. A strong mixture of engineering and biology is the feature that makes this program area unique.

Students in this program area study topics such as biological engineering, food engineering, soil and water conservation, mechanical systems, waste management, small-scale energy production and management, international agriculture, structures and building design, design and construction of secondary roads, and environmental quality engineering.

The program area, which includes two distinct specializations—agricultural engineering and biosystems technology—is offered by the Department of Agricultural and Biological Engineering. The department is located in Riley-Robb Hall, and operates specialized facilities that are among the largest and most complete agricultural engineering facilities in the world.

The **agricultural engineering** specialization is intended for the student who is particularly interested in the theoretical and fundamental aspects of engineering required for design and research. The student must be highly motivated and have a strong aptitude for mathematics and the sciences. Biological, social, and agricultural sciences are integrated into this specialization, but the physical sciences dominate. The specialization is accredited by the Accreditation Board for Engineering and Technology and is jointly sponsored by the New York State College of Agriculture and Life Sciences and the College of Engineering. Students double register in both colleges during their junior and senior years. The specialization provides excellent preparation for a variety of positions in industry, and qualified graduates may also continue study in a Master of Engineering, Master of Science, or doctoral degree program, or in veterinary science or medicine.

For specific course requirements and other information, see the section on the College of Engineering.

The **biosystems technology** specialization emphasizes the applied and technical aspects of agricultural and biological systems. The curriculum incorporates courses in basic biological and physical sciences as well as engineering, agronomy, agricultural economics, natural resources, and animal, plant, and food sciences.

Interest areas include agricultural systems, biological systems, and environmental systems. The student develops his or her own program of advanced and elective courses in consultation with a faculty adviser and may have an informal minor in an area such as communication, business, education, or international agriculture.

Specific course requirements for the specialization in biosystems technology are:

| *A. Basic Subjects* | *Credits* |
|---|---|
| 1. Calculus | 8 |
| 2. Chemistry | 6 |
| 3. Physics | 8 |
| 4. Introductory biological science | 6 |
| 5. Computer applications | 4 |
| 6. Statistics or probability | 3 |
| 7. Economics | 3 |
| 8. Oral communication | 3 |

*B. Advanced and Applied Subjects*

1. Five courses in the agricultural, biological, or environmental sciences 15
2. Five engineering courses at the 300 level or above; at least 9 credits in agricultural and biological engineering 15

*C. Electives*

Additional courses to complete college requirements

*D. Total (minimum)* 120

For further details on both the agricultural engineering and biosystems technology specializations, see the department's undergraduate program brochure, available at 106 Riley-Robb Hall.

## Agronomy: Crops, Soils, and Meteorology

**Agronomy, crop science, meteorology, soil science**, and **weed science** are offered by the Department of Agronomy, which is located in Bradfield and Emerson halls.

**Agronomy** is the study of crop production and soil management, and as a specialization it provides a broad education in all the agronomic sciences, including aspects of environmental quality. Students are expected to take at least ten credits of both crops and soils courses. In addition, agricultural meteorology, weed science, entomology, plant pathology, and farm management are recommended. Students interested in careers in agribusiness and with government agencies should also consider additional training in communication, applied economics, and computer science. Careers in research and development require course work in mathematics and chemistry.

**Crop science** is the application of basic biological and ecological concepts to the production and management of field crops. Examples of field crops are alfalfa, corn, soybeans, and wheat. Courses required include general biology, botany, plant physiology, general chemistry, mathematics, computing, crops, and soils. Students who anticipate a career in agricultural production or service after completion of the B.S. degree should take additional courses in crops, soils, crop physiology, economics, communication, plant pathology, entomology, nutrition, genetics, microbiology, and climatology. Students planning graduate or professional study beyond the bachelor's degree should take advanced course work in biochemistry and botany; qualitative, quantitative, and organic chemistry; and calculus, physics, and statistics.

**Meteorology** is the study of the atmosphere and the processes that shape our weather. The core curriculum in meteorology is designed to provide students with an understanding of the fundamental physical and dynamic properties and processes of the atmosphere. All students are required to complete a minimum of three semesters of calculus; two semesters of physics; a semester each of chemistry, computer science, and statistics; and a sequence of eight courses covering observational, general, theoretical, and synoptic meteorology. Additional courses are available for students interested in subjects of agricultural meteorology, climatology, physical meteorology, and statistical meteorology. The curriculum satisfies the basic requirements for employment as a professional meteorologist and provides a sound background for graduate study or work in the numerous specialized areas of meteorological science. Students are encouraged to choose additional course work in related or complementary areas of interest, such as agriculture, biology, computer science, mathematics, statistics, physics, chemistry, or engineering.

**Soil science** is the application of basic physical and biological science to the classification, use, and management of soils on an ecologically sound basis. The curriculum in soil science combines training in the physical and biological sciences with a thorough background in soil science. Students take 16 credits in soil science, including 4 credits in the introductory course and 12 credits chosen from four of the following five areas: soil geography, soil chemistry, soil physics, soil microbiology, and soil fertility. In addition, 10 credits of chemistry, 6 credits of mathematics, and 6 credits of physics, as well as supporting biological sciences courses, are expected to satisfy the major.

**Weed science** is that branch of pest management which emphasizes the principles and practice of weed control. The scientific basis for mechanical, cultural, chemical, and biological control procedures is considered. Plant physiology, ecology, organic chemistry, and biochemistry are required in addition to fifteen credits in weed science and plant protection. The specialization is offered cooperatively by the departments of Agronomy, Floriculture and Ornamental Horticulture, and Vegetable Crops so that a variety of managed plant systems may be studied.

## Animal Sciences

The animal sciences program area involves two departments—the Department of Animal Science (in Morrison Hall) and the Department of Poultry and Avian Sciences (in Rice Hall)—which offer a coordinated group of courses dealing with the principles of animal breeding, nutrition, physiology, management, and meat science. While emphasis in subject matter is directed toward farm-animal species, including dairy and beef cattle, horses, poultry, pigs, and sheep, laboratory and other species are used in research and teaching programs as well. The departments have extensive facilities for raising animals and well-equipped laboratories and classrooms, including a teaching barn, in which students can gain practical experience in the care and management of large animals at a convenient location on campus.

The program focuses on the application of science to the efficient production of animals for food, fiber, and pleasure and easily accommodates a variety of interests and goals. Beyond a core of basic courses (suggested minimum, 12 credits) students select production (minimum, 6 credits) and advanced (minimum, 6 credits) courses to fulfill an individually tailored program worked out in consultation with their advisers. In this way it is possible to concentrate by species as well as by subject matter (nutrition, physiology, breeding, management, meat science). Dairy management, for example, is a popular program among students who may be preparing to manage a dairy farm or enter a related career. Supporting courses in other departments are readily available and strongly encouraged. Thus, some students elect a program emphasizing supportive preparation

in the basic physical and biological sciences appropriate to graduate or professional study following graduation. Others elect a program heavily oriented toward economics and business in preparation for a career in the poultry, dairy, meat-animal, horse, feed, or meats industry. Those are but two examples of the programs that can be developed to meet a student's career interests. It is highly recommended that students obtain appropriate fieldwork experience during summers.

Several special training opportunities exist for highly motivated students. Upperclass students whose academic records warrant it may, by arrangement with individual faculty members, engage in research (either for credit or for honors) or assist with teaching (for credit). The Dairy Management Fellows program offers an equally challenging but different type of experience for a highly select group of students.

## Applied Economics and Business Management

The undergraduate program in applied economics and business management is based in the Department of Agricultural Economics. Courses in agricultural economics are supplemented with others in related areas such as computer science, economics, sociology, history, government, industrial and labor relations, hotel administration, consumer economics, animal sciences, plant sciences, natural resources, mathematics, and statistics.

Six areas of specialization are offered:

**Agricultural economics** provides a general program in the economics of the agricultural sector. It is an appropriate major for those students who want to (1) survey offerings in agricultural economics, such as management, marketing, economic development, and policy and resource economics; and (2) prepare for graduate work in agricultural economics.

**Business management and marketing** applies the principles of economics and the tools of management to prepare students for careers in business. Special emphasis is given to developing decision-making skills and to the study of the structure and practices of business institutions. Market analysis, sales, banking, merchandising, and production management are fields for which students may prepare.

**Farm business management and finance** is intended for students with farm experience who are interested in farming or in preparing for work in farm management or farm finance, in cooperative extension, or in farm cooperatives.

**Food-industry management** is designed for students interested in management or sales positions with the processing, manufacturing, or distribution segments of the food industry.

**Public affairs management** integrates a wide range of subject areas designed to familiarize students with the nature of public affairs and managerial complexities created by the interaction of economic factors in social and political institutions.

**Resource economics** is an option for students interested in the application of the principles of economics to problems, both public and private, involving natural and human resources.

In planning a course schedule, students must work closely with their faculty adviser. Each area of specialization has its own unique set of required and recommended courses, yet all the areas have enough flexibility to satisfy the interests and abilities of each individual student.

## Biological Sciences

The program of study in biology is offered by the Division of Biological Sciences. Students enroll in either the College of Agriculture and Life Sciences or the College of Arts and Sciences.

Programs of study within the biology major include general biology; animal physiology and anatomy; biochemistry; botany; cell biology; ecology, systematics, and evolution; genetics and development; neurobiology and behavior; and an independent study option. Programs of study are described under the Division of Biological Sciences.

## Communication

Everyone relates to others through the process of communication. Whether these human linkages are personal or through the mass media, there is an increasing need for individuals who can help establish communication relationships and make them more efficient and effective. Individuals who are able to do this must have good communication skills themselves and must comprehend the social psychology of human communication. Students in the Department of Communication have the opportunity to learn both the social science underlying human communication and the most effective means of adapting written, interpersonal, audio, and visual communication to audiences. The curriculum emphasizes learning communication theory along with communication skills.

Students elect one of five different sequences by the beginning of their junior year: public communication, electronic media, publication, interpersonal communication, or science communication. Each sequence has a required core of courses that includes Writing for Media, Theories of Human Communication, Introduction to Mass Media, Visual Communication, and Oral Communication.

**Public communication** prepares students for careers as communication, information, or public relations specialists in a wide variety of organizations. Required courses for this sequence include communication planning and strategy, survey research, communication in organizations, and visual communication. There is heavy emphasis on developing writing skills.

**Electronic media** is a special track within the public communication sequence emphasizing structure and application of electronic media. The track prepares students for careers in electronic media or information agencies in which they must work with electronic media. Required courses include electronic media production, visual communication, media writing, and mass media industries. There is an emphasis on planning and writing skills, and on development of an in-depth understanding of media industry audiences and economic structure.

**Publication** provides an excellent background for working as an editor or writer in virtually any organization. Such work might include preparing annual reports, editing an employee newspaper, writing sales or marketing literature, or writing news stories. Required courses for this sequence are taken in writing, media law, publication design, and communication theory. Students serve as staff members for the *Cornell Countryman* for one or two terms. The publication sequence provides students with a good background for science communication.

**Interpersonal communication** coupled with a carefully designed concentration prepares students for careers in human service professions, such as personnel administration, training, or sales and consulting. The sequence also may be used to prepare for graduate study in communication and other social sciences. Required courses for this sequence are taken in communication theory, survey research, and writing. Electives include such courses as small group communication, listening, persuasion, intercultural communication, and organizational communication.

**Science communication** combines the superior resources of Cornell's natural and social science courses with a broad range of courses in communication principles and skills to offer students the background needed to succeed in positions that involve the communication of scientific and technical information. The sequence emphasizes courses in writing and those involving production in various media. The sequence is appropriate for those who are interested in communicating with the general public or with scientific and technical constituents.

In addition to the requirements for a sequence, a concentration of at least 12 credits outside the department is required. The concentration helps orient students to a communication career in either a business, government, education, or public service organization or to a very specific profession such as agribusiness public relations or science communication.

Students are strongly encouraged to seek practical communication experience through part-time or summer employment, the department's internship course, or the campus media. Work experience contributes to a portfolio of professional materials that is invaluable in obtaining a position in communication.

Detailed descriptions of the sequences and the guidelines for the selection of elective courses are available from the Department of Communication, 307 Roberts Hall.

## Education

The focus in the Department of Education is on organization and management for teaching and learning in both the public and private sectors of society. A major in education provides a student with the opportunity to study educational ideas, practices, and issues from a variety of disciplinary perspectives, not only in public schools, but also in colleges, in business and industry, and in other educational settings.

The core curriculum includes courses in educational psychology, the social/philosophical foundations of education, and field experience. Combined with courses in other social sciences and with appropriate study in a subject area, the program provides a useful

base for careers in a variety of settings. Students work closely with their faculty advisers to plan a systematic sequence of courses relevant to their career goals and interests. Positions as educators are available in such areas as agribusiness and cooperative extension, industrial and military training, and social service sectors such as counseling centers, youth organizations, nature centers and educational publishing, as well as in public or private schools.

**Agricultural education.** This specialization leads to teaching agriculture in secondary schools and two-year colleges, positions in extension education and international agricultural education, and educator jobs in agricultural industry. It is intended for students who have good academic ability, experience in agriculture, and an interest in youth and young adults. The ability to work with people is essential.

Certification is required to teach in public secondary schools. Provisional certification, good for five years, may be earned by completion of an approved curriculum, including a student teaching experience, leading to the baccalaureate degree. A passing grade on a state teacher's test is also required. Permanent certification requires a master's degree. Plant and animal sciences, mechanization, conservation, and agricultural business are the areas most frequently taught in secondary schools. Directed field experiences and internships are used to prepare students for agricultural educator positions not requiring certification.

**Science and Mathematics.** A program leading to certification to teach secondary school science began in 1987. Students selected for the program will major in one of the sciences, e.g., biology, and come to the Department of Education to arrange for courses that will lead to provisional or permanent New York State certification. A program leading to certification to teach mathematics is also available.

Students considering education as a major field of study can secure further information about requirements and options from the Education Department Office, 400 Roberts Hall.

## Entomology

The intent of this curriculum is to provide students with a basic background in the biological and environmental sciences, with a special emphasis on the study of insects. Many students pursue graduate studies in entomology or related sciences upon completion of the B.S. degree, and the requirements are based on a preprofessional degree. Those who do not anticipate graduate training are urged to select electives of immediate value to the careers they plan. Some suggestions are made in section B below.

*A. Specific Requirements*

*Basic Sciences*
- College mathematics, including calculus
- A course in physics
- Chemistry 103–104 or 207–208
- Chemistry 253 (organic)

*General Biology*
- Introductory biology
- Biological Sciences 330 or 331, Principles of Biochemistry
- Biological Sciences 311, Introductory Animal Physiology
- Biological Sciences 281, Genetics, or Plant Breeding 225, Plant Genetics
- Biological Sciences 221, Neurobiology and Behavior
- Biological Sciences 360, General Ecology

*Entomology*
- Entomology 212, Insect Biology, or 241, Applied Entomology
- Entomology 322, Insect Morphology
- Entomology 331, Insect Taxonomy

Two courses selected from the groups below. Both may not be from the same group:

*Group a*
- Entomology 444, Integrated Pest Management
- Entomology 677, Biological Control
- Entomology 690, Insect Toxicology and Insecticidal Chemistry

*Group b*
- Entomology 455, Insect Ecology
- Entomology 471, Ecology and Systematics of Freshwater Invertebrates

*Group c*
- Entomology 452, Medical Entomology
- Entomology 453, Insect Pathology
- Entomology 483, Insect Physiology

*B. Suggested Electives*

The choice of electives should reflect a student's particular interests within entomology. Two broadly distinct areas of interest are the impact of insects on human welfare and the more basic aspects of insect biology. Courses in botany, evolution, invertebrate zoology, microbiology, cell biology and histology, vertebrate biology, statistics, foreign languages, scientific writing, oral communication, plant pathology, and other areas of agriculture are also recommended.

## Food Science

The food science program area is designed to provide students with the basic skills and knowledge necessary to ensure an adequate general food supply. Students may choose from two curricula, food science and food technology. Food science is designed for those interested in the more basic aspects, whereas food technology is intended for those interested in the more applied aspects. Students in both curricula take a core of fundamental courses and in consultation with faculty advisers select courses suitable for specific career objectives.

The core is designed to meet minimum guidelines of the Institute of Food Technologists, the professional society of U.S. food scientists. The flexibility of the food science program allows students to prepare for a variety of positions in industry, government, or education. Some of the positions and areas of work require graduate training, and it can be useful in others as well. Opportunities for graduate study exist at a number of universities, including Cornell.

During the first two years, students are required to take the two-semester introductory courses in biology, chemistry, and physics plus introductory courses in microbiology, calculus, food science, and nutrition. During the last two years, students take courses dealing with the application of science and technology to the processing, preservation, distribution, and utilization of foods. This includes the following required courses: Food Analysis, Food Engineering I, Sanitation and Public Health, Food Processing I and II, Food Chemistry, Sensory and Objective Evaluations of Foods, Food Microbiology, Food Chemistry Laboratory, and introductory statistics. Students also take courses in the social sciences and humanities to meet the general college requirements.

Students may choose additional courses in chemistry, microbiology, or nutrition in preparation for careers in research and development; in mathematics and engineering, for careers in processing and engineering; in marketing and business management; or in a variety of production courses related to specific commodities. Emphasis may be placed on the international aspects of food science.

Students are strongly encouraged to obtain further competence in one or more areas of emphasis. Lists of recommended courses are available for many areas, but the student is free to select courses for special objectives. The areas of emphasis include processing technology; food chemistry; nutritional aspects of processing; technology and management; dairy science; meat, poultry, and fish technology; food microbiology; and international food development.

A state-of-the-art food processing and development laboratory, a full-scale dairy plant, and extensive research laboratory facilities are available for training, research, and employment.

## Landscape Architecture

Landscape architecture is a licensed profession that deals with design of the environment to fit human needs. It involves the interaction between elements of the built and natural landscape and involves creative thought and technical skill in shaping future outdoor environments. Qualifications for licensing include completion of an accredited degree program in landscape architecture, a specified period of approved professional work experience, and passing a comprehensive uniform national licensing examination.

### Bachelor of Science Curriculum

The landscape architecture undergraduate curriculum is a four-year professional program leading to a Bachelor of Science degree. The program is accredited by the American Society of Landscape Architects and is registered with the New York State Education Department State Board for Landscape Architecture.

The undergraduate curriculum in landscape architecture centers around a four-year sequence of design studio courses that begins in the spring semester of the freshman year.

Core courses in design, plant materials, landscape history and theory, landscape planning, landscape materials and construction, graphics, professional practice, and natural sciences are required throughout the four-year curriculum. Studio courses deal with the application of design methods and principles that reflect knowledge and appreciation of land, water, plants, and the built environment in planning and designing land areas for public and private use. Basic to the curriculum is concern for the creation of

environments that meet complex social needs and are ecologically sound and aesthetically pleasing. Requirements for specialization in landscape architecture include satisfactory completion of the core curriculum.

An option for study abroad in Denmark is incorporated into the fall semester of the senior year. Under a special arrangement between Cornell University and the University of Copenhagen, landscape architecture majors who have completed four semesters of design and who have a cumulative average of 3.0 or above have the option of participating in a uniquely developed architecture and design studies curriculum in the Denmark International Study Program in lieu of a semester at Cornell. This program is part of Cornell Abroad and is administered through the Center for International Studies.

**First Year**

| *Fall Term* | *Credits* |
|---|---|
| *LA 100, Landscape Architecture Freshman Orientation | 1 |
| *FR DR 109, Nature Drawing | 3 |
| †Biological sciences elective | 3 |
| †Physical sciences elective | 3 |
| †Social sciences or humanities elective | 3 |
| †Written or oral expression elective | 3 |
| | 16 |
| *Spring Term* | |
| *LA 140, Landscape Design Studio | 4 |
| †Biological sciences elective | 3 |
| †Social sciences or humanities elective | 3 |
| †Written or oral expression elective | 3 |
| ‡Free elective | 3 |
| | 16 |

**Second Year**

| *Fall Term* | |
|---|---|
| *LA 220, Principles of Spatial Design and Aesthetics | 3 |
| *LA 201, Theory and Application Studio | 6 |
| *LA 205, Graphic Communication | 3 |
| *HORT 335, Woody Plant Materials for Landscape Use | 3 |
| | 15 |
| *Spring Term* | |
| *LA 202, Project Design and Site-Planning Studio | 6 |
| *LA 310, Site Construction | 4 |
| †Written or oral expression elective | 3 |
| †Physical sciences elective | 3 |
| | 16 |

**Third Year**

| *Fall Term* | |
|---|---|
| *LA 301, Natural Systems and Planting Design Studio | 6 |
| *LA 521, History of European Landscape Architecture | 3 |
| †Biological sciences elective | 3 |
| ‡Free elective | 3 |
| | 15 |
| *Spring Term* | |
| *LA 302, Urban Systems Studio | 6 |
| *LA 522, History of American Landscape Architecture | 3 |
| †Physical sciences elective | 3 |
| *LA 312, Site Engineering for Landscape Architects | 4 |
| | 16 |

**Fourth Year**

| *Fall Term* | |
|---|---|
| *LA 401, Advanced Project Design and Graphics Studio | 6 |
| ‡LA 520, Contemporary Issues in Landscape Architecture | 2 |
| †Social sciences or humanities elective | 3 |
| ‡Free elective | 3 |
| (Optional landscape architecture study abroad semester in Denmark) | 14 |
| *Spring Term* | |
| *LA 402, Senior Project Studio | 6 |
| †Social sciences or humanities elective | 3 |
| *LA 412, Professional Practice | 1 |
| ‡Free elective | 2 |
| | 12 |
| *Summary of credit requirements* | |
| *Specialization requirements | 68 |
| †Distribution electives | 38 |
| ‡Free electives | 14 |
| | 120 |

**Master of Landscape Architecture (M.L.A.) Degree**

First professional degree curriculum. The three-year M.L.A. curriculum is accredited by the American Society of Landscape Architects and organized to prepare a student for professional practice in landscape architecture. It is structured to provide a first professional degree for students with a bachelor's degree in areas other than landscape architecture or architecture.

Through a course sequence intended to develop basic landscape architectural skills and concepts, the three-year curriculum provides opportunities for students from diverse educational backgrounds to become proficient in landscape design, site construction, graphic communication, plant materials, and other related areas necessary to enter the profession fully qualified at the master's level.

Requirements of the three-year M.L.A. curriculum include 90 credits, satisfactory completion of the core curriculum courses, an approved summer internship, and a thesis.

**First Year**

| *Fall Term* | *Credits* |
|---|---|
| *LA 205, Graphic Communication | 3 |
| *LA 220, Principles of Spatial Design and Aesthetics | 3 |
| *LA 501, Theory & Application Studio | 6 |
| *HORT 335, Woody Plant Materials for Landscape Use | 3 |
| | 15 |
| *Spring Term* | |
| *LA 502, Project Design and Site-Planning Studio | 6 |
| *LA 310, Site Construction | 4 |
| ‡Free elective | 6 |
| | 16 |

**Second Year**

| *Fall Term* | |
|---|---|
| *LA 601, Natural Systems and Planting Design Studio | 6 |
| *LA 611, Site Engineering for Landscape Architects | 4 |
| *LA 521, History of European Landscape Architecture | 3 |
| *LA 531, Regional Landscape Planning I | 4 |
| | 17 |
| *Spring Term* | |
| *LA 602, Urban Systems Studio | 6 |
| *LA 634, Landscape Architectural Research | 3 |
| *LA 522, History of American Landscape Architecture | 3 |
| ‡Free elective(s) | 5 |
| | 17 |

**Third Year**

| *Fall Term* | |
|---|---|
| *LA 701, Advanced Project Design and Graphics Studio | 6 |
| *LA 621, Summer Internship Seminar | 2 |
| *LA 520, Contemporary Issues in Landscape Architecture | 2 |
| ‡Free elective | 3 |
| | 13 |
| *Spring Term* | |
| *LA 800, Master's Thesis in Landscape Architecture | 9 |
| *LA 412, Professional Practice | 1 |
| ‡Free elective(s) | 2 |
| | 12 |
| *Summary of credit requirements* | |
| *Specialization requirements | 74 |
| ‡Free electives | 16 |
| | 90 |

**Second professional degree curriculum.** The two-year Master of Landscape Architecture (M.L.A.) curriculum serves to broaden and enrich undergraduate education in design by providing an expanded educational experience to those who are technically skilled. Applicants are therefore expected to hold a bachelor's degree in landscape architecture or architecture from an accredited program.

The objectives of the two-year M.L.A. curriculum are to permit students to conduct research relating to landscape architecture and to provide advanced education and training to individuals who may wish to teach, practice, or conduct applied research in landscape architecture. Students are permitted considerable flexibility in establishing programs that take full advantage of the teaching and research resources of the university.

Students admitted to the two-year M.L.A. curriculum are required to complete 60 credits of course work as approved by the members of their graduate committee. This must include at least two advanced studios, a graduate seminar, and a thesis or final master's project.

## Microbiology

Microbiology is concerned with both basic and applied study of microorganisms such as bacteria, fungi, and viruses. Microorganisms touch many areas of human activity such as food production and nutrient and waste recycling, in addition to causing infectious diseases. Fundamental knowledge of microbiology is crucial for continued advances in basic biological sciences such as biochemistry and genetics as well as in applied areas such as agriculture, agronomy, animal sciences, bioengineering, ecology, food science, medicine, and natural resources. Microbiology also provides the basis for the new and exciting disciplines of genetic engineering and biotechnology.

The undergraduate major in microbiology provides excellent preparation for graduate study in many areas of biological science, as well as for professional study in medical, veterinary, or dental school. Microbiology graduates can pursue careers in biotechnology or industrial microbiology, clinical microbiology, food microbiology, or pharmaceutical microbiology. Microbiologists also work as technicians in university, government, industry, or hospital research laboratories.

Study in microbiology emphasizes laboratory as well as classroom training and requires a rigorous background in basic sciences. Courses in general biology, genetics, general chemistry, organic chemistry, biochemistry, biochemistry laboratory, physics, and calculus are required. The required microbiology courses include introductory microbiology, advanced general microbiology, microbial physiology, microbial genetics, either pathogenic microbiology or immunology (taught in the College of Veterinary Medicine), and at least two microbiology laboratory courses. Electives include courses in procaryotic cytology, bacterial diversity, tissue culture techniques, soil microbiology, food microbiology, and microbial engineering. Students with good academic records are encouraged to conduct independent research during their senior year.

Students interested in clinical microbiology may apply to the Clinical Microbiology Specialization Program. Students selected for the program spend their senior year at Cornell Medical College and the New York Hospital, studying and working in clinical microbiology. Applicants must have completed their departmental course requirements by the end of their junior year.

More information may be obtained from the Department of Microbiology, Stocking Hall. A pamphlet entitled *Microbiology in Your Future* can be obtained without charge by writing to the American Society for Microbiology, 1913 I Street N.W., Washington, D.C. 20006.

## Natural Resources

The undergraduate curriculum is designed to provide an enduring and broadly applicable education. The focus of study is on the systems that yield our renewable natural resources (water, forests, fish, and wildlife) and includes emphasis on both natural sciences and human organizations involved with resource management. Students are provided with an opportunity to understand the scientific, ethical, and societal basis for the protection and management of renewable resources through the application of ecological principles and knowledge of social needs.

The program is based in the Department of Natural Resources and is housed in Fernow Hall, named after the father of American forestry. The curriculum helps prepare students for a wide range of careers and can serve as a base for graduate work in numerous fields. Students are prepared to appreciate and understand their natural environment and humanity's interactions with it. A foundation is developed for the many students who continue with graduate professional training in natural resource science and management, including wildlife, fisheries, and forest sciences, aquatic systems, and policy studies.

Students are encouraged to study in each of the seven learning areas listed below:

1) Understanding basic substrates for life: geology, soils, water resources
2) Understanding natural processes: chemistry, physics, ecology, field biology, meteorology
3) Understanding how organisms, populations, and ecosystems function: biology, physiology, anatomy, behavior, ecology, population dynamics
4) Understanding how people and their institutions function: psychology, sociology, political science, government, history, anthropology, law, economics
5) Identifying and measuring the environment: taxonomy, remote sensing, mathematics, statistics
6) Understanding resource management processes: communication, analysis, planning, philosophy, computer science, decision making, law, ethics
7) Learning about the world: Students should recognize that not all learning takes place in the classroom. Exploring different careers, participating in campus and community activities, and conducting independent research all contribute to continuing growth.

Students need not select an area of concentration, but those who wish to do so may specialize further in wildlife science, forest science, aquatic science, fishery science, or natural resource policy and management.

Opportunities for field-oriented studies are available at the Arnot Forest Teaching and Research Center; the Cornell Biological Field Station, on the shore of Oneida Lake; and the Uihlein Maple Syrup Research and Extension Field Station at Lake Placid.

Students should seek relevant work experience to complement their academic studies.

## Plant Sciences

Plant sciences students may specialize in general plant science, plant biology, plant breeding, plant pathology, plant protection, field crops, or horticultural sciences, including floriculture and ornamental horticulture, pomology, and vegetable crops. Students with well-defined interests may specialize when they enter college. Others may start in the general plant sciences curriculum and, if they desire, specialize after the second year.

Plant sciences is a multidepartmental program area, sponsored by the Department of Agronomy, in Emerson Hall, and the departments of Floriculture and Ornamental Horticulture, Plant Breeding, Plant Pathology, Pomology, and Vegetable Crops, all located in the Plant Science Building.

**General plant science** is intended for students whose interest in studying plants has not yet centered on any one of the more specialized groups within the area. Students may continue with this option throughout their undergraduate years, particularly if they are likely to be interested in and qualified for advanced studies beyond the bachelor's degree. Students who plan to seek employment upon graduation may prefer to specialize. There are, however, opportunities for general plant science graduates in the service and supply industries as extension agents, as teachers, and as research technicians.

More than a hundred courses are offered that deal directly with some area of plant science. Other courses relating to plant science are offered in agronomy and biological sciences. In addition, an interest in plant science may be combined with some other area of specialization, such as agricultural and biological engineering, education, extension, statistics, international agriculture, food science, or agricultural economics.

Undergraduates are encouraged to obtain practical experience. It may involve research under the direction of a faculty member or work in a commercial industry or research institute or on a farm. Departments will assist students looking for positions that would provide useful experience.

**Floriculture and ornamental horticulture** applies principles of plant science and business management to the production and marketing of florist, nursery, and turfgrass crops, as well as to the selection and management of plants for both indoor and outdoor landscapes. Programs prepare students for careers at the professional and managerial levels in horticultural business, research, teaching, communications, and extension and public education.

The core curriculum consists of the following courses:

Hort 101, Introduction to Horticultural Science
Hort 102, General Horticulture
Hort 230, Woody Plant Materials
Hort 300 or 301, Garden and Interior Plants I or II
Hort 400, Principles of Plant Propagation
Bio S 241, Plant Biology (Introductory Botany)
Bio S 242, Plant Physiology (lecture)
Bio S 244, Plant Physiology (laboratory)
Agron 260, Nature and Properties of Soils
Entom 241, Applied Entomology, or Entom 212, Insect Biology
Pl Pa 301, Introductory Plant Pathology

Although mastery of those subject areas is considered essential for students planning to enter a floriculture or landscape horticulture career, justifiable exceptions to the core curriculum may be granted by the student's adviser.

With permission of the adviser, a transfer student may receive core curriculum credit for similar courses taken at other institutions provided that transfer credit is granted by the college. In addition, all transfer students must complete a minimum of 12 credits in floriculture and ornamental horticulture courses at Cornell. No more than two of the following landscape architecture courses may be included in this 12-credit requirement: LA 140, LA 220, LA 310, or LA 312. No other landscape architecture or freehand drawing courses may be applied to the requirement because they do not contain horticultural subject matter.

Students may select an area of emphasis in either floriculture or landscape horticulture. Specialization in floriculture prepares students for careers in management of the production of crops in greenhouses and wholesale- and retail-florist marketing, whereas specialization in landscape horticulture trains students for careers in nursery-crop production, turfgrass management, landscape contracting and service, retail- and wholesale-marketing of nursery products and services, botanical garden and arboretum management, urban horticulture, and related areas. Some students choose to pursue a general program in floriculture and landscape horticulture including courses in both areas. Similarly, programs in horticultural business management, research, teaching, extension and public education, and communications/journalism may be arranged across two specialization areas. Students wishing to prepare for graduate study in horticultural science may develop a program in basic sciences and their application in horticultural science. Lists of recommended courses for the areas of specialization are available from student advisers and from the undergraduate program coordinator.

Working with his or her faculty adviser, each student will tailor a program to achieve individual educational objectives in floriculture, landscape horticulture, or general horticultural science. Students are also encouraged to take courses in these areas: agricultural economics and business management, agricultural and biological engineering, agronomy (soil science), computer science, ecology, entomology, geology, plant pathology, plant physiology, oral and written expression, and plant taxonomy. Use of electives to pursue study in the humanities and in other areas of special interest to the student is encouraged and provides opportunities for broadening and enriching learning experiences. Numerous opportunities to become familiar with the horticultural industries and professions are provided through field trips, guest lectures, undergraduate seminars, independent or small-group study, optional internship, and work experience programs.

Questions concerning the undergraduate curriculum, advising, and related manners should be addressed to Dr. Carl F. Gortzig, Undergraduate Program Coordinator, Department of Floriculture and Ornamental Horticulture, 20 Plant Science Building, Ithaca, New York 14853-5908 (telephone: 607/255-3090).

The department's office is 20 Plant Science Building. Departmental facilities include classrooms and laboratories in the Plant Science Building, greenhouse and laboratory facilities at the Kenneth Post Laboratory, the Test Garden, the Turfgrass Research Field and Laboratory, landscape architecture studios in East Roberts Hall, and freehand drawing studios in Mann Library.

**Plant biology** provides undergraduates with preparation for graduate study in the plant sciences that stresses basic, rather than applied, research. In cooperation with an adviser, each student plans a curriculum with a concentration in basic sciences supplemented by courses in applied areas that seem appropriate. Options include molecular biology, plant physiology, plant biology, genetics, cytology, organic chemistry, biochemistry, anatomy, taxonomy, ecology and evolution, and statistics. A core of courses, including mathematics, plant biology and physiology, and cytology, is strongly suggested. However, different specialties within plant biology afford a flexible curriculum.

**Plant breeding** provides undergraduates with (1) preparation for graduate study leading to advanced degrees in plant breeding and plant genetics and (2) preparation for work in producing and marketing plant varieties and making varietal recommendations and for positions in seed analysis, regulation, and quality control.

In cooperation with an adviser, each student plans a curriculum with a concentration in basic sciences supplemented by courses in applied fields best suited to his or her individual goals. Options include plant breeding and plant genetics; genetics, cytology, and cytogenetics; mathematics (calculus) and statistics; organic chemistry and biochemistry; plant anatomy, ecology, and physiology; crop production; and plant pathology and disease control.

**Plant pathology** requires broad training in the physical and biological sciences and a general background in crop production with emphasis on crop protection. Specific requirements depend upon a student's career interests. Career options include working as a mycological or microbiological technician, biological research technician, technical representative for agricultural industry, cooperative extension agent, plant protection technician, or biology teacher. Students may also be interested in graduate work in plant pathology or some other area of biology.

A core of basic and applied courses is strongly suggested, including chemistry, mathematics, physics and biological sciences, plant breeding, and plant pathology. Courses chosen from agronomy, entomology, floriculture and ornamental horticulture, pomology, or vegetable crops complete the program.

**Plant protection** is offered for students who are interested in pest management or plant protection. The study of insects, diseases, weeds, vertebrate pests, and other factors that prevent maximum crop production may prepare students for careers in agribusiness, the agrichemical industry, cooperative extension, pest management consulting, state and federal regulatory work, and a variety of other technical positions. Although designed as a terminal program for students desiring a practical preparation in general plant protection, this specialization may also provide an adequate background for graduate work in entomology, plant pathology, or weed science.

The following subjects are considered essential to the plant protection specialization: botany and plant physiology, general ecology, soils, crop science, and microbial ecology. Additional courses in introductory entomology, insect pest management, introductory plant pathology, plant disease control, weed science, and pest management for plant protection are recommended. Students should plan to take a total of 62 to 70 credits in courses required and recommended for the specialization.

In addition, a number of other subjects pertinent to plant protection are recommended, depending upon the student's interests: agricultural economics, agricultural and biological engineering, agronomy, biochemistry, communication, pathology and entomology, general physics, genetics, meteorology, mycology, pesticides in the environment, and plant anatomy. Employment involving practical experience in plant protection between the junior and senior years is encouraged. The job may be on a farm, at an experimental station, with an agrichemical company, or with a regulatory agency.

**Pomology** (the science of fruit growing) provides students with knowledge of the scientific technology and the influence of environmental factors on the production, handling, and storage of deciduous fruit crops. New York is a national leader in fruit production. An on-farm value of over $155 million generates an estimated $620 million for the state's economy.

Courses are selected by students in consultation with a faculty adviser. Flexibility in programs makes it possible to establish a course of study to fit the desired goals of individual students. The diverse pomology curriculum, complemented by courses in basic sciences and arts and electives in a student's area of interest, prepares pomology majors for a career in fruit production, agricultural business related to the fruit industry, storage and merchandising, or professional pomology. Job opportunities for graduates can be found in fruit production, marketing, sales and service, research, teaching, and extension.

**Vegetable crops** is one of the most diverse applied and scientific fields in agriculture. In New York more than twenty economically important vegetables are produced and marketed. Vegetable crops have a high value per acre, making it economically feasible to invest relatively large sums in land, equipment, fertilizers, seed, and pesticides. Many vegetables are highly perishable; consequently, considerable expenditure is made for refrigeration and special storage facilities as well as for packaging and handling techniques that have been specifically developed for each particular crop.

The opportunities for trained personnel are numerous in all aspects of vegetable production and the closely related fields of purchasing, processing, merchandising, extension, and banking. Some students may continue their studies in graduate school in preparation for teaching, research, or cooperative extension work in colleges and universities or in private industry. Recently there has been an

increased interest in growing vegetables in tropical countries, and international agriculture, with a specialization in vegetable crops, provides excellent training for this vocation.

The different specialties within vegetable crops afford a very flexible curriculum. Courses are chosen by students in consultation with an adviser and other members of the staff. Students usually take most of the courses offered by the Department of Vegetable Crops and commonly choose other courses from accounting, agricultural geography, and marketing; soils, soil fertility, and regional agriculture; plant biology, physiology, ecology, and anatomy; oral expression; food sciences; nutritional sciences; plant genetics, statistics, and plant breeding; economic entomology, plant diseases and their control, and weed science. Students supplement their course work with study in areas in which they have particular interest.

## Rural Sociology

Technological, economic, demographic, and environmental changes are social processes, and each has major impacts on individuals, social groups, societies, and the international order. At Cornell, rural sociology students study these and other facets of social change in both domestic and international settings. Among the topic areas in which faculty members in the Department of Rural Sociology specialize are international agricultural and rural development, community and regional development and changes in the United States, environmental sociology, sociology of agriculture, rural industrialization and labor markets, population and development, political economy, and research methodology. Students acquire background in one or more of these areas by specializing in one of the three concentrations described below. Each of the concentrations, through its required courses, provides background in both domestic and international aspects of the subject matter. Normally, students will develop a specialization with either a domestic or international emphasis by choosing appropriate elective courses for their concentration. Regardless of the area of specialization, however, all students learn the theory and methodology of sociology and how to apply both to research and policy in their subject areas.

Recognizing that students are concerned with future career opportunities, the undergraduate program emphasizes acquisition of skills as well as general knowledge in preparation for jobs or further study upon graduation. Accordingly, students are expected to become involved in the application of theory, methodology, principles, and concepts in the analysis of practical problems. The concentration in social data and policy analysis is particularly well suited to providing skills in research and policy analysis that will be useful for students who wish to obtain employment after completion of the baccalaureate degree.

Rural sociology offers degree programs at both the undergraduate and graduate levels (B.S., M.S., M.P.S., or Ph.D.). These programs are offered through the Department of Rural Sociology and the Graduate Field of Development Sociology, both of which are located in Warren Hall. For many years, the department and graduate field have been recognized as among the top programs in the country, and both are known for innovative program orientations. The department is particularly well known for providing instruction in international as well as domestic aspects of development, environmental sociology, sociology of agriculture, population studies, and other topics. Faculty members in this department are committed to both quality instruction and research programs.

Being located in a college of agriculture, faculty members maintain strong ties with the technical fields in the college as well as with the International Agriculture Program, the Biology and Society Program, the Cornell Institute for Social and Economic Research, the Women in Development Program, the Program on Science, Technology, and Society, and the Center for International Studies. Nearly half of the department faculty are associated with one or more area studies programs (the Southeast Asia Program, South Asia Program, Latin American Studies Program, East Asia Program, or the Institute for African Development). Department members also maintain working relations with faculty in the Department of Sociology and other social science units located in other colleges at Cornell. Students are encouraged to supplement their course work by electing courses in these other departments and programs, thereby rounding out their educations by acquiring different perspectives.

The undergraduate concentrations offered in rural sociology include development sociology; population, environment, and society; and social data and policy analysis. The concentrations vary in terms of course requirements and credits needed for graduation.

All students majoring in rural sociology are expected to take four core courses: an introductory course (R Soc 101, 102, or 103), methods (R Soc 213), theory (R Soc 301), and a course in statistics.

**The concentration in development sociology** provides an understanding of the processes and policies that influence social and economic development in rural settings in North America and low-income countries in the developing world. The required courses provide background in the sociology of development in both the advanced and developing countries. Students normally select a set of elective courses in which either domestic or international development is emphasized. The required and elective courses provide background in several aspects of development sociology, including (1) an understanding of the processes of socioeconomic development in low-income or Third World countries and training in the formulation of strategies to enhance the socioeconomic well-being of citizens of those countries, (2) analysis of the social structures and processes for development in nonmetropolitan settings in the United States, (3) analysis of the processes of agricultural change and development in industrialized and low-income countries, and (4) an understanding of the processes of technological development and change in agriculture and other rural industries in developed and developing countries.

Students are encouraged to complement courses in the department with course work in the history and economics of development, area studies, and the policy sciences.

Total credits required, including the four core courses: 27

| *Courses Required* | *Credits* |
|---|---|
| R Soc 205, Rural Sociology and International Development or R Soc 208, Technology and Society | 3 |
| R Soc 445, Rural Social Stratification | 3 |
| R Soc 370, Social Structure of Industrial Change, or R Soc 436, Small Towns in Metropolitan Society: Changing Structures and Quality of Life | 3 |
| | 9 |

*Electives for the Concentration*

At least six credits must be selected from a list of complementary courses for the concentration in development sociology. The list of courses is available in 133 Warren Hall.

**The concentration in population, environment, and society** provides an understanding of (1) the causes and consequences of the major components of population change—fertility, mortality, and migration; (2) the major patterns of population distribution and population characteristics in the United States and the developing world, (3) the relationships between social structure and the biophysical environment, and (4) the relationships between population change and natural resource utilization in development. Students normally select the elective courses for the major in such a way as to stress either population studies or sociological aspects of natural resources and the environment.

Students are encouraged to complement courses in the department with course work in demographic methods, household analysis, ecology and evolution, environmental studies, and natural resources.

Total credits required, including the four core courses: 27

| *Courses Required* | *Credits* |
|---|---|
| R Soc 201, Population Dynamics | 3 |
| R Soc 324, Environment and Society | 3 |
| R Soc 438, Social Demography, or R Soc 440, Social Impact of Rapid Resource Development | 3 |
| | 9 |

*Electives for the Concentration*

At least six credits must be selected from a list of complementary courses for the concentration in population, environment, and society. The list of courses is available in 133 Warren Hall.

**The concentration in social data and policy analysis** provides (1) in-depth knowledge of research methodology, statistics, and computer applications, (2) an understanding of social, economic, political, and historical concepts essential for conducting meaningful analyses of practical problems and issues faced by organizations, communities, regions, and states, and (3) knowledge and practice in policy analysis. Students ordinarily select electives for the concentration in order to specialize in either policy analysis or in a particular area of public policy (international development policy, domestic rural development policy, environmental policy, or population policy).

In addition to the required courses listed below, students in the concentration in social data and policy analysis are required to take Soc 301, Evaluating Statistical Evidence, as their statistics course for meeting the core requirements of the major.

Students are encouraged to complement courses in the department with course work in data collection and research design, evaluation research, computing, and advanced statistics.

Total credits required, including the four core courses: 27–29

| *Courses Required* | *Credits* |
|---|---|
| R Soc 201, Population Dynamics, or R Soc 205, Rural Sociology and International Development, or R Soc 206, Gender and Society, or R Soc 208, Technology and Society | 3 |
| Soc 303, Primary Data Collection and Design [4 credits], or HSS 292, Research Design and Analysis, or Comm 382, Survey Research Methods | 3–4 |
| Ag Eng 102, Introduction to Microcomputer Applications, or CRP 421, Introduction to Computers in Planning [4 credits] | 3–4 |
| | 9–11 |

*Electives for the Concentration*

At least six credits to be selected from a list of complementary courses for the concentration in social data and policy analysis. The list is available in 133 Warren Hall.

Brochures are available from rural sociology faculty members.

## Statistics and Biometry

Statistics is concerned with quantitative aspects of scientific investigation: design, measurement, summarization, and drawing conclusions based on probability statements. Biometry is the application of mathematical and statistical techniques to the life sciences. Students with ability in mathematics and an interest in its applications will find this a chall enging specialization.

The work of a statistician or biometrician can encompass research, teaching, consulting, and computing in almost any mix and in a wide variety of applications. Opportunities for employment are abundant in universities, in government and in businesses and industries ranging from large corporations to small consulting firms, and salaries are usually excellent.

While satisfying course requirements for a specialization in statistics and biometry, students can also take a wide variety of courses in other disciplines. In fact, students are encouraged to take courses in applied disciplines such as agriculture, biology, economics, and the social sciences that involve numerical data and their interpretation.

Students specializing in this area are required to take computer science courses (e.g., Computer Science 100 and 211), mathematics courses (at least three semesters of calculus), and statistics courses (Statistics and Biometry 200, 215, 408–409, 417, 601–602 and 607 and Industrial and Labor Relations 310). Work experience gained through summer employment or undergraduate teaching is highly recommended. Students should contact Charles E. McCulloch for information.

## Special Programs in Agriculture and Life Sciences

Some students are interested in pursuing a general education in the agricultural sciences. Others are uncertain about career objectives in agriculture and the life sciences. The opportunity to develop an independent major in general studies in agriculture and the life sciences is available for such students. In consultation with a faculty adviser, they may plan a sequence of courses suited to their individual interests, abilities, and objectives in an area not encompassed by the existing programs. Once the distribution and other college requirements are met, this major may include a concentration of courses in one or several academic units of the university.

Students completing this major are often planning a career in agriculturally related food and service enterprises. Many of the fast-growing occupations require the broad perspective, the scientific and technical skills, the attitudes, and the analytical ability that a general education fosters. A course of study for a special program must be planned with and approved by a college faculty adviser. Information on the options and names of faculty advisers prepared to advise in special programs are available in the Office of Student Services, 17 Roberts Hall.

**General studies** includes production agriculture as well as technical work in the agricultural and life sciences. Many biotechnology concerns deal with aspects of agriculture, especially plants, crops, and ecosystems in the natural environment. A strong grounding in biological sciences as well as knowledge of the agricultural sciences is essential in this rapidly growing field. Students should plan basic course work in the major areas of study in the college—animal sciences, plant sciences, environment and technology, agronomic sciences, biological sciences, and social sciences. Advanced courses may be selected in those and other areas of individual interest or career aspiration.

**International agriculture** provides students with an understanding of the special problems of applying basic knowledge to the processes of agricultural modernization in low-income countries. The student typically specializes in a particular subject and works with an adviser to plan a program oriented toward international agriculture. The courses in international agriculture are designed to acquaint students with the socioeconomic factors in agricultural development, with the physical and biological nature of tropical crops and animals, and with various world areas for which study programs exist. The study of a foreign language is required.

In addition to the college distribution requirement, students majoring in international agriculture must take a minimum of 30 credits. A minimum of 7 credits in international agriculture and 8 credits in a modern foreign language are required. The other courses recommended are drawn from a wide range of disciplines. The objective is to acquaint students with the many facets of agricultural development in low-income countries. Students are encouraged to take additional specialized courses in one of the other program areas of the college.

# DESCRIPTION OF COURSES

Undergraduate and graduate courses in the college are offered through the seventeen academic departments and also through the Divisions of Biological Sciences and Nutritional Sciences.

Descriptions of courses, both undergraduate and graduate, are given by department, arranged in alphabetical order.

**Graduate study** is organized under graduate fields, which generally coincide with the departments. Graduate degree requirements are described in the *Announcement of the Graduate School*. Courses for graduate students are described in the section on the academic department that offers them.

# NONDEPARTMENTAL COURSES

**ALS 100 American Indian Studies: An Introduction**
Fall. 3 credits. S-U grades optional.
Lec, W 7–10 p.m. Robert W. Venables.
This course provides a foundation for the study of American Indians. Emphasis will be placed on social, cultural, historical, educational, and human development. Guest lecturers from Cornell's staff and the Indian community will serve to broaden the scope of the course.

**ALS 127–128 Introduction to Farm Techniques**
127, fall; 128, spring. 1 credit each semester. Prerequisite: permission of instructor. S-U grades only. Contact C. Place, 192 Roberts Hall, for scheduling. Limited to 8 students per section.
T or W, 1:25–4:30. Class assembles in front of 192 Roberts Hall for transport to various facilities. J. G. Whitcomb.
Practical instruction in the basic skills of farming and field research. Includes safe tractor and equipment operation and maintenance; harvesting and planting crops; safe use of pesticides; caring for and handling dairy and beef animals, sheep, and poultry; and milking by machine and by hand. General orientation in the day-to-day procedures of farm operation. Field trips to area farms and agribusinesses will provide knowledge of farmers' skills, problems, and way of life.

**ALS 318 Ethnohistory of the Northern Iroquois**
Fall. 3 or 4 credits. S-U grades optional.
Lec, T 1:25–4:30. Robert W. Venables.
The development of Iroquois (Houdenosaunee) culture is traced from the Archaic period to the present day. Changes in cultural ecology, social organization, and world view are examined. Supplemental information is drawn from accounts of neighboring groups in southern Canada and western New England. Approximately one-third of the course is devoted to contemporary issues faced by the Iroquois people.

**ALS 400 Internship**
Fall, spring, or summer. 6 credits maximum. Not open to students who have earned internship credits elsewhere or in previous terms. S-U grades only.
Staff.
Students may register only for internships approved by the College Internship Committee. Currently, the opportunities are available in the New York State Assembly Intern Program, the New York State Senate Session Assistant's Program, and the Albany Semester Program. A learning contract is negotiated between the student and the faculty supervisor, stating conditions of the work assignment, supervision, and reporting. Participation is required in any structured learning activities associated with the internship.

**ALS 661 Environmental Policy (also Biological Sciences 661 and Biology and Society 461)**
Fall and spring. 2 or 3 credits each term. Limited to 12 students. Prerequisite: permission of instructor.
Sem R 2:30–4:30 p.m. D. Pimentel.
This course uses an interdisciplinary approach to focus on complex environmental and energy problems. Ten to twelve students, representing several disciplines, investigate significant environmental problems. The research team spends two semesters preparing a scientific report for publication in *Science* or *BioScience*.

**Related Course in Another Department**
**History of the Agricultural Sciences (History 443)**

## AGRICULTURAL AND BIOLOGICAL ENGINEERING

G. E. Rehkugler, chair; L. D. Albright, D. J. Aneshansley, J. A. Bartsch, J. K. Campbell, T. J. Cook, J. R. Cooke, A. K. Datta, R. C. Derksen, R. B. Furry, K. G. Gebremedhin, R. W. Guest, W. W. Gunkel, D. A. Haith, P. E. Hillman, J. B. Hunter, W. W. Irish, L. H. Irwin, W. J. Jewell, H. A. Longhouse, D. C. Ludington, J. Y. Parlange, R. E. Pitt, T. S. Steenhuis, M. B. Timmons, L. P. Walker, M. F. Walter

**102 Introduction to Microcomputer Applications (also Computer Science 102)**
Fall. 3 credits. Each lab section limited to 16 students. Not open to students enrolled in the College of Engineering or to students who have taken any prior computer courses at Cornell. Students in statutory colleges must enroll in Agricultural and Biological Engineering 102.
Lecs, T R 10:10 or 12:20; lab M 1:25–4:25 or 7:30–10:30 p.m., T 1:25–4:25, W 1:25–4:25 or 7:30–10:30 p.m., or R 1:25–4:25. 1 evening prelim. P. E. Hillman and computer science staff.
An introduction to the use of application packages on microcomputers using the Macintosh. An attempt will be made to assess and demonstrate the capability and limitations of the current generation of personal computers through software for word processing, spreadsheets, database, and other applications. The course will involve very little programming using high-level languages.

**110 Farm Metal Work**
Spring. 2 credits.
Lec, R 9:05; labs, M T or R 1:25–4:25, M 7–10 p.m. T. J. Cook.
M, T and R labs, each limited to 20 students, include instruction in sheet metal work, pipe fitting, hot and cold metal work, and arc and acetylene welding.

**132 Farm Carpentry**
Fall. 2 credits. Each lab limited to 15 students.
Lec, T 9:05; labs, T W or R 1:25–4:25, M 7–10 p.m. T. J. Cook.
Instruction in the fundamentals of farm carpentry, including concrete work, and equipment and buildings constructed of wood. Each student is required to plan and construct an approved carpentry project.

**151 Introduction to Computing***
Fall. 4 credits.
M W 11:15; labs, W or R or F. 12:20–2:20 or 2:30–4:30. Plus second evening lab to be arranged. L. D. Albright.
An introduction to computer programming and concepts of problem analysis and algorithm development in an engineering context. The structured programming language, Pascal, is used, implemented on interactive personal computers, and applied to problems of interest in agricultural and biological engineering. No previous programming experience is assumed. An introduction to the use of spreadsheet programs for engineering is included.

*Pending approval of the College Curriculum Committee.

**153 Engineering Drawing**
Fall. 2 credits. Limited to 30 students (15 in each lab).
Lec, M 9:05; lab, T or W 1:25–4:25. H. A. Longhouse.
Designed to promote an understanding of engineering universal graphic language. The lectures and laboratories develop working knowledge of drawing conventions, drafting techniques, and their application to machine and pictorial drawing problems. The course will involve both instrument and Autocad computer drawings.

**200 Undergraduate Seminar**
Spring. 1 credit. S-U grades optional.
Lec, M 2:30. G. E. Rehkugler.
A forum to discuss the contemporary and future role of agricultural and biological engineering in society. A series of lectures will be given by practicing engineers, Cornell faculty members, and students. Written critiques are required. Students may take the seminar more than once but are limited to 2 credits maximum.

**204 Introduction to Computer Uses**
Spring. 4 credits. Each lab section limited to 20 students. S-U grades optional.
Lecs, T R 11:15; lab, T, W or R 1:25–2:15. 2 evening prelims. R. B. Furry.
An introductory course in computing for those interested in using microcomputers to handle data. Topics include preparing and processing computer programs in Pascal and FORTRAN. No prior knowledge of computers or computer languages is necessary.

**221 Plane Surveying**
Fall. 3 credits. S-U grades optional.
Lab, M 1:25–4:25; lecs, M W 12:20. H. A. Longhouse.
Principles and practice of measurement of distance, elevation, and direction. Use and care of equipment is stressed during field problems related to mapping, engineering design, and construction. Other topics include surveying specifications, error analysis, and standards of accuracy.

**250 Engineering Applications in Biological Systems**
Fall. 3 credits. Prerequisite: enrollment in an engineering curriculum. Recommended for the sophomore year.
Lec, M W F 12:20. R. E. Pitt.
Case studies of engineering problems in agricultural and biological systems, including animal and crop production, environmental control, energy, and food engineering. Emphasis is on the application of mathematics, physics, the engineering sciences, and biology to energy and mass balances in agricultural systems.

**301 Introduction to Energy Technology**
Spring. 3 credits. Prerequisite: high school or college physics. S-U grades optional. Offered alternate years.
Lec, M W F 10:10. D. C. Ludington.
Basic concepts of energy transfer and traditional and alternate sources of energy. Design of small systems and appropriate technology are emphasized. Topics include heating, cooling, solar energy, electricity, hydropower, wind power, biogas production, and energy economics.

**305 Principles of Navigation**
Fall. 4 credits.
Lecs, M W F 9:05 or 12:20; rec, R 9:05 or 12:20. W. W. Gunkel.
Coordinated systems, chart projections, navigational aids, instruments, compass observations, tides and currents, soundings. Celestial navigation: time, spherical trigonometry, motion of stars and sun, star identification, position fixing. Nautical Almanac. Electronic navigation.

**310 Advanced Farm Metal Work**
Spring. 1 credit (2-credit option available). Prerequisite: Agricultural and Biological Engineering 110 or permission of instructor.
Lab F 1:25-4 (second lab must be arranged for 2-credit option). T. J. Cook.
Advanced welding and metal construction project.

**311 Farm Machinery**
Fall. 3 credits. Each lab limited to 16 students. Prerequisite: high school physics or equivalent.
Lecs, T R 11:15; rec-lab, T or W 1:25–4:25. W. W. Gunkel.
A study of the operating principles, use, selection, and methods of estimating costs of owning and operating farm machines. Lab work includes practice in the calibration of planting, fertilizing, and pesticide application machinery, and study of the functional characteristics of agricultural machines and

**312 Engines and Tractors for Agricultural Applications**
Spring. 3 credits. Each lab limited to 16 students. Students missing the first week of classes without permission of the instructor are dropped so others may register. Prerequisite: high school physics or equivalent.
Lecs, T R 11:15; lab, M T or W 1:25–4:25. Staff.
A study of the principles of operation, adjustment, and maintenance of internal combustion engines and tractors. Topics include engine cycles, fuels, lubricants, carburetion, fuel injection systems, ignition, charging circuits, valve reconditioning, engine testing, transmissions, traction, and human factors in tractor operation.

**315 Electricity: Its Use and Control**
Spring. 3 credits. Prerequisite: Physics 102 or equivalent.
Lecs, T R 10:10; lab, T or R 1:25-4:25. D. C. Ludington.
The application and control of electricity for power, lighting, and heat are studied. Principles of operation and selection of single-phase equipment are emphasized. Conventional and solid state controls are included. Laboratories offer hands-on experience.

**321 Soil and Water Management**
Spring. 2 credits. S-U grades optional. Concurrent registration in Agronomy 321 required. Prerequisite: Agronomy 190 or 260.
Lec, M W 9:05; disc-lab, M 1:25–4:25. M. Walter, R. Oglesby, T. Scott, N. Bills.
An interdisciplinary course intended to introduce students to the general principles of soil and water interaction and to the effects of human intervention in these processes. Aspects of soil and water management, including hydrology, soil erosion, irrigation, drainage, and water quality are examined. Case studies from both the United States and the tropics are used to illustrate basic principles.

**331 Environmental Control for Agricultural Production Systems**
Fall. 3 credits. S-U grades optional.
M W F 11:15. K. G. Gebremedhin.
A study of analysis and design of agricultural production environments, ventilation design, regulation and control, animal physiology and homeothermy, material handling, waste management, alternate energy sources on the farm, and farmstead layout. Specific farmstead production systems (dairy, swine, poultry, fruit, and vegetable storage facilities) are discussed. A systems approach to agricultural production is emphasized. A project is expected at the end of the semester.

**367 Introduction to Biological Engineering**
Spring. 3 credits. Prerequisites: one year each calculus and introductory biology; minimum one term each college chemistry and physics. S-U grades optional.
Lecs, T R 10:10; lab, R 1:25–4:25. J. B. Hunter.
An exploration of the use of engineering principles to solve biological problems in the context of laboratory experiments. Topics may include artificial organs, electrical signals of nerves and muscles, mass transfer in fermentation, enzyme use in food processing, mechanics of plant or animal tissue, and physical methods of DNA transfer. Many topics are linked to original research underway on campus. Appropriate for both engineering and life science students. Field trips, demonstrations, and readings in current scientific literature are special features of the course.

**[371 Introduction to Hydrology and Ground-Water Pollution**
Fall. 3 credits. Prerequisites: knowledge of soils and one year of calculus. Not offered 1989–90.
Lecs, T R 9:05; lab, R 1:25–3:20. T. S. Steenhuis.
Introduction to basic hydrologic processes that focuses on the description of water in the unsaturated and saturated soil. The interaction of hydrologic processes with chemical transport processes is discussed. Emphasizes basic understanding of the processes involved. Case studies are used to illustrate the theory.]

**401 Career Development In Agricultural and Biological Engineering**
Fall. 1 credit. Limited to seniors. S-U grades only.
Lec, T 12:20. G. E. Rehkugler.
A career development seminar for majors in the field of agricultural and biological engineering. Presentations of career opportunities in corporations, independent businesses, consulting, and public service. Professionalism, ethics, and public policy issues are discussed.

**420 Marine Pollution**
Summer. 2 credits. Prerequisite: Biological Sciences 364 or permission of instructor. A special 2-week course offered at Cornell's Shoals Marine Laboratory. For more details and application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $975.
Daily lecs, labs, and fieldwork for 2 weeks. SML faculty.
Dispersion modeling and the effects of pollutants (including oil, outfalls, solid wastes, sludge and dredge spoils, and radioactive wastes) are discussed from the perspectives of elementary physical oceanography and biological processes. Laboratories include basic methods for targeting and tracing waste water; organic carbon determinations; microbial tests for *Salmonella*, *E. coli*, and *Streptococcus*; and practical field projects.

**435 Principles of Aquaculture**
Spring. 3 credits. Prerequisite: junior and above. S-U grades optional.
Lecs, T R 1:25–3. M. B. Timmons, W. D. Youngs, C. A. Bisogni, G. A. German, G. L. Rumsey, P. R. Bowser, and J. M. Regenstein.
An in-depth treatment of the principles of aquaculuture: fish biology, waste treatment, engineering design, fish health, nutrition, processing, etc. This course is intended to build upon the undergraduate's previous course background and interests. Majority of the grade will be determined from a term project.

**450 Instrument Design**
Fall. 3 credits. Prerequisites: Math 293 or equivalent, physics or electrical science, computer programming.
Lecs M W 12:20; lab to be arranged. D. J. Aneshansley.
An introduction to static and dynamic characteristics of instruments, electronic instruments, digital and analog signal conditioning circuits and techniques, data acquisition and instrument control with personal computers and micro-controllers, and computer data analysis. Biological and agricultural examples of instrument problems and designs are used. A final design project is required.

**451 Biomass Conversion Processes for Energy and Chemicals**
Spring. 3 credits. Prerequisites: Agricultural and Biological Engineering 250, Mathematics 294, thermodynamics (co-registration permissible), and Chemistry 207 or equivalent.
Lecs, M W F 12:20. L. P. Walker.
There are a variety of physical and biological processes available for converting plants and other biomass resources into energy, industrial chemicals, and foods. The design of these processes is accomplished through fusing concepts from biochemistry, microbiology, and plant biology with the concepts and methods of engineering. There are four major components to this course: plants as biochemical resources, heat and mass transfer, enzyme catalysis, and fermentation kinetics. Each component is concluded with a case study that demonstrates how the scientific concepts and methods are used to design a biomass conversion process.

**461 Agromechanical Engineering: Machine Systems and Design**
Fall. 3 credits. Prerequisites: Agricultural and Biological Engineering 250 and mechanical design or equivalent.
Lecs, T R 10:10; lab, R 1:25–4:25. W. W. Gunkel.
Principles of design and analysis of agricultural machines to meet functional requirements. Emphasis is given to computer-aided analysis and design, selection of construction materials, and testing procedures. Engineering creativity, economic considerations, and safety are also stressed.

**462 Agromechanical Engineering: Power and Traction**
Spring. 3 credits. Prerequisites: engineering dynamics, thermodynamics, and Agricultural and Biological Engineering 250.
Lecs, T R 10:10; lab, R 1:25–4:25. Staff.
Synthesis of engineering sciences in the analysis, design, and testing of internal combustion engines and traction devices. Study areas include vehicle statics and dynamics, soil-machine interaction, electro-hydraulic control systems, human factors in vehicle design, and machine reliability. Computer analysis involves Runge-Kutta simulation, the finite element method, and digital data acquisition and processing. Students gain experience in modern laboratory and field testing.

**[465 Agricultural Processing Systems**
Fall. 3 credits. Prerequisite: Agricultural and Biological Engineering 250. Not offered 1989–90.
Lecs, T R 11:15; lab, W 2–4:25. R. B. Furry.
Grain drying, flow measurement, and material handling for agricultural engineering applications, with an introduction to system simulation, dimensional analysis, and similitude.]

**466 Food Engineering: Design of Equipment and Processes**
Spring. 3 credits. Prerequisite: courses in either fluid mechanics and heat transfer or unit operations in food processing.
T R 9:05, F 1:25–3:25. A. K. Datta.
Process equipment design and analysis for various food operations including transportation, heat transfer, concentration, drying, freezing, separation, on-line property sensing, inspection using machine vision computer control, etc. Materials of construction and a review of food properties are included. Emphasis is on uniqueness of food influencing the design. Field trips to food industries.

**467 Bioprocessing Applications in Agriculture**
Fall. 4 credits. S-U grades optional. Prerequisites: Biochemistry 231, college biology and calculus, one year each; Agricultural and Biological Engineering 250 or Engineering 219, or senior standing in life sciences. May not be taken for credit after Chemical Engineering 643.
T R 10:10–12. J. B. Hunter.
An introduction to microbial and enzymatic process technology for engineers and life scientists. A substantial introduction to process engineering is illustrated by case studies of food and agricultural bioprocesses. Emphasis on engineering analysis and design. Suitable for both engineers and life scientists seeking careers in the biotechnology industry.

**471 Geohydrology (also Geology 445 and Civil and Environmental Engineering 431. Students enrolled in the statutory colleges must enroll in Agricultural and Biological Engineering 471.)**
Fall. 3 credits. Prerequisites: Mathematics 294 and Engineering 202.
Lecs, M W F 10:10. T. S. Steenhuis, J.-Y. Parlange, A. L. Bloom, W. H. Brutsaert, L. M. Cathles.
An intermediate course in surface and groundwater flow and related design factors. Includes principles of fluid flow, the hydrologic cycle, natural channel dynamics and sediment transport, description and behavior of natural aquifers, ground-water hydraulics, soil water, and solute transport.

**475 Environmental Systems Analysis**
Fall. 3 credits. Prerequisites: computer programming and one year of calculus.
M W F 11:15. D. A. Haith.
Systems analysis and its use in environmental quality management. Emphasis is on mathematical modeling of environmental problems, translation of models into efficient computational algorithms, and use of computer simulation and optimization procedures (search techniques, linear programming, dynamic programming, and separable programming) to evaluate management alternatives. Applications include pollution control and resource management problems.

**481 Design of Wood Structures**
Spring. 3 credits. Prerequisite: permission of instructor.
Lecs, M W 11:15; disc-lab. T 1:25–4:25. K. G. Gebremedhin.
Computer-aided and design code manual procedures of timber engineering of agricultural, commercial, and industrial structures. Timber stress properties, design of columns, beams, trusses, rigid and post-frame buildings, shear walls, horizontal diaphragms, connections, and special timber structural systems.

**482 Environmental Control for Animals and Plants**
Spring. 3 credits. Prerequisite: Agricultural and Biological Engineering 250.
Lecs, T R 11:15; lab, M 1:25–4:25. L. D. Albright.
Analysis and design of the thermal and aerial environment of animal housing and greenhouses. Heat flow, air flow, psychrometrics, energy balances, thermal modeling, mechanical and natural ventilation, solar energy, and weather phenomena.

**491 Highway Engineering (also Civil and Environmental Engineering 642)**
Spring. 3 credits. Prerequisites: junior standing in engineering, fluid mechanics, and soil mechanics (may be taken concurrently).
Lecs, M F 12:20; lab, M 1:25–4:25. L. H. Irwin.
An introduction to engineering design in professional practice, using the design of highways as the subject of study. Students will use current standards and design criteria in five laboratory design projects. Topics of discussion include planning, economic analysis, human factors and public safety, route location and design, traffic engineering, hydrology and drainage design, soil engineering, highway materials, pavement design, and maintenance.

**497 Special Topics in Agricultural and Biological Engineering**
Fall or spring. 1–4 credits. S-U option. Prerequisite: written permission of instructor and adequate ability and training for the work proposed. Normally reserved for seniors in upper two-fifths of their class. Undergraduates must attach to their course enrollment material written permission from the staff member who will supervise the work and assign the grade.
Staff.
Special work in any area of agricultural engineering on problems under investigation by the department or of special interest to the student, provided, in the latter case, that adequate facilities can be obtained.

**498 Undergraduate Teaching**
Fall or spring. 1–3 credits. Prerequisite: written permission of instructor.
Staff.
The student assists in teaching an agricultural and biological engineering course appropriate to his/her previous training. The student meets with a discussion or laboratory section, prepares course materials, grades assignments, and regularly discusses objectives and techniques with the faculty member in charge of the course.

**499 Undergraduate Research**
Fall or spring. 1–3 credits. Prerequisites: normally reserved for seniors in upper two-fifths of their class. Adequate training for work proposed. Written permission of instructor.
Staff.
Research in any area of agricultural or biological engineering on problems under investigation by the department or of special interest to the student, provided that adequate facilities can be obtained. The student must review pertinent literature, prepare a project outline, carry out an approved plan, and submit a formal final report.

**501–502 M.P.S. Project**
Fall and spring. 1–6 credits. Required of each M.P.S. candidate in the field.
Hours to be arranged. Staff.
A comprehensive project emphasizing the application of agricultural technology to the solution of a real problem.

**551–552 Agricultural and Biological Engineering Design Project**
Fall and spring. 6 credits. Prerequisite: admission to the M.Eng.(Agr.) degree program.
Hours to be arranged. D. J. Aneshansley and staff.
Comprehensive design projects dealing with existing engineering problems in the field. Emphasis is on the formulation of alternative design proposals that include consideration of economics, nontechnical factors, engineering analysis, and complete design for the best design solution. Projects are supervised by faculty members on an individual basis. However, there is a formal orientation during the first four weeks of the semester. A formal report and public presentation of the results of the design project are required for completion of the course(s).

**652 Instrumentation**
Spring. 3 credits. Prerequisites: linear differential equations, Fourier Transforms, experience with computer data-acquisition systems, and introductory biology and electrical science, or permission of the instructor.
Lecs, T R 12:20; lab to be arranged. D. J. Aneshansley.
Application of instrumentation concepts and systems to the measurement of environmental, biological, and agricultural phenomena. Construction and characterization of electronic sensors and transducers will be emphasized. Digital signal conditioning techniques will also be included. A final project is required. Intended for seniors and first-year graduate students.

**655 Thermodynamics and Its Applications**
Spring. 3 credits. Prerequisite: Mathematics 293 or equivalent.
Lecs, M W F 12:20. J.-Y. Parlange.
Thermodynamics and its applications to problems in engineering and agriculture. Topics include basic concepts (equilibrium, entropy, processes, systems, potentials, stability, phase transitions) and applications (soil and water processes, dilute solutions, electromagnetism, surface phenomena, heat and mass transport, structure of organizations).

**665 Engineering Properties of Foods (also Food Science 665)**
Fall. 2 credits. Prerequisite: course in transport processes or unit operations as applied to foods; or permission of instructor.
Lecs, T R 12:20. S. S. H. Rizvi, A. K. Datta.
Theories and methods of measurement and prediction of rheological, thermal, and mass transport properties of foods and biomaterial systems. Emphasis is on physical-mathematical basis of the measurement as well as the prediction processes. Examples of appropriate use of these properties in engineering design and analysis of food processes will also be provided.

**[671 Analysis of the Flow of Water and Chemicals in Soils**
Fall. 3 credits. Prerequisites: two calculus courses and fluid mechanics. Not offered 1989–90.
Lecs T R 3:35–4:50. J.-Y. Parlange, T. S. Steenhuis.
The course encompasses the full range from simple to complex methods to describe the chemical and water flows on the surface, in the vadose zone, and through the aquifer. Current analytical, semi-analytical, and computer-based techniques are discussed. Both homogeneous and heterogeneous soils are analyzed. Offered alternately with Civil and Environmental Engineering 633—a complementary, but not identical, course.]

**[672 Drainage**
Spring. 4 credits. Prerequisites: Agricultural and Biological Engineering 371 and two calculus courses. Not offered 1989–90.
Lecs, M W F 10:10; lab, T 1:25–4:25. T. S. Steenhuis.
The physics of groundwater flow with specific reference to tile drainage. Critical review of benefits of drainage as well as a thorough analysis of the design of drainage systems. Effects of drainage on water quality will be discussed. Laboratories are used to measure physical parameters used in drainage designs.]

**673 Irrigation Systems**
Spring. 3 credits. Prerequisite: permission of instructor.
M W F 10:10. M. F. Walter.
An introduction with a systems perspective to the design and implementation of irrigation. Topics include systems planning and appraisal, irrigation structures and measuring devices, water distribution, and scheduling. Emphasis will be on getting a broad understanding of irrigation systems through the use of case studies.

**677 Treatment and Disposal of Agricultural Wastes**
Spring. 3 credits. Prerequisite: permission of instructor.
3 lecs, hours to be arranged. W. J. Jewell.
Emphasis is on the causes of agricultural waste problems and the application of fundamentals of treatment and control methods to minimize related pollution. Fundamentals of biological, physical, and chemical pollution control methods are applied to wastes from animals, food production, and food and fiber processing, with actual systems as examples.

**678 Nonpoint Source Models**
Spring. 3 credits. Prerequisites: computer programming and calculus.
Lecs, M W F 11:15. D. H. Haith.
Development and programming of simulation models for management of water pollution from runoff and percolation. Emphasis is on prediction of water and chemical inputs to surface waters and groundwater. Applications include urban and rural runoff, lake eutrophication, groundwater waste loadings from land disposal sites, pesticides and nutrients in agricultural drainage, irrigation return flows, and watershed stream-flow and sediment yield.

**[679 Use of Land for Waste Treatment and Disposal**
Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Lecs, T R 3:35–4:50. W. J. Jewell.
Covers social, legal, and technical factors; the properties of land and crop systems that make land application of wastes a viable alternative; and the use of fundamentals in the development of regulations and the design of full-scale units.]

**682 Building Environment Control**
Spring. 3 credits. Prerequisites: one course in building environment control and a course in heat transfer. Offered alternate years.
Hours to be arranged. L. D. Albright.
Topics include thermal interactions of animals and plants with their environments, time-dependent thermal modeling of buildings, natural ventilation processes in buildings, sensors and controllers, and psychrometric processes.

**685 Biological Engineering Analysis**
Spring. 4 credits. Prerequisite: Theoretical and Applied Mechanics 310 or permission of instructor.
M W F 1:25–2:40. J. R. Cooke.
Engineering problem-solving strategies and techniques are explored. Students solve several representative engineering problems that inherently involve biological properties. Emphasis is on formulation and solution of mathematical models and the interpretation of results. The student's knowledge of fundamental principles is used extensively.

**692 Pavement Engineering (also Civil and Environmental Engineering 643)**
Fall. 4 credits. Limited to engineering seniors and graduate students. Prerequisite: one introductory course in soil mechanics or highway engineering.
Lecs, M T R 12:20; lab, M 1:25–4:25. L. H. Irwin.
Application of geotechnical engineering principles to the selection of materials and the design of highway and airfield pavements. Laboratory will provide experience with materials testing, asphalt concrete mix design, and chemical soil stabilization. Topics of discussion will include properties of asphalts, aggregates, and bituminous mixture design; base courses and soil stabilization methods; seal-coat design; design of flexible and rigid pavements; design for frost conditions; and pavement evaluation using nondestructive test methods.

**700 General Seminar**
Fall. No credit. S-U grades only.
M 12:20. Staff.
Presentation and discussion of research and special developments in agricultural and biological engineering and related fields.

**701 Special Topics in Agricultural and Biological Engineering**
Fall or spring. 1–6 credits. Prerequisite: permission of instructor. S-U grades optional.
Hours to be arranged. Staff.
Topics are arranged by the staff at the beginning of the term.

**750 Orientation for Research**
Fall. 1 credit. Limited to newly joining graduate students. S-U grades only.
Lecs, first 7 weeks, M 3:35; remainder to be arranged. W. W. Gunkel.
An introduction to departmental research policy, programs, methodology, resources, and degree candidates' responsibilities and opportunities.

**754 Sociotechnical Aspects of Irrigation (also Rural Sociology 754 and Agricultural Economics 754)**
Spring. 3 credits.
Hours to be arranged. M. F. Walter, T. S. Steenhuis, R. Barker, E. W. Coward, Jr., N. Uphoff.
Examines irrigated agriculture and its relation to agricultural development. Emphasis on social processes within irrigation systems and interactions with the social setting. The course provides an opportunity to examine systematically the institutional and organizational policy issues associated with the design and operation of systems of irrigated agriculture.

**761 Power and Machinery Seminar**
Spring. 1 credit. Limited to graduate students. Prerequisite: permission of instructor. S-U grades only.
Hours to be arranged. W. W. Gunkel.
Study and discussions of research and new developments in agricultural power and machinery.

**771 Soil and Water Engineering Seminar**
Fall and spring. 1–3 credits. Prerequisite: graduate status or permission of instructor. S-U grades optional.
Hours to be arranged. T. S. Steenhuis, M. F. Walter, J.-Y. Parlange.
Study and discussion of research or design procedures related to selected topics in irrigation, drainage, erosion control, hydrology, and water quality.

**775 Agricultural Waste Management Seminar**
Spring. 1 credit. Prerequisite: permission of instructor. S-U grades only.
Hours to be arranged. Staff.
Management of agricultural wastes, with emphasis on physical, chemical, biological, and economic factors affecting waste production, treatment and handling, utilization, and disposal.

**781 Agricultural Structures and Related Topics Seminar**
Spring. 1 credit. Prerequisite: graduate status or permission of instructor. S-U grades only.
Disc to be arranged. K. G. Gebremedhin.
Consideration of farmstead production systems, with emphasis on biological, economic, environmental, and structural requirements.

**785 Biological Engineering Seminar**
Spring. 1 credit. Prerequisite: graduate status or permission of instructor. S-U grades only.
Disc to be arranged. J. R. Cooke.
The interactions of engineering and biology, especially the environmental aspects of plant, animal, and human physiology, are examined in order to improve communication between engineers and biologists.

# AGRICULTURAL ECONOMICS

W. G. Tomek, chair; D. J. Allee, B. L. Anderson, R. D. Aplin, R. Barker, N. L. Bills, D. Blandford, R. N. Boisvert, J. Brake, K. Bryant, J. B. Bugliari, D. L. Call, G. L. Casler, L. D. Chapman, G. J. Conneman, J. Conrad, H. de Gorter, W. Earle, E. E. Figueroa, O. D. Forker, G. A. German, D. A. Grossman, R. Herdt, M. Hubbert, H. M. Kaiser, R. J. Kalter, W. A. Knoblauch, S. C. Kyle, E. L. LaDue, D. Lee, W. H. Lesser, E. W. McLaughlin, R. A. Milligan, T. D. Mount, A. M. Novakovic, P. Pinstrup-Andersen, T. T. Poleman, J. Pratt, C. Ranney, D. G. Sisler, B. F. Stanton, D. Streeter, L. Tauer, E. Thorbecke, C. van Es, G. B. White, L. S. Willett, K. Wing

**150 Economics of Agricultural Geography**

Fall. 3 credits.
Lecs, M W F 11:15. 2 evening prelims. J. Sinner.

The economics and geography of world agriculture, providing a basis for understanding past development and future changes. Elementary economic principles, historical development, physical geography, and population growth are studied in their relation to agricultural development and the economic problems of farmers. Where possible, current domestic and foreign agricultural issues are used to illustrate principles.

**220 Introduction to Business Management**

Fall. 3 credits.
Lecs, M W F 10:10 or 11:15; disc, M 2:30–4:25 or 7:30–9:25 p.m. (3 secs); T 8–9:55, 12:20–2:15, 1–2:55, or 2:30–4:25; W 8–9:55, 10:10–12:05, 2:30–4:25, 7:30–9:25 p.m. (2 secs); R 8–9:55 or 2:30–4:25. In weeks when discs are held, there will be no W lecture. Discs are held instead of a lecture in all but four weeks of the term. 2 evening prelims. R. D. Aplin.

Principles and tools useful in performing four major functions of management: planning, organizing, directing and leading, and controlling. Within this framework, consideration is given to the firm's internal and external environments; forms of business ownership; financial statements; cost behavior; and a few key concepts and tools in financial management.

**221 Financial Accounting**

Spring. 3 credits. Not open to freshmen.
Lecs, M F 10:10 or 11:15; lab, T 10:10–12:05 (2 secs), 12:20–2:15, or 2:30–4:25; W 10:10–12:05 (2 secs), 12:20–2:15 (2 secs), 2:30–4:25 (2 secs), or 7–9 p.m. (3 secs); R 10:10–12:05, 12:20–2:15, or 2:30–4:25. 2 evening prelims and a comprehensive final. M. Hubbert.

A comprehensive introduction to financial accounting concepts and techniques, intended to provide a basic understanding of the accounting cycle, elements of financial statements, and statements interpretation.

**240 Marketing**

Spring. 3 credits.
Lecs, M W F 11:15; lab, M 2:30–4:25, T 12:20–2:15 or 2:30–4:25, W 2:30–4:25, R 12:20–2:15 or 2:30–4:25, or F 10:10–12:05. In weeks labs are held, there will be no F lecture. G. A. German.

An introductory study of the food marketing system and the society it serves, including the goals and practices of producers and marketers (in such areas as buying and selling, grading, transporting, packaging, and advertising), price-making institutions (such as commodity futures markets), the behavior and purchasing practices of consumers, and the interrelationships among those groups.

**252 Natural Resource and Environmental Economics**

Spring. 3 credits. Prerequisite: Economics 101.
Lecs, M W F 9:05. D. Chapman.

An introduction to the concepts and methods of analysis in the public and private use of resources, particularly benefit-cost analysis and discounting. Major current problems in utilities, water quality, agriculture, conservation, and global petroleum resources. The growing world trade in resource-intensive manufactured products and the impact on income, employment, and pollution. Comparative resource use and environmental protection in industrialized and developing countries.

**302 Farm Business Management**

Fall. 4 credits. Not open to freshmen. This course is a prerequisite for Agricultural Economics 402 and 405.
Lecs, M W F 10:10; lab, T W or R 1:25–4:25. On days farms are visited, the lab period is 1:25–5:30. W. A. Knoblauch.

An intensive study of problems associated with planning, organizing, operating, and managing a farm business, with emphasis on the tools of managerial analysis and decision making. Topics include management information systems, business analysis, budgeting, and acquisition, organization, and management of capital, labor, land, and machinery.

**310 Introductory Statistics**

Spring. 4 credits. Prerequisite: Education 115 or equivalent level of algebra.
Lecs, M W F 1:25; lab T 9:05–11 or 1:25–3:20 (2 labs); W 11:15–1:10 or 2:30–4:25 (2 labs); or R 9:05–11 or 2:30–4:25 (2 labs). Evening exams. C. van Es.

An introduction to statistical methods. Topics to be covered include the descriptive analysis of data, probability concepts and distributions, estimation and hypothesis testing, regression, and correlation analysis. Applications from business, economics, and the biological sciences are used to illustrate the methods covered in the course.

**320 Business Law**

Fall. 3 credits. Limited to juniors, seniors, and graduate students.
Lecs, M W F 9:05. 1 evening prelim. J. B. Bugliari and D. A. Grossman.

Consideration is given chiefly to legal problems of particular interest to persons who expect to engage in business. Emphasis is on the law pertaining to personal property, contracts, agency, real property, and the landlord-tenant relationship.

**321 Law of Business Associations**

Spring. 3 credits. Limited to juniors, seniors, and graduate students. Prerequisite: Agricultural Economics 320 or permission of instructor. 321 and 420 may be taken concurrently.
Lec, T R 2:30–4. 1 evening prelim. J. B. Bugliari.

The first portion of this course examines the formation and operation of business enterprises, particularly partnerships and corporations. The second portion of the course will review government regulations and control of business organizations. Special attention will be given to the antitrust laws, consumer protection legislation, and environmental protection legislation.

**322 Taxation in Business and Personal Decision Making**

Spring. 3 credits. Recommended: background in accounting and business law.
Lecs, M W 2:30–4. D. A. Grossman.

The impact of taxation on business and personal decision making. After a brief discussion of tax policy, an in-depth examination is conducted of federal income and estate and gift taxes affecting individuals and business entities. Both tax management and tax reporting are stressed.

**323 Managerial Accounting**

Fall. 3 credits. Prerequisite: Agricultural Economics 221 or equivalent.
Lecs, M W 12:20 or 1:25; disc, R 8–9:55,10:10–12:05,12:20–2:15 (2 secs), or 2:30–4:25; or F 10:10–12:05, 12:20–2:15, or 1:25–3:20. 2 evening prelims and a final exam. M. Hubbert.

An introduction to cost accounting that emphasizes the application of accounting concepts to managerial control and decision making. Major topics include product costing, standard costing, cost behavior, cost allocation, budgeting, inventory control, variance analysis, measuring divisional performance, and accounting systems in the manufacturing environment. Limited use of Lotus on the IBM PC.

**324 Financial Management**

Spring. 4 credits. Prerequisite: Agricultural Economics 220 or equivalent. Recommended: Agricultural Economics 221 and 310 or equivalents.
Lecs, M W F 9:05; disc, W 2:30–4:25 or R 9:05–11, 12:20–2:15, or 2:30–4:25, or F 10:10–12:05 or 12:20–2:15. 2 evening prelims. B. L. Anderson.

Focuses on three major questions facing management: how to evaluate capital investment decisions, how to raise the capital to finance those investments, and how to generate sufficient cash flows to meet the firm's cash obligations. Major topics include methods to analyze capital decisions, impact of taxes, techniques for handling risk and uncertainty, effects of inflation, sources and costs of debt and equity, capital structure, leverage, and working capital management. Microcomputers are used for analyzing financial problems. No previous computer experience is required.

**[332 Economics of the Public Sector**
Spring. 3 credits. Limited to 150 juniors and seniors. Prerequisite: Economics 101 or equivalent. Not offered 1989-90.

Lecs, T R 12:20–2:15. C. Ranney.

The application of economic concepts to evaluation of the structure and performance of the public sectors of the economy. Emphasis on microeconomic analysis of public finance and public resource allocation. Principal topics: market failure, articulation of public choice and interests, evaluation of public decisions, and current public policy.]

**340 Futures and Options Trading**
Spring. 2 credits. Restricted to seniors. Prerequisites: Economics 101 and Agricultural Economics 240.

Lec, T R 12:20–2:15. D. Streeter.

The focus of the course is on the use of agricultural financial futures and options as marketing and management tools. A primary objective is to understand how companies, financial institutions, and farm businesses can employ hedging strategies to manage risk. All but the final lecture will be held during weeks 1–7. During weeks 7–15 students will participate in a computerized simulated hedging exercise, with a concluding lecture in week 15.

**341 Personal Enterprise and Small Business Management**
Spring. 3 credits. Limited to juniors and seniors. Prerequisites: Agricultural Economics 220 and 221 or permission of instructor.

Lec, M W 11:15–12:45 or M W 2:30–4. Staff.

Designed to acquaint students with the role of small business in the American economy. Special emphasis on the problems related to starting a new business, including financing strategic planning, staffing, marketing, and managing growth. The term project will be group development of a business plan. Visiting entrepreneurs will illustrate a variety of business formats.

**342 Marketing Management**
Fall. 3 credits. Limited to ALS majors. Prerequisites: Agricultural Economics 240 and Economics 101–102.

Lecs, M W F 10:10; disc, R 12:20–1:50 or 2:30–4 (3 secs), F 10:10–11:40 (2 secs), or 12:20–1:50 (2 secs). In weeks discs are held, there is no F lecture. R. Christy.

Deals with principles and practices in the firm's management of the marketing function. Emphasizes the management aspects of marketing by considering sales forecasting and strategies in product and brand selection, pricing, promotion, and channel selection. Identification and generation of economic data necessary for marketing decisions are considered. Public policy and ethical dimensions of marketing are examined.

**346 Dairy Markets and Policy**
Spring. 2 credits. Limited to juniors and seniors. Prerequisite: Economics 101.

Lecs, T R 9:05. A. M. Novakovic.

A review of the structural characteristics of the dairy industry and an analysis of policy issues, pricing systems, and government programs, including marketing orders, price supports, and import policies.

**347 Marketing Fruits, Vegetables, and Ornamental Products**
Fall. 3 credits. Prerequisite: Agricultural Economics 240 or equivalent. S-U grades optional.

Lec M W F 12:20. A field trip of one or two days. E. E. Figueroa.

A study of fruits, vegetables, and ornamental markets, including seasonal variations. Role of market intermediaries, role of government agencies, and the price discovery process. Discussion and description of horticultural product market orders in the U. S. The emerging importance of interregional and international markets.

**380 Independent Honors Research in Social Science**
Fall or spring. 1–6 credits. Limited to students who have met the requirements for the honors program. A maximum of 6 credits may be earned in the honors program.

**402 Advanced Farm Business Management**
Spring. 3 credits. Prerequisite: Agricultural Economics 302 or equivalent.

Lecs, M W 9:05; disc, W 1:25–3:20. G. L. Casler.

Emphasis is on evaluating the profitability of alternative investments and enterprises. Principal topics include strategic planning, the effects of income taxes on investment decisions, capital investment analysis, linear programming, labor management, and financial risk and uncertainty. Experience in computer applications to farm business management is provided. Previous computer experience is not required.

**405 Farm Finance**
Spring. 4 credits. Prerequisite: Agricultural Economics 302 or equivalent.

Lecs, T R 11:15, W 1:25; disc, W 2:30–3:20. 2 evening prelims. E. L. LaDue.

The principles and practices used in financing farm businesses, from the perspectives of the farmer and the farm lender. Topics include sources of capital, financing entry into agriculture, financial analysis of a business, capital management, financial statements, credit instruments, loan analysis, financial risk, and leasing.

**406 Farm and Rural Real Estate Appraisal**
Spring, weeks 7–15. 2 credits. Limited to 45 students. Prerequisites: Agricultural Economics 302 or equivalent and permission of instructor.

Lec, R 11:15; lab, R 1:25–5:30. 6 half-day field trips, 1 all-day field trip. G. J. Conneman.

The basic concepts and principles involved in appraisal. Factors governing the price of farms and rural real estate and methods of valuation are studied. Practice in appraising farms and other rural properties.

**407 Advanced Agricultural Finance Seminar**
Spring. 2 credits. Limited to 16 seniors with extensive course work in farm management and farm finance. Open by application prior to March 1 of the year before the course is offered.

W 3:35–5:30. E. L. LaDue.

A special program in agricultural finance, conducted with financial support from the Farm Credit System. Includes two days at Farm Credit Banks of Springfield, one week in Farm Credit Association offices, an all-day field trip observing FHA financing during fall term, a four-day trip to financial institutions in New York City during intersession, and lecture-discussions in the spring term. Representatives from banking, agribusiness, finance, and similar areas participate in spring-term lecture-discussion sessions.

**408 Seminar in Farm Business Decision Making**
Fall (1 week in intersession). 1 credit. Prerequisites: Agricultural Economics 302 and 405 or equivalent, and permission of instructor.

M T W R F 8–5. G. J. Conneman.

Develops method of analyzing farm business management problems. Gives student experience in identifying alternatives in problem solving. Provides opportunities to analyze and evaluate actual farm situations. Two field trips and intensive work with a farm family.

**409 Farm Management Workshop**
Fall. 1 credit. Limited to seniors and graduate students.

T 12:20-2. B. F. Stanton and staff.

Presentation and interpretation of research in farm management and production economics. Participants conduct seminars reporting on research methodology and results obtained. Students prepare a summary and evaluation of a recent research publication during the semester.

**410 Business Statistics**
Spring. 3 credits. Prerequisite: Agricultural Economics 310 or equivalent.

Lecs, M W F 10:10. C. van Es.

This course focuses on five major topics used to analyze data from marketing research, business, and economics. Topics studied are: survey sampling procedures, nonparametric methods, index numbers, time series and forecasting, and experimental design and ANOVA. The course will involve a research project designed to give experience in collecting and interpreting data.

**411 Financial Management in Farming**
Fall. Weeks 1–9. 2 credits. Limited to ALS majors. Prerequisite: Agricultural Economics 405.

Lecs, M W F 1:25. J. R. Brake.

Financial markets and policies affecting agriculture and farmers. How money and capital markets offset credit cost and availability in agriculture. Insurance concepts for farmers. Financial considerations in starting to farm. Issues in choice of farm organizational structure.

**412 Introduction to Mathematical Programming**
Fall. 3 credits. Primarily for juniors, seniors, and M.S. degree candidates. Prerequisite: Agricultural Economics 310 or equivalent.

Lecs, M W 9:05; lab, W 12:20-2:15. H. M. Kaiser.

This is primarily a course in applied linear programming, but some basic nonlinear programming techniques will be covered. The links between theoretical and empirical models are stressed in this course. Emphasis will be placed on model building, estimation, and interpretation of results. Some topics include applied linear, quadratic, and integer programming to agricultural and nonagricultural decision-making problems.

**415 Price Analysis**
Fall. 3 credits. Prerequisite: an introductory course in economics, such as Economics 101–102. S-U grades optional.
Lecs, M W F 11:15. L. S. Willett.
The focus of this course is on the analysis of supply and demand characteristics of commodities with particular attention to agricultural products. Institutional aspects of pricing farm and food products, temporal and spatial price relationships, price forecasting, and the economic consequences of pricing decisions are included.

**416 Introduction to Econometrics**
Spring. 3 credits. Prerequisite: Agricultural Economics 310 or equivalent. Recommended: Agricultural Economics 415.
Lecs, T R 10:10–11:25. J. Pratt.
The course introduces students to basic econometric principles and the use of statistical procedures in empirical studies of demand, supply, and price behavior. Assumptions, properties, and problems encountered in the use of multiple linear regression procedures are discussed, and simultaneous equation models are introduced. Emphasis is given to regression applications in agricultural product markets, business, and consumer demand. Students are required to specify, estimate, and report the results of an empirical model.

**418 Information Systems and Decision Analysis**
Spring. 3 credits. Prerequisites: Agricultural and Biological Engineering 102 or equivalent, Economics 101 or equivalent, and Agricultural Economics 310.
Lecs, M W 11:15; disc hours to be arranged. D. Streeter.
The focus of the course is on management decision making and the support provided by management information systems. The student will learn the behavioral assumptions made in economics about decision making and the decision rules that result. Techniques for implementing the decision rules will be introduced (decision trees, network analysis, Markov analysis, sensitivity analysis), as well as the statistical techniques (simulation, forecasting) used to produce the information necessary to the decision process. The topics will be discussed in a variety of decision settings (inventory, congestion, planning, and scheduling).

**420 Advanced Business Law**
Spring. 3 credits. Limited to juniors, seniors, and graduate students.
Lecs, T R 8:30–9:55. One evening prelim. J. B. Bugliari.
Designed to provide a fairly detailed and comprehensive legal background in areas of commercial law affecting the operation of business enterprises. Particular consideration is given to the law pertaining to bailments, sales, secured transactions, bankruptcy, and commercial paper.

**422 Estate Planning**
Fall. 1 credit. Limited to upperclass students. S-U grades only.
Lec, M 4. J. B. Bugliari.
Fourteen sessions on the various aspects of estate-planning techniques. The law and use of trusts, the law of wills, federal and New York State estate and gift taxes, and probate procedures are covered.

**424 Business Policy**
Spring. 3 credits. Limited to seniors majoring in business management and marketing.
T R 9:05–10:35, 11:05–12:35, or 2:30–4. R. D. Aplin.
An integrating course that examines business policy formulation and implementation from the standpoint of the general manager of an organization, focusing on decision making and leadership. The course is built around a series of cases. Several guest executives. Emphasizes improving oral and written communication skills.

**426 Cooperative Strategies**
Spring. 3 credits.. Recommended: Agricultural Economics 220 or equivalent.
Lecs, M W F 12:20. Evening prelim. B. L. Anderson.
Investigates the unique aspects of cooperative business organizations. Topics are approached from the points of view of management, the board of directors, and members and include cooperative principles, legislation, taxation, as well as cooperative management, financial and marketing strategies. Primary focus is on operating cooperatives in agriculture and the strategic alternatives they face.

**431 Farm and Food Policies**
Fall. 3 credits.
Lecs, T R 9:05; disc, R 11:15 or 1:25, or F 10:10. B. F. Stanton.
The course deals broadly with farm and food policies, including price support and storage or reserve policies, agricultural protection, soil conservation programs, the structure of agriculture, and domestic food subsidy programs. The importance of international trade and agricultural policies in other countries is emphasized.

**443 Food-Industry Management**
Spring. 4 credits. Limited to juniors and seniors. Prerequisite: Agricultural Economics 448 or 342 or permission of instructor.
Lecs, T R 9:05–10:35; sec, T 2–3:30. G. A. German.
A case-study approach is used to examine the application of management principles and concepts to marketing and distribution problems of the food industry. Cases covering new product introductions, merchandising strategies, and investment decisions are included. Guest speakers from the food industry present case-study solutions at the Tuesday session.

**445 Counseling Small Business**
Fall. 3 credits. Prerequisites: Agricultural Economics 220, 221, and 341 and permission of instructor.
Lec, M 2:30–4. Staff.
Allows students to serve as consultants to small businesses throughout New York State. Provides the opportunity to identify and confront problems facing small personal enterprises. Encourages the application of basic business courses to an actual business and the witnessing, first hand, of the results of firm-level decision making. Student teams meet with the instructor at predesignated times throughout the semester.

**448 Food Merchandising**
Fall. 3 credits. Limited to juniors and seniors. Prerequisite: Agricultural Economics 240.
Lecs, T R 10:10–11:25. G. A. German.
Merchandising principles and practices as they apply to food industry situations. The various elements of merchandising are examined, including buying, pricing, advertising, promotion, display, store layout, profit planning and control, and merchandising strategy. The consequences of food industry trends and initiatives for other industry members, public policymakers, and consumers are considered.

**[449 Applications in Strategic Marketing**
Fall. 2 credits. Prerequisite: Agricultural Economics 342 or permission of instructor. Cost of field trips, about $250. Not offered 1989–90.
W 2:30–4. Two 1-day field trips to the upstate area and a 3-day trip to the New York City area during intersession, just prior to registration. E. W. McLaughlin.
Focuses on the major components of strategic marketing with an applied orientation: product mix, distribution, pricing, advertising and promotion, and market research. Students are given firsthand exposure to a wide range of marketing strategies through field trips, guest lectures, case studies, group exercises, and development of a strategic marketing plan.]

**452 Resource Economics**
Fall. 3 credits. Prerequisites: Mathematics 111 and Economics 311.
Lecs, T R 10:10; disc, M or T 2:30. J. Conrad.
This course develops economic models for renewable resources, exhaustible resources, and environmental quality. Applications to fisheries, forestry, oil and gas, and air and water pollution are presented. Emphasis is on the microeconomic foundations in resource economics and the policy implications for resource management.

**[454 The History and Economics of Whaling in North America (also History 416)**
Spring. 4 credits. Prerequisites: Economics 101–102. Offered alternate years. Not offered 1989–90.
Lec, T R 2:30–4:20. D. Usner, J. Conrad.
The whaling industry of 19th-century America is a rich source of documents and data describing the people, resources, and technology that contributed to the development of the United States. Social relations, cross-cultural influences, economic motivations, prices, markets, resource dynamics, and technical change will be examined during the rise and fall of this unique American industry.]

**455 Agricultural Law**
Spring. 3 credits. Limited to juniors, seniors, and graduate students.
Sems, M W F 10:10. D. A. Grossman.
Law and government regulation as they apply to agriculture and the use of land for agricultural production. An overview of legal issues in installment sales and financing, farm leases, warehousing, cooperatives, employment, soil and water management, farm lands preservation and use, and ownership of animals.

**464 Economics of Agricultural Development**
Spring. 3 credits. Prerequisites: Agricultural Economics 150, Economics 101–102, or permission of instructor.
Lecs, T R 9:05–10:20. S. Kyle.
This course is designed to provide an understanding of the economics of the agricultural sector in low-income countries. In addition, more general issues of economic development beyond the agricultural sector will be covered in order to provide the necessary context for an understanding of rural problems. Among the areas covered are the nature of development and technical change, welfare and income distribution, land reform, food and nutrition policy, food security and food aid, competition with more developed countries and international markets, the effect of U.S. policy on agricultural development, and the role of international institutions such as the World Bank. Examples from a wide variety of developing countries will be used to illustrate the basis for economic analysis.

**497 Special Topics**
Fall or spring. Variable credit. Written permission from the staff member who will supervise the work and assign the grade must be attached to course enrollment material.
Hours to be arranged. Staff.
Special projects designed by faculty members to supplement existing classes.

**498 Supervised Teaching Experience**
Fall or spring. 1–3 credits. Total of 4 credits maximum during undergraduate program.
Hours to be arranged. Staff.
Designed to give qualified undergraduates experience through actual involvement in planning and teaching courses under the supervision of department faculty. Students are expected to actually teach at least one hour per week for each credit awarded. Students cannot receive both pay and credit for the same hours of preparation and teaching.

**499 Undergraduate Research**
Fall or spring. 1–4 credits. Limited to seniors with grade-point averages of at least 2.7. Prerequisite: written permission of the staff member who will supervise the work and assign the grade; this permission must be attached to course enrollment material. S-U grades optional.
Permits outstanding undergraduates to carry out independent study of suitable problems under appropriate supervision.

**[605 Agricultural Finance and Capital Management**
Fall. 3 credits. Prerequisite: Agricultural Economics 402 or 405, or equivalent. Offered alternate years. Not offered 1989–90. $25 charge for reading materials; no text.
T R 8:40–9:55. J. Brake, L. Tauer, E. LaDue.
Advanced topics in capital management and financing of agriculture. Special emphasis on current issues. Example topics: farm-sector funds flows, financial risk and decision analysis, agricultural finance policy, financial intermediation and intermediaries, firm growth, inflation investment-replacement models, and selected topics on financing agriculture in developing countries.]

**608 Production Economics**
Fall. 3 credits. Prerequisite: Economics 311 or equivalent. Recommended: Mathematics 111 or equivalent.
Lecs, M W F 10:10. L. W. Tauer.
The theory of production economics with emphasis on applications to agriculture. Topics include the derivation, estimation, and use of production, cost, profit, demand, and supply functions. Production response over time and under risk is introduced.

**630 Policy Analysis I: Welfare Theory, Agriculture, and Trade**
Spring. 4 credits. Prerequisites: Agricultural Economics 608 or Consumer Economics 603, Economics 313, or equivalent intermediate micro theory incorporating calculus.
Lecs T R 8–9:55. H. de Gorter.
The first half of the course surveys the theory of welfare economics as a foundation for public policy analysis. Major issues addressed include the problem of social welfare measurement, the choice of welfare criteria, and the choice of market or nonmarket allocation. Basic concepts covered include measurement of welfare change, including the compensation principle, consumer and producer surplus, willingness-to-pay measures, externalities, and the general theory of second-best optima. The second half of the course focuses on public policy analysis as applied to domestic agricultural policy and international trade. The domestic policy component examines major U.S. farm commodity programs and related food and macroeconomic policies and analyzes their effects on producers, consumers, and other groups. The international trade component examines the structure of world agricultural trade, analytical concepts of trade policy analysis, and the principal trade policies employed by countries in international markets.

**631 Policy Analysis II: Resources and Agricultural Development**
Fall. 4 credits. Prerequisite: Agricultural Economics 630.
Lecs, T R 8–9:55. D. Chapman, D. Blandford.
The first half of this course covers issues related to natural resources. Beginning with an overview of benefit-cost analysis and project evaluation, the course continues by considering global and transnational resource topics including exhaustible and renewable resource theory, externalities, and international environmental problems. Issues related to the role of resources in development. The second half of the semester focuses on the analysis of policies for agricultural growth and development. Theories of growth and agriculture's role in the development process are discussed. Macroeconomic and sectoral policies affecting production, consumption, and trade are evaluated.

**640 Analysis of Agricultural Markets**
Fall, weeks. 1–7. 2 credits. Prerequisites: Agricultural Economics 415 and 416 or equivalents.
Lecs, T R 12:20–2:15. L. Willett.
This course is about markets for agricultural products. Focus is placed on identifying their distinguishing characteristics, establishing criteria for evaluating performance, analyzing models for price determination and farm-retail marketing margins, and evaluating selected public-policy issues related to market performance.

**641 Commodity Futures Markets**
Fall, weeks 8–14. 2 credits. Prerequisites: Agricultural Economics 415 and 416 or equivalents. Recommended: Agricultural Economics 640.
Lecs, T R 12:20–2:15. W. G. Tomek.
This course is primarily about markets for agricultural futures contracts. Emphasis is placed on price behavior on cash and futures markets and the relationships among prices. These principles provide a foundation for a discussion of hedging, speculation, and public-policy issues.

**643 Export Marketing**
Fall. 3 credits. Prerequisite: graduate or upperclass standing. Estimated cost of field trip, $150.
Lec, R 2:30–4:45. Overnight field trip to New York City required. W. H. Lesser.
An exploration of the processes and procedures for export marketing. Emphasis is placed on financing arrangements and on alternative risk-reducing strategies. Organization for export marketing is discussed along with government export-promotion programs. This course is intended to provide practical information on the process of marketing overseas. Students participate in a custom-developed, competitive export-trading simulation.

**651 Economics of Resource Use**
Fall. 4 credits. Economics 509 or Agricultural Economics 452 recommended.
Lec-sem, hours to be arranged.
D. Chapman.
Introduction to recent literature on theory and applied analysis. Dynamic optimization and resource use, externality theory and its application to environmental economics. Principles of utility regulation. Ecosystem modeling. Economic growth and resource use. Selected topics.

**652 Land Economics Problems**
Fall or spring. 1 or more credits. Limited to graduate students. Prerequisite: permission of instructor. S-U grades optional.
Hours to be arranged. D. J. Allee.
Special work on any subject in the field of land economics.

**660 Food, Population, and Employment**
Fall. 4 credits. Enrollment limited to 15 to ensure that students have an opportunity to work individually with instructor.
M W 2:30–4 and an individual weekly meeting with the instructor.
T. T. Poleman.
Designed to introduce first-year graduate students to the interrelated problems of food, population, and employment in developing countries. Food economics and the world food situation are treated as cornerstones. Emphasis is given to the techniques for preparing a research proposal or paper.

**[663 Macroeconomic Issues in Agricultural Development**
Fall. 3 credits. Prerequisite: permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lec to be arranged. E. Thorbecke.
Issues such as the role of agriculture in economic development, the household farm as a producing and consuming unit, operation of product and factor markets in agricultural and rural areas, structural transformation of agriculture in the process of economic development, theories of agricultural

development, and agricultural and rural development strategies and models. The approach followed is theoretical, quantitative, and empirical.]

**664 Microeconomic Issues in Agricultural Development**
Spring. 3 credits. Prerequisite: Agricultural Economics 608, Economics 311, or permission of instructor. S-U grades optional.
T R 4:30–5:55. R. Barker.
Issues such as production efficiency, induced technological change, allocation of research resources, and the distribution of benefits from new technology are discussed. The theoretical argument is related to applied research problems.

**685 Food and Nutrition Policy (also Nutritional Sciences 685)**
Fall. 3 credits. Prerequisites: Consumer Economics 603 or Economics 313 or Agricultural Economics 415 or equivalent, and knowledge of multiple regression.
Lecs, M W 1:25–2:40.
P. Pinstrup-Andersen.
The course will identify the principal links between human nutrition and government action, with emphasis on developing countries. The process of policy formation, including economic and political factors, will be discussed. Political economy issues, including the influence of and conflict among interest groups and rent-seeking behavior related to food and nutrition policies and programs, will be analyzed. The role of nutrition information and surveillance in policy design, implementation, and evaluation will be analyzed along with methodologies for empirical analysis of food and nutrition policy. Findings and analytical methodologies from case studies in developing countries will be used, as appropriate. The role of improved nutrition in economic development both as an indicator of welfare and as a productivity-enhancing factor as well as basic relationships among nutrition, poverty, food, health, and household behavior will be briefly presented at the beginning of the course to provide a context for policy discussions.

**699 M.P.S. Research**
1–6 credits. Prerequisite: registration as an M.P.S. student. Credit is granted for the M.P.S. project report.

**700 Topics in Agricultural Economics**
Fall or spring. Limited to graduate students. Credit, class hours, and other details arranged with a faculty member.
This course is used to offer special topics in agricultural economics that are not covered in regular class offerings. More than one topic may be given each semester in different sections. The student must register in the section appropriate to the topic being covered; the section number is provided by the instructor.

**708 Advanced Production Economics**
Fall. 3 credits. Prerequisite: Agricultural Economics 608, 710, or equivalents; Economics 509 is highly recommended. Offered alternate years.
Hours to be arranged. R. N. Boisvert.
Theoretical and mathematical developments in production economics, with emphasis on estimating micro- and macro-production relationships, scale economies, technical change, factor substitution. Recent developments in flexible functional forms, duality and dynamic adjustment models are emphasized. Discussions of several other selected topics such as risk, supply response, and household production functions change from year to year based on student interest.

**710 Econometrics I**
Spring. 4 credits. Prerequisite: enough preparation in matrix algebra and statistics (e.g., Statistics 417 and 601) to read J. Johnston, *Econometric Methods*, 3d edition, chapters 5ff.
Lecs, T R 2:30–4:25. W. G. Tomek.
This course provides an intermediate-level treatment of the specification, identification, estimation, and evaluation of econometric models. Common econometric problems are treated, including collinearity, specification error, autocorrelated disturbances, lagged variables, errors in variables, and simultaneity. Students seeking an introduction to econometrics should take Agricultural Economics 416.

**711 Econometrics II**
Fall. 4 credits. Prerequisite: Agricultural Economics 710 or equivalent. Statistics 417 recommended.
Lecs, T R 10:10–12:05. T. D. Mount.
Coverage beyond that of Agricultural Economics 710 of generalized least squares, testing linear hypotheses, the effects of specification errors, and regression diagnostics. Applications include seemingly unrelated regressions, estimation with pooled data, models with stochastic coefficients, models with limited dependent variables, and distributed lag models.

**712 Quantitative Methods I**
Fall. 4 credits. Prerequisite: some formal training in matrix algebra. A course at the level of Statistics 417 is highly recommended.
Lecs, M W 9:05–11. R. N. Boisvert.
A comprehensive treatment of linear programming and its extensions, including postoptimality analysis, goal programming, and the transportation model. Special topics in nonlinear programming, including separable, spatial equilibrium and risk programming models. Input-output models and their role in social accounting matrices and computable general equilibrium models are discussed. Applications are made to agricultural, resource, and regional economic problems.

**713 Quantitative Methods II**
Spring. 4 credits. Prerequisites: Economics 509 and Agricultural Economics 710.
Lecs, W F 9:05–11. J. M. Conrad, T. D. Mount.
This course is concerned with the analysis and optimization of dynamic systems. Course objectives are to (1) present the basic theory of dynamical systems and dynamic optimization, (2) introduce associated methods of numerical and econometric analysis, (3) review some applications of dynamic analysis from various subfields in economics, and thereby (4) equip students with basic theory and methods to perform applied research on dynamic allocation problems.

**717 Research Methods in Agricultural Economics**
Spring. 2 credits. Limited to graduate students.
M 1:25–3:20. B. F. Stanton, D. G. Sisler.
Discussion of the research process and scientific method as applied in agricultural economics. Topics include problem identification, hypotheses, sources of data, sampling concepts and designs, methods of collecting data, questionnaire design and testing, field organization, and analysis of data. During the semester each student develops a research proposal that may be associated with his or her thesis.

**730 Seminar on Agricultural Trade Policy**
Spring. 3 credits. Limited to graduate students. Prerequisites: Agricultural Economics 630–631 and basic familiarity with quantitative methods.
F 1:25–4. D. Blandford, D. G. Sisler.
A discussion of selected topics in agricultural trade policy, such as the linkage between domestic agricultural and trade policies, instability and market stabilization, and agricultural trade and development. The preparation of a term paper is an important part of the course.

**740 Agricultural Markets and Public Policy**
Spring, weeks 1–7. 2 credits. Limited to graduate students. Prerequisite: familiarity with multiple regression techniques at the Agricultural Economics 416 level or higher. Recommended: Agricultural Economics 640.
T R 12:20–2:15. W. H. Lesser.
Develops the concepts and methodology for applying and analyzing the effects of public-policy directives to the improvement of performance in the U.S. food marketing system. Topics include a survey of industrial organization principles, antitrust and other legal controls, and coordination systems in agriculture.

**741 Methods of Trade and Commodity Policy Analysis**
Spring, weeks 8–14. 2 credits. Limited to graduate students. Prerequisite: familiarity with multiple regression techniques at the level of Statistics and Biometry 601. Recommended: Agricultural Economics 640.
T R 12:20–2:15. D. Blandford.
The nature, use, and usefulness of alternative quantitative methods of trade and commodity policy analysis. Principal topics are the analysis of export supply-import demand for a single country, international commodity models, and macroeconomic or general equilibrium models of commodity trade.

**750 Economics of Renewable Resources**
Spring. 4 credits. Prerequisites: Economics 509 and 518, or Agricultural Economics 713.
Hours to be arranged. J. M. Conrad.
This course is concerned with the optimal allocation of renewable resources. Bioeconomic models of fishing and forestry are presented along with models of groundwater and residuals (environmental) management. Theory, applications, and management policy are considered.

**751 Seminar on Agricultural Policy**
Spring. 2 credits. Limited to graduate students. Offered alternate years.
W 12:20–2:15. H. de Gorter.
A review of the professional literature relating to agricultural policy issues and techniques appropriate to the analysis of such issues.

**754 Sociotechnical Aspects of Irrigation (also Rural Sociology 754 and Agricultural and Biological Engineering 754)**
Spring. 3 credits. S-U grades optional.
Hours to be arranged. R. Barker, E. W. Coward, Jr., N. T. Uphoff, M. F. Walter.
Examines irrigated agriculture and its relation to agricultural development. Emphasis on social processes within irrigation systems and interactions with the social setting. The seminar provides an opportunity to examine systematically the institutional and organizational policy issues associated with the design and operation of systems of irrigated agriculture.

**[763 Macro Policy in Developing Countries**
Spring. 3 credits. Prerequisites: Economics 509, 510, 513 (may be taken concurrently), or permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, T R 12:20–1:35. S. Kyle.
This course examines macroeconomics policies in developing countries and their interaction with economic growth, development, and stability. First, theoretical models useful for analysis of macro policies will be covered, followed by an examination of empirical studies. Emphasis will be on research topics of current interest to students and professionals in the field, particularly those relating to the interaction of macro policy with micro and sectoral analysis.]

## AGRONOMY

R. J. Wagenet, chair; M. Alexander, P. C. Baveye, D. R. Bouldin, R. B. Bryant, S. J. Colucci, W. J. Cox, S. D. DeGloria, J. D. DiTomaso, J. M. Duxbury, G. A. Ferguson, G. W. Fick, D. L. Grunes, R. R. Hahn, J. L. Hutson, S. D. Klausner, W. W. Knapp, L. V. Kochian, T. A. LaRue, D. J. Lathwell, A. C. Leopold, D. L. Linscott, R. F. Lucey, D. V. Lynch, M. B. McBride, J. Mt. Pleasant, R. L. Obendorf, W. D. Pardee, J. H. Peverly, W. R. Philipson, W. S. Reid, S. J. Riha, T. W. Scott, R. R. Seaney, T. L. Setter, P. L. Steponkus, H. M. van Es, A. Van Wambeke, W. J. Waltman, R. M. Welch, D. S. Wilks, M. J. Wright, M. W. Wysocki, R. W. Zobel

### Courses by Subject

Crop Science: 311, 312, 314, 315, 317, 607, 608, 610, 611, 612, 613, 614, 642, 690

Meteorology: 131, 232, 250, 334, 351, 353, 354, 435, 437, 441–442, 447, 450, 451, 452

Remote Sensing: 660, 661, 662

Soil Science: 190, 260, 321, 361, 362, 372, 373, 385, 465, 466, 471, 476, 477, 483, 663, 666, 667, 669, 675, 676, 771, 774

**131 Basic Principles of Meteorology**
Fall. 3 credits. Limited to 75 students.
Lecs, T R 11:15; lab, T W or R 1:25–4:25. M. W. Wysocki.
A simplified treatment of the structure of the atmosphere: heat balance of the earth; general and secondary circulations; air masses, fronts, and cyclones; and hurricanes, thunderstorms, tornadoes, and atmospheric condensation. In the laboratory, emphasis is on techniques of analysis of weather systems.

**190 Food and Fiber Production: Possibilities and Perils**
Spring. 2 credits. Limited to 40 students. S-U grades optional.
Lec, T 9:05–9:55; labs, R 9:05–11 or R 1:25–3 :20. T. W. Scott, D. S. Wilks, M. J. Wright.
Crops, climate, and soil are elements of the system that supports civilization. By developing agriculture, people increased their control over crop production. A continual upward trend in population creates the need to explore the limitations of our resources and technology. This course acquaints the student with some important features of crops, climate, soil, and their interactions. The detrimental effects of present agricultural practices on the environment and some proposed solutions will be considered. Laboratory exercises will provide hands-on experience with soil and plant materials and meteorological instruments.

**232 Climatology**
Spring. 3 credits. Prerequisite: Agronomy 131.
Lecs M W F 11:15. M. W. Wysocki.
The first part of the course is devoted to the description of world climates in terms of the global distribution of radiation, temperature, pressure, wind, precipitation, and air masses. The second part of the course relates climates and climatic anomalies to planetary, regional, and local circulations.

**250 Meteorological Observations and Instruments**
Spring. 3 credits. Prerequisite: Agronomy 131.
Lecs, M W 12:20; lab, R 1:25–3:20. M. W. Wysocki.
Methods and principles of meteorological measurements and observations, including surface, free-air, and remote systems. Instrument siting, mounting, and protection. Instrument response characteristics, calibration, and standardization. Recorders and data-logging systems. Laboratory exercises in observation and data analysis. Intended to serve as preparation for Observers Examination.

**260 Introduction to Soil Science**
Spring. 4 credits. Prerequisite: Chemistry 103, 207 or 215. S-U grades optional.
Lecs, M W F 9:05; lab, M T W or R 1:25. Staff.
A comprehensive introduction to the field of soil science, with emphasis on scientific principles and their application to solving practical soil-management problems. The last weeks of the semester will be devoted to several different topics, to provide broad experience in soil science.

**311 Grain Crops**
Fall. 4 credits. Prerequisite: Agronomy 260 or Biological Sciences 241.
Lecs, M W F 10:10; lab, M or T 1:25–4:25. 1 or 2 field trips during lab periods (until 5 p.m. or on weekends). R. L. Obendorf.
Principles of field-crop growth, development and maturation, species recognition, soil and climatic adaptations, liming and mineral nutrition, weed control, cropping sequences, management systems, and crop improvement are considered. Grain, protein, fiber, and sugar crops are emphasized.

**312 Forage Crops**
Spring. 4 credits. Prerequisites: Agronomy 260 or Biological Sciences 241 or equivalent. Recommended: Animal Science 112.
Lecs, M W F 11:15; lab, M or T 1:25–4:25. G. W. Fick.
The production and management of crops used for livestock feed are considered in terms of establishment, growth, maintenance, harvesting, and preservation. Forage grasses, forage legumes, and corn are emphasized, and consideration is given to their value as livestock feed in terms of energy, protein, and other nutritional components.

**[314 Production of Tropical Crops**
Spring. 3 credits. Prerequisite: a course in crop production. Not offered 1989–90.
Lecs, M W F 10:10. Staff.
An introduction to the characteristics and culture of the principal food staple crops of the tropics and subtropics and of some of the crops grown for export. Vegetables and fruits are not emphasized.]

**315 Weed Science**
Fall. 3 credits. Prerequisite: introductory course in biology or botany.
Lecs, T R 9:05; lab, M, T, or W 2–4:25. J. DiTomaso.
Principles of weed science are examined. Emphasis is on (a) weed ecology, (b) chemistry of herbicides in relation to effects on the environment and plant growth, and (c) control of weeds in crops. Laboratory covers weed identification and ecology, herbicide selectivity, symptomology, and behavior in soil.

**317 Seed Science and Technology**
Fall. 3 credits. Prerequisite: Biological Sciences 241 or equivalent. Offered alternate years.
Lecs, T R 11:15; lab, R 1:25–4:25; 2 all-day field trips will be scheduled during the semester. A. G. Taylor, Geneva Experiment Station (Ithaca contact, R. L. Obendorf).
The principles and practices involved in the production, harvesting, processing, storage, testing, quality management, certification, and use of high-quality seed from improved cultivars. Information is applicable to various kinds of agricultural seeds.

**321 Soil and Water Management**
Spring. 2 credits. Prerequisites: Agronomy 190 or 260. Concurrent registration in Agricultural and Biological Engineering 321 required. S-U grades optional.
Lec, M W 9:05; disc, M 1:25–4:25. T. W. Scott, M. F. Walter, R. T. Oglesby.
An interdisciplinary course intended to introduce students to the general principles of soil and water interaction and to the effects of human intervention in these processes. Aspects of soil and water management, including hydrology, soil erosion, irrigation, drainage, and water quality are examined. Case studies from both the United States and the tropics are used to illustrate basic principles.

**334 Agricultural Meteorology**
Spring. 3 credits. Recommended: a previous course in physics.
T R 10:10–11:25. D. S. Wilks.
An introduction to the relationships of radiant energy, temperature, wind, and moisture in the atmosphere near the ground. The interplay between physical processes of the atmosphere, plant canopies, and soil is examined. Moisture relationships in the atmosphere-soil-plant continuum, the effects of environmental modification, and the bioclimatic requirements of plants are also discussed.

**351 Synoptic Meteorology I**
Fall. 3 credits. Prerequisites: Agronomy 131 and one year of calculus.
Lecs, T R 9:05; lab, M 1:25–3:20.
S. J. Colucci.
An introduction to the tools and principles of weather forecasting and analysis. Vorticity, divergence, and deformation theorems applied to the problems of cyclogenesis, vertical celocity, and frontogenesis. National Meteorological Center DIFAX products, GOES visible and infrared satellite images, digital and Doppler radar.

**353 Forecasting and Dynamics Lab I**
Fall. 2 credits. Prerequisites: Agronomy 131 and concurrent registration in Agronomy 441.
Lec, T 12:20; lab, F 1:25–3:20.
M. W. Wysocki.
Weather briefings by the instructor based upon real-time operational guidance. Computer tutorials in thermodynamics, including sounding diagrams, stability indices, and static energy terms.

**354 Forecasting and Dynamics Lab II**
Spring. 2 credits. Prerequisites: Agronomy 353 and concurrent registration in Agronomy 442.
Lec, T 12:20; lab, F 1:25–3:20.
M. W. Wysocki.
Weather discussions prepared by students. Computer tutorials in hydrodynamics, including vorticity and divergence computation, geostrophic and thermal wind concepts, and Richardson, Reynolds, and Froude numbers.

**361 Genesis, Classification, and Geography of Soils**
Fall. 4 credits. Prerequisite: Agronomy 260 or consent of instructor. S-U grades optional.
Lecs, M W F 10:10; lab, W 1:25–4:25; all-day field trip required. R. B. Bryant.
The soil as a natural body. Factors and processes of soil formation. Principles of field identification, classification, survey, and interpretation. Geography of major kinds of soil of North America and the world in relation to environment and cultural patterns. Laboratory exercises and field trips assist in identifying and interpreting soils in relation to landscape.

**362 Soil Morphology**
Fall. 1 credit. Undergraduates only. Recommended for sophomores and juniors.
R 1:25–4:25; all-day field trip required.
R. B. Bryant, W. J. Waltman.
The principles for field identification of soil properties, profiles, and landscapes are presented. A series of soil pits are examined, described, classified, and interpreted in the field.

**372 Soil Fertility Management**
Fall. 3 credits. Prerequisite: Agronomy 260 or permission of instructor.
M W F 9:05. D. R. Bouldin.
An integrated discussion of soil crop yield relationships, with emphasis on the soil as a source of mineral nutrients for crops and the role of fertilizers and manure in crop production.

**373 Soil, Water, and Aquatic Plants**
Fall. 3 credits. Prerequisites: Agronomy 260, Biological Sciences 101–102, and Chemistry 103–104 or equivalents.
T R 11:15, R 1:25–4:25. J. H. Peverly.
The success or failure of soil and water management is manifested in streams, wetlands, lakes, and aquifers. Chemical and biological changes downstream are studied and related to agricultural management techniques upstream. Basic chemical and physiological processes are presented and used to suggest appropriate responses to water management problems.

**385 Biogeochemical Cycles, Agriculture, and the Environment**
Spring. 2 credits. Prerequisites: Chemistry 103 or 207 and Agronomy 260 or equivalent.
Lecs, T R 11:15–12:05. J. M. Duxbury.
The impact of agriculture on aspects of the global biogeochemical cycles of carbon. nitrogen, sulfur, and phosphorus is discussed and illustrated with current agricultural and environmental issues. Topics include sustainable agriculture, effects of nitrogen fixation, acid rain, global warming, and land disposal of wastes.

**435 Statistical Methods in Meteorology**
Fall. 3 credits. Prerequisite: an introductory course in statistics (e.g., Statistics 215 or Agricultural Economics 310). Familiarity with elementary matrix algebra helpful. Offered alternate years.
T R 10:10–11:25. D. S. Wilks.
Statistical methods used in operational weather forecasting and selected meteorological research applications. Probabilistic vs. categorical forecasts, and subjective vs. objective forecasts. Multiple regression models and the MOS system. Forecast verification techniques and scoring rules. Some statistical characteristics of meteorological data, including probability distributions, intercorrelations, and parametric time series models.

**[437 Agrometeorological Decision Analysis**
Fall. 3 credits. Prerequisite: Agricultural Economics 310 or Statistics 215, or equivalents. Offered alternate years. Not offered 1989–90.
T R 10:10–11:25. D. S. Wilks.
Application of Statistical Decision Analysis to weather-sensitive agricultural decision problems. Characteristics of categorical and probabilistic weather forecasts, incorporation of forecast information into the decision problem, selection of optimal strategies, forecast value in relation to forecast quality, effects of the decision maker's attitude toward risk, and static vs. dynamic decision-making problems.]

**441–442 Theoretical Meteorology I and II**
441, fall; 442, spring. 3 credits each semester. Prerequisites: a year each of calculus and physics.
M W F 10:10. W. W. Knapp.
Fall semester topics include thermodynamics of dry air, water vapor and moist air, and hydrostatics and stability. Topics considered in the spring term include meteorological coordinate systems, variation of wind and pressure fields in the vertical, winds in the planetary boundary layer, surfaces of discontinuity, mechanisms of pressure change, and vorticity and circulation.

**[447 Physical Meteorology**
Fall. 3 credits. Prerequisites: a year each of calculus and physics. Offered alternate years. Not offered 1989–90.
M W F 12:20. W. W. Knapp.
Primarily a survey of natural phenomena of the atmosphere, with emphasis on their underlying physical principles. Topics include composition and structure of the atmosphere, atmospheric optics, acoustics and electricity, solar, and terrestrial radiation, and principles of radar probing of the atmosphere.]

**452 Synoptic Meteorology II**
Spring. 3 credits. Prerequisites: Agronomy 351, 441, and 442.
Lecs, T R 9:05; lab, M 1:25–3:20.
S. J. Colucci.
Advanced topics in weather prediction. East Coast secondary cyclogenesis. Tropical storm formation. Squall-line formation and flash floods. Lake-effect snowsqualls and downslope windstorms.

**465 Soil and Plant Analysis**
Spring. 3 credits. Prerequisite: Agronomy 260.
Lec, T R 1:25–2:15; lab, R 2:30–4:20.
G. A. Ferguson.
Intensive and systematic study of the theoretical and practical aspects of soil and plant analysis. Analyses of soil and plant samples are carried out with emphasis on analytical problem solving and evaluation of the experimental data. Sampling philosophy and preliminary treatment of samples is covered. A variety of wet chemistry and instrumental methods are employed. Considerable attention is given to correlation of quantities and chemical forms of elements in soils and plants with plant growth and yield.

**466 Soil Chemistry**
Spring. 3 credits. Prerequisites: Agronomy 260 and Chemistry 207–208.
Lecs, M W F 9:05. M. B. McBride.
A discussion of the chemical nature and reactions of the mineral and organic components of soil. Topics to be emphasized include mineralogy, cation and anion adsorption, soil acidity, oxidation/reduction reactions, and soil salinity. The relationship of soil chemical properties to fertility will be described.

**[471 Geography and Appraisal of Soils of the Tropics**
Fall. 3 credits. Prerequisite: Agronomy 260 or equivalent. S-U grades optional. No audits accepted. Not offered 1989–90.
Lecs, T R 10:10; disc, W 2:30–4:25.
A. Van Wambeke.
The character of principal kinds of soils in the major regions of the tropics. Emphasis is on soil properties as a basis for interpretation of crop management requirements and production potential. Lectures introduce principles whose applications are examined through discussions, problem solving, and independent reading.]

**476 Soil Microbiology, Lectures**
Spring. 3 credits. Prerequisite: Agronomy 260 or Microbiology 290. Offered alternate years.
M W F 10:10. M. Alexander.
A study of the major groups of soil microorganisms, their ecological interrelationships, and the biochemical functions of organisms in soil.

**477 The Fate of Chemicals in Soil**
Fall. 3 credits. Prerequisites: Agronomy 260 or equivalent and Chemistry 103 or 207.
Lec, M W F 9:05. J. M. Duxbury, M. Alexander, M. B. McBride, R. J. Wagenet.
An integrated discussion of the biological, chemical, and physical processes that determine the fate and environmental impact of chemicals added to soils.

**483 Environmental Biophysics**
Fall. 4 credits. Prerequisite: Agronomy 260 or equivalent.
Lecs, M W F 11:15. S. J. Riha. Discussion section to be arranged.
Introduction to basic principles of energy and water transfer and storage in soil-plant systems. Energy budgets, soil heat flow, water movement in saturated and unsaturated soils, infiltration, evaporation, and water dynamics and solute transport in the soil-plant-atmosphere continuum will be covered. Applications are considered through extended discussions and problem sets, including exercises emphasizing measurement techniques and data analysis.

**497 Special Topics**
Fall or spring. 1–6 credits. S-U grades optional. Undergraduates must attach to their course enrollment material written permission from the staff member who will supervise the work and assign the grade.
Hours to be arranged. Staff.
The topics are arranged at the beginning of the term for individual study or for group discussions.

**498 Teaching Experience**
Fall or spring. 1–5 credits. S-U grades optional.
Hours to be arranged. Staff.
Teaching experience in crop science, meteorology, or soil science is obtained by assisting in the instruction of a departmental course.

**499 Undergraduate Research**
Fall or spring. Credit to be arranged. Written permission from the staff member who will supervise the work and assign the grade must be attached to course enrollment material.
Hours to be arranged. Staff.
Independent research on current problems selected from any phase of crop science, meteorology, or soil science.

**607 Lipid Biochemistry of Crop Plants**
Fall. 3 credits. Prerequisite: plant physiology, biochemistry, or permission of instructor. Offered alternate years.
Lecs T R 9:05–10:20. D. V. Lynch.
A comprehensive study of plant lipid biochemistry, emphasizing aspects of lipid metabolism relevant to the physiology and commercial value of crop species. Lipid synthesis/degradation, lipid structure and function, seed oil formation, wax synthesis, and nutritional aspects of plant lipids are among the topics covered.

**[608 Water Status in Plants and Soils**
Fall. 1 credit. Prerequisite: permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lec, 1 hour to be arranged; lab, R 1:25–4:25 or as arranged. T. L. Setter.
Techniques for field appraisal of the status of water in plants and soil, including methods used in evapotranspiration studies.]

**610 Physiology of Environmental Stresses**
Spring. 3 credits. Prerequisite: Biological Sciences 242 or 341.
Lecs, T R 10:10–11:25. P. L. Steponkus.
A study of the responses of plants to environmental stresses, including chilling, freezing, high temperature, and drought. Emphasis is on the physiological and biochemical basis of injury and plant resistance mechanisms at the whole-plant, cellular, and molecular levels.

**[611 Crop Simulation Modeling**
Fall. 3 credits. Prerequisite: Biological Sciences 242 or 341. Recommended: computer programming experience. Offered alternate years. Not offered 1989–90.
M W F 11:15. G. W. Fick.
A study of existing crop models is followed by development and refinement of programs representing students' work. Emphasis is on quantitative formulation and testing of complex hypotheses related to crop growth. Carbon exchange, transpiration, microclimate, soil water supply, root functions, and dry-matter distribution in growing crops are covered.]

**[612 Seed Physiology**
Spring. 3 credits. Prerequisite: plant physiology. Not offered 1989–90.
T R 8:30–9:55. R. L. Obendorf.
Morphology, physiology, and biochemistry of cereal, legume, and oil-seed formation, composition, storage, and germination. Emphasis is on the deposition of seed reserves during seed formation, stabilization of reserves during storage, and mobilization of reserves during germination. Topics range from on-farm problems to molecular mechanisms.]

**613 Physiology and Ecology of Yield**
Spring. 3 credits. Prerequisite: plant physiology.
M W F 12:20. T. L. Setter.
A study of the constraints on crop productivity from a physiological perspective. Influence of environment and genetics on the assimilation, translocation, and partitioning of carbon and nitrogen during crop ontogeny. Emphasis on growth processes of vegetative plant organs.

**[614 Advances in Weed Science**
Spring. 3 credits. Prerequisite: Agronomy 315 or equivalent. Offered alternate years. Not offered 1989–90.
Lec and labs to be arranged.
J. M. DiTomaso.
In-depth examination of the biology and ecology of weed-crop interactions and herbicide behavior in soils and plants. Topics include a detailed understanding of herbicide mode of action, selectivity, resistance, and soil persistence. Important herbicide families will be emphasized, particularly those in current use. Cultural and biological weed control methods, herbicide-stress interactions, groundwater contamination, and public perception of pesticides will also be discussed.]

**642 Plant Mineral Nutrition (also Biological Sciences 642)**
Spring. 3 credits. Prerequisite: Biological Sciences 341 or equivalent.
Lecs, M W F 10:10–11. L. V. Kochian, R. M. Welch.
A detailed study of the processes by which plants acquire and utilize mineral nutrients from the soil. Topics will include the uptake, translocation, and compartmentation of mineral elements; root-soil interactions; metabolism of mineral elements; the involvement of mineral nutrients in various physiological processes; and nutrition of plants adapted to extreme environmental stresses (e.g., salinity). Specific mineral elements will be emphasized to illustrate the above topics.

**660 Remote Sensing Fundamentals (also Civil & Environmental Engineering 610)**
Fall. 3 credits. Prerequisite: permission of instructor.
Lecs, T R 10:10; lab, T 2:30–4:25. W. R. Philipson.
An introduction to equipment and methods used in obtaining information about earth resources and the environment from aircraft or satellite. Coverage includes sensors, sensor and ground-data acquisition, data analysis and interpretation, and project design.

**661 Remote Sensing: Environmental Applications (also Civil & Environmental Engineering 611)**
Spring. 3 credits. Prerequisite: permission of instructor.
Lecs, T R 10:10; lab, T 2:30–4:25 (a second lab sec will be scheduled if more than 15 students register).
W. R. Philipson.
A survey of how remote sensing is applied in various environmental disciplines. Laboratory emphasis is on using aircraft and satellite imagery for inventorying and monitoring surface features in engineering, planning, agriculture, and natural resource assessments.

**662 Seminar in Remote Sensing (also Civil & Environmental Engineering 619)**
Spring. 1 credit. S-U grades only.
W 4:30. W. R. Philipson.
Lectures on current developments in assessing earth resources or the environment. Each week a different topic on remote sensing or geographic information systems is presented by specialists from government, industry, Cornell, or other research or academic institutions.

**[663 Pedology**
Spring. 3 credits. Prerequisite: Agronomy 361 or permission of instructor. Offered alternate years. Not offered 1989–90. Textbook recommended, not required.
T R 10:30–12. R. B. Bryant.
Weathering, reactions, and processes of soil genesis. Principles of soil classification and the rationale and utilization of soil taxonomy. Development and significance of major groups of soils of the world.]

**666 Advanced Soil Microbiology**
Fall. 1 credit. Prerequisite: Agronomy 476 or permission of instructor. S-U grades only for graduate students.
T 12:20. M. Alexander.
Discussions of current topics in special areas of soil microbiology. Particular attention is given to biochemical problems in microbial ecology.

**[667 Advanced Soil Physics**
Fall. 3 credits. Prerequisites: One year of college physics and Agronomy 483 or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
M W F 11:15. P. C. Baveye.
A detailed study of the hydrostatics of aqueous solutions in soils and porous media, with emphasis on fundamental principles. Examination of the molecular aspects of water-solid interactions, including shrink-swell phenomena and the properties of absorbed water. Analysis of equilibrium water adsorption from thermodynamical and mechanistic (molecular) standpoints. Mechanical and thermodynamical analysis of the equilibrium status of aqueous solutions in deformable soils. Formal lectures are complemented by tutorial sessions.]

**669 Soil Organic Matter**
Spring. 2 or 3 credits. Prerequisites: Agronomy 260 and Chemistry 357–358 or equivalent.
T R 9:05; disc F 2:30–4. J. M. Duxbury.
A discussion of current concepts of the nature, mode of formation, dynamics, and role of organic matter in soils.

**[675 Soil and Water Solute Modeling**
Spring. 3 credits. Prerequisite: Agronomy 483 or equivalent. Offered alternate years. Not offered 1989–90.
Lecs, T R 1:25–2:45. R. J. Wagenet, S. J. Riha.
Development, derivation, and use of models of water and solute transfer under laboratory and field conditions. Discussion of models that include transport, interaction, and transformation of solutes. Design and interpretation of experiments for model validation.]

**[676 Biodegradation of Chemicals**
Spring. 2 credits. Prerequisite: Organic chemistry. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10–11:10. M. Alexander.
A consideration of biological transformations of organic chemicals and toxicants in soil and waters and the biological, biochemical, and environmental factors affecting those transformations.]

**690 Root-Soil Interactions**
Fall or spring. 1–2 credits. S-U grades optional.
Hours to be arranged. R. W. Zobel.
A topic dealing with root-soil interaction will be selected during the first meeting of the term. Students will prepare one or two seminars based on published work on the topic. Possible topics include root genetics, root morphology, conservation tillage, and soil temperature.

**691 Special Topics in Crop Science**
Fall or spring. 1–6 credits. S-U grades optional.
Hours to be arranged. Staff.
Study of topics in crop science that are more specialized or different from other courses. Special topics to be offered will depend on staff and student interests.

**692 Special Topics in Meteorology**
Fall or spring. 1–6 credits. S-U grades optional.
Hours to be arranged. Staff.
Study of topics in meteorology that are more specialized or different from other courses. Special topics to be covered will depend on staff and student interests.

**693 Special Topics in Soil Science**
Fall or spring. 1–6 credits. S-U grades optional.
Hours to be arranged. Staff.
Study of topics in soil science that are more specialized or different from other courses. Special topics to be covered will depend on staff and student interests.

**771 Clay Chemistry**
Fall. 3 credits. Prerequisite: one year of physical chemistry or permission of instructor. Offered alternate years.
Lecs, M W F 11:15. M. B. McBride.
A detailed examination of the structure and surface chemistry of minerals common to soils. Ion exchange, mineral-solution equilibria, and adsorption reactions of silicate clays and oxides will be emphasized.

**[774 Soil Fertility Advanced Course**
Spring. 3 credits. Prerequisite: graduate status with a major or minor in agronomy. Offered alternate years. Not offered 1989–90.
T R 8:30–9:55. D. R. Bouldin.
A study of selected topics in soil-crop relationships, with emphasis on concepts of soil fertility, interpretation of experimental data, and soil fertilizer chemistry.]

**790 Agronomy Seminar**
Fall or spring. No credit. Required of graduate students majoring or minoring in the department. S-U grades only.
T 4.

**791 Meteorology Seminar**
Fall or spring. Prerequisite: permission of instructor.
Hours to be announced. Staff.
Subjects such as weather modification, paleoclimatology, and atmospheric pollution.

**829 Master's-Level Thesis Research in Crop Science**
Fall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional.
Hours by arrangement.

**859 Master's-Level Thesis Research in Meteorology**
Fall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional.
Hours by arrangement.

**889 Master's-Level Thesis Research in Soil Science**
Fall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional.
Hours by arrangement.

**929 Doctoral-Level Thesis Research in Crop Science**
Fall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional. Hours by arrangement.

**959 Doctoral-Level Thesis Research in Meteorology**
Fall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional.
Hours by arrangement.

**989 Doctoral-Level Thesis Research in Soil Science**
Fall or spring. Credit by arrangement. Limited to students in the graduate field. S-U grades optional.
Hours by arrangement.

Courses in "Remote Sensing" are also listed under the Department of Civil and Environmental Engineering, in the College of Engineering.

## ANIMAL SCIENCES

**Department of Animal Science:** J. M. Elliot, chair; B. J. Apgar, D. E. Bauman, D. H. Beermann, A. W. Bell, R. W. Blake, R. D. Boyd, W. R. Butler, L. E. Chase, W. B. Currie, D. L. DeVol, H. N. Erb, R. W. Everett, J. D. Ferguson, R. H. Foote, D. G. Fox, D. M. Galton, R. C. Gorewit, W. Hansel, H. F. Hintz, D. E. Hogue, L. Jones, W. G. Merrill, E. A. Oltenacu, P. A. Oltenacu, J. E. Parks, E. J. Pollak, R. L. Quaas, J. B. Russell, S. W. Sabin, H. F. Schryver, R. D. Smith, B. E. Straw, M. L. Thonney, D. R. Van Campen, P. J. Van Soest, R. G. Warner, M. J. Wylie

**Department of Poultry and Avian Science:** R. E. Austic, chair; P. W. Aho, R. C. Baker, S. E. Bloom, G. F. Combs, Jr., R. R. Dietert, P. A. Johnson, K. Keshavarz, H. G. Ketola, C. C. McCormick, J. A. Marsh, J. M. Regenstein, G. L. Rumsey, C. S. Winstead

**100 Domestic Animal Biology I**
Fall. 3 credits. S-U grades optional.
Lec, M W F 9:05; lab/disc, T W R 2–4:25. W. B. Currie, M. L. Thonney, and staff.
An introduction to the science of raising animals in the context of commercial animal production. Lectures, labs, and optional discussion sessions address the biology of economically important species (morphology, anatomy, and physiology) and application of the biology to the management of animals within major livestock industries. Topics covered include fundamentals of anatomy, regulatory mechanisms, vital systems, digestion, and metabolism. Students care for small numbers of cattle, sheep, pigs, and chickens in different phases of their life cycle to maximize hands-on contact. Living animals will be used noninvasively, and fresh organs and tissues from dead animals will be used in laboratories.

**150 Domestic Animal Biology II**
Spring. 3 or 4 credits. Students who have taken Animal Sciences 100 register for 4 credits. Nonmajors and transfer students who have not taken Animal Sciences 100 take Animal Sciences 150 for 3 credits; they may take Animal Sciences 150 for 4 credits if they participate in the discussion group and complete an assigned paper. S-U grades optional.
Lec, M W F 9:05; lab/disc T W R 2–4:25. W. B. Currie and staff.
Second of a two-semester sequence (100/150) applying the basic biology of growth, defense mechanisms, reproduction, and lactation to aspects of the husbandry of animals within major livestock industries. Living animals and tissues/organs from dead animals will be used in laboratories.

**212 Livestock Nutrition**
Fall. 4 credits. Prerequisite: Chemistry 104 or 208. Recommended: Animal Sciences 100 and 150.
Lecs, M W F 11:15; lab, M T W R or F 1:25–4:25, or R 10:10–12:20.
R. G. Warner.
An introduction to animal nutrition covering fundamentals of nutrition, the nutritive value of feeds, and the application of feeding standards to various forms of production in dairy and beef cattle, sheep, swine, horses, and poultry. Gastrointestinal tract dissections will be made on rodents and chickens. A simple nutritional experiment will be performed using rats and possibly calves, sheep, and pigs.

**[213 Nutrition of Companion Animals**
Spring, weeks 1–7. 1 credit. Prerequisite: Animal Sciences 212 or equivalent. Offered odd-numbered years only.
W 7:30–9:25 p.m. H. F. Hintz.
Nutrition of companion animals, with emphasis on the dog and cat. Digestive physiology, nutrient requirements, feeding practices, and interactions of nutrition and disease.]

**214 Nutrition of Exotic Animals**
Spring, weeks 1–7. 1 credit. Prerequisite: Animal Science 212. Offered even-numbered years only.
Lec W 7:30–9:30 p.m. H. F. Hintz.
Principles of nutrition for exotic animals including birds and fish. Nutrient requirements, sources of nutrients, feeding management systems, and ration formulation will be discussed. Signs of nutrient deficiencies and excesses will be described.

**[220 Animal Repro and Development**
Fall. 4 credits. Each lab limited to 30 students. Prerequisite: a year of college biology or equivalent. Not offered 1989–90.
Lecs, T R 9:05; demonstration and lab, M T W or R 2–4:25. J. Parks.
An introduction to the comparative anatomy and physiology of reproduction of farm animals. The life cycle from fertilization through development and growth to sexual maturity is studied, with emphasis on physiological mechanisms involved, relevant genetic control, and application to fertility regulation of animal and human populations. An audiotutorial laboratory is available for selected lecture and laboratory topics. Dissection and examination of tissues from vertebrate animals will be included in selected laboratory exercises.]

**221 Introductory Animal Genetics**
Spring. 3 credits. Prerequisite: a year of college biology.
Lecs, T R 9:05; disc, T W R or F 2–4:25.
E. J. Pollak.
An examination of basic genetic principles and their application to the improvement of domestic animals, with emphasis on the effects of selection and mating systems on animal populations.

**230 Poultry Biology**
Spring. 3 credits.
Lecs, T R 11:15; lab, W 2–4:25. Field trips during lab periods may last longer.
R. E. Austic.
Designed to acquaint the student with the scope of the poultry industry. Emphasis is on the principles of avian biology and their application in the various facets of poultry production. Some laboratory sessions involve dissection and/or the handling of live poultry.

**251 Dairy Cattle Selection**
Spring. 2 credits.
Lab, W 12:20–4:25. 1 all-day S field trip.
D. M. Galton, C. R. Holtz.
Emphasis on economical and type traits to be used in the selection and evaluation of dairy cattle. Practical sessions include planned trips to dairy herds in the state.

**265 Horses**
Spring. 3 credits. Prerequisites: Animal Sciences 100 and 150 or permission of instructor. S-U grades optional.
Lecs, T R 10:10; lab, R 1:25–4:25.
H. F. Hintz.
Selection, management, feeding, breeding, and training of light horses.

**290 Meat Science**
Fall. 3 credits.
Lecs, T R 10:10; lab, M T or W 1:25–4:25.
D. H. Beermann and staff.
An introduction to meat science through a study of the structure, composition, and function of muscle and its conversion to meat. Properties of fresh and processed meat, microbiology, preservation, nutritive value, inspection, and sanitation are also studied. Laboratory exercises include meat-animal slaughter, meat cutting, wholesale and retail cut identification, anatomy, processing, inspection, grading, quality control, and meat merchandising. An all-day field trip to commercial meat plants is taken.

**305 Farm Animal Behavior**
Spring. 2 credits. Prerequisites: an introductory course in animal physiology and an introductory course in genetics; at least one animal production course is recommended. S-U grades optional.
Lec, R 11:15–12:55. E. A. Oltenacu and K. A. Houpt.
The behavior of production species (avian and mammalian) influences the success of any management program. Students will study behaviors relating to feeding, reproduction, and social interactions of poultry, cattle, sheep, and swine. Management systems for commercial livestock production and their implications for animal behavior and welfare will be stressed.

**[321 Seminar: Horse Genetics**
Spring. 1 credit. Prerequisite: Animal Sciences 265 or permission of instructor. Recommended: Animal Sciences 221 or Biological Sciences 281. Not offered 1989–90.
M T or W 9:05. Staff.
A discussion of genetics of the horse, with special reference to simply inherited traits and selection for quantitative traits.]

**330 Commercial Poultry Production**
Fall. 1–2 credits. Prerequisites: Animal Sciences 100, 150, and 230 or permission of instructor. Offered in odd-numbered years.
F 2–4 (occasional field trips run past 4 p.m.). K. Keshavarz.
The course emphasizes production and business management aspects of commercial poultry farm operation and is designed to acquaint the student with current technology involved in commercial poultry production.

**[332 Poultry Hygiene and Disease (also Veterinary Medicine 255)**
Spring, odd-numbered years. 2 credits. Minimum enrollment, 5 students; maximum enrollment, 15 students. Prerequisites: Microbiology 290 and permission of the instructor.
Lec and lab, W 2:05–4:25.
H. L. Shivaprasad.
Concerns biology of the chicken: salient features of anatomy and physiology; common terms used in pathology; degeneration and necrosis of cells, disturbances of growth; aplasia to neoplasia, inflammation; and definition and types of inflammation, healing, and repair. Principles of the diagnosis, management, and control of diseases and diagnostic procedures, euthanasia, necropsy technique, and laboratory procedures are covered. Considers nutritional deficiency and infectious diseases, including host-parasite relationships; viral, bacterial, fungal, and parasitic diseases; avian immunology and immunologic impairment; and diseases affecting various systems of the body. The course will include many laboratories in which review of anatomy, bleeding, and dissection techniques, and recognition of lesions and their interpretation will be covered.]

**340 Decision Analysis in Dairy Systems**
Fall. 2 credits. Prerequisites: Animal Sciences 100 and 150. Recommended: Animal Sciences 350 or equivalent.
Lecs, T R 10:10. P. A. Oltenacu.
The concepts of decision making under uncertainty are presented. The course covers model building for a decision problem, assessment and revision of probabilities, value of information, options for making a choice, and preference theory and methods for dealing with risk, such as risk sharing and diversification. The concepts are presented in an animal production context.

**350 Dairy Cattle**
Fall. 3 credits. S-U grades optional. Recommended: Animal Sciences 150 or equivalent, 212 and 221.
Lecs, T R 10:10; lab, M T R 1:25–4.
D. M. Galton, C. R. Holtz.
Introduction to the background and scientific principles relating to dairy cattle production. Laboratories are designed to provide an understanding of production techniques. This course is a prerequisite for Animal Sciences 355.

**355 Dairy Herd Management**
Spring. 4 credits. Prerequisites: Animal Sciences 150, 221, and 350, or equivalents. Recommended: Agricultural Economics 302.
Lecs, M W F 11:15; lab, M T 1:25–4:25; plus 1 unscheduled half-day lab period.
W. G. Merrill and staff.
Application of scientific principles to practical herd management, analyses of alternatives, and decision making. Laboratories emphasize practical applications, problem solving, and discussion.

**360 Beef Cattle**
Spring. 3 credits. Prerequisite: Animal Science 100, 150 or equivalent, 212, 221, or permission of instructor.
Lecs, T R 10:10; lab, W R 2–4:25.
M. L. Thonney.
Emphasis is on the management of reproduction, nutrition, and selection in beef cattle enterprises. A cattle growth model is studied. Laboratories acquaint students with the management skills needed for a beef operation. Students are required to spend several days during the semester feeding and caring for cattle and observing calving.

**370 Swine Production**
Fall. 3 credits. Limited to 80 students; each lab limited to 40 students. Prerequisites: Animal Science 150 or equivalent, 212, 221, or permission of instructor.
Lecs, T R 11:15; lab, T or W 2–4:25.
R. D. Boyd.
The objective is to provide an opportunity to acquire practical knowledge and a technical basis for making decisions in various types of swine enterprises. Emphasis on the types of production systems; selection and breeding programs; reproductive, farrowing, and lactation management; nutrition; herd health; and housing facilities. Laboratories are designed to extend and apply principles discussed in lecture and to provide students with the opportunity to develop management skills.

**[380 Sheep**
Fall. 3 credits. Prerequisites: Animal Sciences 100 and 150. Recommended: Animal Sciences 212 and 221. Not offered fall 1989.
Lec, T R 9:05; lab and disc periods, W 1:25–4:25 every other week.
D. E. Hogue.
The breeding, feeding, management, and selection of sheep. Lectures and laboratories are designed to give students a practical knowledge of sheep production as well as the scientific background for improved practices.]

**390 Meat Animal Evaluation**
Spring. 2 credits. Prerequisites: Animal Sciences 100 and 150 or permission of instructor. Offered even-numbered years.
Lec and lab, W 1:25–4:25.
D. H. Beermann and staff.
Fundamental biological principles of meat animal growth and factors influencing composition are presented. Principles and techniques of meat animal and carcass grading and evaluation are discussed and followed by student evaluation of live animals and the carcasses from them.

**392 Animal Growth Biology**
Fall. 2 credits. Not open to freshmen; sophomores by permission of instructor only. Prerequisites: one year of college biology and one course in animal or human physiology, Animal Science 212 and 221.
Lec, R 1:25–3:25; disc, F 1:25–2:15.
D. H. Beermann.
A detailed discussion of the anatomy and physiology of growth in domestic farm animals. Cellular aspects of tissue-growth patterns, their relationship to body composition, and measurement of growth and body composition will be discussed. Endocrine, genetic, nutritional, and pharmacological influences on growth, metabolism, and body composition will be emphasized.

**400 Tropical Livestock Production**
Spring. 3 credits. Prerequisite: Animal Sciences 150 or equivalent, 212, or 221 or permission of instructor.
Lecs, T R 9:05; disc W 1:25–3:20.
R. W. Blake.
An analysis of constraints on livestock production in developing countries of the tropics, economic objectives and risk, and production methods. Emphasis is on strategic use of animal and plant resources, animal performance with inputs restricted, decision making, and alternative systems of production. Principles, real examples, and independent study projects will help identify research to improve food security.

**401 Dairy Production Seminar**
Spring. 1 credit. Limited to juniors and seniors.
Disc, M 7:30 p.m. D. E. Bauman.
Students, with the help of faculty members, complete a study of the research literature on topics of current interest in the dairy industry. Students make oral and written reports.

**402 Seminar in Animal Sciences**
Spring. 1 credit. Limited to juniors and seniors. May be repeated. S-U grades optional.
Hours to be arranged. W. R. Butler and staff.
Review of literature pertinent to topics of animal science or reports of undergraduate research and honors projects. Students present oral and written reports.

**403 Tropical Forages**
Spring. 2 credits. Limited to seniors and graduate students except by permission of instructor. Prerequisites: crop production and livestock nutrition. Offered even-numbered years.
Lecs, T R 12:20. P. J. VanSoest.
An overview of tropical grasslands, seeded pastures, and crop residues as feed resources; grass and legume characteristics; establishment and management of pastures; determination of feeding value forages and crop residues; physiology of digestion of ruminants that affects feeding behavior of various species; problems of chemical inhibitors in plants; and utilization of tropical forages as hay or silage.

**410 Principles of Animal Nutrition**
Fall. 3 credits. Prerequisite: organic chemistry. Recommended: biochemistry or concurrent registration in a biochemistry course.
M W F 11:15; 2 discs to be arranged. 2 evening prelims to be arranged.
C. C. McCormick.
A fundamental approach to nutrition focusing on the metabolism as well as the biochemical and physiological function of the known nutrients. The basic principles of nutrition are elaborated with examples drawn from a broad range of animal species, including humans. Emphasis is also directed toward nutritional techniques and the application of the topics covered.

**415 Poultry Nutrition**
Spring. 1 credit. Prerequisite: Animal Sciences 410 or permission of instructor.
F 11:15. G. F. Combs, Jr.
A practical consideration of principles of nutrition applied to feeding poultry, including use of linear programming techniques in diet formulation.

**419 Animal Cytogenetics (also Toxicology 419)**
Fall. 4 credits. Prerequisites: Animal Sciences 221, Biological Sciences 281, or permission of instructor.
Lec, T R 9:05; disc, T or W 1:25–3:20.
S. E. Bloom.
A study of normal and aberrant chromosomes in animals and man. Lecture topics include chromosome organization, variations in chromosome structure and number, chromosomes in mitosis and meiosis, cytogenetics of abortuses, parthenogenesis, chromosomes in cancer, veterinary and human cytogenetics, genetic engineering, and genetic toxicology. Students investigate topics of their choice for discussions and a research paper.

**420 Quantitative Animal Genetics**
Fall. 3 credits.
Lecs, T R 11:15; lab, W R or F 2–4:25.
N. B. Cameron.
A consideration of problems involved in improvement of animals, especially farm animals, through application of the theory of quantitative genetics, with emphasis on selection index.

**[421 Seminar in Animal Genetics**
Fall. 1 credit. Prerequisite: Animal Sciences 221 or concurrent registration in Animal Sciences 420. Not offered 1989–90.
T 12:20. Staff.
A discussion of applications of principles of quantitative genetics and animal breeding to specific types of animals such as dairy animals, meat animals, and horses.]

**[422 Methods: Quantitative Genetics**
Fall. 1 credit. Prerequisite: Animal Sciences 420 or concurrent registration in Animal Sciences 420. Not offered 1989–90.
R 12:20. Staff.
An introduction to methods of research in quantitative genetics and animal breeding, including estimation of heritability, repeatability, and genetic and phenotypic correlations.]

**427 Fundamentals of Endocrinology**
Fall. 3 credits. Prerequisite: human or veterinary physiology or permission of instructor.
Lecs, M W F 9:05. P. A. Johnson.
Physiology and regulation of endocrine secretions. Neuroendocrine, reproductive, growth, and metabolic aspects of endocrinology are emphasized. Examples are selected from many animals, including humans.

**430 AI and ET of Farm Animals**
Fall. 2 credits. Prerequisite: a course in reproductive physiology or permission of instructor.
Lecs, T R 9:05, labs: to be arranged.
R. H. Foote.
Principles and practice of semen handling and evaluation, artificial insemination, freezing of sperm and embryos, embryo evaluation, micromanipulation and transfer in farm animals and rabbits.

**431 Embryo Handling and Transfer**
Fall. 1 credit. Prerequisites: Animal Sciences 220 and 430 or their equivalent. Permission of instructor must be obtained at course enrollment. S-U grades only. Lab fee.
Lecs, T R 8; labs by arrangement.
R. H. Foote.
Designed to provide students with the requirements for managing animals and embryos in a successful embryo transfer program (5 lectures and films). The practical work consists of superovulation, embryo recovery, evaluation, manipulation, freezing, and transfer.

**450 Immunophysiology**
Spring. 3 credits. Prerequisites: basic immunology and animal physiology or permission of instructor.
Lecs, M W F 11:15. 2 evening prelims to be arranged. J. A. Marsh.
Emphasis on the development and regulation of the immune system and the physiological parameters affecting or affected by immune function. Major topics include development immunology, immunoregulation, immunological involvement in reproduction and gonadal function, interrelationships between immune and endocrine functioning, and the immunology of aging.

**451 Lactation Physiology**
Spring. 3 credits. Prerequisite: either Animal Sciences 150 or equivalent or permission of instructor.
Lecs, T R 9:05; lab, R 2–4:25.
R. C. Gorewit.
Emphasis is on mammary gland development, anatomy, physiological control of milk secretion, and synthesis of milk constituents in dairy cattle. Experimental procedures on animals are performed.

**456 Dairy Management Fellowship**
Fall or spring. 2 credits. Limited to seniors. Prerequisites: Animal Sciences 355, Agricultural Economics 302 or equivalent, and permission of instructor. S-U grades only.
Hours to be arranged. D. M. Galton.
The program is designed for undergraduates who have a sincere interest in dairy farm management. Objectives are to gain further understanding of the integration and application of dairy farm management principles and programs with respect to dairymen's objectives and methodology, to expand the concept of team approach in the development and implementation of management programs, and to gain further understanding of the role of research and industry in agriculture. Students are selected during the spring semester of the junior year according to their commitment to dairy farm management in course program and career goals.

**457 Dairy Herd Health**
Fall. 1 credit. Prerequisite: must be taken concurrently with Animal Science 456. S-U grades only.
Lec, W 12:20, labs alternate weeks, hours to be arranged. D. M. Galton and staff.
Emphasis on the application of disease control practices and preventive medicine programs in dairy herd health. Laboratories are designed to provide students the opportunity to learn management skills.

**486 Immunogenetics (also Biological Sciences 486)**
Fall. 3 credits. Limited to seniors (25) and graduate students. Prerequisites: an introductory course in genetics and prior or concurrent enrollment in basic immunology.
Lecs, M W F 10:10. R. R. Dietert.
The genetic control of a variety of cellular antigens and their use in understanding biological and immunological functions. The genetics of antibody diversity, antigen recognition, immune response, transplantation, and disease resistance.

**[490 Commercial Meat Processing**
Spring. 3 credits. Prerequisite: Animal Sciences 290 or permission of instructor. Not offered 1989–90.
Lecs, T R 9:05; lab, T or R 1:25–4:25. Field trip to commercial meat processing plants. D. H. Beermann.
A study of the classification, formulation, and production of commercially available processed meat products. Physical and chemical characteristics of meat and nonmeat ingredients; their functional properties; various methodologies; microbiology; packaging, handling, and storage; and quality assurance are discussed.]

**496 Animal Sciences Honors Seminar**
Fall. 1 credit. S-U grades only. Students must be accepted into the Animal Sciences Honors Program.
Disc, M 4–5:30. J. A. Marsh.
The course is designed to provide information and guidance for students enrolled in the honors program in animal sciences and expecting to complete an honors thesis. The course will meet for 1-1/2 hours per week for 8 to 10 consecutive weeks, during which time the following topics will be presented and discussed: requirements and expectations of the honors program, formulating hypotheses, the scientific method, experimental design, data handling and manipulation, library usage and literature search techniques, animals in research, ethics in science, and scientific writing.

**497 Special Topics in Animal Science**
Fall or spring. 1–3 credits; may be repeated for credit. Intended for students in animal sciences. Prerequisite: permission of instructor. S-U grades optional.
Staff.
May include individual tutorial study or a lecture topic selected by a professor. Since topics may change, the course may be repeated for credit.

**498 Undergraduate Teaching**
Fall or spring. 1 or 2 credits; 4 credits maximum during undergraduate career. Limited to students with grade-point averages of at least 2.7.
Designed to consolidate the student's knowledge. A participating student assists in teaching a course allied with the student's education and experience. The student is expected to meet regularly with a discussion or laboratory section, to gain teaching experience, and regularly to discuss teaching objectives, techniques, and subject matter with the professor in charge.

**499 Undergraduate Research**
Fall or spring. 6 credits maximum during undergraduate career. Not open to students who have earned 6 or more undergraduate research credits elsewhere in the college. Limited to juniors and seniors with grade-point averages of at least 2.7.
Affords opportunities for students to carry out independent research under appropriate supervision. Each student is expected to review pertinent literature, prepare a project outline, conduct the research, and prepare a report.

**600 Research**
Fall or spring. Credit to be arranged. S-U grades optional.
Hours to be arranged.
All members of animal sciences program area.

**[601 Proteins and Amino Acids (also Nutritional Sciences 601)**
Fall. 2 credits. Prerequisites: physiology, biochemistry, and nutrition, or permission of instructor. Not offered 1989–90.
Hours to be arranged. R. E. Austic.
A course in amino acid and protein nutrition, with emphasis on the dynamic aspects of protein digestion and amino acid absorption, protein and amino acid metabolism, nutritional interrelationships, assessment of protein quality, amino acid availability, and amino acid requirements.]

**604 Vitamins**
Fall. 2 credits.
T R 10:10. G. F. Combs, Jr.
A discussion of the chemistry, biochemistry, and physiological functions of the vitamins, with emphasis on nutritional aspects.

**605 Forage, Fiber, and the Rumen**
Spring. 4 credits. Prerequisites: either general nutrition and biochemistry or permission of instructor. S-U grades optional.
M W F 12:20; disc, W 11:15 or F 1:25.
P. J. Van Soest.
Ruminant nutrition; lower-tract fermentation in monogastrics; nutritional biochemistry of forage plants, fiber, and cellulosic material.

**[607 Microbiology of the Rumen**
Fall. 3 credits. Prerequisites: general biochemistry and microbiology. Not offered 1989–90.
Lecs, M W F 10:10. J. B. Russell.
Nutrition, biochemistry, physiology, taxonomy, and ecology of rumen microorganisms. Effects of rumen microbial ecology on ruminant nutrition. Manipulation of rumen fermentations to maximize host-animal performance.]

**609 Seminar in Poultry Biology**
Fall and spring. Limited to graduate students. S-U grades only.
Hours to be arranged. Staff.
A survey of recent literature and research in poultry biology.

**610 Seminar**
Fall and spring. 1 credit. Required of all graduate students with a major or minor in animal sciences. S-U grades only.
M noon. Department faculty.

**613 Forage Analysis**
Spring. 2 credits. Prerequisite: permission of instructor. S-U grades optional.
Lab, R 2–4. P. J. Van Soest.
Chemical composition and nutritive evaluation of forage plants and related materials. The course includes a term paper summarizing results of independent laboratory study of either materials or methods.

**619 Field of Nutrition Seminar**
Fall and spring. No credit. S-U grades only.
M 4:30.
Current research in nutrition is presented by visitors and faculty.

**620 Seminar in Animal Breeding**
Fall and spring. 1 credit. Limited to graduate students with a major or minor in animal breeding. S-U grades only.
Hours to be arranged.

**621 Seminar: Endo/Reprod Biology**
Fall and spring. 1 credit. Registration limited to graduate students. Advanced undergraduates welcome to attend. S-U grades only.
W 4:30. W. R. Butler and staff.
Current research in reproductive physiology is presented by staff members, graduate students, and visitors.

**630 Bioenergetics/Nutritional Physiology**
Spring. 3 credits. Prerequisites: Animal Sciences 410 and biochemistry or physiology, or permission of instructor. S-U grades optional.
Lec, M W R 10:10. A. W. Bell and D. E. Bauman.
An integrated systems approach to the nutritional physiology and energy metabolism of productive animals. Emphasis on extracellular regulation of tissue and organ metabolism of specific nutrients in relation to level and efficiency of milk and meat production. Critical discussion of techniques and approaches to the study of animal bioenergetics.

**640 Special Topics in Animal Science**
Fall or spring. 1 or more credits. S-U grades optional.
Hours to be arranged. Staff.
Study of topics in animal science more advanced than, or different from, other courses. Subject matter depends on interests of students and availability of staff.

**720 Advanced Quantitative Genetics**
Spring. 3 credits. Prerequisites: matrix algebra, linear models, and mathematical statistics. S-U grades optional. Offered even-numbered years.
Hours to be arranged. R. L. Quaas.
Estimation of genetic and environmental parameters required to design efficient selection programs. Emphasis is given to interpretation of experimental and survey data with unequal subclass numbers, and prediction of genetic progress resulting from alternative selection methods.

**Related Courses in Other Departments**

**Introductory Animal Physiology (Biological Sciences 311)**

**Introductory Animal Physiology Laboratory (Biological Sciences 319)**

**Milk Quality (Food Science 351)**

**Agriculture in the Developing Nations (International Agriculture 602)**

**Lipids (Nutritional Sciences 602)**

**Basic Immunology, Lectures (Veterinary Medicine 315)**

**Basic Immunology, Laboratory (Veterinary Medicine 316)**

**The Population Biology of Health and Disease (Veterinary Medicine 330)**

**Health and Diseases of Animals (Veterinary Medicine 475)**

## BIOLOGICAL SCIENCES

The program of study in biology is offered by the Division of Biological Sciences. For course descriptions, see the section on the Division of Biological Sciences.

## COMMUNICATION

R. D. Colle, chair; N. E. Awa, B. O. Earle, D. Fraleigh, G. Gay, C. J. Glynn, D. A. Grossman, J. E. Hardy, B. Lewenstein, D. G. McDonald, R. D. Martin, R. E. Ostman, R. Roe, T. M. Russo, C. Scherer, D. F. Schwartz, M. A. Shapiro, P. Stepp, R. B. Thompson, L. VanBuskirk, W. B. Ward, S. Warland, S. A. White, C. Whittle, A. M. Wilkinson, J. P. Yarbrough

The middle and last digits of course numbers are used to denote specific areas:

| | |
|---|---|
| 00–09 | Speech communication |
| 10–19 | Interpersonal communication |
| 20–29 | Mass communication |
| 30–39 | Visual communication and graphic design |
| 40–49 | Electronic media |
| 50–59 | Journalistic writing |
| 60–66 | Professional writing |
| 67–69 | Editing |
| 70–79 | Communication planning and strategy (advertising and public relations) |
| 80–89 | Research methods and interdisciplinary courses |
| 90–94 | Special topics and seminars |
| 95–99 | Individualized study |

**101–109 Rhetorical Scholarship Lab**
Fall and spring. Maximum 1 credit per semester; may be repeated up to 6 credits in different labs. Limited to 20 communication majors or students with permission of instructor. S-U grades only.
Lec, hours to be arranged. P. Stepp and staff.
Students research and analyze contemporary issues to identify facts and derive the underlying values. Research will be used to write lines of argument, cases for debate, and speeches for public address, or to analyze pieces of literature to understand the author's intent. Analyses will be used to develop approaches to the oral presentation of the literature.

**101 Debate: Affirmative Case**

**102 Debate: Value Objections**

**103 Debate: Briefs**

**104 Public Address: Persuasion**

**105 Public Address: Rhetorical Criticism**

**106 Public Address: Informative**

**107 Oral Interpretation: Prose**

**108 Oral Interpretation: Poetry**

**109 Oral Interpretation: Dramatic Duo**

**116 Theories of Human Communication**
Spring or summer. 3 credits. Not open to first-semester freshmen. S-U grades optional.
Spring: lecs, M W 12:20; disc., F 12:20. R. Roe
Designed to introduce students to the basic areas of study common in communication theory and research. Basic ideas and theories about language, interpersonal communication, small-group communication, nonverbal communication, organizational communication, and the mass media will be covered.

**120 Introduction to Mass Media**
Fall or summer. 3 credits. S-U grades optional.
Fall: lecs, M W F 12:20. D. McDonald.
History, processes, philosophies, policies, and functions of U.S. communication media. The media are examined individually and collectively in regard to content, economics, production, effects of messages, regulation, and other contemporary issues.

**150 Writing for Media**
Fall, spring, or summer. 3 credits. Limited to communication majors—freshmen and transfers—fall and spring; open enrollment in summer.
Fall: Lec, T 9:05–11; lab, R 9:05–11 or R 11:15–1:10. M. Shapiro. Spring: Lec,T 8–10; lab 1, W 8–10; lab 2, R 8–10. B. Lewenstein.
Basic writing for print and broadcast. A back-to-basics approach to writing for clarity and style, using news and feature writing as a framework. Media form and style are analyzed. Weekly writing assignments, both in and outside of class, are given.

**161 Writing in the Biological Sciences**
Fall. 3 credits. Freshman Seminar designed for College of Agriculture and Life Sciences students. Concurrent registration is required in Biological Sciences 101–102, 103–104, 105–106, or 109–110.
M W F 11:15. B. Lewenstein.
Factual, informative writing based on information and laboratory experiences in biology. Emphasis on writing rather than subject matter and on objective observation rather than subjective personal experience. Discussion of effective sentence and paragraph structure, organization, usage, grammatical structure, meaning of words, and punctuation. Objective is clear, concise, concrete writing.

**190 Communication Perspectives Seminar**
Fall. 1 credit. S-U grades optional. Possible field trip(s).
Lec, F 1:25. B. O. Earle and staff.
Forum to discuss contemporary and future role of communication in society. Presentations by Cornell faculty and staff members, and by professionals in the field. Topics will be selected from areas such as new technology, constitutional and policy issues, career opportunities, professionalism and ethics, societal changes and implications. Open to freshman/transfer students in the Department of Communication.

**201 Oral Communication**
Fall, spring, or summer. 3 credits. Each section limited to 24 students. Preference given to sophomores, juniors, and seniors. Students missing the first two class meetings without university excuse are dropped so others may register. No student will be added or dropped after the second week of classes. $10 copying and materials fee charges.
Disc, M W F 8; M 8 and W F 9:05; M 9:05 and W F 8; W M F 9:05; M 9:05 and W F 10:10; M 9:05 and W F 11:15; M 9:05 and W F 12:20; M W F 10:10; M 10:10 and W F 11:15; M F 11:15 and W 1:25; M F 12:20 and W 1:25; M 12:20 and W F 9:05; M 12:20 and W F 10:10; M W F 1:25; M T W 12:20; T R 9:05 and W 12:20; T R 10:10 and W 12:20; T R 10:10 and W 1:25; T R 11:15 and W 12:20; T R 11:15 and W 1:25; T W R 12:20 and W 1:25; T W R 1:25; M 10:10 and T R 9:05; M T R 10:10. Some section times may be omitted in some semesters. R. B. Thompson, B. O. Earle, D. Fraleigh, R. Roe, T. Russo, P. Stepp, S. Warland, and staff.
Through theory and practice students develop self-confidence and competence in researching, organizing, and presenting material to audiences. Students give four graded speeches, write short papers, perform speaker evaluations, and engage in other speech-related activities.

**203 Argumentation and Debate**
Fall. 3 credits. Prerequisite: Communication 201.
T R 12:20–1:45. P. Stepp and D. Fraleigh.
The student will learn the principles of argumentation and the rules of debate. Classroom debates on the CEDA national topic will provide experience in critical thinking, rapid organization of thoughts, employment of research, and writing and speaking in a logical, persuasive manner.

**204 Effective Listening**
Fall, spring, or summer. 3 credits. Limited to 25 nonfreshman students per section. No students accepted or allowed to drop after the second week of classes.
Lec, M 1:25–2:40; lab, T, W, R, or F 1:25–2:40. Evening prelim: fall, Oct. 19 and Nov. 16; spring, March 8 and Apr. 19. S. Warland.
Lecture and sections are used to present an analysis of the process of listening, to identify barriers to effective listening, and to develop students' listening skills. Topics include audiology, cultural contents, intercultural communication, linguistics, therapeutic listening, and critical analysis of information. Students are involved in skill-building exercises and in writing self-analytical papers, as well as attending seminars.

**205 Parliamentary Procedure**
Fall. 3 credits. Each section is limited to 40 nonfreshman students. No adds allowed after the second week of classes.
Lec, T 1:25; sec, T or R 2:30–4:25. D. Fraleigh.
A study of parliamentary procedure, with an emphasis on rules applicable to oral communication activities such as discussion, meetings, and legislative debates. Techniques for effective meetings (including alternatives to formal parliamentary procedure) discussed. Sections emphasize participation in discussions governed by parliamentary law and meeting simulations. Each student will chair meetings. Outside assignments include meeting observations and a paper.

**230 Visual Communication**
Fall. 3 credits. Limited to nonfreshmen and communication freshmen. Not recommended for design or art majors. Cost of individual project materials, $20-$30.
Lec, T R 9:05; computer lab 1, T 10:10–12:05, lab 2, R 1:25–3:20, lab 3, R 3:35–5:30, lab 4, F 10:10–12:05. C. Scherer.
A basic course in the use and importance of visual communication. Course focuses on objectives, audiences, and methods of visual production. Particular emphasis is placed on the visual communication of scientific and technical information. The laboratory concentrates on the use of computers for production of visual materials. Practical projects are assigned.

**232 Art of Publication**
Fall and spring. 3 credits. Each lab limited to 30 nonfreshman students. Students missing the first two classes without university excuse are dropped so others may register. Project materials cost $30–$50.
Fall: lec, T R 1:25; lab, T or R 2:30–4:25; spring: lec, M W 1:25; lab, M or W 2:30–4:25. Staff.
A basic course designed to explore visual concepts that increase communication effectiveness through the printed word. The importance of selecting and coordinating format, layout, typography, and illustrations is stressed. Lectures, a field trip, in-class laboratory assignments, and outside projects examine opportunities and problems in publication design and production.

**234 Photo Communication**
Spring and summer. 2 credits. A lecture course for those with limited experience in photography. Students are expected to supply their own cameras.
T 1:25–4:25. Staff.
Basic photography; photojournalism is emphasized during the latter part of the course.

**250 Newswriting for Newspapers**
Fall or spring. 3 credits. Limited to 30 students. Prerequisite: Comm 150, major in communication, or permission of instructor. Keyboarding ability essential.
Lec, R 1:25–2:20; lab, R 2:30–4:25, plus out-of-class writing assignments. Staff.
Writing and analyzing news stories. A study of the elements that make news, sources of news, interviewing, writing style and structure, press problems, and press-society relations. Concentration on newswriting as it is practiced by newspapers in the United States. Two writing assignments each week, one done in class, one done out of class.

**272 Principles of Public Relations and Advertising**
Fall. 3 credits. Preference given to ALS students. Not open to freshmen.
Lecs, M W F 1:25. Staff.
Survey of the fields of public relations and advertising. Descriptions of organizations, jobs, and functions in the industry. The roles of public relations and advertising in society, the economic system, and organizations. Psychological and sociological principles as formulations for appeals. Strategies for media selection and message execution. Introduction to research and regulation.

**301 Business and Professional Speaking**
Fall or spring. 3 credits. Prerequisite: Communication 201.
Fall: lec, M 11:15; lab, T or W 11:15–1:10 or R 12:20–2:15. Spring: lec, M 11:15; lab, T 11:15–1:10, W 10:10–12:05 or R 12:20–2:15. B. O. Earle.
The study and practice of oral communication skills used in organizations, including speeches, interviews, reports, and discussions. It is expected that students will develop the analytical and presentation skills needed in business and professional careers.

**[314 Small-Group Communication**
Spring. 3 credits. Limited to juniors and seniors. Prerequisite: Communication 116 or permission of instructor. Not offered 1989–90.
T R 1:25–3. N. E. Awa.
Exploration of the principles, values, and limitations of group discussion in democratic systems. Principles are put into practice in decision-making and problem-solving groups.]

**316 Rhetorical Theory**
Fall. 3 credits. Limited to 20 communication majors. Prerequisites: Communication 116 and 201 or permission of instructor.
M W F 1:25. R. Thompson.
Considers current views of rhetoric in historical perspective. Shows how assumptions about communication both shape the worldview of the communicator and either aid or hinder the reaching of various communication goals. Treats historical figures briefly; focuses on contemporary thinkers such as Toulmin, Ong, Ehninger, Richards, Kuhn. Second half of course taught in seminar format.

**342 Electronic Media**
Fall. 3 credits. Limited to 18 communication majors. Prerequisites: Comm 120 and 150.
Lec, T 1:25; lab, R 1:30–3:30. T. Russo.
The techniques of audio and video message design and production. Emphasis on development of pre- and postproduction skills needed for the development of effective audio/video production. Students complete exercises designed to develop specific competencies and work on projects from conception through production.

**[344 Radio Writing and Production**
Fall. 3 credits. Limited to 30 communication majors. Prerequisite: Communication 342. Not offered 1989–90.
Lec, M W 1:25; lab, W 2:30–4:25. Staff.
Scripting and recording various public information formats for possible use on local and state radio stations. Students create complete broadcasting plans and materials for public and private organizations.]

**[346 Television Writing and Production**
Spring (odd-numbered years). 3 credits. Limited to 30 communication majors. Prerequisite: Communication 342. Not offered 1989–90.
Lec, T R 1:25; lab, T 2:30–4:25. D. McDonald.
Television and video production. Students gain experience in studio and field production. Lectures concentrate on developing a sense of project planning and production aesthetics; lab concentration is on producing full-scale information, documentary, or public affairs programs from development of the idea through research, scripting, planning, and production.]

**348 Video Communication**
Fall or summer. 3 credits. Prerequisites: Communication 116, 230, 342, and permission of instructor.
R 1:25–4:25. S. White.
An overview of video communication applications. Examination of relevant organizational and visual communication theory. Development of basic competency with portable videotape recording, equipment, audio and visual input to video and production, and postproduction planning and editing techniques.

**350 Writing for Magazines**
Fall or spring. 3 credits. Limited to 25 juniors, seniors, and graduate students, or others with permission of instructor. No drops after third week. Extensive out-of-class writing assignments.
Fall: M 1:25–4:25, W. B. Ward; spring: T R 11:15–12:45. Staff.
A course in nonfiction freelance writing for magazines. Intensive fact writing to help students communicate more effectively through the medium of the printed word in magazines. Art and techniques of good writing are studied; magazines in many fields of interest are reviewed. All articles are analyzed and returned to the student to rewrite and submit to a magazine.

**352 Science Writing for the Mass Media**
Fall. 3 credits. Not open to freshmen. Limited to 25 students. No drops after third week.
Lecs, M W F 9:05 plus out-of-class writing assignments. B. Lewenstein.
Writing to explain and simplify scientific and technical topics for newspaper and magazine readers, radio listeners, television viewers, and educational-material consumers. Includes frequent writing assignments. Students learn interviewing and research methods that ensure technical accuracy. Students should become familiar with the public policy and institutional milieu that affects science writing.

**354 Print Media Laboratory**
Fall. 3 credits. Limited to junior, senior, and graduate communication majors. Prerequisite: Communication 232, 250, or 350.
R 1:25–4:25. J. E. Hardy and staff.
Writing, editing, and layout principles practiced in publishing the *Cornell Countryman*. Some additional outside work sessions may be required. Students will use microcomputers.

**356 Print Media Laboratory**
Spring. 3 credits. Limited to junior, senior, and graduate communication majors. Prerequisite: Communication 232, 250, or 350.
R 1:25–4:25. J. E. Hardy and staff.
A continuation of Communication 354. Students will use microcomputers.

**360 Scientific Writing for Public Information**
Fall, spring, or summer. 3 credits. Limited to 25 nonfreshman or graduate students per section. Prerequisite: any college-level writing course.
Fall: lecs, M W F 9:05 (L. VanBuskirk); T R 9:05 and W 11:15 (J. E. Hardy); T R 10:10 and W 12:20 (J. E. Hardy). Spring: M W F 9:05 (L. VanBuskirk), T R 10:10 and W 12:20 (J. E. Hardy).
An intensive course in simplifying scientific and technical material for specific audiences within the general public. Weekly assignments include instructions, descriptions, explanations, and summaries in such formats as the newsletter, brochure, and report. Audience analysis will be emphasized. Not oriented to the mass media.

**363 Organizational Writing**
Fall, spring, or summer. 3 credits. Limited to 25 junior, senior, or graduate students per section. Prerequisite: any college-level writing course.
M W F 9:05, A. M. Wilkinson; M W F 11:15 and 12:20, L. VanBuskirk.
Students write as members of different organizations, in the position of supervisor, subordinate, colleague, and representative of business, government, community, and other organizations. Emphasis on adapting tone to the audience and the purpose of the message. Weekly writing assignments include various kinds of internal and external reports, memoranda, proposals, and letters. Assignments based on case studies.

**[365 Writing in the Sciences and Engineering**
Spring. 3 credits. Limited to 25 junior, senior, or graduate students per section. Prerequisite: any college-level writing course. Not offered 1989–90.
M W F 10:10. A. M. Wilkinson.
Students write scientific or technical material for colleagues in their own field. The objective is clear, concise writing, with attention to grammatical construction, usage, paragraph development, and organization. Weekly writing assignments include scientific or technical instructions, descriptions of equipment and procedures, definition and explanation of concepts, graphic presentations and discussion of data, abstract and summary, memorandum, research proposal, progress report, and research report.]

**368 Editing**
Spring. 3 credits. Limited to 25 junior, senior, or graduate students. Prerequisite: Communication 250, 350, 352, 360, or 365.
W F 10:10–11:25. J. E. Hardy.
Students will follow the process that takes a manuscript from final draft to page proof. Emphasis will be on copy editing, proofreading, fitting copy, working with authors, making editorial decisions, and developing skill in critical reading. Appropriate for any student who expects to work with manuscripts or do editorial work.

**372 Advanced Advertising**
Fall and spring. 3 credits. Prerequisites: Communication 272 and communication or marketing major.
Lecs, M W 2:30–3:20; labs, M W 3:20–4:25. C. Whittle.
A continuation of Communication 272. Examination of the qualitative and quantitative aspects of the mass media and how they are evaluated by advertisers. Function of media strategy in the marketing mix survey of advertising from the viewpoints of consumers. Introduction to research in advertising, with emphasis on identifying and predicting advertising effectiveness. Investigation into the planning, creation, and evaluation of advertisements and advertising campaigns.

**375 Communication Planning and Strategy I**
Spring. 3 credits. Limited to 35 juniors and seniors. Prerequisite: Communication 272 or permission of instructor.
Lec, M W 10:10; disc, F 10:10 or 11:15. C. Glynn.
Theories that guide and influence the solutions to public relations and public information problems in agriculture, business education, government, and social welfare organizations. Examination of the process of the formation of public opinion. Discussion of research techniques and communication tools used in communication planning, and fundamentals of developing a communication plan. Case studies and projects.

**376 Communication Planning and Strategy II**
Fall. 3 credits. Limited to 25 juniors and seniors. Prerequisite: Communication 375. Communication 382 strongly recommended.
Lec and lab, T R 10:10–11:40. C. Glynn.
A continuation of Communication 375. Focus is on the development and implementation of actual communication campaigns. Students work closely with a community organization in designing and implementing a communication program.

**380 Independent Honors Research in Social Science**
Fall or spring. 1–6 credits. Limited to undergraduates who have met the requirements for the honors program.
N. E. Awa.

**382 Survey Research Methods**
Fall or spring. 3 credits. Limited to 20 junior, senior, or graduate communication majors; others by permission of instructor. Prerequisite: Communication 116 or 120 or permission of instructor.
Fall: M W 12:20, lab F 12:20–2:15, P. Yarbrough; spring: M W 11:15, lab F 11:15–1:10. R. Ostman.
Analysis of public opinion polls, market research, media audience ratings, readership surveys, and communication impact designs. Development of class research project from research question to final report. Instruction in computer use of Statistical Package for the Social Sciences (SPSS) to assist in data analysis. Familiarity with basic statistical concepts helpful.

**410 Organizational Communication**
Fall. 3 credits. Labs limited to 15 junior, senior, or graduate communication students; others by permission. Prerequisite: Communication 116 or equivalent.
Lec, T R 12:20; lab 1, T 2:30–4:20, lab 2, W 1:30–3:20; lab 3, R 1:30–3:20.
D. Schwartz.
Study of managerial communication practices in formal organizations, with emphasis on communication between supervisor and subordinate; examination of the structure and function of planned and unplanned organizational communication networks. Case studies analyzed in lab.

**416 Psychology of Communication**
Fall. 3 credits. Prerequisite: Communication 116 or permission of instructor.
T R 10:10–11:30. N. E. Awa.
An advanced multidisciplinary study of communication theory. Topics include personal interaction, channels of communication, and effectiveness of messages. Study includes intensive analysis of major communication theorists.

**418 Persuasion**
Spring. 3 credits. Prerequisite: Communication 116 or permission of instructor.
Lecs, M W F 11:15. M. Shapiro.
The course explores the influence of communication in persuasion and attitude change. Topics may include persuasion as it applies to mass communication, advertising, public communication, or interpersonal communication.

**420 Media Industries**
Spring, even-numbered years. 3 credits. Limited to communication majors. Prerequisites: Communication 120 and 272.
T R 1:25–3:20. D. McDonald.
The workings and functions of mass media industries. Emphasis is placed on the structure of media industries, audience research, media economics programming, and the organization of content production. For several projects, students will use microcomputers and work with data supplied by an audience research firm.

**[421 Broadcast Media Laboratory**
Fall. 2 credits. Limited to junior and senior communication majors. Prerequisite: Communication 344 or 346. Not offered 1989–90.
Emphasis on production of television and radio programs for various audiences. Course work is done primarily through individual tutorial arrangement.]

**[423 Broadcast Media Laboratory**
Spring. 2 credits. Not offered 1989–90.
Hours to be arranged.
A continuation of Communication 421.]

**428 Communication Law**
Fall. 3 credits. Limited to junior, senior, and graduate students.
M W F 11:15. D. A. Grossman.
A practical survey of the law governing mass media, primarily for those working in the field. Coverage includes restraints on news gathering and publication, privacy, defamation, copyright, broadcast licensing, access, and other issues of current interest.

**439 Interactive Multimedia: Design and Research Issues**
Fall. 3 credits. Prerequisite: permission of instructor.
Lec, T 1:25–4:25; lab TBA. Geri Gay.
An overview of interactive multimedia technologies (videodisc, DC-ROM, digital video interactive [DVI], computer graphics, and text). Course will focus on theories and research applicable to interactive multimedia such as visualization, learner control, mental models, knowledge representations, and information processing. Course will emphasize interactive multimedia design, application, and evaluation.

**490 Special Topics in Communication**
Fall, spring, or summer. 1–3 credits variable. S-U grades optional. Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Study of topics in communication not otherwise provided by a department course and determined by the interest of the faculty and students.

**496 Internship**
Fall, spring, or summer. 1–3 credits. Students must apply to department internship committee no later than the spring pre-course-enrollment period for a fall internship or the fall pre-course-enrollment period for a spring or summer internship. Prerequisites: communication junior or senior, 3.0 average in communication courses, and approval of committee. S-U grades only.
Lec, one hour per week to be arranged.
C. Whittle.
Structured, on-the-job learning experience under supervision of professionals in a cooperating organization. Students have a faculty course supervisor, who must be approved by the department internship committee. The faculty course supervisor awards the credit and grade (S-U only). A learning contract is written between the faculty supervisor and student, stating the conditions of the work assignment, supervision, and reporting. Minimum of 60 on-the-job hours per credit granted. May be repeated to a maximum of 6 credits.

**497 Independent Study**
Fall or spring. 1–3 credits; may be repeated to 6 credits with a different supervising faculty member. Prerequisite: 3.0 cumulative average. Undergraduates must attach to their course enrollment material written permission from the faculty member who will supervise the work and assign the grade.
Staff.
Group or individual study under faculty supervision. Work should concentrate on locating, assimilating, synthesizing, and reporting existing knowledge on a selected topic. Attempts to implement this knowledge in a practical application are desirable.

**498 Communication Teaching Experience**
Fall or spring. 1–3 credits; may be repeated to 6 credits. Limited to juniors and seniors. Intended for undergraduates desiring classroom teaching experience. Prerequisite: 3.0 cumulative average (2.5 if teaching assistant for a skill development course) and permission of the faculty member who will supervise the work and assign the grade.
Hours to be arranged. Staff.
Periodic meetings with the instructor cover realization of course objectives, evaluation of teaching methods, and student feedback. In addition to aiding with the actual instruction, each student prepares a paper on some aspect of the course.

**499 Independent Research**
Fall or spring. 1–3 credits; may be repeated to 6 credits. Limited to seniors and graduate students. Prerequisite: 3.0 cumulative average. Seniors must attach to their course enrollment material written permission from the faculty member who will supervise the work and assign the grade. Students must use the faculty member's section number to register.
Staff.
Permits outstanding students to conduct laboratory or field research in communication under appropriate faculty supervision. The research should be scientific: systematic, controlled, empirical. Research goals should include description, prediction, explanation, or policy orientation and should generate new knowledge.

**610 Organizational Communication**
Spring. 3 credits. Open to seniors.
T R 12:20–2:15. D. Schwartz.
Study of interpersonal communication systems in organizations. Methods for analyzing organizational and human communication effectiveness, including communication audits and network analysis.

**611 Communication in Organizations**
Fall. 3 credits. Prerequisite: Communication 610 or permission of instructor.
M 1:25–4:25. S. White.
Review of theories, research, and practical systems as they relate to human communication effectiveness in organizations. Includes components of interpersonal communication, intragroup and intergroup communication, communication processes involved in organizational goal setting, renewal, and change.

**612 Intercultural and Development Communication**
Fall. 3 credits.
T 1:25–4:30. N. E. Awa.
A systematic analysis of sociocultural and psycholinguistic obstacles to effective communication between cultures, subcultures, and ethnic and identity groups. Also examined are the subtleties and complexities of nonverbal behavior in cross-cultural transactions. Examples are drawn from ethnolinguistic and cross-cultural studies.

**[616 Interpersonal Communication**
Spring. 3 credits. Limited to graduate students in communication; others by permission of instructor. Not offered 1989–90.
M W 10:10–12. N. E. Awa.
A study of recent advances in interpersonal communication and social cognition. Theories and research in relational development. Human understanding of social events in an interpersonal context is explored.]

**620 Public Opinion and Communication**
Fall. 3 credits. Graduate students and advanced undergraduates.
T 1:25–4:25. C. Glynn.
Examination of the concept *public opinion*: investigation of how it is measured and applied in society. Analysis of relationships between public opinion and communication. Practical applications.

**[624 Communication in the Developing Nations**
Spring. 3 credits. Open to seniors. Not offered 1989–90.
Lec, M 1:25–4:25. R. D. Colle.
An examination of existing communication patterns and systems and their contributions to the development process. Attention is given to the interaction between communication systems and national development in primarily agrarian societies.]

**626 Impact of Communication Technologies**
Spring. 3 credits. Open to seniors. Offered alternate years.
W F 12:20–2:15. P. Yarbrough.
A study of emerging technologies of communication, such as computer-based information systems and satellites and their potentials for influencing communication processes and social systems. Also examines the impacts of previous communication innovations from cave painting to television.

**665 Scientific Writing for Scientists**
Fall. 3 credits. Prerequisites: research in progress and permission of instructor.
T R 8:30–9:55. A. M. Wilkinson.
Workshop for students with research in progress. Discussion and lectures on writing a journal article, thesis, report, and proposal; on objectives in scientific writing, relation of rhetoric and linguistics to scientific writing, process of publication and reviewing, and preparation of tables and illustrations; and on advanced and special problems in organization, paragraph development, sentence structure, and usage.

**666 Perspectives on Science Writing**
Spring. 3 credits. Open to graduate students and advanced undergraduates (with permission) from all departments.
M W F 10:10. B. Lewenstein.
A graduate reading course that uses various approaches to understand science writing for the general public as it appears in the mass media. Among the perspectives are history, anthropology, sociology, philosophy, institutional analysis, literary analysis, and critical journalism. As an ancillary to the primary goals of the course, students will also learn basic techniques of science writing.

**676 Communication Planning and Strategy**
Spring. 3 credits. Primarily for graduate students but open to seniors.
T R 10:10–12. C. Scherer.
Seminar in the planning of communication activities for the support of directed social-change programs. Examines communication and social theories, case studies, and planning models. Participants produce a comprehensive communication plan designed to solve a significant (real) communication problem of interest to them. Case studies and discussion focus on communication problems from nutrition and health, rural development programs, marketing, nonformal education programs, and corporate and government public information campaigns.

**680 Studies in Communication**
Fall. 3 credits. Limited to graduate students in communication; others by permission of instructor.
T 10:10–12. P. Yarbrough.
A review of classical and contemporary research in communication, including key concepts and areas of investigation. An exploration of the scope of the field and the interrelationships of its various branches.

**681 Communication Effects and the Individual**
Spring. 3 credits. Prerequisite: graduate students in communication; others by permission of instructor.
Lecs, T 2:30–3:20 and R 2:30–4:25.
M. Shapiro.
An introduction to theory and research in communication, focusing on the mental processes of the communicating individual. Discussions and readings will include how individuals process and remember communication information, how communication information is used in decision processes, how motivation influences processing of mass communication information, and how developmental processes influence processing and use of mass communication information.

**682 Methods of Communication Research**
Fall. 3 credits. Limited to graduate students.
M W 10:10–12. R. E. Ostman.
An analysis of the methods used in communication research. Emphasis is on understanding the rationale for experimental, descriptive (empirical and nonempirical), and historical-critical research methods.

**683 Survey Research Methods in Communication**
Spring. 3 credits. Prerequisite: Communication 682 or equivalent.
Lec, M W 1:25–3:20. D. McDonald.
Practical experience in survey techniques in communication research. Course topics include design and measurement, data collection, data preparation, data analysis, and interpretation of results. Secondary analyses of survey data are conducted within each topic area.

**685 Training and Development: Theory and Practice (also Education 685, International Agriculture 685 and Industrial and Labor Relations 658)**
Spring and summer. 4 credits. S-U grades optional. Charge for materials, $45.
F 9:05–12:05. Communication Graduate Center, N. Awa, D. Deshler, W. Frank.
Analysis, design, conduct, administration, and evaluation of training programs for the development of human resources in small-farm agriculture, rural health and nutrition, literacy and nonformal education, and general community development. Designed for scientists, administrators, educator-trainers, and social organizers in rural and agricultural development programs in the U.S. and abroad.

**694 Seminar: Communication Issues**
Fall and spring. No credit. S-U grades only.
Alternate F 2:30. S. White and C. Scherer.
A departmental seminar for students and faculty on contemporary issues in communication.

**792 Advanced Communication Studies**
Fall or spring. 3 credits. Limited to communication graduate students. May not be repeated. Students must use the faculty member's section number to register.
Graduate faculty.
Independent studies and projects are carried out in conjunction with selected undergraduate courses.

**794 Seminar in Communication Issues**
Fall, spring, or summer. 1–3 credits. Prerequisite: permission of instructor.
Hours to be arranged.
Small group study of topical issue(s) in communication not otherwise examined in a graduate field course.

**797 Graduate Independent Study**
Fall, spring, or summer. 1–3 credits. Prerequisite: permission of instructor.
Hours to be arranged.
Individual study concentrating on locating, assimilating, synthesizing, and reporting existing knowledge on a selected topic.

**798 Communication Teaching Laboratory**
Fall and spring. 1–3 credits each semester. May be repeated once. Limited to graduate students. Prerequisite: permission of the faculty member who will supervise the work and assign the grade. Students must use the faculty member's section number to register.
Graduate faculty.
Designed primarily for graduate students who want experience in teaching communication courses. Students work with an instructor in developing course objectives and philosophy, planning, and teaching.

**799 Graduate Research**
Fall, spring, or summer. 1–3 credits. Prerequisite: appropriate communication graduate course work or permission of instructor.
Hours to be arranged.
Small-group or individual research based on original, empirical, data-based designs regarding topical issues in communication not otherwise examined in a graduate field course.

**899 Directed Graduate Study**
Fall or spring. 3–6 credits. S-U grades only. Students must use the faculty member's section number to register.
Graduate faculty.

# EDUCATION

R. E. Ripple, chair; J. P. Bail, A. L. Berkey, R. L. Bruce, W. S. Carlsen, J. Confrey, H. R. Cushman, D. Deshler, W. E. Drake, J. A. Dunn, J. R. Egner, G. Gay, J. H. Gould, D. B. Gowin, E. J. Haller, D. E. Hedlund, J. McGonigal, J. Millman, D. H. Monk, J. D. Novak, G. J. Posner, D. E. Schrader, K. A. Strike, H. D. Sutphin, D. J. Trumbull, J. D. Volmink, H. L. Wardeberg

**005 Basic Review Mathematics**
Fall. 3 credits (this credit is not counted toward the 120 credits required for the degree). Primarily for entering students.
Fall: M W F 9:05 or 12:20; J. Confrey and J. D. Volmink.
Introduction to concepts necessary for success in Education 115 and basic statistics courses. Topics include problem solving, ratios and proportions, factoring and solving algebraic equations, graphing linear and quadratic equations, and trigonometry. Considerable emphasis is placed on learning to learn mathematics for understanding and on comprehending word problems.

**115 Introductory College Mathematics**
Fall or spring. 4 credits.
Fall: lecs, M W 11:15 or 12:20; labs, R 8, 10:10, 12:20 or F 10:10, 12:20, 2:30.
Spring: lecs, M W F 9:05; lab: T 9:05, 10:10, 11:15, or 12:20 or R 10:10, 11:15, or 12:20. J. Confrey and J. D. Volmink.
Designed to give students with sound high school mathematics backgrounds a unified treatment of the basic concepts of college algebra, trigonometry, and geometry. Considerable emphasis is placed on the concept of function, graphing, problem solving, and applications. Selected software is used to strengthen and integrate the mathematical topics covered.

**120 Education for Empowerment**
Spring. 1–3 credits.
T R 2:30–4. Staff.
A modular course, with each module spanning 5 weeks for 1 credit. Common themes running through the modules include human learning, teaching strategies, political/social/economic factors affecting education. The course provides an opportunity to sample different areas of study and to gain knowledge and awareness of one's own educational processes.

**210 Psychology of Learning and Memory**
Fall. 3 credits. Prerequisite: introductory psychology.
M W F 10:10. J. A. Dunn.
This course deals with contemporary theories of learning, issues in the study of learning, and application of the principles of learning to the management of teaching and learning. Practical applications of research findings will be emphasized. One or more experimental projects and the use of microcomputers will be required. Not acceptable as a substitute for Education 311.

**240 The Art of Teaching**
Fall and spring. 3 credits.
Lec, T 2:30–4:25, fieldwork to be arranged. J. R. Egner, G. J. Posner, D. J. Tumbull, H. L. Wardeberg, and staff.
This course is designed for all students interested in finding out more about teaching. Students engage in field experiences to find out what teaching involves (minimum of two hours a week). Possible field experiences range from large group to tutorial situations, from preschool to adult education, from traditional school subject matters to recreational and vocational areas, and from school-based to nonformal situations. Class work builds on those experiences and provides skills and concepts to make the field experiences more profitable.

**247 Instructional Application of Microcomputers and Related Technologies**
Spring. 2–3 credits. Not available to students who have completed ABEN 102 or NR 107.
R 2:30–3:45; lab to be arranged.
H. D. Sutphin.
This course provides an introduction to instructional applications and strategies for using microcomputers and related technologies in public and private education in the private sector. The course also helps students learn to use technologies to enhance their college studies. Wordprocessing, spreadsheets, databases, hypertext, electronic bibliographical searching, networking, and desktop publishing are covered. Module A (1 credit) is the first seven weeks of the semester, focused on Macintosh technology. Module B (1 credit) is the second seven weeks, focused on IBM-compatible and related technologies. For Module C (1 credit) students propose and complete an approved special project related to the class.

**[271 Sociology of Education**
Fall. 3 credits. S-U grades optional. Not offered 1989–90.
T R 10:10–11:30. E. J. Haller
An introduction to the sociological study of schooling and education. Topics include the effects of social factors on educational achievement, the norms and values learned as part of the process of schooling, the relations between students and teachers, and the school's relations to the economic and political systems. All levels of education, from elementary school to the university, are considered.]

**283 Education and Cultural Process in Rural Development**
Fall. 4 credits.
T R 1:25–3:20. Staff.
This course is an introduction to the social and behavioral science side of rural and agricultural development. Students will study human behavior as it occurs in typical interfaces between key groups like peasants and government officers, farmers and extension agents, rural female and male development workers, academicians and practitioners, administrators/supervisors and field workers, generalists and specialists, rural teachers and parents, merchants and farmers. A problem-solving approach will be used to help students identify factors inhibiting human interaction and to design approaches for dealing with such factors.

**284 Introduction to U.S. Cooperative Extension**
Fall. 3 credits.
T 3:35–4:25, R 2:30–4:25. J. H. Gould.
History, programs, policy analysis, organization, and future role of cooperative extension in the United States. The role of the change agent, extension program development process, education techniques, communication skills, and volunteer involvement will be stressed. For students interested in a field of practice that makes use of undergraduate majors in ALS or the College of Human Ecology and for international students interested in an introduction to the U.S. extension experience.

**301 Knowing and Learning in Science and Mathematics**
Fall. 3 credits. Prerequisite: enrollment in science/mathematics certification program or permission of instructor.
M W F 2:30. D. J. Trumbull.
Students examine both current notions in the history and philosophy of science that explain how knowledge within a discipline develops and current theory and research that examines the individual's acquisition of knowledge. This material serves as a basis for students to conduct clinical interviews under the direct supervision of program staff. During the course students examine their own understanding of their major as the first step in their preparation as teachers.

**302 Observing Science and Math Instruction**
Spring. 3 credits. Prerequisite: Education 301 or permission of instructor.
Lec, W 2–4:25. W. S. Carlsen and J. Confrey.
The study of a variety of methods for recording and understanding science and mathematics teaching and learning. By reading and conducting research from a variety of analytic/interpretive paradigms, students will approach the familiar world of the secondary classroom with fresh perspectives. The course will include a final project that involves observing and evaluating a case of teaching. Students enrolled in teacher education programs will be expected to focus on their own teaching for the final project.

**310 Psychology of Instructional System Design**
Fall. 2–3 credits. Prerequisite: Education 210 or permission of instructor.
M W 11:15, hour to be arranged.
J. A. Dunn.
The course reviews the relevance of theories of learning and issues in the study of learning to the technology of instruction. Various examples of instructional systems will be considered. Student projects and laboratory exercises will be required.

**311 Educational Psychology**
Fall or spring. 3 credits. Prerequisite: introductory psychology. S-U grades optional in fall; letter grade only in spring.
Fall: M W 11:15, F to be arranged; D. E. Schrader and staff. Spring: M W F 10:10. J. A. Dunn.
An introductory survey course. Emphasis is on human learning and the educational process from a psychological point of view. The course is set in a broadly based teaching-learning context appropriate for prospective teachers, youth group leaders, community leaders, and those in the service-helping professions.

**312 Learning to Learn**
Spring. 3 credits. Prerequisite: one or more courses in psychology or educational psychology
T R 9:05. J. D. Novak.
This course is intended for persons interested in the improvement of their learning strategies and the application of new ideas and methods to improve educational programs. Lectures and discussions are based on assigned readings and the contributions of class

members. The major focus of the course is how and why concepts play a central role in human learning. Concept mapping and other strategies for educating will be used. Students will apply principles and methodologies in a project related to their interests.

**317 Psychology of Adolescence**
Spring. 3 credits. Prerequisite: introductory psychology. S-U grades optional.
M W F 11:15. D. E. Schrader and staff.
A survey of the nature of adolescent development, with emphasis on causal factors of adolescent behavior. Focus is on an examination of the interrelationships among the major aspects of adolescent development, an examination of some of the dominant themes of adolescence, acquaintance with research on adolescent development, and implications for the educational process.

**331 Introduction to Agricultural and Extension Education**
Fall. 2 credits.
Lec, M 1:25–3:25; lab to be arranged.
W. E. Drake and staff.
The course is intended for persons interested in careers as professional educators in agriculture. Investigates careers as a secondary school or two-year college teacher, cooperative extension agent, or educator in agriculture business and industry. The course emphasizes career information, methodology, and introductory teaching experiences. Class activities include presentations by resource persons currently in teaching and extension careers, field trips, and microteaching experiences.

**332 Instructional Methods in Agricultural and Extension Education**
Spring. 3 credits. Prerequisite: permission of instructor.
M 2–4:25 and F 12:20. H. Cushman, W. Drake, J. Gould
Selection, practice, and evaluation of methods in agricultural and extension education will be stressed. The course will focus on both general teaching strategies and methodology unique to teaching in either schools or extension. Course activities include microteaching and/or field experience during arranged times.

**335 Youth Organizations**
Spring. 3 credits. Prerequisite: introductory psychology or permission of instructor.
Lecs, T R 10:10; lab to be arranged.
J. P. Bail, J. H. Gould.
The role of selected youth organizations in providing educational experiences for youth. Factors affecting membership, purposes, design, operation, and administration are surveyed, emphasizing the roles an adult volunteer leader may play. The course is designed to give students an in-depth, learning-by-doing experience of how youth organizations function. Field experience with a recognized youth organization is required.

**352 Reading Statistics**
Fall or spring. 1 credit. Prerequisite for spring: concurrent registration in Education 353.
Fall: T 12:20; spring: T R 8:30–9. Staff.
An introduction to statistical vocabulary and symbolism frequently used in reporting empirical research in education and other social sciences. Students are taught how to comprehend statistical terminology and results.

**[353 Introduction to Educational Statistics**
Spring. 3 credits. Enrollment limited to 40 students. Prerequisite: Education 352 or concurrent registration, or permission of instructor. Not offered 1989–90.
T R 9:05–11. J. Millman.
A study of common univariate and multivariate statistical procedures encountered in educational and psychological inquiry. Meaning of concepts and mastery of course content is emphasized; computational details are not. Microcomputers are used extensively in class to develop understanding of the properties of statistical indices.]

**370 Issues in Educational Policy**
Spring. 3 credits.
T R 10:10–11:30. K. A. Strike.
An examination of selected policy issues in current education. Included are such topics as equality of educational opportunity; student, parent, and teacher rights; and educational politics. Issues are treated from legal, sociological, and economic perspectives.

**378 Political Economy of Education**
Fall. 3 credits. S-U grades optional. Prerequisites: one introductory level course in either government or economics, or prior permission of instructor.
T 2:30–4:25, R 2:30–3:20. D. H. Monk.
A policy oriented examination of educational systems with an emphasis on political and economic perspectives. Attention will be paid to both external and internal aspects of educational activities. Specific topics will include the changing contributions of education to earnings, school-community relations, power within educational organizations, the impact of technology in the workplace and in classrooms, and the sources and impact of educational costs. A variety of education settings will be examined including higher education and non-formal education.

**380 Independent Honors Research in Social Science**
Fall or spring. 1–6 credits. Limited to students who have met requirements for the honors program. S-U grades optional. A maximum of 6 credits may be earned in the honors program.
Staff.

**401 Our Physical Environment**
Fall or spring. 3 credits. Prerequisite: permission of instructor. Charge for photo supplies, approximately $7.
T 1:25–4:25. V. N. Rockcastle.
A practical, relatively nonmathematical study of some basic relationships and physical interactions in the environment, with emphasis on physics and earth science. Attention is paid to analysis for understanding and techniques for teaching. A two-week session on photography and an individual research project are included. Useful for teachers and environmental educators.

**[411 Introduction to Educational Measurement**
Fall. 3 credits. Not offered 1989–90.
T 9:05–11, R 9:05–9:55. J. Millman.
Presents practices and theories of the measurement of human knowledge and performance. Students will be expected to acquire the practical skills of planning and constructing tests for a variety of purposes, interpreting and using test results, evaluating commercially available instruments, and the like. Students will also be expected to discuss intelligently a myriad of social, ethical, legal, and technical issues associated with educational testing. One course in statistics or concurrent registration in Education 352 is recommended but is not required.]

**413 Psychology of Human Interaction**
Fall. 3 credits. Enrollment limited. Prerequisite: permission of instructor. Fee, $5.
T R 10:10–12:05. D. E. Hedlund.
Designed to develop skills for, and understanding of, effective interpersonal communication and interaction. Appropriate for students in the helping professions, education, and areas involving management of human resources.

**414 Counseling Psychology**
Spring. 4 credits. Limited to 30 students. Prerequisites: introductory psychology, social or personality psychology, and Education 413.
T R 10:10–12:05. D. E. Hedlund.
The processes of counseling are examined from various theoretical perspectives. Typical adult counseling issues are examined, and implications are drawn for counseling strategies with an adult population, including psychological assessment, establishing therapeutic goals, intervention strategies, and evaluation of outcomes. Alternative models of service delivery, such as outreach, consultation, and psychoeducation, are emphasized.

**420 Field Experience**
Fall or spring. 1–4 credits. S-U grades optional. Undergraduates must attach to their course enrollment material written permission from the faculty member who will supervise the work and assign the grade.
Staff.
Students may engage in planned, semiprofessional, or professional practice in an educational enterprise. Each student prepares a plan of action including rationale, purposes, and procedures and arranges with a faculty member to supervise and evaluate the field experience.

**430 Special Problems in Agricultural Education**
Fall, spring, or summer. 1–3 credits. S-U grades optional.
Fall and summer: hours to be arranged; spring: T 8. H. R. Cushman.
An opportunity to study individually selected problems in agricultural education.

**432 Teaching Agriculture: Methods, Materials, Practice**
Fall. 9 credits. Prerequisites: Education 332 and concurrent registration in Education 430 and 499.
M T W R F 8–3. A. L. Berkey and staff.
Directed participation in teaching agriculture at the secondary school level. Program includes a four-day intensive on-campus period and periodic seminars addressing selected methods and materials in teaching agriculture, combined with a 14-week period in a student teaching center. Includes evaluation of area resources, instructional materials and facilities, planning and executing instruction, directing work experience, and advising youth organizations.

**445 Curriculum Design Workshop**
Fall. 3 credits. Education 644 may be taken concurrently.
T R 10:10–11:30. G. J. Posner.
A general practical approach to course planning. Readings, group discussions, workshops, and individual conferences centering on each student's project. This project consists of designing a course in a subject area for an age level and an institutional setting of the student's choosing.

**[457 Discourse Analysis**
Fall. 3 credits. Offered alternate years. Not offered 1989–90.
Lec, T R 2:30–3:45. W. S. Carlsen.
An introduction to the sociolinguistics of education, this course begins with a series of readings and discussions on the language of the classroom and, through a series of practical exercises, prepares students to analyze language in projects of their own design. In the context of classrooms and schools, we will consider among other issues: participation structures, propositional analysis, questioning, turn-taking, and the ways teachers and students negotiate meanings during lessons. Many of the cases and exemplars in the lab will be taken from science and mathematics classrooms, and special attention will be paid to communicative patterns in the small-group activities that often characterize excellent science and mathematics teaching.]

**472 Philosophy of Education**
Fall. 3 credits.
T 2:30–4:25. K. A. Strike.
A study of central issues in the philosophy of education. Questions of ethics, political philosophy, and the theory of knowledge are examined and linked to current educational issues.

**473 Contemporary Philosophy of Education**
Spring. 3 credits.
M W 11:15, plus additional work to be arranged. D. B. Gowin.
The emphasis in this course is the architectonics of meaning as a guide to philosophizing about education, our topic. We begin with the fact that philosophers disagree, as do experts in all fields. Every discipline exhibits competing philosophical principles. The appeal to facts to settle disagreements fails because some philosophical principle is necessary to give meaning to facts. Philosophy concerns itself with problems we can neither solve nor abandon. Each year the readings in the course will change as we seek to use texts that are the most up-to-date and also the most fundamental in philosophy. Thus, the course may be taken more than once. The curriculum is emergent.

**477 Law and Educational Policy**
Fall. 3 credits.
M 2:30–4:25. K. A. Strike.
A study of recent federal court decisions concerning education. Emphasis on examining legal issues against a background of related educational issues and in terms of the consequences of legal decisions for the development and operation of educational institutions.

**481 Educating for Community Action**
Spring. 3 credits.
T R 11:15–1:10. R. L. Bruce.
The design and execution of educational aspects of community-action and nonformal education programs. Deals with the identification and statement of educational goals, selection of teaching strategies, and evaluation of outcomes.

**482 Introduction to Adult Education**
Fall. 3 credits. S-U grades optional.
T R 12:20–2:15. D. Deshler.
Focuses on the broad aspects of adult education: scope and history of adult-education programs, philosophy and principles, perspective of the adult learner, media and methods of instruction, and program development. Opportunities are provided for observation of adult-education programs in community organizations and agencies.

**483 Comparative Studies in Adult Education**
Spring. 3 credits. S-U grades optional.
W 7:30–10:30 p.m. D. Deshler.
Focuses on the variety of adult-education programs in countries around the world. Literature on comparative adult education, international conferences on adult education, UNESCO adult-education publications, and international community development are analyzed in relationship to each student's exploration of adult education in two countries. Description of adult education in other countries is shared by international students.

**497 Independent Study**
Fall or spring. 1–3 credits. S-U grades optional. Undergraduates must attach to their course enrollment material written permission from the faculty member who will supervise the work and assign the grade.
Staff.
A student may, with approval of a faculty adviser, study a problem or topic not covered in a regular course or may undertake tutorial study of an independent nature in an area of educational interest.

**498 Undergraduate Teaching**
Fall or spring. 1 or 2 credits; 4 credits maximum during undergraduate career. Limited to students with grade-point averages of at least 2.7. S-U grades optional.
Staff.
Participating students assist in teaching a course allied with their education and experience. Students are expected to meet regularly with a discussion or laboratory section, to gain teaching experience, and regularly to discuss teaching objectives, techniques, and subject matter with the professor in charge.

**499 Undergraduate Research**
Fall or spring. 6 credits maximum during undergraduate career. Not open to students who have earned 6 or more undergraduate research credits elsewhere in the college. Limited to juniors and seniors with grade-point averages of at least 2.7.
Staff.
Affords opportunities for students to carry out independent research under appropriate supervision. Each student is expected to review pertinent literature, prepare a project outline, conduct the research, and prepare a report.

**547 Improvement of College Teaching**
Fall, spring, or summer. 2 credits.
D. B. Gowin.
Concepts of teaching, learning, curriculum, and governance are used to guide practical activities that enhance faculty competence. Recent studies of concept mapping and learning, structure of knowledge, science teaching, adult learning, and evaluation provide a conceptual basis for improving teaching.

**590 Special Topics in Education**
Fall, spring, or summer. 1–3 credits. Prerequisite: permission of instructor. S-U grades optional. Hours to be arranged.
Staff.
Topics to be announced.

**601 Secondary Science and Mathematics Teaching Practicum**
Fall or spring. 3 credits. Prerequisite: permission of instructor. Letter grades only. For graduate students enrolled in the Teacher Education in Science and Mathematics Program.
M T W R F 8–3. D. J. Trumbull and staff.
Supervised student teaching in science or mathematics at the secondary level. Program includes teaching at a local school for ten weeks.

**602 Teaching Science/Mathematics: Methods, Materials, Practice**
Fall. 9 credits. Prerequisite: concurrent enrollment in Education 601 or permission of instructor.
Lec, M F 9–12 and 1–3, first 5 weeks; last 10 weeks to be arranged. G. J. Posner and staff.
The course begins with five weeks of intensive consideration of theoretical frameworks relevant to all aspects of student teaching. Assignments and a weekly seminar during the next ten weeks require students to use those theories to develop and evaluate teaching materials and practices. Students will complete an extensive portfolio documenting their work.

**603 Teaching Mathematics**
Spring. 3 credits.
M 2–4:25. J. Confrey.
Current research in mathematics education will be examined in order to develop a picture of the mathematics classroom that integrates subject matter, student conceptions, affective variables, and issues in the social context of learning mathematics. Special topics will include research on problem solving, women and mathematics, misconceptions, and research on teaching.

**606 Seminar in Science and Mathematics Education**
Fall or spring. 1 credit. S-U grades only.
Fall R 3:35; spring R 4:30. W. S. Carlsen and J. D. Novak.
Explores various interests in science, mathematics, and environmental education. Discussions center around curriculum development, research and thesis writing, current problems, and current literature.

**609 Educational Ethnography**
Spring. 3 credits. Prerequisite: course in research methods or measurement or permission of instructor.
M W 2:30–4. D. J. Trumbull.
The course will study educational ethnography as a form of interpretive research, a perspective that attends to the complex interactions between researcher, researched, and context and accepts the centrality of meaning-making in the conduct of human affairs. Students will examine some of the philosophical debates about research approaches and will discuss research methods as they relate to the aims and assumptions of interpretive research. Students will conduct a joint research project during the course of the semester.

**611 Educational Psychology**
Fall. 3 credits. Prerequisite: introductory psychology. S-U grades optional.
M 12:20–1:10; W 12:20–2:15.
D. E. Schrader.
A basic survey course for graduate students. Emphasis on psychological factors involved in human learning and the educational process. Set in a broad-based conceptual model of any behavioral setting for learning. Appropriate for those seeking an introduction to educational psychology or a refresher course in contemporary educational psychology.

**613 Theory and Methods for Education**
Fall. 3 credits. Prerequisite: Education 311 or 611 or permission of instructor.
T R 9:05. J. D. Novak.
Presents a coherent theory of education combining concepts from philosophy, psychology of learning, curriculum, and instruction. New educational methods, including concept mapping and clinical interviews, will be presented. Students will gain competence by applying concepts and methods in a project related to their interests. Classes include discussion of student-initiated questions and use of videotape to analyze educational techniques.

**620 Internship In Education**
Fall or spring. 2–6 credits. S-U grades optional. Each student, before course enrollment, must obtain the approval of a faculty member who will assume responsibility for supervising the work.
Staff.
An opportunity for practical experience in educational professions development.

**630 Special Problems in Agricultural and Occupational Education**
Fall or spring; may also be offered in summer. 1–3 credits. S-U grades optional.
Hours to be arranged. A. L. Berkey and staff.
The course provides an opportunity for graduate-level study of individually selected problems and issues in agricultural and occupational education. Designed for experienced teachers.

**632 Teaching Agricultural and Occupational Education**
Spring. 3 credits. Prerequisite: an introductory course in teaching methods or permission of instructor.
M 8–10. A. L. Berkey.
The focus of the course is on the selection, use, and evaluation of methods and materials for teaching occupational subjects. Methods for both group and laboratory instruction are covered. Opportunity is provided for students to develop teaching competencies based on their individual needs and interests. Development of self-evaluation skills is included. A class project on the development of instructional materials is required.

**633 Curriculum in Agricultural and Occupational Education**
Fall. 3 credits.
T 1:25–3:20; labs to be arranged.
W. E. Drake.
Current situations affecting occupational education curricula are examined. Principles, objectives, and sources of information are developed for planning curricula. Strategies for developing occupational courses are examined. Consideration is given to planning, developing, and managing work experience programs. Participants have an opportunity to observe ongoing programs at the secondary and two-year college levels and to pursue individual interests in curriculum improvement.

**643 Structure of Knowledge and Curriculum**
Spring. 3 credits. Prerequisite: permission of instructor.
M W 12:20–2:15. D. B. Gowin.
Curriculum studies are the opening door to the four commonplaces of educating: curriculum, teaching, learning, and governance. A theory of educating explains the relations among these educational variables. Practice in concept mapping and Vee diagramming is required to achieve proficiency in curriculum analysis and curriculum construction. A theory and method for the analysis of the structure of knowledge is presented.

**644 Curriculum Theory and Analysis**
Fall. 3 credits.
M W 10:10–11:30. G. J. Posner.
An examination of the basic elements involved in making curriculum decisions and an analysis of current approaches to curriculum. The course focuses on the assumptions underlying any curriculum. The major task of each student is to choose and conduct an in-depth analysis of a curriculum. This course is the basic graduate course in curriculum.

**647 Instructional Technologies: Analysis and Practices**
Spring. 2–4 credits. Prerequisite: skills in statistics and research design. Letter grade only.
R 2:30–3:45; lab to be arranged.
H. D. Sutphin.
Current research and literature on instructional computing and related technologies in the public and private sectors will be examined. Students complete a group research project on educational technologies and meet for five seminar sessions to earn 2 credits. The research experience includes design, data collection, input, analysis, and synthesis. Concurrent attendance in ED 247 Modules A and B is required (2 credits); or 247 may be taken as a prerequisite.

**650 Methods of Educational Inquiry**
Fall. 1 credit.
T 2:30–3:20. D. J. Trumbull.
A survey of approaches to inquiry in the social sciences, including experimental and comparative designs, survey research, case study, simulation, philosophical and historical inquiry, content analysis, and secondary data analysis. The course is intended to broaden the student's views of appropriate methods of disciplined inquiry.

**651 Writing a Thesis Proposal**
Fall. 1 credit. S-U grades only.
T 3:35. W. S. Carlsen.
Procedures for developing and writing a master's or doctoral thesis proposal. Emphasis will be given to identifying a significant topic, conducting and describing a group minireserach study, recognizing weaknesses in illustrative proposals, and clear and concise writing. Students will be provided ample assistance in constructing a brief thesis proposal of their own.

**654 Evaluation for Program Management**
Spring. 3 credits. S-U grades optional.
M 1:25–4:25. R. L. Bruce.
The course will consist of three modules, each for one hour of credit. (1) Evaluation as a programming function: fitting an evaluation to decision needs; program monitoring; evaluation and information systems. No prerequisite. (2) Evaluation models: comparative examination of various models and their implications for practice. No prerequisite. (3) Practicum in program evaluation: directed practice in the design and conduct of a "live" evaluation. Prerequisite: module 1.

**[659 Special Topics in Research Methods**
Spring. 2–3 credits. Prerequisite: permission of instructor. S-U grades only. Not offered 1989–90.
Hours to be arranged. J. Millman.
Consideration of new techniques and current topics in educational research design, measurement, or evaluation of programs, products, and personnel.]

**661 Administration of Educational Organizations**
Fall. 3 credits.
W 3:35–6. J. R. Egner
Perspectives on the administration of educational organizations. Consideration of social science, legal and ethical theories, and their application to both public schools and higher education. Intended for students who are considering careers as educational administrators, as well as for those who want to further their understanding of schools as organizations.

**664 Educational Finance**
Fall. 3 credits. S-U grades optional.
R 3:35–6. D. H. Monk.
An analysis of the distribution and utilization of public and private resources for educational purposes. The discussion will revolve around the issues of equity, efficiency, and freedom of choice. Alternative methods of financing schools will be evaluated, and the perplexing legal and moral issues raised by such questions as "Who pays?" and "Who benefits?" will be discussed. Specific attention will be given to budgeting, accountability, and productivity. An opportunity for individuals to focus on their own areas of interest, such as occupational education, the two-year college, or secondary or higher education.

**665 Administrative Decision Making**
Spring. 3 credits. S-U grades optional.
W 3:35–6. D. H. Monk.
An introduction to decision making theory and its relevance to the field of educational administration. Specific applications will be made to the study and improvement of productivity within educational systems. A wide variety of educational settings will be considered, including higher education and non-formal education.

**673 Seminar in Dewey's Philosophy of Education**
Fall. 3 credits. S-U grades optional.
R 3–5. D. B. Gowin.
Dewey's corpus of philosophical works has been given new life by contemporary philosophers (Richard Rorty, Richard Bernstein, James Gouinlock, and Walter Watson). After fifty years or so of inattention, Dewey is now acknowledged as a "philosophic genius" of the twentieth century (along with Wittgenstein and Heidegger). Education and democracy are central to Dewey's thought; this seminar is an exploration of theory, method, and practical educative consequences of Dewey's views. The Dewey Center edition of original works is now available in Cornell libraries.

**[674 History of American Education**
Fall. 3 credits. Not offered 1989–90.
M 3:35–5:15. Staff.
An examination of American schools, colleges, and other educative agencies from colonial beginnings to the present. An attempt is made to view education in the context of the evolution of American norms and values.]

**678 Planning Educational Systems**
Spring. 3 credits. S-U grades optional.
T 2:30–4:25. D. H. Monk.
A seminar focused on a comparative analysis of educational planning as it is practiced in both industrialized and developing nations. Topics will include manpower planning, the social demand approach to educational planning, benefit-cost analysis, and incentive models of planning. Attention will be given to case studies that will be selected in accordance with students' interests. The political and economic implications of attempts to plan education will be emphasized.

**679 Policy Issues in Higher Education**
Spring. 3 credits. S-U grades optional.
T 11:15–1:15. J. R. Egner
Deals with administration of higher educational organizations. Current approaches to planning and analysis of special problems.

**680 Foundations of Extension Adult Education**
Fall. 3 credits. Limited to 20 students. S-U grades optional.
F 9:05–12:10. D. Deshler.
An analysis of alternative purposes, nature, and scope of extension, adult, and continuing education programs in the United States and abroad, with emphasis on the relationship of programs to historical, cultural, political, and social settings. Definitions, conceptual controversies, philosophical issues, and current research directions will be examined through a seminar approach.

**[681 Designing Extension and Continuing Education Programs**
Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
T 1:25–4. R. L. Bruce.
Designed to help students understand the concepts, principles, and procedures relevant to developing programs and curricula for the continuing education of adults. Emphasis is on such key areas as the nature and role of programming, situation analysis and needs identification, choosing among alternative courses of action, stating program objectives, and program organization.]

**682 Community Education and Development**
Fall. 3 credits. For students who have interest or experience in education or development programs in which community is an important concern.
W 2:30–5. Staff.
An examination of the concept of community; changes in community life; the analysis of community; alternative strategies for community development; patterns of response to community by universities, colleges, schools, cooperative extension, and government service agencies; and such functional dimensions of community education programming as participatory decision making, volunteers, leadership development, council formation and function, interagency coordination, and change-agent roles.

**[683 Administration of Nonformal Education**
Spring. 3 credits. Not offered 1989–90.
W 1:25–4. Staff.
An overview of selected theories, principles, and strategies applicable to management of decentralized, professionally staffed, nonformal educational organizations and change agencies. Content includes management functions, managerial leadership, management by objectives, and decision-making strategies. Particular attention is given to leadership of organizations with volunteer staff.]

**684 Adult Education Programs: Organization and Direction**
Spring. 3 credits.
F 1:25–4:25. H. R. Cushman.
Alternative procedural models for organizing and conducting adult occupational education courses are presented. Guidelines and procedures for implementing the models in secondary and postsecondary school settings are emphasized.

**685 Training and Development: Theory and Practice (also Communication 685, International Agriculture 685 and Industrial and Labor Relations 658)**
Spring and summer. 4 credits. S-U grades optional. Charge for materials, $45.
F 9:05–12:05. Communication Graduate Center. N. Awa, D. Deshler, W. Frank.
Analysis, design, conduct, administration, and evaluation of training programs for the development of human resources in small-farm agriculture, rural health and nutrition, literacy and nonformal education, and general community development. Designed for scientists, administrators, educator-trainers, and social organizers in rural and agricultural development programs in the U.S. and abroad.

**690 Research Seminar**
Fall and/or spring. No credit.
T 12:20. J. P. Bail.
Presentation of current research in the field of education by graduate students and staff. Opportunities to discuss methodology, findings, and other aspects of research.

**711 Contemporary Issues in Educational Psychology**
Spring. 2–3 credits.
M W 11:15. 1 hour to be arranged. J. A. Dunn.
This is a graduate-level seminar dealing with key issues in contemporary psychology having implications for educational practice and research. Topics will vary from year to year. Students may take the course more than once.

**715 Seminar in Psychology and Education**
Fall or spring. Variable credit. Prerequisite: permission of instructor.
W 1:25–3:25. D E. Hedlund.
Selected topics focusing on the interaction of theoretical and research developments in psychology and education.

**718 Adult Learning and Development**
Spring. 3 credits. Prerequisite: permission of instructor. S-U grades optional. Offered alternate years.
Hours to be arranged. R. E. Ripple, R. L. Bruce.
Deals with adult development and learning behavior from points of view of educational psychology, social psychology, and sociology. Inferences are drawn from theory and research to the practice of adult continuing education. Appropriate for graduate students in educational psychology, extension and continuing education, and community service education, and for others interested in adult learning and development.

**719 Seminar in Educational Psychology**
Fall. 1 credit. S-U only.
W 12:20. J. A. Dunn.
Presentation and discussion of current professional topics in educational psychology. Current research and theoretical controversies in the field will be covered.

**730 Seminar in Agricultural and Occupational Education**
Spring. 2 credits. S-U grades optional.
R 8–9:55. H. D. Sutphin and staff.
For master's degree candidates who have had teaching experience and doctoral candidates with majors or minors in agricultural and occupational education. Emphasis is on current problems and research. Includes discussion and analysis of student research proposals.

**735 Teacher Preparation in Agriculture**
Fall. 3 credits. Prerequisite: teaching experience in agriculture.
W 1:25–3:20. A. L. Berkey.
For persons with teaching experience interested in the preparation of occupational teachers. Involvement in the Cornell program of teacher preparation in agriculture is expected.

**736 Occupational Education Program: Administration and Supervision**
Spring. 3 credits.
T 3:35–6; special sessions to be arranged. J. P. Bail.
Practices and procedures of organizing, administering, and supervising programs of occupational education at the secondary and postsecondary level are stressed. The role of the director in providing leadership in improving instruction, designing programs, and using resources at federal, state, and local levels is considered.

**739 Evaluating Programs in Occupational Education**
Spring. 3 credits. Offered alternate years.
T 1:25–3:20; labs to be arranged.
W. E. Drake.
This course examines objectives, criteria, and strategies for evaluating programs of occupational education in secondary and postsecondary schools. Evaluation models, case studies, and evaluation as a function of program planning are considered. Participants examine the roles of supervision in evaluation and have

an opportunity to develop and apply evaluative instruments. Field trips and resource persons provide opportunities to observe actual evaluation problems and procedures.

**745 Seminar in Curriculum Theory and Research**
Spring. 3 credits. Prerequisite: Education 644, or permission of instructor.
W 8–11. G. J. Posner.
Theoretical issues in curriculum and appropriate areas for curriculum research are discussed. Two current topics of interest are the hidden curriculum and school reform. Both topics serve to uncover the relation between ideology and research.

**750 Conceptual Problems in Educational Inquiry**
Fall. 3 credits. S-U grades optional.
R 12:20–2:15. D. B. Gowin.
A constructionist view (as opposed to the conventional foundationalist viewpoint) of creating knowledge and value claims is the starting point of this seminar. We will be concerned with the conceptual principles (both normative and scientific) that guide research such that knowing and valuing are integrated in research. A view of theory-driven programmatic research is presented. We will read recent works in women's way of knowing, in children's clever misconceptions of science and math, alternative ways of knowing peace and war, and Hispanic minorities' view of knowing. Familiarity with master's and doctoral dissertation work of the past fifteen years at Cornell is expected. Copies are available in the libraries.

**[751 Quantitative Approaches to Qualitative Data Analysis**
Spring. 3 credits. Prerequisite: Education 353 or equivalent. Offered alternate years. Not offered 1989–90.
Lec, T 10:10, R 10:10–12:05.
W. S. Carlsen.
This course focuses on techniques for analyzing and reporting interpretive research data. Although we will consider some general analytic methods (e.g., constant comparative analysis) and their theoretical foundations, the emphasis in this course will be on categorical, computational, and graphical approaches to constructing meaning from rich interpretive data sets. This course is intended to complement but not replace the study of discipline-specific interpretive approaches like ethnography, historiography, and sociolinguistics.]

**[762 Research in Educational Administration**
Spring. 3 credits. Prerequisite: one course in elementary statistics or permission of instructor. S-U grades only. Not offered 1989–90.
Hours to be arranged. E. J. Haller.
An analysis and critique of current research in educational administration. Discussion of research priorities and strategies. For graduate students interested in research on problems of educational administration. Students will carry out a small-scale empirical research project.]

**772 Seminar in Philosophy of Education**
Spring. 3 credits. Prerequisite: permission of instructor. S-U grades optional.
Hours to be arranged. K. A. Strike.
Topics to be announced.

**782 Behavioral Change in International Rural Modernization**
Fall. 3 credits. For students who have interest or experience in international rural development or community development.
Staff.
An exploration of the social psychological aspects of socioeconomic development, focusing on individual modernity, values-beliefs-motives, achievement motivation, entrepreneurship, innovativeness, expectancies, and self-efficacy, and the applied orientations of indigenous learning and knowledge systems, adoption behavior under conditions of risk and uncertainty, appropriate social-educational-biomechanical technology, communication-diffusion of innovations, and development education.

**783 Comparative Extension Education Systems**
Spring. 3 credits. Prerequisite: Education 782 or permission of instructor.
R 1:25–4:25. Staff.
Extension education in the developing nations is studied using, as an analytical frame of reference, a hypothetical model comprising such components as community organization, community-based learning, indigenous facilitators and leaders, extension generalists and specialists, training, and research-extension linkages. Case materials on alternative extension models and intercountry experiences provide an empirical base.

**[784 Technology-Focused Decision Making: Models for Extension Educators**
Fall. 3 credits. Not offered 1989–90.
M 12:20–2:15. R. Bruce, J. McGonigal.
The educational and program management decisions involved in the adoption of educational technology in extension, rural development, and nonformal education programs are reviewed, and a variety of decision-making approaches is explored. An overall problem-solving method with case study illustrations is used. Consideration is given to structure and operating style of the educational organization, as well as to the characteristics of the technology under consideration. The course makes use of recent literature and continuously updated files on current developments in technology applications.]

**800 Master's-Level Thesis Research**
Fall or spring. Credit to be arranged. S-U grades optional. Each student, before course enrollment, must obtain the approval of a faculty member who will assume responsibility for guiding the work.
Staff.

**900 Doctoral-Level Thesis Research**
Fall or spring. Credit to be arranged. Limited to students working on theses or other research and development projects. S-U grades optional. Each student, before course enrollment, must obtain the approval of a faculty member who will assume responsibility for guiding the work
Staff.

**Related Course in Another Department**
**Historical Roots of Modern Psychology (Psychology 490)**

# ENTOMOLOGY

R. A. Morse, chair; W. L. Brown, Jr., G. C. Eickwort, P. P. Feeny, W. T. Johnson, J. P. Kramer, J. K. Liebherr, B. L. Peckarsky, D. Pimentel, E. M. Raffensperger, R. B. Root, R. T. Roush, D. A. Rutz, J. P. Sanderson, J. G. Scott, E. J. Shields, M. J. Tauber, W. M. Tingey, S. Via, Q. D. Wheeler

Emeritus professors: J. E. Dewey, J. G. Franclemont, G. G. Gyrisco, A. A. Muka, C. E. Palm, R. L. Patton, L. L. Pechuman, W. A. Rawlins, M. Semel, E. H. Smith, R. G. Young

**Courses by Subject**

Apiculture: 260, 262, 264
Behavior: 662
Ecology: 370, 455, 464, 470, 471, 664, 672
Introductory courses: 200, 212
Medical entomology and pathology: 452, 453, 454, 653
Morphology: 322
Pest management: 241, 342, 443, 444, 472, 640, 677
Physiology and toxicology: 411, 483, 685, 690
Systematics and acarology: 331, 332, 621, 630, 631, 633, 634, 636, 674, 710

**200 Cultural Entomology**
Fall. 2 credits. S-U grades optional. Intended for students in all colleges.
Lecs, T R 10:10. E. M. Raffensperger.
A presentation of the insects, with attention to their roles in nature and in civilization. Biological, historical, social, economic, and cultural aspects are discussed.

**212 Insect Biology**
Fall. 4 credits. Prerequisites: Biological Sciences 101–102 (may be taken concurrently) or equivalent.
Lecs, W F 11:15; lab, M T or W 1:25–4:25.
G. C. Eickwort.
Introduces the science of entomology by focusing on basic principles of systematics, morphology, physiology, behavior, and ecology of insects. The laboratory in early fall includes field trips to collect and study insects in the natural environment. A small collection emphasizing ecological and taxonomic categories is required.

**241 Applied Entomology**
Spring. 3 credits. Prerequisites: Biological Sciences 101–102 or equivalent.
1 Lecs, T R 10:10; lab, T W or R 2–4:25.
E. M. Raffensperger.
A compendium of the insects associated with crops and farm animals. Discussions of insect pest management requirements on farm and in garden, along with descriptions of control methods, materials, and equipment.

**260 Introductory Beekeeping**
Fall. 2 credits.
Lecs,T R 11:15. R. A. Morse.
Introduces the fundamentals of practical beekeeping, including the life history, physiology, and behavior of honey bees. The classical experiments on the dance language and the role of pheromones are reviewed. Some lectures are devoted to pollination of agricultural crops and the production of honey and beeswax.

**262 The Biology of the Honey Bee**
Fall. 1 credit. Limited to 10 students.
Prerequisite: permission of instructor.
Labs, afternoons or weekends to be arranged; course will meet in Sept. and Oct. only. R. A. Morse.
A series of laboratories in which students perform some of the classical experiments on honey bee behavior. Various techniques used in bee research are introduced.

**264 Practical Beekeeping**
Fall. 1 credit. Limited to 20 students.
Prerequisite: Entomology 260 (may be taken concurrently).
Lab, R 2–4:25. R. A. Morse.
This course consists of fourteen laboratory sessions to acquaint students with practical methods of colony management. Laboratories involve actual work with honey bee colonies and equipment. Some of the topics covered are management of bees for apple pollination, honey harvesting and processing, and disease identification and control.

**[322 Insect Morphology**
Fall. 5 credits. Prerequisite: Entomology 212 or 241. Offered alternate years. Not offered 1989–90.
Lecs, M W F 9:05; labs, M F 1:25–4:25. G. C. Eickwort.
An introduction to the external and internal anatomy of insects, with emphasis on the comparative and functional aspects. The laboratory is devoted largely to dissection.]

**331 Introductory Insect Systematics**
Spring. 4 credits. Prerequisite: Entomology 212.
Lecs, T R 10:10; labs,T R 1:25–4:25. W. L. Brown.
An introduction to the classification, evolutionary history, and distribution of the insects. Laboratory practice in the identification of orders, families, and representative genera of insects; methods of collection, preservation, and study. Lectures on theory and practice of insect systematics and major features of insect evolution. Insect collections are required.

**[332 Systematics Discussion Group**
Spring. 1 credit. Prerequisite: concurrent enrollment in Entomology 331 or permission of instructor. S-U grades only. Offered alternate years. Not offered 1989–90.
Disc, hours to be arranged. Q. D. Wheeler.
Readings and discussion on topics in systematics coordinated with the lecture series in Entomology 331.]

**342 Special Topics in Economic Entomology**
Hours to be arranged.
Staff.
Topics to be announced.

**[370 Pesticides and the Environment (also Toxicology 370)**
Fall. 2 credits. Prerequisites: Biological Sciences 101–102 or equivalent. Not offered 1989–90.
Lecs, T R 9:05. J. G. Scott.
A survey of the different types of pesticides, their uses, properties, and effects on the environment. Discussion of the risks, benefits, regulation, and current controversies associated with pesticide use.]

**[441 Seminar in Insect Pest Management**
Spring. 1 credit. Limited to 10 students.
Prerequisite: Entomology 241 or 444 or permission of instructor. S-U grades only. Not offered 1989–90.
Hours to be arranged. A. M. Shelton.
Discussion of current topics in pest management, with an emphasis on insect pest management.]

**[443 Pathology and Entomology of Trees and Shrubs (also Plant Pathology 443)**
Fall. 5 credits. Prerequisites: Plant Pathology 301 and Entomology 241 or equivalent.
Offered alternate years. Not offered 1989–90.
Lecs, M W F 10:10; labs, W F 1:25–4:25. Evening prelims. W. T. Johnson, G. W. Hudler.
For students preparing for careers in horticulture, urban forestry, and pest management. Deals with the nature, diagnosis, assessment, and treatment of diseases and arthropod pests of trees and shrubs. Forest, shade, and ornamental plants are considered.]

**[444 Integrated Pest Management (also Plant Pathology 444)**
Fall. 4 credits. Prerequisites: Biological Sciences 260 or 360, Entomology 212 or 241, and Plant Pathology 301 or their equivalents or permission of instructor. Not offered 1989–90.
Lecs, M W F 9:05; lab, M or W 1:25–4:25. Evening prelims. P. A. Arneson.
Lectures integrate the principles of pest control, ecology, and economics in the management of pest-crop systems. Laboratories consist of exercises to reinforce concepts presented in lecture and demonstrate pest monitoring techniques and the application of computer technology to management problems.]

**[452 Medical Entomology**
Fall. 3 credits. Prerequisites: Entomology 212 or permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10; lab, R 1:25–4:25. Staff.
A survey of arthropods of public health and veterinary importance, with emphasis on transmission dynamics of pathogens, bionomics of vector populations, and current control concepts. Morphology and taxonomy of selected groups are examined in the laboratory, with additional exercises in vector-pathogen relationships and epidemiological techniques.]

**[453 Insect Pathology**
Spring. 4 credits. Prerequisite: Entomology 212 or 241 or permission of instructor. Recommended: a course in microbiology.
Offered alternate years. Not offered 1989–90.
Lecs, M W 10:10; lab, R 1:25–4:25. J. P. Kramer.
A survey of the diseases of insects caused by viruses, bacteria, fungi, and protozoans and a consideration of the role of microbial diseases in natural and applied insect control. Laboratory investigations center around living insect-pathogen associations and the consequences of these associations for both insect and microbe.]

**[454 Insect Pathology Seminar**
Spring. 1 credit. Prerequisite: Entomology 453. S-U grades only. Offered alternate years. Not offered 1989–90.
Hours to be arranged. J. P. Kramer.
Presentations, discussions, and analyses of current topics by the participants. Focus centers on microbial diseases of insects.]

**455 Insect Ecology, Lectures (also Biological Sciences 455)**
Fall. 3 credits. Prerequisites: Biological Sciences 261 and Entomology 212 or their equivalents. Offered alternate years.
Lecs, W F 11:15 and 1 hour of discussion weekly to be arranged. R. B. Root.
Ecological and evolutionary principles are integrated by thorough examination of outstanding investigations. Topics discussed include the factors responsible for the great diversity of insects, adaptive syndromes associated with climate, natural history of arthropod guilds, impact of insects on terrestrial vegetation, population regulation, and the contrast between natural and managed ecosystems.

**464 Microevolution and Macroevolution (also Biological Sciences 464)**
Spring. 4 credits. Prerequisite: Biological Sciences 378 or consent of instructor. S-U grades optional with permission of instructor. Offered alternate years. Limited to 25 students.
Lecs, T R 10:10–11:30; disc, 1 hr/wk to be arranged. A. McCune, S. Via.
An advanced course in evolutionary biology integrating macroevolutionary and microevolutionary approaches. Areas of emphasis include patterns and processes of speciation, phylogeny reconstruction in populations and higher taxa, the origins and fate of variation, and causes of major evolutionary transitions. Discussion of these problems will involve data and approaches from genetics, morphology, systematics, paleobiology, development, and ecology.

**[470 Ecological Genetics (also Biological Sciences 470)**
Spring. 4 credits. Prerequisite: Biological Sciences 378 or consent of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10–11:30; disc, 1 hr/wk to be arranged. S. Via.
A study of the relationships between genetic and ecological processes in populations. Topics include consequences of genetic variation in age-structured populations, demographic concepts of fitness, evaluation of methods for measuring genetic variation and natural selection on ecologically important traits, genetics of competitive ability and predator avoidance, genetic and ecological aspects of phenotypic plasticity, character displacement, maintenance of genetic variability, and limits to selection. We will consider how theory can be used to formulate hypotheses about evolutionary mechanisms in natural populations and evaluate experiments designed to test such hypotheses.]

**471 Freshwater Invertebrate Ecology and Systematics**
Spring. 5 credits. Recommended: Entomology 212, Biological Sciences 261 or 262, and 462 or 464.
Lecs, T R 9:05; labs, T R 1:25–4:25. One evening prelim. B. L. Peckarsky.
The lecture explores the life histories, behavior, feeding ecology, and factors affecting distribution, abundance, and community structure of macroscopic freshwater invertebrates with an emphasis on insects. The laboratory involves field collections and laboratory identification of invertebrates and stresses the use of keys. Students may elect to conduct ecological field projects or to prepare a collection of freshwater invertebrates.

**472 Genetics of Pest Management**
Fall. 4 credits. Prerequisite: Biological Sciences 281 or equivalent. S-U grades optional.
Lecs, T R 12:20–1:45; lab to be arranged (3 hours). R. T. Roush.
A detailed survey of the application of genetics to pest management. Includes discussion of host plant resistance, pesticide resistance, insect mass rearing technology, autocidal controls (e.g., sterile males), and the establishment and genetic improvement of biological control agents, with examples from plant pathology, weed science, and entomology.

**483 Insect Physiology**
Spring. 4 credits. Prerequisite: Entomology 212 or permission of instructor.
Lecs, M W F 11:15; lab, W 1:25–4:25. Staff.
An introduction to the often unique ways in which insects have met their basic needs. Each organ system is examined with emphasis on basic principles and specific examples. The student will also be introduced to some common methods used in physiological research and to the critical reading of scientific literature.

**497 Special Topics for Undergraduates**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Undergraduates must attach to their course enrollment material written permission from the staff member who will supervise the work.
Staff.

**498 Undergraduate Teaching**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Undergraduate teaching assistance in an entomology course by agreement with the instructor. Undergraduates must attach to their course enrollment material written permission from the staff member who will supervise their work.
Staff.

**499 Undergraduate Research**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Undergraduates must attach to their course enrollment material written permission from the staff member who will supervise the work.
Staff.

**621 Acarology**
Fall. 4 credits. Prerequisites: Entomology 212 and permission of instructor. Offered alternate years.
Lecs, M W 9:05; lab, M 1:25–4:25. G. C. Eickwort.
An introduction to the taxonomy, morphology, and bionomics of mites and ticks, with emphasis on taxa of economic importance. A collection is required.

**[630 Field Entomology**
Spring. 2 credits. Prerequisites: Entomology 331 and permission of instructors. Offered alternate years. S-U grades optional. Not offered 1989–90.
Hours to be arranged. J. K. Liebherr, Q. D. Wheeler.
The course will be comprised of weekly meetings and an intensive two-week field trip. Evening meetings before the field trip will orient participants to chosen field sites, which will then be surveyed using advanced collecting techniques. After the trip, material will be processed for inclusion in the Cornell University Insect Collection. Students will be responsible for food costs while traveling to and from the field sites.]

**[631 Systematics of the Coleoptera**
Fall. 4 credits. Prerequisite: Entomology 331. Offered alternate years. Not offered 1989–90.
Lecs, M W 12:20; labs, M W 1:25–4:25. S field trips. Q. D. Wheeler.
A comprehensive review of the comparative morphology, phylogenetic relationships, classification, natural history, and distribution of the Coleoptera, including adult and immature stages. Laboratory practice in identification and methods for collection and study of beetles. A collection is required.]

**[633 Systematics of the Diptera and Hymenoptera**
Spring. 3 credits. Prerequisite: Entomology 331. Offered alternate years. Not offered 1989–90.
Lec and two labs, hours to be arranged. W. L. Brown.
Lectures on the classification, evolution, and bionomics of the Diptera and Hymenoptera. Laboratory studies on the literature, characters, and classification of representative genera and species of these orders, based on adult and immature stages.]

**634 Special Topics in Systematic Entomology**
Fall or spring; taught on demand. 2–4 credits. Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Lectures on the classification, evolution, and bionomics of selected taxa, with accompanying laboratory studies on identification and comparative morphology. Collections sometimes required.

**636 Seminar in Systematic Entomology**
Fall or spring. 1 credit. Prerequisite: permission of instructor. S-U grades only.
Hours to be arranged. Staff.
Discussion of current topics in systematic entomology. Topics to be announced, including current theoretical issues in insect classification, evolution, and biogeography.

**640 Pest Management: Quantitative Aspects**
Fall. 3 credits. Prerequisites: Entomology 444 and a course in statistics. Recommended: an introductory course in computer science. S-U grades optional. Offered alternate years.
Lecs and disc,T R 10:10–12:15. J. P. Nyrop.
Quantitative aspects of the development of pest and agricultural resource management systems. Systems analysis, modeling and simulation, sampling, quantitative biological research, and economics are covered in lectures. Discussions of philosophical issues and current and classical literature.

**[653 Advanced Insect Pathology**
Fall. 3 credits. Prerequisite: Entomology 453, Microbiology 290, or permission of instructor. S-U grades optional. Not offered 1989–90.
Hours to be arranged for lec and lab. D. W. Roberts.
Detailed presentations on the major diseases of insects caused by viruses, bacteria, fungi, protozoa, and nematodes. Emphasis will be on host-pathogen interactions, including at the cellular level. Also, molecular genetics and epizoological principles will be discussed. Laboratories will include practical aspects (such as bioassays) of working with each group.]

**[662 Insect Behavior Seminar**
Spring. 2 credits. Prerequisites: permission of instructors and Entomology 212 and Biological Sciences 221 or equivalents. S-U grades optional. Offered alternate years. Not offered 1989–90.
Hours to be arranged. G. C. Eickwort, M. J. Tauber.]

**664 Insect-Plant Interactions Seminar (also Biological Sciences 664)**
Spring. 2 credits. Limited to 15 students. Prerequisites: entomology, ecology, evolution, organic chemistry, and written permission of instructor. S-U grades optional. Offered alternate years.
One evening a week, to be arranged. P. P. Feeny.
For graduate students and seniors. Presentations and discussions by students on the evolution of patterns of interaction between plants and insects, emphasizing critical evaluation of concepts and evidence.

**672 Seminar in Aquatic Ecology**
Spring. 1 credit. Prerequisites: permission of instructor and either Entomology 471 or Biological Sciences 462, 464. S-U grades optional. Offered alternate years.
Hours to be arranged. B. L. Peckarsky.
Discussion and analysis of current topics in the ecology of streams and lakes, including synthesis of key papers in the literature. Reports on personal research or ideas by students are encouraged.

**674 Principles of Systematics (also Biological Sciences 674)**
Spring. 4 credits. Prerequisite: Entomology 331 or introductory systematics course in another field of biological sciences. Offered alternate years.
Lecs-disc-labs, M W 1:25–4:25. Staff (Q. D. Wheeler, coordinator).
An introduction to modern theory and methods of systematic biology. Lectures, readings, and discussions on theoretical systematics, including species concepts, classification, phylogenetics, and biogeography. Laboratories include various methods of analysis of data (e.g., cladistic hand and computer methods, numerical methods). Part of the grade is based on a final paper.

**677 Biological Control**
Fall. 3 credits. Prerequisites: Entomology 212, Biological Sciences 261, and permission of instructor. Offered alternate years.
Lecs, T R 9:05; lab, T 2–4:25. M. J. Tauber.
Theory and method of biological control of arthropod pests and weeds. Laboratory includes studies with living parasitoids and predators.

**685 Seminar in Insect Physiology**
Spring. 1 credit. S-U grades optional. Prerequisite: permission of instructor.
Hours to be arranged. Staff.

**[690 Insect Toxicology and Insecticidal Chemistry (also Toxicology 690)**
Spring. 4 credits. Prerequisites: general chemistry and organic chemistry. Undergraduate students by permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, M W F 9:05; lab, day to be arranged, 1:25–4:25. J. G. Scott.
The chemistry of insecticides and their metabolism and mode of action in insects and mammals.]

**707 Special Topics for Graduate Students**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Not for thesis research.
Staff.

**708 Graduate Research**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Not for thesis research.
Staff.

**709 Teaching Entomology**
Credit to be arranged.
Staff.
Teaching entomology or for extension training.

**710 Curation in Entomology**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. S-U grades only.
Hours to be arranged. J. K. Liebherr and staff.
The range of curatorial techniques required to operate an institutional insect collection will be investigated by working with staff. Curation of a specific taxon of interest will comprise part of the course of study.

**800 Master's-Level Thesis Research**
Credit to be arranged. Prerequisite: permission of instructor. S-U grades optional.
Staff.

**900 Doctoral-Level Thesis Research**
Credit to be arranged. Prerequisite: permission of instructor. S-U grades optional.
Staff.

**Jugatae Seminar**
Fall and spring.
M 4–5.
A seminar conducted by Jugatae, the entomology club of Cornell University, to discuss topics of interest to its members and guests.

## FLORICULTURE AND ORNAMENTAL HORTICULTURE: HORTICULTURAL SCIENCES

G. L. Good, chair; M. I. Adleman, N. L. Bassuk, A. M. Elliot, C. C. Fischer, C. F. Gortzig, J. Gruttadaurio, N. W. Hummel, Jr., T. H. Johnson, R. E. Kozlowski, D. W Krall, R. J. Lambert, R. W. Langhans, A. S. Lieberman, L. J. Mirin, R. G. Mower, K. W. Mudge, J. C. Neal, A. M. Petrovic, D. A. Rakow, R. T. Trancik, P. J. Trowbridge, T. C. Weiler, T. H. Whitlow

### Courses by Subject

Commercial floriculture-crop production: 410, 411
Floral design: 205, 210
Freehand drawing and illustration: see the section below, "Freehand Drawing and Scientific Illustration"
Horticultural physiology: 400, 405, 605
Horticultural sales and service businesses: 425
Independent study, research and teaching in floriculture and ornamental horticulture: 495, 496, 497, 498, 499, 500, 700, 800, 900
Introductory courses: 101,102
Landscape architecture (professionally accredited program): see the section below, "Landscape Architecture"
Landscape horticulture: Hort. Sci. 435, Landscape Architecture 140, 205, 220, 310, 312, 475, 521, 522
Nursery-crop production: 420
Plant materials: 230, 300, 301, 335, 342, 430
Postharvest physiology of horticultural crops: 315
Retail floriculture: 205, 210, 425
Seminars in floriculture and ornamental horticulture: 495, 600.
Turfgrass management: 435, 440

**101 Introduction to Horticultural Science**
Fall. 4 credits.
Lecs, M W F 10:10; lab, W 2–4:25.
C. F. Gortzig.
An introduction to horticulture in all of its components: floriculture, landscape horticulture, pomology vegetable crops, and related professional and commercial fields. Emphasis is on the history, geography, and literature of the field; the structure and organization of the component industries, institutions, and professions; and the role of science and technology in the continuing development of horticultural practice. Field trips are taken to horticultural firms, institutions, and historic sites.

**205 Floral Design**
Fall or spring. 2 credits. Each studio is limited to 22 students. Prerequisite: permission of instructor, with preference given to plant science majors, then to students in education, design, and journalism. Charge to purchase instructional plant materials that the student will keep: $75. Enrolled students who do not attend the first session and fail to notify the secretary in 20 Plant Science Building of their absence will automatically be dropped.
T or R 1:25–4:25. C. C. Fischer.
A study of the established floral design techniques of this country, presenting the principles and the mechanics of the art to prepare the student to design for varying themes and occasions. Other aspects include selection, preparation, and factors affecting keeping-quality of plant materials. Emphasizes the economical use of all supplies.

**210 Floral Design: Intermediate**
Fall. 2 credits. Prerequisite: Horticultural Sciences 205 or permission of instructor; preference given to students planning a career in retail horticulture. Charge to purchase instructional plant materials that the student will keep: $75.
Studio W 1:25–4:25. C. C. Fischer.
Advanced study of the art of floral design. The students assist in scheduling the design themes and occasions for floral display during the semester. Enrolled students who do not attend the first session and fail to report their absence to the secretary in 20 Plant Science Building will automatically be dropped.

**230 Woody Plant Materials**
Spring. 4 credits. Fee for lecture-laboratory manual: $25.
Lecs, T R 9:05; lab, T 2–4:25 and W or F 2–4:25. R. G. Mower.
A study of the trees, shrubs, ground covers, and vines used in landscape plantings. Emphasis is on winter identification and values for use as landscape material.

**300 Garden and Interior Plants I**
Fall. 3 credits. Fee for lecture-laboratory manual: $25.
Lecs, T R 10:10; lab, T 2–4:25.
R. G. Mower.
A study of ornamental plants used in garden and interior situations. The first seven weeks cover primarily herbaceous annuals and perennials, with the laboratory devoted to various practical gardening activities. The remainder of the semester covers the major kinds of foliage and flowering plants used in the home and in other interior landscape situations. Emphasis is on identification, use, and general cultural requirements.

**301 Garden and Interior Plants II**
Spring. 3 credits. Prerequisite: Horticultural Sciences 300 or permission of instructor. Fee for lecture-laboratory manual: $25.
Lecs, M W 11:15; lab, M 2–4:25.
R. G. Mower.
A continuation of Horticultural Sciences 300. The first seven weeks are devoted to a further study of interior plants, with emphasis on specialized groups of interior plants such as orchids, cacti and succulents, gesneriads, ferns, palms, and bromeliads. The second seven weeks are devoted to outdoor herbaceous plants, such as tulips, daffodils, crocuses, and irises, as well as other spring-blooming bulbs and perennial plants. Outdoor laboratories emphasize practical gardening activities appropriate to the spring season.

**315 Postharvest Physiology and Storage of Horticultural Crops**
Fall. 3 credits. Prerequisite: one horticulture course or permission of instructor.
Lecs, M W 9:05; lab, W 1:30–4. F. W. Liu.
The physiology—transpiration, respiration, ethylene synthesis and action, maturation, ripening, and senescence—of fruits, vegetables, flowers and ornamental crops is studied. Environmental factors influencing the physiological process, thus affecting the quality and marketability of the products, are considered. The principles and methods of harvesting, cleaning, grading, packing, precooling, waxing, sanitation, and transportation of the products are studied. Storage methods, including common storage, refrigerated storage, controlled-atmosphere storage, and hypobaric storage, are discussed.

**335 Woody Plant Materials for Landscape Use**
Fall. 3 credits. Limited to 30 students. Primarily for landscape architecture majors. Fee for lecture-laboratory manual, $25.
Lec, M W 9:05; lab, R 1:25–4:25.
R. G. Mower.
A study of the trees, shrubs, vines, and ground covers used in landscape plantings in the northeastern United States. Emphasis is on leaf identification and on characteristics that determine the usefulness of each as landscape subjects.

**[342 Taxonomy of Cultivated Plants (also Biological Sciences 342)**
Spring. 4 credits. Not offered 1989–90.
Lecs, M W 10:10; labs, M W 2–4:25.
A study of ferns and seed plants, their relationships and their classification into families and genera, emphasizing cultivated plants. Emphasis is on gaining proficiency in identifying distinguishing families and in preparing and using analytical keys. Attention is also given to the economic importance of taxa, to the basic taxonomic literature, and to the elements of nomenclature.]

**400 Principles of Plant Propagation**
Fall. 3 credits. Prerequisites: Biological Sciences 242 and 244 or another course in plant physiology. A field-trip fee will be charged.
Lecs, T R 8; lab, R 1:25–4:25.
K. W. Mudge.
Propagation of plants using vegetative techniques including cuttage, graftage, tissue culture, and propagation from seed. Physiological, environmental, and anatomical principles are stressed rather than hands-on techniques. Examples include horticultural, agronomic, and forestry crops.

**[405 Physiology of Horticultural Plants**
Spring. 4 credits. Prerequisites: Biological Sciences 242 and 244; 341 or permission of instructor. Not offered 1989–90.
Lec, M W F 8; lab to be arranged. Staff.
A study of the physiology of growth and development of horticultural plants in response to their environment.]

**410 Principles of Florist-Crop Production**
Spring. 4 credits. Limited to 40 students. Preference given to juniors. Prerequisites: Horticultural Sciences 400 and Biological Sciences 242 and 244 (may be taken concurrently), or equivalent, or permission of instructor. Offered 1990 and alternate years. Cost for field trip and special laboratory supplies: $60.
Lecs, M W F 8; lab, R 2–4:25.
T. C. Weiler.
A study of commercial production of florist crops with emphasis on their culture as influenced by greenhouse environment. Three field trips are made to commercial greenhouses.

**411 Greenhouse Production Management**
Spring. 4 credits. Primarily for seniors. Prerequisite: an elementary course in horticulture or equivalent. Cost of field trips: $150.
Lecs, T R 10:10–12:05; lab, 3 hours to be scheduled. Two field trips.
R. W. Langhans.
Intended to provide the latest information on efficient operation and administration of a commercial greenhouse, outside the sphere of production methods for specific crops. Consideration is given to the industry, centers of production, competition, location, types of structures, heating, ventilation, cooling, fertilizing, watering systems, and business analysis and management.

**420 Principles of Nursery-Crop Production**
Fall. 4 credits. Prerequisite: Horticultural Sciences 400.
Lecs, M W F 9:05; lab, M 2–4:25; field trips are included. G. L. Good.
Principles of commercial production of nursery crops to marketable stage, including postharvest handling and storage. Term project is required. Field trips are made to commercial nurseries.

**425 Horticultural Sales and Service Businesses**
Spring. 4 credits. Prerequisites: Agricultural Economics 240 and 347 or permission of instructor. Cost of field trips approximately $150.
Lecs, M W F 10:10; lab 1:25–4:25.
C. F. Gortzig.
A study of the application of horticultural, marketing, and management principles and practices in the operation of horticultural sales and service firms, e.g., garden centers, retail florist and nursery stores, wholesale marketing operations, mail order businesses, mass markets, interior and outdoor landscape service and related firms. Field trips are taken to commercial operations.

**430 Special Topics in Ornamental Plants**
Fall or spring. Credit to be arranged. Primarily for upperclass floriculture and ornamental horticulture majors. Prerequisites: Horticultural Sciences 230, 300, 301, 335, or the equivalent, and permission of instructor.
Hours to be arranged. R. G. Mower.
Topical subjects in plant materials. Independent and group study of important groups of woody and herbaceous plant materials not considered in other courses. The topic is given in the supplementary announcement.

**435 Landscape Management**
Fall. 4 credits. Prerequisites: Horticultural Sciences 230 or 335, and Biological Sciences 241 or permission of instructor. Biological Sciences 242 and 244 are desirable but not required.
Lec, M W F 12:20–1:10; lab T 1:25–4:25.
D. A. Rakow.
A study of the practices involved in the planting and maintenance of ornamental plants in the landscape. The two major emphases will be woody plants and turfgrass. The lectures will focus on the physiological bases for and logistics of essential management principles. The focus in the labs will be on hands-on practice.

**440 Turfgrass Management**
Fall. 3 credits. Prerequisites: Horticultural Sciences 435 or concurrent registration in Horticultural Sciences 435 and permission of instructor.
Lecs, T R 9:05; lab, R 10:10–12:05.
A. M. Petrovic.
Study of the scientific principles involved in the management of golf courses, athletic fields, parks, industrial grounds, and sod production. Emphasis is placed on pest management, irrigation design, and field diagnostic technology.

**495 Undergraduate Seminar**
Fall or spring. May be taken for one to three credits per semester. S-U grades only. Graduate students should enroll in Horticultural Sciences 600.
R 12:20. D. W. Krall, D. A. Rakow.
Undergraduate participation in departmental weekly seminar series.

**496 Internship in Horticultural Sciences**
Fall or spring. Credit variable. S-U grades optional. Prerequisite: permission of student's adviser in advance of participation in internship programs. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their study and assign their grade.
Staff.

**497 Independent Study in Horticultural Sciences**
Fall or spring. Credit variable. S-U grades optional. Prerequisite: permission of instructor(s). Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their study and assign their grade. Independent study in horticultural sciences under the direction of one or more staff members.

**498 Undergraduate Teaching Experience**
Fall or spring. Credit variable. S-U grades optional. Prerequisites: previous enrollment in course to be taught or equivalent, and written permission of the instructor. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their teaching experience and assign their grade.
Hours to be arranged.
Designed to give qualified undergraduate students teaching experience through actual involvement in planning and teaching horticultural sciences courses under the supervision of departmental faculty members. This experience may include leading discussion sections; preparing, assisting in, or teaching laboratories; and tutoring.

**499 Undergraduate Research**
Fall or spring. Credit variable. S-U grades optional. Prerequisite: permission of instructor. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their research and assign their grade.
Staff.
Undergraduate research projects in horticultural sciences.

**500 Master of Professional Studies (Agriculture) Project**
Fall or spring. 1–6 credits. (6 credits maximum toward MPS [Agriculture] degree). S-U grades optional.
Hours to be arranged. Graduate faculty.
A comprehensive project emphasizing the application of floricultural and ornamental horticultural principles and practices to professional horticultural teaching, extension, and research programs and situations. Required of Masters of Professional Studies (Agriculture) candidates in the field.

**600 Seminar**
Fall or spring. Open for credit to graduate students only. Undergraduates should register for Horticultural Sciences 495. S-U grades only. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the student's committee chair.
R 12:20. D. W. Krall and D. A. Rakow.
Graduate student participation in departmental weekly seminar series.

**[605 Current Topics in Floricultural and Ornamental Horticultural Physiology**
Spring. Variable credit. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. Staff.
Discussions of modern concepts, research, and commercial problems as reflected in current horticultural literature.]

**629 Special Topics in Plant Science Extension (also Plant Breeding 629)**
Spring. 2 credits.
F 1:25–4:25. W. D. Pardee.
Designed for graduate students and advanced undergraduates to provide a broader knowledge of cooperative extension philosophy and methods. Developed for students interested in extension and research in public and commercial organizations. Topics relate to extension in other countries as well as in the United States.

**700 Graduate Teaching Experience**
Fall or spring. Credit variable. Open only to graduate students. Undergraduates should enroll in Horticultural Sciences 498. S-U grades optional. Prerequisite: permission of instructor. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their teaching and assign their grade.
Hours to be arranged.
Designed to give graduate students teaching experience through actual involvement in planning and teaching courses under the supervision of departmental faculty members. The experience may include leading discussion sections; preparing, assisting in, or teaching laboratories; and tutoring.

**800 Thesis Research, Master of Science**
Fall or spring. Credit to be arranged. S-U grades only. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their research and assign their grade.
Staff.

**900 Thesis Research, Doctor of Philosophy**
Fall or spring. Credit to be arranged. S-U grades only. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their research and assign their grade.
Staff.
See also other courses in Horticultural Sciences.

## Freehand Drawing and Scientific Illustration

**109 Nature Drawing**
Fall. 3 credits. Limited to 25 students. S-U grades optional.
M W F 10:10–12:05. R. J. Lambert.
A beginning course with emphasis on the drawing of natural forms: plants, animals, and landscapes. Of particular interest to students in floriculture and ornamental horticulture, landscape architecture, biological sciences, nature education, etc. Outside field notebook assignments.

**111 Freehand Drawing**
Fall or spring. 3 credits. Each section limited to 25 students. S-U grades optional. Credit may not be received for both Freehand Drawing 109 and 111.
Fall: lec, R 10:10; studios, T 9:05–11, R 1:25–4. Spring: permission of instructor required (registration must specify lecture hour and all studio hours). Lec, T or W 10:10, plus 5 additional studio hours to be scheduled in 2- or 3-hour blocks during M T W R F 9:05–12:20 and T 1:25–4. A. Elliot.
Developing accuracy of observation and a personal graphic vocabulary. Freehand perspective and its uses in establishing design and spatial relationships, practice in figure and landscape drawing, form vs. value drawing. Weekly outside sketchbook assignments.

**210 Architectural Sketching in Watercolor**
Summer. 3 credits. S-U grades optional.
M T W R F 11:30–12:45. R. J. Lambert.
Practice in outdoor architectural sketching, primarily in watercolor, but including pen and ink, pencil, and colored pencil. Studio will develop working sketches into complete renderings. Principles of perspective are taught and applied. For any student who wishes to develop skill in handling watercolor. Outside-of-class sketchbook work required.

**211 Freehand Drawing and Illustration**
Fall. 2 credits. Prerequisite: Freehand Drawing 111 or equivalent. S-U grades optional.
6 studio hours scheduled in 2- or 3-hour units between 9:05 and 12:05 M T W R F. R. J. Lambert.
Progression to the organization of complete illustrations. Subject matter largely from sketchbooks, still life, and imagination. Composition, perspective, and ways of rendering in different media are considered.

**214 Watercolor**
Spring. 2 credits. Prerequisite: Freehand Drawing 111 or equivalent. S-U grades optional.
6 studio hours scheduled in 2- or 3-hour units between 9:05 and 12:05 M T W R F. R. J. Lambert.
A survey of watercolor techniques. Subject matter largely still life, sketchbook, and on-the-spot outdoor painting.

**316 Advanced Drawing**
Fall or spring. 2 credits. Prerequisite: Freehand Drawing 211 or permission of instructor. S-U grades optional.
6 hours to be arranged. A. Elliot or R. J. Lambert.
For students who want to attain proficiency in a particular type of illustration or technique.

**417 Scientific Illustration**
Fall. 2 credits. Prerequisite: Freehand Drawing 211 or 316 or equivalent. S-U grades optional for graduate students only.
6 studio hours scheduled between 9:05 and 12:05 M W F. A. Elliot.
A survey of methods of illustration. Training in techniques of accurate representation in media suitable for reproduction processes, including pen and ink, scratchboard, wash, and mixed media.

## Landscape Architecture

**100 Landscape Architecture Freshman Orientation**
Fall. 1 credit. Limited to freshman majors. S-U grades only.
T 2–4. M. I. Adleman.
Introduction to resources supporting Landscape Architecture at Cornell.

**140 Landscape Design Studio**
Spring. 4 credits. Limited to approximately 15 students; primarily for nonmajors and freshman landscape architecture students. Prerequisite: permission of instructor. Lab fee, $20.
Lecs, T R 1:25; studio, T R 2:30–4:25. D. W. Krall.
Fundamentals of landscape design applied to residential and other small-scale site-planning projects. Work in the studio introduces course participant to the design process, design principles, construction materials, planting design, and graphics.

**201 Theory and Application Studio**
Fall. 6 credits. Limited to landscape architecture majors. Cost of basic drafting equipment and supplies, about $200; expenses for field trip, about $200.
M W F 1:25–4:25. Required field trip. M. I. Adleman.
Basic design principles and processes applied to the design of the outdoor environment. Studio projects focus on the analysis, organization, and form of outdoor space through the use of three-dimensional components including structures, vegetation, and earthform.

**202 Project Design and Site-Planning Studio**
Spring. 6 credits. Prerequisite: LA 201 with a grade of C or better. Cost of drafting supplies, about $100.
M W F 1:25–4:25. T. H. Johnson.
Site design and planning for parks, housing, and architectural ensembles. Basic theory, historic precedents, and the design process are correlated with garden landscapes, open-space systems, earth form, vegetation, and circulation systems.

**205 Graphic Communication**
Fall. 3 credits. Prerequisite: concurrent enrollment in LA 201 or LA 501 or permission of instructor. Cost of supplies, about $30.
Lecs, T R 9:05–11. T. H. Johnson.
Basic skills in graphic presentation, including pencil-and-ink drawing and drafting techniques applicable to landscape architecture projects. Freehand drawing, orthographic projection, axonometric projection, and lettering are covered in the course.

**220 Principles of Spatial Design and Aesthetics (also City and Regional Planning 481)**
Fall. 3 credits.
Lecs, M W 10:10; disc, F 10:10. R. T. Trancik.
Basic principles involved in design theory, interpretation, and methodology as they are applied to shaping the outdoor environment. Students are introduced to spatial design vocabularies for a variety of environmental scales and spatial types.

**301 Natural Systems and Planting Design Studio**
Fall. 6 credits. Prerequisite: LA 202 with a grade of C or better. Lab fee $20; cost of drafting supplies, about $100; expenses for field trip, about $200.
Lecs, M W F 1:25; studios, M W F 2:30–4:25. Required 5-day field trip. D. W. Krall.
The application of planning processes and techniques at a regional scale. Students examine the management of landscape units within physiographic and/or politically defined areas using state-of-the-art methodologies.

***302 Urban Landscape Systems Studio**
Spring. 6 credits.
L. Mirin.

**310 Site Construction**
Spring. 4 credits. Prerequisite: permission of instructor. Fee $20.
Lecs, M W 9:05; studio,T R 9:05–11. P. J. Trowbridge.
Construction materials, specifications, cost estimates, and methods used by landscape architects in project implementation. The course includes lectures, studio problems, and development of construction documentation for a selected project.

**312 Site Engineering for Landscape Architects**
Spring. 4 credits. Prerequisite: completion of LA 310 with a grade of C or better.
Lecs, M W 9:05; studios, M W 10:10–12:05. M. I. Adleman.
Lectures and studio projects focusing on the development of a working knowledge of site grading, earthwork, storm-water management, site irrigation, site layout, and road alignment.

**401 Advanced Project Design and Graphics Studio**
Fall. 6 credits. Prerequisites: LA 205 with a grade of C or better and LA 302 with a grade of C or better. Cost of supplies, about $100; basic expenses for field trip, about $200.
M W F 1:25–4:25. Required field trip. R. T. Trancik.
A sequence of projects introducing students to advanced skills in spatial design, and historic precedent in an urban context.

**402 Senior Project Studio**
Spring. 6 credits. Prerequisite: completion of LA 401 or of the Denmark landscape architecture studio with a grade of C or better. Cost of supplies and reproductions, about $200.
M W F 1:25–4:25. M. I. Adleman.
Site design and construction developed for a specific project as an evaluation of each student's professional competency in landscape architecture.

**412 Professional Practice**
Spring. 1 credit.
Lec. F 11:15. K. Wolf.
Presents the student with a comprehensive understanding of the role of the professional landscape architect and the problems and opportunities one may encounter in an office or other professional situations. Topics discussed include practice diversity, marketing professional services, office and project management, construction management, computers in the profession, and ethics.

**490 Special Topics in Landscape Architecture**
Fall or spring. 1–3 credits; may be repeated for credit. S-U grades optional.
Staff.
Topical subjects in landscape architectural design, theory, history, or technology. Group study of topics not considered in other courses.

**497 Independent Study in Landscape Architecture**
Fall or spring. 1–5 credits; may be repeated for credit. S-U grades optional.
Staff.
Work on special topics by individuals or small groups.

***501 Theory and Application Studio**
Fall. 6 credits.
L. Mirin.

**502 Project Design and Site-Planning Studio**
Spring. 6 credits. Limited to graduate students. Cost of drafting supplies, about $100.
Lecs, M W F 1:25; studios, M W F 2:30–4:25. D. W. Krall.
The studio will focus on the spatial design of project-scale site development. Students will develop their expertise in applying the design theory, vocabulary, and graphic expression introduced in LA 501.

***520 Contemporary Issues in Landscape Architecture**
Fall. 2 credits.
L. Mirin.
*Offered through the College of Architecture, Art, and Planning.

***521 History of European Landscape Architecture**
Fall. 3 credits.
L. Mirin.

***522 History of American Landscape Architecture**
Spring. 3 credits.
L. Mirin.

**531 Regional Landscape Planning I**
Fall. 4 credits. Prerequisite: permission of instructor.
Lecs, T R F 9:05 plus 1 hour disc to be arranged. A. S. Lieberman.
Landscape ecology as a basis for regional landscape planning. Regional landscape planning strategies and methods that have been developed and employed in North America, Europe, Australia, and the Middle East. This course is intended to provide a base for understanding the utilization of landscape ecological knowledge in the planning process. It is presented through a series of lectures, readings, class discussions, exercises, and review of case studies. The course is directed to graduate students in landscape architecture, architecture, city and regional planning, ecology, international studies, international agriculture and rural development, and natural resources.

**601 Advanced Project Design Studio**
Fall. 6 credits. Limited to graduate students. Cost of supplies, about $100; expenses for field trip, about $200.
M T R 1:25–4:25. Required field trip. T. H. Johnson.
Advanced studio linking master planning and detail design sequences while including diverse issues such as design research, project management, and environmental impact.

**602 Urban Systems Studio (also City and Regional Planning 555)**
Spring. 6 credits. Limited to graduate students. Cost of drafting supplies, about $100.
M T R 1:25–4:25. R. T. Trancik and staff.
Application of urban-design and town-planning techniques to specific contemporary problems of city environments. Issues of urbanism are investigated and applied to physical design interventions and spatial typologies involving the street, square, block, garden, and park systems. Urban land-use development and public and private implementation of urban-design plans are examined. This is a specially arranged collaborative studio with the Department of City and Regional Planning.

**611 Site Engineering for Landscape Architects**
Fall. 4 credits.
Lec, M W 9:05; studios M W 10:10–12:05. M. I. Adleman.
Lectures and studio projects focusing on the development of a working knowledge of site grading, earthwork, storm-water management, and road alignment.

***621 Summer Internship Seminar**
Fall. 2 credits.
L. Mirin.

**634 Landscape Architectural Research**
Spring. 3 credits.
M W 10:10. T. H. Johnson.
An introduction to general research methods and to the diversity of landscape architectural research. Focus will be on practical, descriptive, qualitative, and archival methods as a bridge between the design professions and the traditional research professions.

***650 Fieldwork or Workshop in Landscape Architecture**
Fall or spring. 1–5 credits.
L. J. Mirin.

**690 Independent Study in Landscape Ecology and Regional Landscape Planning**
Fall. 1–3 credits. Limited to 7 students. Prerequisite: permission of instructor. S-U grades optional.
A. S. Lieberman.
This course is designed to allow students who have taken LA 531 to engage in advanced readings and research in the human ecosystem science of landscape ecology. Also designed for other students who wish to gain familiarity with the conceptual and practical tools offered by landscape ecology. Open to graduate students in landscape architecture, city and regional planning, ecology, international studies, international agriculture and rural development, and natural resources. The course allows participants to engage in research or study leading to thesis preparation.

**701 Natural Systems and Planting Design Studio**
Fall. 6 credits. Limited to graduate students. Cost of drafting supplies, about $100; expenses for field trip, about $200.
M W F 1:25–4:25. Required field trip. P. J. Trowbridge.
An application of design and planning methods within large physiographic or political units. Course participants will be engaged in the use of soil maps, aerial photographs, remote-sensed images, census data, and techniques for manipulating large, complex data bases. The course focuses specifically on plant communities.

**800 Master's Thesis in Landscape Architecture**
Fall or spring. 9 credits.
Hours to be arranged. Staff.
Independent research, under faculty guidance leading to the development of a comprehensive and defensible design or study related to the field of landscape architecture. Work is expected to be completed in final semester of residency.

*Offered through the College of Architecture, Art, and Planning

## FOOD SCIENCE

R. A. Ledford, chair; R. C. Baker D. K. Bandler, D. M. Barbano, C. A. Batt, D. H. Beermann, J. Brady, A. K. Datta, D. C. Graham, R. B. Gravani, P. F. Hopper, J. H. Hotchkiss, J. E. Kinsella, H. T. Lawless, E. A. Leonard, F.W. Liu, D. D. Miller, N. N. Potter, J. M. Regenstein, S. S. H. Rizvi, J. W. Sherbon, R. R. Zall

**100 Introductory Food Science**
Fall. 3 credits.
M W F 10:10. N. N. Potter.
A comprehensive introduction to food science and technology—its scope, principles, and practices. Topics are constituent properties; methods of preservation; the major food groups, including their handling and processing; and current problems such as chemical additives and world feeding needs. Interrelationships between chemical and physical properties, processing, nutrition, and food quality are stressed.

**101 Topics in Food Science**
Fall. 1 credit. Limited to food science majors taking Food Science 100. Prerequisite: Food Science 100. A required companion course to Food Science 100.
Lec and disc, F 11:15. N. N. Potter and staff. Members of the staff lecture and lead discussion on selected topics.

**150 Food Choices and Issues**
Spring. 2 credits. S-U grades optional.
Lecs, T R 12:20. D. Miller, R. B. Gravani, and staff.
This course provides nonmajors with the knowledge they need to make appropriate food choices. Lectures will emphasize: concepts necessary for selecting nutritious diets and interpreting popular nutrition literature; the impact of food science and technology on food choices; the quality characteristics of the major food commodity groups; current issues affecting food choices, availability, and distribution.

**210 Food Analysis**
Spring. 3 credits. Prerequisite: Chemistry 104 or 208.
Lecs, M F 12:20; lab, M F 1:25–4:25. J. W. Sherbon.
Designed to acquaint the student with chemical tests used by food analysts. Emphasis is on understanding and use of good analytical techniques, including gravimetric, volumetric, and spectrophotometric methods. Procedures for screening, routine quality control, and official tests for fats, proteins, carbohydrates, and selected minor nutrients are introduced.

**220 Food Science for Industry**
Fall. 2 credits.
Lec and lab, F 12:20–4:25. Field trips. R. C. Baker.
Provides understanding of food industry operations. Half the laboratories are production of food products (such as sausages and pastries) by students and half are visits to commercial plants producing those products. One or two longer field trips will be offered.

**247 Postharvest Food Systems**
Fall. 2 credits. Prerequisite: freshman chemistry. S-U grades optional.
T R 10:10. M. C. Bourne and staff.
An interdisciplinary course designed for all undergraduate and graduate students in ALS that describes postharvest food losses and methods to reduce the loss. Topics include storage and care of unprocessed and minimally processed foods such as cereal grains, fruits, vegetables, tubers, and fish; biology and control of fungi, insects, and vertebrates in foods; chemical causes of quality loss; simple drying and storage practices; effects of climate; and economic and social factors affecting food preservation and storage. Emphasis is given to the problems in developing countries.

**[301 Nutritional Aspects of Raw and Processed Foods (also Nutritional Sciences 301)**
Spring. 3 credits. Prerequisites: organic chemistry and Food Science 100 or Nutritional Sciences 115. S-U grades optional. Not offered 1989–90.
M W F 9:05. D. D. Miller.
An evaluation of factors affecting the nutritional quality of foods and diets. Nutritional quality is defined. Methods and approaches for assessing nutritional quality are presented. Factors that may alter the nutritional quality of foods and food supplies (e.g., agricultural practices, processing, storage, cooking, government regulations, new technologies, fortification) are discussed.]

**311 Milk and Frozen Desserts**
Fall. 2 credits. Prerequisite: Food Science 322 or permission of instructor. Offered alternate years.
Lec, R 12:20; lab, R 1:25. J. W. Sherbon.
Deals with the principles and practices of processing fluid milk products and frozen desserts. The chemical, microbiological, and technological aspects of processing these dairy products are considered.

**312 Technology of Poultry, Fish, and Other Meats**
Fall. 3 credits. Prerequisite: organic chemistry.
Lec, T R 8–9:55. J. M. Regenstein.
Intended to give a unified introduction to the food technology of poultry, seafood. and other meats and to relate the underlying chemistry, biochemistry, and physiology of muscle to these technologies. Social, political, and economic factors will be discussed in terms of their effects on the technology.

**321 Food Engineering I**
Fall. 4 credits. Prerequisites: physics and Food Science 100.
Lecs, M W F 11:15; lab, T 1:25–4:25. S. S. H. Rizvi.
Intended to give food science students an introduction to the engineering aspects of food processes and equipment. Emphasis on the fundamental concepts of momentum, heat, and mass-transport processes.

**322 Food Processing I**
Spring. 3 credits. Prerequisites: Food Science 100 and 321 and Microbiology 290 and 291.
Lecs, T R 10:10; lab, T 1:25–4:25. N. N. Potter, R. R. Zall.
Deals with the principles and practices of concentration, drying, and freezing applied to foods. Current processing methods and their relations to the chemistry, microbiology, and technology of raw materials and final products are discussed.

**331 Statistical Quality Control of Food Processing**
Spring. 1 credit. Prerequisite: Agricultural Economics 310 or equivalent.
Lab, R 1:25–4:25. G. Houghton.
An introduction to the statistical tools used to control quality in food-processing plants. Topics covered include estimating product variability, estimating shelf life, using control charts, and doing acceptance sampling.

**351 Milk Quality**
Spring. 1 credit. Prerequisite: Animal Science 350 or equivalent or permission of instructor.
F 12:20. D. K. Bandler.
Focuses on the important aspects of farm sanitation and milk handling as they affect milk flavor and quality. The course is an overview of quality control tests, basic microbiology, cleaning and sanitizing, and special problems in manufacturing and marketing fresh and storable dairy products.

**394 Food Microbiology Lectures**
Fall. 2 credits. Prerequisites: Microbiology 290 and 291.
M W 12:20. D. C. Graham, C. A. Batt, R. B. Gravani.
The major families of microorganisms of importance in foods are studied systematically, with emphasis on the roles of those organisms in food preservation, food fermentations, and public health.

**395 Food Microbiology Laboratory**
Fall. 2 credits. Graduate students must have permission of the instructor.
M W 2–4:25. R. A. Ledford.
Work includes study of the physiological characteristics of representative food microorganisms, practice in using general and special methods for microbiological testing and control of food products, and practice in isolating and characterizing organisms of importance in foods.

**396 Food Sanitation as Related to Public Health and Food Plant Processing**
Spring. 2 credits. Prerequisite: Food Science 100.
Lec, T R 9:05. R. R. Zall.
Deals with measures essential in producing and processing wholesome and safe foods. Rules and regulations of the Food and Drug Administration, the U.S. Department of Agriculture, and other organizations important to the food industry are covered. Sanitation practices as they relate to plant construction, unit operation, and storage practices are discussed.

**400 Senior Seminar in Food Science and Technology**
Spring. 1 credit. Limited to seniors.
Lec, M 4:30. R. A. Ledford, D. K. Bandler.
With assistance of faculty members, students complete a study of the literature on topics of current interest in food science and technology. Students make oral and written reports.

**401 Concepts of Product Development**
Spring. 2 credits. Prerequisite: Food Science 100 or equivalent. Offered alternate years.
M W 9:05–9:55. J. H. Hotchkiss.
A discussion of the sequence of events in developing and marketing new food products. Topics include packaging and labeling, food additive and ingredient regulations, taste panels, market testing, market research, and patents.

**402 Product Development Laboratory**
Spring. 2 credits. Limited to food science majors. Prerequisites: concurrent registration in Food Science 401 and permission of instructor. S-U grades optional. Offered alternate years.
Labs, T R 8–9:55. J. H. Hotchkiss.
Emphasis is on gaining practical experience in the development of new foods.

**[403 International Food Science and Development**
Spring. 3 credits. Offered alternate years. Not offered 1989–90.
Lecs, T R 8:30–9:55. D. C. Graham.
A critical evaluation of humanity's needs for food in the world and the international food technologies, organizations, and policies to meet such needs. Novel extrusion, ultrafiltration, and fermentation food processes and basic nutrient foods for developing countries are described.]

**[404 Technology of Lipid Foods**
Spring. 2 credits. Prerequisite: Biological Sciences 231. Offered alternate years. Not offered 1989–90.
Lec, M 12:20; lab, M 1:25–4:25. J. W. Sherbon.
Sources and utilization of food fats and the technologies of extraction and processing will be studied. The functional properties of fats as food ingredients will be covered. Special features of the chemical and physical reactions of fats will be stressed throughout the term.]

**405 Waste Management and Energy Conservation**
Spring. 2 credits. Prerequisite: FS 100 or its equivalent. Offered alternate years.
Lec, M 12:20, lab, M 2–4:25. R. R. Zall.
Field trips, laboratories, and demonstrations. Deals with the principles and practices related to managing, reducing, and reclaiming wastes from food plants and other unit operations important to the food industry. Selected types of methods used to conserve energy will be covered.

**406 Food Processing Fermentations Lectures**
Fall. 2 credits. Prerequisite: background in microbiology.
Lecs, T R 11:15. R. A. Ledford.
Principles and practices of lactic acid fermentation processes as they apply to cheeses, cultured dairy foods, meats, vegetables, and related products.

**[408 Food Processing Fermentations Laboratory**
Fall. 2 credits. Enrollment limited. Prerequisite: concurrent registration in Food Science 406. Offered alternate years. Not offered 1989–90.
Lab, T 1:25–4:25. Staff.
Laboratory exercises and demonstrations in the making of cheeses and cultured dairy foods and related products. A field trip provides additional experience.]

**409 Food Chemistry**
Spring. 4 credits. Prerequisite: introductory biochemistry.
Lecs, T R 11:15–1:10. J. E. Kinsella, J. M. Regenstein, J. P. VanBuren.
Deals with the relationship between the chemical composition and chemical and physical properties of foods. Attention is given to the interactions among the components of food. The effects of processing on quality, functional attributes and nutrient bioavailability are emphasized.

**410 Sensory Evaluations of Foods**
Fall. 3 credits. Prerequisite: statistics.
Lecs, M W F 10:10. H. T. Lawless.
Deals with the sensory techniques used in evaluating the flavor, color, and texture of foods and the evaluation of consumer acceptance. Includes methods for measuring these qualities, underlying psychological principles, statistical methods for analyzing results, and establishing a full-service sensory evaluation program.

**[411 Food Mycology**
Fall. 3 credits. Prerequisite: Microbiology 290 or 291 or equivalent. Recommended: Microbiology 394. Offered alternate years. Not offered 1989–90.
Lecs, T R 11:15; lab, W 1:25–4:25. D. C. Graham.
To acquaint students with important fungi, from the standpoint of their beneficial as well as their harmful effects in food production, preservation, and spoilage. Laboratories deal with morphology, physiology, culture and isolation, identification of fungi, and isolation and quantification of fungal toxins.]

**415 Principles of Food Packaging**
Fall. 3 credits.
M W F 9:05. J. H. Hotchkiss.
The chemical and physical properties and manufacture of the basic material used to construct packaging are discussed. Specific packages currently used for individual food commodity groups are also presented with emphasis on newer technologies. Economics, design, and regulation of food packaging are briefly presented.

**[416 Food Packaging Laboratory**
Spring. 2 credits. Prerequisite: Food Science 415. Offered alternate years. Not offered 1989–90.
Lec, F 8; lab to be arranged. J. H. Hotchkiss.
A laboratory course designed to introduce several testing methods used to evaluate adequacy of food packaging. Emphases are on physical testing methods of packaging materials and the evaluation of total packages. Students will design and build a new food package.]

**419 Food Chemistry Laboratory**
Spring. 2 credits. Prerequisites: Biological Sciences 330 or 331 and concurrent registration in Food Science 409.
Lab, W 12:20–4:25. D. D. Miller.
Intended to complement Food Science 409 in developing an understanding of the chemistry of food. Laboratory exercises deal with the chemical properties of food components and changes these components undergo in processing and storage. The relationship between the chemical composition of foods and functional, nutritional, and organoleptic properties is stressed.

**421 Food Processing II**
Fall. 2 credits. Prerequisite: Food Science 322.
Lecs, T 10:10; lab, R 1:25. S. S. H. Rizvi.
Principles and practices of thermal processing of foods, with emphasis on kinetics of destruction of microorganisms and quality factors. Laboratory measurement of kinetic data, retort processing, and lethality evaluation.

**422 Food Engineering II**
Spring. 3 credits. Prerequisite: Food Science 421.
Lecs, M W F 10:10. S. S. H. Rizvi, M. R. McLellan.
Application of transport and unit operations to food processes. Engineering aspects of food plant operations and automation, with emphasis on future directions.

**456 Advanced Concepts in Sensory Evaluation**
Spring. 2 credits. Prerequisite: Food Science 410.
Lecs, F 1:25–3:25. H. T. Lawless.
Readings and discussions of primary source materials in sensory evaluation, including historical perspectives, psychophysics, perceptual biases, human information processing. Concepts influencing detection of sensory differences, use of rating scales, and characterization of sensory properties will be emphasized.

**496 Extension Methods in Food Science**
Fall. 2 credits. Offered in alternate years.
F 1:25–4:25. D. K. Bandler.
A series of lectures, demonstrations, and practical exercises to improve the basic communication skills of the food scientist. The course will deal specifically with presenting scientific data in oral, visual, and written form.

**497 Special Topics in Food Science**
Fall or spring. 3 credits maximum. Prerequisite: permission of instructor. S-U grades optional.
Staff.
For the food science student. May include individual tutorial study, a special lecture topic selected by a professor or a group of students, or selected lectures of a course already offered. As topics may be changed, the course may be repeated for credit.

**499 Undergraduate Research in Food Science**
Fall or spring. 4 credits maximum. S-U grades optional. Students must attach to their course enrollment materials written permission from the staff member who will supervise the work and assign the grade. Except for students enrolled in the honors program, credit will be limited to 4 credits total.
Hours to be arranged. Staff.
Independent study.

**600 Seminar**
Fall or spring. 1 credit. Required of all food science graduate students. S-U grades only.

**[601 Food Protein Chemistry**
Fall. 3 credits. Not offered 1989–90. Limited to graduate students and to seniors with permission of instructor. Prerequisite: Food Science 409 or equivalent.
Lecs, M W F 9:05. J. M. Regenstein.
The chemistry and physical chemistry of proteins are discussed critically with respect to current methods of characterizing and purifying proteins. Food protein functionality is emphasized.]

**602 Computers in Food Laboratories**
Fall. 3 credits. Prerequisite: introductory physics.
Lec, M 12:20; 2 labs per week, hours to be arranged. G. Houghton.
An introduction to computers as tools for data acquisition, process control, and data analysis in food science. Independently scheduled labs will teach basic analog and digital electronics, computer function and programming, the interfacing of computers with laboratory and industrial equipment, and the use of data analysis software. A background in computers or electronics is not required.

**[604 Chemistry of Dairy Products**
Fall. 2 credits. Limited to 16 students. Prerequisites: organic chemistry, biochemistry, knowledge of dairy-product manufacturing procedures, and permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, F 1:25–3:30. D. M. Barbano.
A detailed study of milk constituents and their properties. Properties of various milk constituents are related to observed physical and chemical changes that occur in dairy products during and after processing. This course will emphasize current research in dairy chemistry.]

**[605 Physical Chemistry of Food Components**
Fall. 3 credits. Prerequisite: an undergraduate course in physical chemistry. Offered alternate years. Not offered 1989–90.
Lecs, M W F 10:10. J. W. Brady.
This course will cover the physical properties of food molecules. Emphasis will be placed on the molecular basis of structural characteristics; colloidal properties; molecular interactions; foams, gels; and water binding of foods.]

**[606 Instrumental Methods**
Fall. 3 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, M W 8; lab, M 1:25–3:20, alternate weeks. J. W. Sherbon.
Deals with instrumental methods widely used in research and industry. Includes chromatography, spectroscopy, electrophoresis, and thermal analysis. The stress is on the theoretical and practical aspects of the material presented. After the introduction, students will schedule laboratory time at their convenience.]

**607 Advanced Food Microbiology**
Spring. 2 credits. Prerequisites: food microbiology, genetics (preferred). Offered alternate years.
M W 11:15. C. A. Batt.
Primary emphasis will be to review new methods for detecting microorganisms and their products by DNA-DNA hybridization, monoclonal antibodies, etc. The theory and application of genetic engineering for improvement of microorganisms used in the food and other industries will be addressed.

**608 Food Color and Food Pigments**
Fall. 1 credit. Prerequisite: organic chemistry. Offered alternate years.
Lec, F 11:15. J. P. VanBuren.
A survey of chemical and physical properties of the major intrinsic food pigments and their stability during processing and storage. Chemical and physical origins of color. Food color as an indicator of other food qualities. Color and pigments of selected commodities are examined.

**[609 Rheology**
Spring. 3 credits. Prerequisites: Food Science 321 and 605 or permission of instructor. Not offered 1989–90.
Lec, M W 11:15; lab, R 1:25–4:25. Staff.
Fundamental concepts of rheology applied to foods, with emphasis on the relations between molecular structure and rheological behavior. The laboratory will cover the main rheological techniques. Examples of rheological behavior of gels, suspensions, emulsions, doughs.]

**610 Introductory Chemical and Environmental Toxicology (also Toxicology 610)**
Fall. 3 credits. Prerequisites: biochemistry and animal physiology.
Lecs, M W F 11:15. J. H. Hotchkiss and staff.
Introduction to the concepts and essentials of toxicology. The various biological responses to toxicants and the *in vivo* and *in vitro* methods of assessing toxicity, as well as the role of epidemiology, will be discussed. The chemical and biological factors that affect toxicity and specific sources of toxicants, including air pollution, agriculture, industrial processes, foods, naturally occurring toxicants, and social poisons will be presented. Regulation of toxic materials will be introduced.

**[615 Secondary Plant Metabolites in Foods**
Fall. 1 credit. Prerequisite: Biological Sciences 330 or 331. Offered alternate years. Not offered 1989–90
Lec, F 9:05. G. Hrazdina.
Deals with the chemistry and biochemistry of secondary plant metabolites (chlorophyll, lignin, flavonoids, alkaloids, terpenes, carotenoids, steroids, and cyanogenic glycosides) and their importance to food products. Emphasis is on the chemical and biochemical properties of these compounds, their occurrence in edible plants, their reactions, and influence on food products.]

**620 Food Carbohydrates (also Nutritional Sciences 620)**
Spring. 2 credits. Limited to qualified seniors and graduate students. Prerequisite: Biological Sciences 330 or equivalent. Offered alternate years.
Lecs, T R 10:10. B. A. Lewis, J. W. Brady.
A consideration of the chemistry of carbohydrates, including sugars, starches, pectins, hemicelluloses, gums, and other complex carbohydrates. Emphasis is on the intrinsic chemistry and functionality in food systems and the changes occurring during food processing and storage.

**665 Engineering Properties of Foods (also Agricultural and Biological Engineering 665)**
Fall. 2 credits. Prerequisite: course in transport processes or unit operations as applied to foods; or permission of instructor. Offered alternate years.
Lecs, T R 12:20. S. S. H. Rizvi, A. K. Datta.
Theories and methods of measurement and prediction of rheological, thermal, and mass transport properties of foods and biomaterial systems. Emphasis is on physical-mathematical basis of measurement as well as the prediction processes. Examples of appropriate use of these properties in engineering design and analysis of food processes will also be provided.

**800 Research**
Fall or spring. Credit to be arranged. Maximum credit, 10/semester. Limited to master's and doctoral candidates with permission of the graduate field member concerned. S-U grades only.

**Related Courses in Other Departments**

**Computing in Agricultural and Biological Engineering (ABEN 151)**

**Food Engineering: Design of Equipment and Processes (ABEN 466)**

**Marketing (Agricultural Economics 240)**

**Food Industry Management (Agricultural Economics 443)**

**Meat Science (Animal Science 290)**

**Commercial Meat Processing (Animal Science 490)**

**Advanced General Microbiology Lectures (Microbiology 390)**

**Fundamentals of Postharvest Physiology: Handling and Storage of Horticultural Crops (Horticultural Sciences 315)**

**Handling and Storage of Vegetables (Horticultural Sciences 325)**

**Quality of Horticultural Crops during Marketing (Horticultural Sciences 330)**

**Economic Fruits of the World (Horticultural Sciences 215)**

## HORTICULTURAL SCIENCES

Department Chairs

Floriculture and Ornamental Horticulture: G. L. Good

Pomology: G. H. Oberly

Vegetable Crops: E. E. Ewing

Horticultural Sciences courses at Cornell University are taught by the faculties of the three departments listed above and the Department of Horticultural Sciences at the N.Y.S. Agricultural Experiment Station at Geneva. Descriptions of each course appear under the department whose name appears in parentheses after the horticultural sciences course number below (e.g., the description for Horticultural Science 200 appears under Pomology).

### Horticultural Sciences Courses

**101 (FOH) Introduction to Horticultural Science**

**102 (VC) General Horticulture**

**200 (POM) Introductory Pomology**

**205 (FOH) Floral Design: Introduction**

**210 (FOH) Floral Design: Intermediate**

**215 (POM) Economic Fruits of the World**

**220 (VC) Vegetable Types and Identification**

**225 (VC) Commercial Vegetable Crops**

**230 (FOH) Woody Plant Materials**

**300 (FOH) Garden and Interior Plants I**

**301 (FOH) Garden and Interior Plants II**

**315 (FOH, VC, POM) Postharvest Physiology and Storage of Horticultural Crops**

**325 (VC) Practical Aspects of Postharvest Handling of Horticultural Crops**

**335 (FOH) Woody Plant Materials for Landscape Use**

**[342 (FOH) (also Biological Sciences 342) Taxonomy of Cultivated Plants]**

**345 (POM) Fruit Tree Nursery Operation**

**[350 (POM) Small Fruits]**

**355 (POM) Viticulture**

**[360 (POM) Fruit Crop Systematics]**

**[365 (POM) Utilization of Fruit Crops]**

**[370 (POM) Fruit Variety Improvement]**

**400 (FOH) Principles of Plant Propagation**

**[405 (FOH) Physiology of Horticultural Plants]**

**410 (FOH) Principles of Florist Crop Production**

**411 (FOH) Greenhouse Production Management**

**420 (FOH) Principles of Nursery Crop Production**

**425 (FOH) Horticultural Sales and Service Businesses**

**430 (FOH) Special Topics In Ornamental Plants**

**435 (FOH) Landscape Management**

**440 (FOH) Turfgrass Management**

**[445 (POM) Orchard Management I]**

**450 (POM) Orchard Management II**

**455 (VC) Vegetable Crop Physiology**

**460 (VC) Plant-Plant Interactions**

**[465 (VC) Vegetable Varieties and Their Evaluation]**

**[470 (POM) Special Topics in Experimental Pomology]**

**495 (FOH, POM, VC) Undergraduate Seminar**

**496 (FOH, VC) Internship in Horticultural Sciences**

**497 (FOH, POM, VC) Independent Study in Horticultural Sciences**

**498 (FOH, VC) Undergraduate Teaching Experience**

**499 (FOH, POM, VC) Undergraduate Research**

**500 (FOH, POM, VC) Master of Professional Studies (Agriculture) Project**

**600 (FOH) Seminar in Floriculture and Ornamental Horticulture**

**601 (POM) Seminar in Pomology**

**602 (VC) Seminar in Vegetable Crops**

**[605 (FOH) Current Topics in Floricultural and Ornamental Horticultural Physiology]**

**610 (POM) Growth and Development of Woody Plants**

**615 (VC) Quantitative Methods in Horticultural Research**

**620 (POM) Developing Effective Horticultural Research Programs**

**[625 (VC) Advanced Postharvest Physiology of Horticultural Crops]**

**629 (FOH, VC) (also Plant Breeding 629) Special Topics in Plant Science Extension**

**630 (POM) Current Topics in Postharvest Horticulture**

**700 (FOH, POM, VC) Graduate Teaching Experience**

**800 (FOH, POM, VC) Thesis Research, Master of Science**

**900 (FOH, POM, VC) Thesis Research, Doctor of Philosophy**

## INTERNATIONAL AGRICULTURE

**300 Perspectives in International Agriculture and Rural Development**
Fall. 2 credits.
F 1:25–3:20. E. C. Erickson and staff.
A forum to discuss both contemporary and future world food issues and the need for an integrated, multidisciplinary team approach in helping farmers and rural development planners adjust to the ever-changing food needs of the world.

**402 Agriculture in Tropical America**
Fall. 2 credits. Prerequisite: upper class or graduate standing. Letter grades only.
F 1:25–3:20. H. D. Thurston and staff.
A preparatory course for participation in International Agriculture 602. Physical resources, vegetation, history, crop and animal production, and various social and economic aspects of agriculture in tropical America will be discussed.

**403 Traditional Agriculture in Developing Countries**
Fall. 1 credit. S-U only.
T 8–8:50. H. D. Thurston and staff.
Today, perhaps over half of the world's arable land is farmed by traditional farmers. They developed sustainable agriculture practices which allowed them to produce food and fiber for millennia with few outside inputs. Many of these practices have been forgotten in developed countries but are still used by many traditional, subsistence, or partially subsistence farmers in developing countries. The course will examine traditional systems from several disciplinary points of view.

**599 International Agriculture and Rural Development Project Paper**
Fall and spring. 1–6 credits. Limited to M.P.S. candidates in international agriculture and rural development. S-U grades only.
Staff.

**600 Seminar: International Agriculture**
Fall and spring. No credit. S-U grades only.
Third and fourth W of each month, 4–5.
Staff.
The seminar focuses on developing an understanding of the nature and interrelatedness of agricultural development and the social sciences, plant and animal sciences, foods and nutrition, and natural resources.

**602 Agriculture in the Developing Nations**
Spring. 3 credits. Prerequisites: International Agriculture 402 and permission of instructors. Cost of field-study trip includes air fare and $400 for lodging, meals, and personal expenses.
T R 2:30–4:25 until midterm only.
R. W. Blake and staff.
Oriented to provide students an opportunity to observe agricultural development in a tropical environment and promote interdisciplinary exchange among staff and students. The two-week field-study trip during January to Latin American countries is followed by discussions and assignments dealing with problems in agriculture and livestock production in the context of social and economic conditions.

**603 Administration of Agricultural and Rural Development (also Government 692 and Management NBA 588)**
Spring. 4 credits.
T 2:30–5:30. M. J. Esman, E. B. Oyer, N. T. Uphoff, L. W. Zuidema.
An intercollege course designed to provide graduate students with a multidisciplinary perspective on the administration of agricultural and rural development activities in developing countries. The course is oriented to students trained in agricultural and social sciences who are likely to occupy administrative roles during their professional careers.

**[604 Seminar on African Agriculture and Rural Development**
Fall. 2 credits. S-U grades optional. Offered alternate years. Not offered 1989–90.
M 1:25–3:20. F. W. Young.
Strategies for increasing food production and raising rural incomes in Africa. Topics include cropping systems in Africa and the role of agricultural technology in increasing yields and improving livestock production; strategies for improving human nutrition; food storage and mechanization; rural employment projects; alternative rural development strategies; and experience with World Bank and other internationally funded rural development projects.]

**[606 Farming Systems Research**
Fall. 3 credits. Not offered 1989–90.
T 2:30–4:25, R 12:30–1:25. R. Barker and staff.
An interdisciplinary course focusing on the development of agricultural technologies and policies designed to assist small-scale farmers in developing countries. Techniques for gathering information, specifying research problems, and analyzing and interpreting data will be explored. The involvement of farmers in the research process is stressed.]

**650 Special Topics in International Agricultural and Rural Development**
Fall and spring. 1–3 credits
Staff.
A seminar on current themes of agricultural and rural development. Specific content varies each semester.

**685 Training and Development: Theory and Practice (also Communication 685, Education 685 and Industrial and Labor Relations 658)**
Spring and summer. 4 credits. S-U grades optional. Charge for materials $45.
F 9:05–12:05. At Communication Graduate Center. N. E. Awa, D. Deshler, W. W. Frank.
Analysis, design, and administration of training programs for the development of human resources in small-farm agriculture, rural health and nutrition, literacy as nonformal education, and general community development. Designed for scientists, administrators, educator-trainers, and social organizers in rural and agricultural development programs in the U.S. and abroad.

**695 International Nutrition, Agriculture, and Development (also Nutritional Sciences 695)**
Spring. 3 credits.
W F 11:15–12:45. T. Brun and staff.
A course concentrating on the major issues in food and nutrition policies as they relate to agriculture, including Africa's nutritional and agricultural decline, lessons from socialist countries, the cash- versus food-crop debate, land reform, Green Revolution, and nutrition impact of agricultural programs. Emphasis will be on agricultural policies leading to growth with equity.

**703 Seminar for Special Projects in Agricultural and Rural Development**
Spring. 1 credit. Required for graduate students enrolled in the M.P.S. (Agr.) degree program and majoring in international agricultural and rural development; others with permission of the program director. S-U grades only.
M 12:20. L. W. Zuidema.
The seminar provides students with the opportunity to present their special projects. It also serves as a forum for discussion of current issues in low-income agricultural and rural development, with particular attention to interdisciplinary complexities.

### Related Courses in Other Departments

**Political Economy of Ideology and Development in Africa (Africana Studies and Research Center 400)**

**Political Theory, Planning, and Development in Africa (Africana Studies and Research Center 500)**

**Economics of Agricultural Geography (Agricultural Economics 150)**

**Economics of Agricultural Development (Agricultural Economics 464)**

**Food, Population, and Employment (Agricultural Economics 660)**

**[Macroeconomic Issues in Agricultural Development (Agricultural Economics 663) Not offered 1988–89.]**

**Microeconomic Issues in Agricultural Development (Agricultural Economics 664)**

**Seminar on Agricultural Trade Policy (Agricultural Economics 730)**

**[Production of Tropical Crops (Agronomy 314) Not offered 1989–90.]**

**[Geography and Appraisal of Soils of the Tropics (Agronomy 471) Not offered 1989–90.]**

**Tropical Livestock Production (Animal Science 400)**

**Tropical Forages (Animal Sciences 403)**

**Southeast Asia Seminar: Country Seminar (Asian Studies 601 and 602)**

**Ethnobotany (Biological Sciences 246)**

**Food, Agriculture, and Society (Biological Sciences 469)**

**Seminar in Science and Technology Policy in Developing Nations (City and Regional Planning**

**Seminar in Policy Planning in Developing Nations: Technology Transfer and Adaption (City and Regional Planning 772)**

**Seminar in Project Planning in Developing Countries (City and Regional Planning 773)**

**Intercultural and Development Communication (Communication 612)**

**Communication in the Developing Nations (Communication 624)**

**Planning Educational Systems (Education 678)**

**[Designing Extension and Continuing Education Programs (Education 681) Not offered 1989–90.]**

**Community Education and Development (Education 682)**

**Behavioral Change in International Rural Modernization (Education 782)**

**Comparative Extension Education Systems (Education 783)**

**Postharvest Food Systems (Food Science 247)**

**International Food Sciences and Development (Food Science 403)**

**Ethics and Public Life (Philosophy 247)**

**Political Economy of Change: Rural Development in the Third World (Government 648)**

**Regional Landscape Planning I (Landscape Architecture 531 )**

**Regional Landscape Planning II (Landscape Architecture 532)**

**International Environmental Issues (Natural Resources 400)**

**National and International Food Economics (Nutritional Sciences 457)**

**International Nutrition Problems, Policy, and Programs (Nutritional Sciences 680)**

**Seminar in International Nutrition and Development Policy (Nutritional Sciences 695)**

**Special Topics in International Nutrition (Nutritional Sciences 699)**

**Plant Diseases in Tropical Agriculture (Plant Pathology 655)**

**Economic Fruits of the World (Horticultural Sciences 215)**

**Rural Sociology and Agrarian Problems (Rural Sociology 205)**

**[Social Indicators and Data Management (Rural Sociology 213) Not offered 1989–90.]**

**Social and Demographic Changes in Asia (Rural Sociology 439)**

**Rural Social Stratification (Rural Sociology 445)**

**Contemporary Sociological Theories of Development (Rural Sociology 606)**

**[Social Organization of Agriculture (Rural Sociology 650) Not offered 1989–90.]**

**The Political Economy of Policies and Planning in Third World States (Rural Sociology 675)**

**[Design and Data Analysis in Development Research (Rural Sociology 715) Not offered 1989–90.]**

**[Social Movements in Agrarian Society (Rural Sociology 723) Not offered 1989–90.]**

**Sociotechnical Aspects of Irrigation (Rural Sociology 754, Agricultural Economics 754, and Agricultural and Biological Engineering 754)**

## LANDSCAPE ARCHITECTURE

The Landscape Architecture Program at Cornell is sponsored by the College of Agriculture and Life Sciences through the Department of Floriculture and Ornamental Horticulture and the College of Architecture, Art, and Planning. For course descriptions, see the listings under the Department of Floriculture and Ornamental Horticulture.

## MICROBIOLOGY

W. C. Ghiorse, chair, R. P. Mortlock, C. M. Rehkugler, V. J. Stewart, M. L. Tortorello, S. C. Winans, S. H. Zinder

**290 General Microbiology Lectures**
Fall, spring, or summer. 3 credits. Prerequisites: Biological Sciences 101–102 and 103–104 and Chemistry 104 or 208. Recommended: concurrent registration in Microbiology 291.
M W F 11:15. Three evening exams.
M. L. Tortorello and M. Cordts.
A study of the basic principles and relationships in the field of microbiology, with fundamentals necessary for further work in the subject.

**291 General Microbiology Laboratory**
Fall or spring, 2 credits. Summer, 3 credits. Prerequisite: Microbiology 290 (may be taken concurrently).
M W 2–4:25 or 7–9:30 p.m. (spring only), or T R 8–10:30,11:15–1:45, or 2–4:25.
C. M. Rehkugler.
A study of the basic principles and techniques of laboratory practice in microbiology, and fundamentals necessary for further work in the subject.

**292 General Microbiology Discussion**
Spring. 1 credit. Prerequisite: Microbiology 290 (may be taken concurrently). S-U grades only.
Hours to be arranged. C. M. Rehkugler and E. Seacord.
A series of discussion groups in specialized areas of microbiology to complement Microbiology 290.

**314 Tissue Culture Techniques and Applications**
Fall. 2 credits. Prerequisites: Microbiology 290 and 291 or permission of instructor.
F 1:25–2:30; lab exercises with follow-up work done independently, F 2:30–4:30.
C. M. Rehkugler.
A series of lectures and demonstrations dealing with cell culture methods especially those required to culture cells of animals from different tissue origins. The application of cell culture to the study of bacterial diseases, virus replication, and the production of biologicals is considered.

**[336 Applied and Industrial Microbiology**
Fall. 3 credits. Prerequisites: Microbiology 290 and organic chemistry. Not offered 1989–90.
T R 10:10–11:25. Staff.
A survey of the microbiology of industrial fermentations and public health aspects of water and wastewater.]

**390 Advanced General Microbiology Lectures**
Fall. 3 credits. Prerequisites: Microbiology 290 and 291 and organic chemistry. Biochemistry 330 or equivalent recommended. May be taken without Microbiology 391.
M W F 11:15. S. H. Zinder.
A consideration of the physiology, ecology, genetics, and practical potential of important groups of bacteria. Topics include molecular methods for determining bacterial phylogeny and taxonomy, and the evolution of diverse mechanisms of energy conservation, fixation of carbon and nitrogen, and adaptation to extreme environments.

**391 Advanced General Microbiology Laboratory**
Fall. 2 credits. Prerequisites: Microbiology 390 (may be taken concurrently) and permission of instructor.
M W 2–4:25. S. H. Zinder.
Intended as a laboratory complementing Microbiology 390. The enrichment, isolation, characterization, and study of bacteria included in Microbiology 390.

**400 Seminar in Microbiology**
Fall. 1 credit. Limited to undergraduate students specializing in microbiology. Required for microbiology students in their junior year. S-U grades only. The course cannot be used to fulfill the specialization requirement.
W 12:20. Staff.
A series of lecures and seminars designed to present students with laboratory safety training and acquaint them with research projects in microbiology on Cornell campus.

**412–413 Clinical Microbiology**
412, fall; 413, spring. Credit to be arranged. Prerequisite: permission of instructor.
Hours to be arranged. R. P. Mortlock.
Training and practical experience in clinical microbiology in the hospital laboratory of the Cornell Medical College and New York Hospital in New York City. Emphasis will be upon developing students' capability in the isolation and rapid identification of organisms from various types of clinical specimens. This course is intended to prepare the student for state and federal licensing in various areas of clinical microbiology.

**480 Microbial Physiology Lectures**
Spring. 3 credits. Prerequisites: Microbiology 290 and 291 or equivalent and biochemistry. Micro 390 recommended. S-U grades optional for students not specializing in microbiology.
M W F 11:15. R. P. Mortlock.
The concern is with the physiological functions of microorganisms. Consideration is given to chemical structure, regulation, growth, and the energy metabolism of prokaryotic organisms. Special attention given to those aspects of microbial metabolism and carbohydrate catabolism not normally studied closely in biochemistry courses.

**481 Microbial Physiology Laboratory**
Spring. 3 credits. Limited to 12 students. Prerequisites: Microbiology 480 (may be taken concurrently) and permission of instructor. S-U grades optional.
T R 12:20–4:25. R. P. Mortlock.
The laboratory component of Microbiology 480. Deals with laboratory experiments and techniques used in studying the enzymology and physiological characteristics of microorganisms.

**484 Prokaryotic Cytology Lectures**
Spring. 3 credits. Prerequisites: Microbiology 390 and biochemistry. S-U grades optional.
M W F 10:10. W. C. Ghiorse.
Morphology, ultrastructure, macromolecular organization and life cycles of prokaryotic cells are considered with regard to chemical composition and physiological function of cellular components.

**485 Prokaryotic Cytology Laboratory**
Spring. 1 or 2 credits. Enrollment limited. Prerequisites: Microbiology 484 or concurrent enrollment, and permission of instructor.
Hours to be arranged. W. C. Ghiorse.
Proper use and theory of microscopes; cytological and cytochemical techniques for light and electron microscopy that are applicable to the study of prokaryotic cells.

**498 Teaching Experience**
Fall or spring. 1–3 credits. Enrollment limited. Prerequisites: previous enrollment in the course to be taught or equivalent, and written permission of instructor. S-U grades with permission of instructor.
Hours to be arranged. Staff.
Designed to give qualified undergraduate students teaching experience through actual involvement in planning and teaching microbiology courses under supervision of departmental faculty. This experience may include leading a discussion group; preparing, assisting, or teaching a microbiology laboratory; or tutoring. Microbiology courses currently offering such experience include 291 and 292. This course cannot be used to fulfill the specialization requirement.

**499 Research in Microbiology**
Fall or spring. 1–3 credits. Undergraduates must attach to their course enrollment materials written permission of the staff member who will supervise the work and assign the grade. This course cannot be used to fulfill the specialization requirement.
Hours to be arranged. Staff.

**[694 Bacterial Diversity**
Offered by special arrangement; see instructor. 4 credits. Prerequisites: Microbiology 290 and 291, and Biological Sciences 330 or 331 or equivalent. Not offered 1989–90.
Hours to be arranged. Staff.
Physiology, ecology, and morphology of selected groups of bacteria, including the methanogenic bacteria, spirochetes, nitrogen-fixing bacteria, photosynthetic bacteria, thermophilic bacteria, myxobacteria, and others. Behavior of bacteria in response to environmental stimuli.]

**695 Advanced Microbial Genetics Lectures**
Fall. 3 credits. Prerequisites: Biological Sciences 281 and 633 or permission of instructor. Recommended: Biological Sciences 485.
Lec, T R 10:10–11:25. V. J. Stewart.
Current themes in prokaryotic genetics are considered in detail through examination of the primary literature. Topics include recombination and genetic exchange, transposons, mutagenesis and DNA repair, pathway-specific and global regulation of gene expression, and differentiation. Emphasis is on coordinated studies that derive complementary information from both *in vivo* and *in vitro* techniques.

**[696 Advanced Microbial Genetics Laboratory**
Fall. 2 credits. Prerequisites: Microbiology 291, Biological Sciences 281, and permission of instructor. Corequisite: Microbiology 695 or Biological Sciences 485. Primarily for microbiology and genetics graduate students and for microbiology undergraduate students. Enrollment is limited to eight students. Admission to the course is dependent upon the results of a personal interview with the instructor, which must be held before the first day of classes. *There is no admission to the course without the interview.* Students are urged to interview during preregistration. Not offered 1989–90.
Lab, T R 1:25–4:25; disc, F 10:10.
V. J. Stewart.
Theory and practice of prokaryotic genetics as applied to Escherichia coli. Topics include isolating, characterizing, and mapping mutations; using transposons as mutagens and as linked selectable markers; constructing operon and gene fusions; and using selected recombinant DNA methods for gene isolation and analysis.]

**699 Microbiology Seminar**
Fall and spring. Required of all graduate students in the Department of Microbiology and open to all who are interested.
Hours to be arranged. Staff.

**731–736 Current Topics in Microbiology**
Fall, 731, 733, and 735; spring, 732, 734, and 736. 1/2 or 1 credit for each topic. May be repeated for credit. (Students registering for 1/2 credit should not fill in the credit-hour column on the optical-mark registration form; the computer is programmed to register students automatically for 1/2 credit.) Designed primarily for graduate students in microbiology. Prerequisite: upper-level courses in microbiology. S-U grades only.
Hours to be arranged. Staff.
Lectures and seminars on special topics in microbiology.

**791 Graduate Seminar in Microbiology**
Fall and spring. 1 credit each semester. All students in the Graduate Field of Microbiology must enroll for at least their first three semesters in residence. Students will be expected to lead discussions on recent primary literature in microbiology. S-U grades only.
Hours to be arranged. Staff.

**792 Graduate Research Seminar in Microbiology**
Fall and spring. 1 credit each semester. Required of all graduate students in microbiology; a seminar relating to the research activities of those enrolled. Students who have completed the Microbiology 791 series requirement are required to present a seminar concerning their research interests and activities at least once each year. S-U grades only.
Hours to be arranged. Staff.

**Related Courses in Other Departments**

**Bioprocessing Applications in Agriculture (Agricultural and Biological Engineering 467)**

**Soil Microbiology (Agronomy 476)**

**Advanced Soil Microbiology (Agronomy 666)**

**[Microbiology of the Rumen (Animal Science 607)**
Not offered 1989–90.]

**Microbial Genetics, Lectures (Biological Sciences 485)**

**Microbial Genetics, Laboratory (Biological Sciences 487)**

**Introduction to Bioprocess Engineering (Chemical Engineering 643)**

**Controlled Cultivation of Microbial Cells (Chemical Engineering 646)**

**Insect Pathology (Entomology 453)**

**Food Microbiology Lectures (Food Science 394)**

**Food Microbiology Laboratory (Food Science 395)**

**Food Mycology (Food Science 411)**

**[Advanced Food Microbiology Lectures (Food Science 607)**
Not offered 1988–89.]

**Basic Immunology, Lectures (Veterinary Medicine 315 and Biological Sciences 305)**

**Basic Immunology, Laboratory (Veterinary Medicine 316 and Biological Sciences 307)**

**Pathogenic Microbiology (Veterinary Medicine 317)**

**Advanced Work in Bacteriology, Virology, or Immunology (Veterinary Medicine 707)**

**Advanced Animal Virology, Lectures (Veterinary Medicine 708)**

## NATURAL RESOURCES

J. P. Lassoie, chair; R. A. Baer, H. B. Brumsted, D. J. Decker, T. J. Fahey, T. A. Gavin, J. W. Gillett, J. W. Kelley, B. A. Knuth, M. E. Krasny, C. C. Krueger, R. J. McNeil, R. A. Malecki, A. N. Moen, R. T. Oglesby, M. E. Richmond, C. L. Schofield, C. R. Smith, L. H. Weinstein, B. T. Wilkins, W. D. Youngs

**100 Principles of Conservation**
Fall. 3 credits. Limited to students specializing in natural resources. Not open to students who have passed Natural Resources 201.
Lecs, M W F 9:05; 1-hr disc to be arranged. R. T. Oglesby.
The nature of natural resources, how they are managed, and their interactions with individuals and societies are considered. Case histories and demonstrations will be used to illustrate both principles and practices. Emphasis will be on management of renewable resources based on ecological and cultural perspectives.

**106 Management Using Common Software**
Spring, first half of term. 1 credit. Prerequisite: Natural Resources 100 or permission of instructor.
Lec 10:10. B. Wilkins.
Emphasizes important resource-management elements facilitated by use of IBM PC and Macintosh. Processes include those facilitated by spreadsheets, database systems, and technical writing. No prior knowledge of computers is required.

**107 Management Using Database System**
Spring. 2 credits. Prerequisite: Natural Resources 100 or concurrent registration in Natural Resources 106 or permission of instructor.
Lec to be arranged; lab to be arranged. B. Wilkins.
Ten assignments requiring use of spreadsheets, database systems, and technical writing help develop students' ability to analyze data and prepare written materials to aid in management of natural resources. No prior knowledge of computers is required. Concurrent registration in NR 106 would be appropriate for many first-year students but is not required. This course is not open to those who have taken Ed 447 or Ag Eng 102.

**201 Environmental Conservation**
Spring. 3 credits.
Lecs, M W F 10:10; 1-hr disc to be arranged. T. J. Fahey.
A survey course intended for students in any year and major. Designed to provide information and to stimulate ideas as an aid to understanding the major environmental problems facing spaceship Earth. A topical approach with representative case histories is taken. Topics include global changes—$CO_2$, ozone, and climate; population growth and the world food problem; energy resources and alternatives; mineral resources and recycling; land use in urban and rural landscapes; air, water, and soil pollution; and endangered species and wildlands.

**210 Introductory Field Biology**
Fall. 4 credits. Limited to 45 students. Open to sophomores and juniors with an adviser in Natural Resources *or* by permission of instructor. Prerequisites: Biological Sciences 101 and 102 or equivalent. Cost of field trips, approximately $10.
Lec, W 9:05; labs, M W 1:25–4:25. 2 overnight field trips required.
T. A. Gavin.
Introduction to methods of inventorying and identifying plants and animals. Approximately 150 species of vertebrates and 75 species of woody plants found in New York State are covered. Selected aspects of current ecological thinking, relevant to problems in assessment of the distribution and abundance of organisms, are stressed. The interaction of students with biological events in the field and accurate recording of these events are emphasized.

**250 Introduction to Wildlife Biology**
Spring, first third of term. 1 credit.
Lecs, M W F 8. T. A. Gavin.
An introduction to biological topics relevant to informed management of wildlife; emphasis will be on the *population* as the unit of interest. An overview of the history of wildlife management in North America will illustrate the importance of the interaction between biological and nonbiological factors on wildlife. However, this course is about wildlife biology, not wildlife management, which is treated in Natural Resources 308 and 410.

**251 Introduction to Fishery Biology**
Spring, weeks 6–10. 1 credit.
Lecs, M W F 8. Staff.
Subject areas that form the basis of fishery biology are introduced by staff member working in that particular area. The areas included are limnology, insect biology, biology of fishes, genetics, life history, population biology, environmental impacts, policy, and management.

**252 Introduction to Forest Science**
Spring, last third of term. 1 credit. Prerequisite: Natural Resources 210 or permission of instructor.
Lecs, M W F 8. J. P. Lassoie.
Appreciation of forests as a natural resource. Introduction to the importance of ecology, tree biology, and environment as bases for forest management and silviculture. Emphasis is on the forests of the northeastern United States.

**270 Bird Biology and Conservation**
Spring. 2 credits.
Lec, T R 11:15–12:05. C. Smith.
A survey course for majors and nonmajors, focusing on birds and the ways they illustrate general principles of behavior, ecology, management, and conservation at the organism, population, and community levels. Topics covered will emphasize attributes of birds that can be observed directly by the student. Current resource-management issues relevant to birds will be explored in the contexts of habitat management, tropical deforestation, the design and management of natural preserves, endangered species management, and the economic importance of bird study as an outdoor recreational activity.

**271 Bird Biology and Conservation Laboratory**
Spring. 1 credit. Concurrent enrollment in Natural Resources 270 required.
Six Saturday-morning field trips plus three indoor labs. C. Smith.
A field-oriented course designed to teach skills of bird observation and identification based on the integration of field marks, songs and calls, and habitat cues. Topics covered will include the choice and effective use of field guides, binoculars, and other aids to bird identification; procedures for taking and organizing field notes; the relationships of birds to their habitats and to other birds; and methods and procedures for censusing and surveying songbird populations. Students are expected to provide their own binoculars for field use.

**302 Forest Ecology**
Fall. 4 credits. Cost of trip, no more than $20.
Lecs, M W F 11:15; lab, M 12:20–4:25.
1 weekend trip S through M. T. J. Fahey.
Analysis of the distribution, structure, and dynamics of forest ecosystems. All laboratory sessions in the field. One weekend field trip to the Adirondacks or other forest region.

**303 Woodlot Management**
Fall. 3 credits. Letter grades only.
Lecs, T R 10:10; lab, R 12:20–4:25.
J. W. Kelley.
A practical, field-oriented course emphasizing multiple purpose management of small nonindustrial private forestland in the northeastern United States.

**304 Wildlife Ecology**
Spring. 3 credits. Prerequisites: general biology and at least one course in computer programming or proficiency.
Lec, M W F 11:15. Labs to be arranged.
A. Moen.
This course focuses on the physiological, behavioral, and population characteristics of wild species, interactions among species, and their relationships with range characteristics and resources. Computer modeling is an integral part of the course.

**305 Maple Syrup Production**
Spring. 2 credits. Limited to 20 students. Prerequisite: permission of instructor. Letter grades only.
T 12:20–4:25 (preliminary seminars followed by several half-days of fieldwork during the maple season).
J. Kelley.
Students work in most phases of the Arnot Forest maple operation and learn modern sap-collecting techniques and quality control in making syrup.

**306 Coastal and Oceanic Law and Policy**
Summer. 1 credit. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $675.
Daily lecs and discs for 1 week.
SML faculty.
Intended for persons interested in careers in management of marine or coastal resources or in the natural sciences. Subjects include law and policy related to ocean dumping, marine sanctuaries, environmental impact statements, water and air pollution, fisheries management, offshore gas and oil production, and territorial jurisdiction. Lectures on the status and history of law are accompanied by discussion of relevant policy and analysis of the efficacy of various legal techniques. A case study that requires extensive use of the laboratory's library and personnel is assigned. The week concludes with a mock hearing.

**308 Natural Resources Management**
Fall. 3 credits. Prerequisite: junior standing; introductory ecology or permission of instructor.
M W F 10:10. B. A. Knuth.
Introduction to management of natural resources with a focus on fish, wildlife, and forest resources. Emphasis is placed on concepts necessary to formulate and achieve specific management goals and objectives. Topics include historical overview; planning processes and the management cycle; ecological, social, and institutional dimensions; jurisdiction, allocation, and ownership; decision making; the future. Focus is on state-level management of natural resources geared toward multiple interests.

**[331 Beyond the Year 2000 (also Government 331)**
Spring. 4 credits. Not offered 1989–90.
Hours to be arranged. E. Kenworthy, B. Gibson.
This course explores present projections of where the world will be twenty-five years from now, drawing on computer and other analyses of present trends regarding environmental and social conditions. An evaluation of these projections will be coupled with an analysis of what it would take to get a future we prefer over the future that appears likely.]

**400 International Environmental Issues**
Fall. 3 credits. Limited to 30 students. Prerequisite: junior standing or above.
Lecs, M W F 12:20. R. J. McNeil.
International aspects of the preservation and development of environmental and natural resources. Concepts include development, resource ownership, exploitation, compensation, and preservation. Cultural differences in attitudes and behavior toward environment. Management practices under different cultural, economic, and social systems. Will cover current issues such as acid precipitation; management of migratory whales, fish, and waterfowl; Antarctic development; global energy issues; and preservation of fragile and endangered resources. Lecture and discussion, term paper, and examinations.

**401 Environmental and Natural Resources Policies**
Fall or spring. 3 or 4 credits. Prerequisites: junior standing and participation in Cornell-in-Washington Program.
Lab to be arranged. R. J. McNeil and staff.
Concepts and principles fundamental to the environmental policy process. Biological and ecological principles central to decision making in the natural resources arena, particularly at the national and international levels. Role of the legal system in the policy process; roles of citizen organizations, lobbyists, bureaucrats, legislators. Case studies, interviews with Washington officials, several short papers, one exam. A fourth credit available requires a more extensive written assignment and an oral presentation.

**402 Natural Resources Policy, Planning, and Politics**
Spring. 3 credits. Prerequisites: junior standing and permission of instructor.
Lec, January 2-week intersession; one 2-hr. orientation session in Dec. and four 2-hr. seminars in Jan. and Feb.
R. J. McNeil and staff.
An introduction to the environmental policy process and its conceptual framework. Recognition of phenomena identified as natural resources or environmental problems and issues; steps leading to legislation or regulations to solve problems; implementation and evaluation stages; role of the legal system; roles of citizens, lobbyists, government actors. Case studies; presentations by and discussions with about twenty prominent Washington policy makers appearing as guest lecturers. Required interviews, term paper, oral reports. Several meetings in Ithaca before and after intensive January session in Washington.

**[406 Conducting Marine and Natural Resource Extension Programs**
Spring. 3 credits. Not offered 1989–90.
Lec and rec. One weekend field trip.
B. T. Wilkins.
Extension programs stimulate and help citizens use current research knowledge to reach decisions on the management of natural resources. The course provides an overview of the constructs used in this emerging natural resource field, and gives students experience in components important in conducting such efforts.]

**407 Religion, Ethics, and the Environment**
Spring. 3 credits. For juniors, seniors, and graduate students; others by permission only. S-U grades optional.
T R 9:05, 1-hr. disc to be arranged. R. A. Baer.
A study of how religion (mainly Christianity and Judaism), philosophy, and ethics affect our understanding and treatment of nature. The terms religion, value, knowledge, nature, and the public interest are examined in detail. Particular themes include the structure of modern science, play and work, and human finitude and death. Also, responsibility to future generations, limiting growth and questions of distributive justice, and world population and global hunger.

**410 Principles of Wildlife Management**
Spring. 3 credits. Prerequisite: introductory biology. Junior, senior, graduate level standing.
M W F 9:05. A. N. Moen.
In-depth analyses of the ecological basis for decision making in wildlife management, computer simulations of management problems and effects of options.

**414 Selected Topics in Wildlife Resource Policy**
Spring. 2 credits. Intended for juniors, seniors, and graduate students. Prerequisite: Natural Resources 410 or equivalent or permission of instructor. Cost of field trips, no more than $25.
Time to be arranged. Several field trips usually taken weekdays; one overnight field trip to Albany. H. B. Brumsted.
A seminar devoted to analysis of selected current policy issues in wildlife management. Particular attention is given to citizen roles in policy development.

**[417 Wetland Resources**
Summer, 1 week at Shoals. 1 credit. Not offered 1989–90.
R. A. Malecki.
For description, see listing under "Courses in Marine Science," in the section on the Division of Biological Sciences.]

**438 Fishery Management**
Spring. 3 credits. Prerequisite: Natural Resources 440 or permission of instructor.
Lecs, T R 8 plus discs. C. C. Krueger.
Introduction to management as an adaptive process that focuses on achievement of goals. Coverage includes sport and commercial fisheries. Topics include setting goals and objectives, regulations, habitat management, population control, stocking, and management of trout, reservoirs, the Great Lakes, and Pacific halibut. Ecological, social, political, and economic aspects of those topics are discussed.

**440 Fishery Science**
Fall. 3 credits. For juniors and seniors majoring in fishery science; others by permission of instructor. Prerequisites: a year of statistics and calculus. Offered alternate years.
M W F 12:20. W. D. Youngs.
Principles and theories involved in dynamics of fish populations. Methods of obtaining and evaluating statistics of growth, population size, mortality, yield, and production are considered.

**[442 Techniques in Fishery Science**
Fall. 5 credits. Limited to 15 upperclass and graduate fishery students. Offered 1990–91. Cost of field trips, no more than $30.
T R 1:25–4:25; 1 or more weekend field trips. C. C. Krueger.
Emphasis is on methods of collecting data on attributes of fish populations and their habitat. Topics include passive and active fish-capture methods, tagging and marking, and physical and chemical habitat measurements. Assumptions and limitations inherent in data sets, research planning, and scientific report writing are also discussed. Several field trips provide hands-on experience in data collection on streams and lakes.]

**492 Contemporary Issues Seminars: Integrating Sociological and Biological Approaches to Natural Resource Management**
Fall. 2 credits.
Hours to be arranged. C. Geisler and T. Gavin.
Conservation biology is a rapidly spreading subfield of biology actively engaging professionals from the biological sciences in the conservation of biotic diversity. This course examines such conservation from both biological and sociological perspectives in the belief that both are essential to successful conservation biology. Students will become sophisticated in social, cultural, and institutional factors, which are integrated through rarely explored dimensions of species and habitat protection policies.

**493 Research in Policy and Human Studies in Natural Resource Management**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. S-U grades optional.
R. A. Baer, H. B. Brumsted, D. J. Decker, B. A. Knuth, R. J. McNeil, B. T. Wilkins.

**494 Research in Fishery Science**
Fall or spring. Credit to be arranged. S-U grades optional.
Hours to be arranged. J. L. Forney, C. C. Krueger, R. T. Oglesby, C. L. Schofield, W. D. Youngs.

**495 Research in Wildlife Science**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. S-U grades optional.
H. B. Brumsted, T. A. Gavin, R. A. Malecki, A. N. Moen, M. E. Richmond.

**496 Research in Forestry**
Fall or spring. Credit to be arranged. S-U grades; letter grade by permission of instructor.
Hours to be arranged. T. J. Fahey, J. P. Lassoie, L. H. Weinstein.

**498 Teaching in Natural Resources**
Fall and spring. 1–4 credits. Prerequisite: permission of instructor.
Staff.
Course designed to give students an opportunity to obtain teaching experience by assisting in labs, field trips for designated sections, discussions, and grading. Students will gain insights into the organization, preparation, and execution of course plans through application and discussions with instructor.

**500 Professional Projects—M.P.S.**
Fall and spring. Credit to be arranged. Limited to graduate students working on professional master's projects. S-U grades only.
Staff.

**601 Seminar on Selected Topics in Fishery Biology**
Fall or spring. 1 credit. S-U grades optional.
Hours to be arranged. Staff.

**603 Habitat Ecology**
Spring. 1 or 2 credits. Limited to 12 seniors and graduate students majoring in natural resources or biological sciences. Prerequisite: permission of instructor. Cost of field trips, no more than $20.
W 12:20–3. M. E. Richmond.
This course requires an understanding of broad ecological concepts relative to plant-wildlife interactions. The concepts of niche, habitat, and ecotope are addressed from the standpoint of island biogeographic principles, structural and spatial heterogeneity of the vegetation, community productivity, and temporal change. Major landforms and plant-animal communities of the northeastern United States will be discussed and visited during weekend field trips as scheduling permits. Paper required for 2-credit option.

**604 Seminar on Selected Topics in Resource Policy and Planning**
Fall. 1 credit. S-U grades only.
Hours to be arranged. Staff.
Primarily for graduate students with a major or minor in resource policy and planning and upper level undergraduates with a strong interest in policy analysis. Topics vary with staff involved.

**[606 Marine Resources Policies**
Spring. 2 credits. Prerequisite: at least one related course such as Natural Resources 308, 438; or permission of instructor. S-U grades optional. Not offered 1989–90.
W 1:30–3:30. B. T. Wilkins.
A seminar discussing the law and issues concerning current marine policy questions, such as coastal zone management, marine fish regulations, marine mammal protection, and wetland preservation.]

**607 Ecotoxicology**
Spring. 3 credits. Prerequisites: graduate or senior status and two 300-level courses in chemistry, biochemistry, or toxicology.
Lecs, M W F 11:15. J. W. Gillett.
Lectures, readings, and special guests focus on the principles of effects of toxic chemicals on natural ecosystems, their components, and processes. Major topics include fate and transport of chemicals (chemodynamics), comparative biochemical toxicology, ecosystem process analysis, simulation through mathematical and physical (microcosm) models, and relationships to regulation and environmental management.

**[608 Resource Policy and Administration**
Fall. 3 credits. Prerequisite: graduate standing; juniors and seniors with instructor's permission. Not offered 1989–90.
T R 2:30–3:45. B. A. Knuth.
An examination, through lectures, readings, and discussions, of policy, planning, and administration relating to natural resource management in the public domain. Emphasis is on concepts relevant to policy formulation, implementation, and evaluation with specific applications from fisheries, wildlife, forest and

water resource management. Topics include bureaucracies and organizational effectiveness, professionalism and ethics, policymaking process and philosophies, comprehensive planning, problem-solving and decision aids including mediation, impact assessment, benefit/cost analysis, risk assessment and management, and group decision processes.]

**610 Conservation Seminar**
Fall and spring. No credit. All graduate students in natural resources are expected to participate.
Hours to be arranged. Staff.

**611 Seminar in Environmental Values**
Fall. 3 credits. For graduate students, seniors, and juniors. S-U grades optional.
W 1:25–3:50. R. A. Baer.
Moral concerns relative to agriculture and/or the environment. In successive years, the seminar will focus on such topics as (1) natural resources management and the concept of the public interest, (2) land use ethics, (3) formulating natural resource policy in a democratic and pluralistic society, and (4) responsibility to future generations.

**612 Wildlife Science Seminar**
Fall and spring. 1 credit. Prerequisite: permission of instructor. S-U grades optional.
Hours to be arranged. Wildlife science faculty.
Discussion of individual research or current problems in wildlife science.

**615 Seminar in Agroforestry**
Spring. 2 credits. Prerequisites: senior or graduate standing and permission of instructor.
Lec, M 7–9 p.m. J. P. Lassoie.
An interdisciplinary course intended to introduce students to the general principles and types of agroforestry systems. Agronomic, forestry, socioeconomic, and institutional factors are considered through the use of case studies. Conceptual and methodological approaches to agroforestry research design and program development are stressed. A presentation during the seminar and a short library research paper are required of all enrolled.

**616 Forest Science and Management Seminar**
Fall/spring. 1 credit. Permission of instructor.
Staff.
Selected readings and discussions of research and/or current problems in forest science and management.

**800 Master's Thesis Research**
Fall and spring. Credit to be arranged. Limited to graduate students working on master's thesis research. S-U grades only.
Staff.

**900 Ph.D. Thesis Research**
Fall and spring. Credit to be arranged. Limited to graduate students working on Ph.D. thesis research. S-U grades only.
Staff.

**Related Courses in Other Departments**
See department advisers and curriculum materials for information about other related courses.

**Environmental Policy (Agriculture and Life Sciences 661, Biological Sciences 661, and Biology and Society 461)**

**Resource Economics (Agricultural Economics 150, 252, 332, 452, 631, 651, 652, 750)**

**The Vertebrates (Biological Sciences 274)**

**Limnology (Biological Sciences 462)**

**Mammalogy (Biological Sciences 471)**

**Ornithology (Biological Sciences 475)**

**Biology of Fishes (Biological Sciences 476)**

**Insect Biology (Entomology 212)**

**Public Administration (City and Regional Planning 643)**

**Policy Analysis (City and Regional Planning 720)**

**Soil Science (Agronomy 260, 361)**

**International Development (City and Regional Planning 777, Government 648)**

**Environmental Planning Law (Law 660, City and Regional Planning 653, 656)**

**Political Economy and Political Theory (City and Regional Planning 719, Government 428)**

**Philosophy 381—Philosophy of Science**

## PLANT BREEDING

W. R. Coffman, chair; R. E. Anderson, E. D. Earle, H. L. Everett, C. C. Lowe, H. M. Munger, R. P. Murphy, M. A. Mutschler, W. D. Pardee, O. H. Pearson, R. L. Plaisted, R. R. Seaney, M. E. Smith, M. E. Sorrells, J. C. Steffens, S. D. Tanksley, D. R. Viands, D. H. Wallace

Biometry courses are listed under "Statistics and Biometry."

**201 Introduction to Plant Breeding**
Spring. 2 credits. Prerequisite: one year of introductory biology.
Lecs, T R 11:15. W. R. Coffman.
The contributions of plant breeding to national and international development. An overview of genetics, breeding methods, systems, and operational procedures for producing commercial crop varieties are considered along with the major breeding objectives.

**225 Plant Genetics**
Spring. 4 credits. Prerequisite: one year of introductory biology or permission of instructor. Limited to 50 students.
Lecs, M W F 9:05; lab, T or W 1:25; lab section assignments at first lecture. Labs start first week. M. A. Mutschler.
An overview of genetic principles is related to plant sciences. Mendelian inheritance and cell mechanics, DNA as genetic material, genetic fine structure and gene regulation, gene recombination, linkage and mapping, gene interaction, extranuclear inheritance, environmental effect on phenotypic expression, gene mutation and chromosomal aberrations, variation in chromosome numbers, genes in populations, multiple gene inheritance, tissue culture, and genetic engineering. Students conduct an independent inheritance project with *Brassica campestris*. The course may not be used to fulfill the genetics requirement for students in the Division of Biological Sciences.

**401 Plant Cell and Tissue Culture**
Fall. 2 credits. Prerequisites: a course in plant physiology, cell biology, or genetics, or permission of instructor.
Lecs, T R 10:10. E. D. Earle.
Lectures and demonstrations dealing with the techniques of plant tissue, cell, protoplast, embryo, and anther culture and the applications of those techniques to biological and agricultural studies. Methods for plant improvement via manipulations of cultured cells will be discussed.

**402 Plant Tissue Culture Laboratory**
Fall. 1 credit. Enrollment limited. Prerequisites: Plant Breeding 401 (may be taken concurrently) *and* written permission of instructor.
W 1:25–4:25 plus 1 hr. to be arranged, alternate weeks. E. D. Earle.
Laboratory exercises complementing Plant Breeding 401. Techniques for establishing, evaluating, and utilizing plant organ, embryo, callus, cell, protoplast, and anther cultures will be covered. Experiments will use a broad range of plant materials.

**496 Internship in Plant Breeding**
Fall or spring. Credits variable, may be repeated to a maximum of 6. Minimum of 60 on-the-job hours per credit granted. Prerequisites: permission of adviser and enrollment during the pre-enrollment period of the semester before the internship. Student must be a plant breeding junior or senior with a minimum 3.0 average in plant breeding courses. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their study and assign their credits and grade. S-U grades only.
Staff.
On-the-job learning experience under the supervision of professionals in a cooperating organization. A learning contract is written between the faculty supervisor and student, stating the conditions of the work assignment, supervision, and reporting.

**497 Special Topics for Undergraduates**
Fall or spring. Credits variable, may be repeated to a maximum of 6. Prerequisite: permission of instructor. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their study and assign their credits and grade. S-U optional.
Staff.

**498 Undergraduate Teaching**
Fall or spring. Credits variable, may be repeated to a maximum of 6. Prerequisites: permission of instructor, and previous enrollment in course to be taught or equivalent. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their study and assign their credits and grade. S-U optional.
Staff.
Undergraduate teaching assistance in a plant breeding course. Teaching experience may include leading a discussion section, preparing and teaching laboratories, and tutoring.

**499 Undergraduate Research**
Fall or spring. Credits variable, may be repeated to a maximum of 6. Prerequisite: permission of instructor. Students must attach to their course enrollment materials a "CALS Independent Study, Research, Teaching, or Internship" form signed by the faculty member who will supervise their study and assign their credits and grade. S-U optional.
Staff.
Undergraduate research projects in plant breeding.

**603 Methods of Plant Breeding**
Fall. 3 credits. Prerequisites: Biological Sciences 281 or Plant Breeding 225 or equivalent and an introductory course in crop production.
M W F 11:15. M. E. Smith.
Breeding methods, systems, and operational procedures for producing commercial crop varieties are considered in detail. Emphasis is on an integrated, interdisciplinary approach to major breeding objectives, including agronomic characteristics, quality characteristics, and biotic and abiotic tolerances. Inbreeding methods, population genetics, population improvement, and breeding methods for special situations will be covered.

**604 Methods of Plant Breeding Laboratory**
Fall. 2 credits. Prerequisite: Plant Breeding 603 or equivalent.
T R 1:25–4:15. M. E. Sorrells and R. E. Anderson.
Field trips to public and private plant breeding programs. Discussion of breeding methods used, overall goals, selection and screening techniques, and variety and germ plasm release. Uses of computers in plant breeding research. Organization and presentation of a comprehensive breeding program on a chosen crop.

**605 Physiological Genetics of Plant Adaptation and Yield**
Spring. 1 credit. Prerequisite: genetics or plant breeding, or permission of instructor. Offered alternate years.
R 10:10. D. H. Wallace.
The physiology and genetics of yield accumulation and of cultivar adaptation are explored. Biological relationships between adaptation and yield are studied. Early and modern literature on breeding for adaptation and yield in any environment are compared.

**[608 Biochemical Approaches in Plant Breeding**
Fall. 2 credits. Prerequisite: Biological Sciences 330, 331, or permission of instructor. Not offered 1989–90.
M W 10:10. J. C. Steffens.
A review of biochemical, spectroscopic, and immunological techniques used in the analysis, selection, and generation of crop plants. Examples from current literature and possible applications of new technologies will be discussed. Critical assessment of appropriate means of targeting biochemical plant breeding problems will be discussed.]

**622 Seminar**
Fall or spring. 1 credit. S-U grades only.
T 12:20. Staff and graduate students.

**629 Special Topics in Plant Science Extension**
Spring. 2 credits.
F 1:25–4:25. W. D. Pardee.
Designed for graduate students and advanced undergraduates to provide a broader knowledge of cooperative extension philosophy and methods. Developed for students interested in extension and research in public and commercial organizations. Topics relate to extension in other countries as well as in the United States.

**650 Special Problems in Research and Teaching**
Fall or spring. 1 or more credits. Prerequisite: permission of instructor supervising the research or teaching.
Staff.

**653 Plant Molecular Genetics (also Biological Sciences 653)**
Spring. 3 credits. Prerequisites: Biological Sciences 281, and 330 or 331, or their equivalents.
Lecs, T R 10:10–11:30. S. D.Tanksley, M. R. Hanson, J. B. Nasrallah, P. Palukaitis.
A review of the organization, function, and evolution of genetic information in higher plants. An in-depth treatment of the organization of the chloroplast, mitochondrial, and nuclear genomes as well as their interactions. Current information on gene regulation in higher plants is also discussed.

**[716 Perspectives in Plant Breeding Strategies**
Spring. 3 credits. S-U grades optional. Prerequisite: Plant Breeding 603. Not offered 1989–90.
T 1:25–2:15, R 12:20–2:15. M. E. Sorrells.
Selection techniques and breeding objectives, methods, and strategies for both self- and cross-pollinated crops are reviewed and discussed. Extensive outside reading is required. Emphasis is on discussion and evaluation of selected benchmark papers and current literature.]

**717 Quantitative Genetics in Plant Breeding**
Spring, even years. 3 credits. Prerequisites: Plant Breeding 603 and Statistics 601. S-U grades only.
T R 8:30–9:55. D. R. Viands, R. L. Plaisted.
Discussion of quantitative genetics to help make decisions for more efficient plant breeding. Specific topics include components of variance (estimated from mating designs), gene pool development, linkage, heritability, phenotypic and genotypic correlation coefficients, and theoretical gain from selection. During one period, plants in the greenhouse will be evaluated to provide data for computing quantitative genetic parameters.

## PLANT PATHOLOGY

W. E. Fry, chair; J. R. Aist, P. A. Arneson, S. V. Beer, G. C. Bergstrom, B. B. Brodie, A. R. Collmer, S. M. Gray, R. K. Horst, G. W. Hudler, H. W. Israel, M. P. Ko, R. P. Korf, J. W. Lorbeer, R. Loria, M. T. McGrath, M. G. Milgroom, E. B. Nelson, P. F. Palukaitis, W. A. Sinclair, S. A. Slack, H. D. Thurston, O. C. Yoder, M. Zaitlin, T. A. Zitter

**301 Introductory Plant Pathology**
Fall. 4 credits. Prerequisites: Biological Sciences 101–102 and 103–104, or 105–106 or 109–110. Recommended: Biological Sciences 241 or equivalent.
Lecs, T R 11:15; lab, M T W or R 1:25–4:25 and one period weekly, scheduled at the convenience of the student. W. A. Sinclair.
An introduction to the theory and practice of plant pathology with emphasis in lectures on principles that govern interactions of plants and pathogens and in laboratories on diagnostic criteria, life cycles of pathogens, and epidemiological phenomena and control. Specific aspects considered in detail include fungi, bacteria, nematodes, viruses, and mycoplasmas as plant pathogens; attack and resistance mechanisms; environmental influences; disease forecasting and loss assessment; development of resistant plants; and chemical and biological control.

**[309 Introductory Mycology**
Fall. 3 credits. Prerequisite: a year of biology or equivalent. Not offered 1989–90.
Lecs, T R 9:05–9:55; labs, R 1:25–4:25. R. P. Korf.
An introduction to fungi, emphasizing biology, comparative morphology, and taxonomy.]

**319 Field Mycology**
Fall. 1 or 2 credits. Prerequisite: CALS biology students, PP 309 or equivalent; others by permission of instructor.
Lab, W 1:25–4:25 and 7:30–9:30 p.m. R. P. Korf.
Study of mushrooms and other fungi on 7 field excursions followed by 7 evening labs devoted to identification and study of collections under the microscope. Emphasis on ecology, biology, and means of identification. Students electing 2 credits attend 12 additional labs to prepare special project. There are no lectures; grades will be determined on basis of laboratory final and, for 2 credits, also on special project report.

**402 Plant Disease Control**
Spring. 3 credits. Prerequisite: Plant Pathology 301 or equivalent.
Lecs, T R 11:15; lab and rec, T W 1:25–4:25. P. A. Arneson.
This course complements Plant Pathology 301 with an in-depth presentation of the principles and practices of plant disease control that builds on students' knowledge of diseases and their causal agents. General principles and concepts, illustrated by specific examples, are presented. Students write a term paper applying those principles to a specific disease-control problem. The laboratories provide practical experience in diagnosis and disease-control techniques.

**411 Plant Disease Diagnosis**
Fall. 3 credits. For senior undergraduates specializing in plant pathology or pest management and for graduate students with a major or minor in plant pathology or plant protection. Limited to 20 students. Prerequisites: Plant Pathology 301 or equivalent *and* permission of instructor.
Lec, M 11:15; lab, M W 1:25–4:25.
G. W. Hudler.
A method for diagnosis of plant disease is presented with emphasis on contemporary laboratory techniques and effective use of the literature.

**[443 Pathology and Entomology of Trees and Shrubs (also Entomology 443)**
Fall. 5 credits. Prerequisites: Plant Pathology 301 and Entomology 241 or equivalents. Offered alternate years. Not offered 1989–90.
Lecs, M W F 10:10; labs, T R 1:25–4:25 or W F 1:25–4:25. Evening prelims.
W. T. Johnson, G. W. Hudler.
For students preparing for careers in horticulture, urban forestry, and pest management. Deals with the nature, diagnosis, assessment, and treatment of diseases and anthropod pests of trees and shrubs. Forest, shade, and ornamental plants are considered.]

**[444 Integrated Pest Management (also Entomology 444)**
Fall. 4 credits. Prerequisites: Biological Sciences 261, Entomology 212 or 241, and Plant Pathology 301 or their equivalents or permission of instructor. Not offered 1989–90.
Lecs, M W F 9:05; lab, M or W 1:25–4:25.
P. A. Arneson.
Lectures integrate the principles of pest control, ecology, and economics in the management of pest crop systems. Laboratories consist of exercises to reinforce concepts presented in lecture and demonstrate pest monitoring techniques and the application of computer technology to management problems.]

**497 Special Topics**
Fall or spring. 1–5 credits. S-U grades optional.
Hours to be arranged. Staff.
An opportunity for independent study of a special topic in mycology or plant pathology under the direction of a faculty member.

**498 Teaching Experience**
Fall or spring. 1–5 credits. S-U grades optional.
Hours to be arranged. Staff.
Undergraduate teaching assistance in a mycology or plant pathology course by mutual agreement with the instructor.

**499 Undergraduate Research**
Fall or spring. 3–5 credits. S-U grades optional.
Hours to be arranged. Staff.
An opportunity for research experience under the direction of a faculty member.

**642–661 Special Topics Series**
*Unless otherwise indicated, the following description applies to courses 642–661.* Fall or spring. 1 credit. Prerequisite: permission of instructor. S-U grades only.
Hours to be arranged.
Weekly discussions of current topics in special areas of plant pathology and mycology. Students are required to do extensive reading of current literature and to present oral and written reports.

**642 Plant Disease Epidemiology**
Fall.
T 12:20. M. G. Milgroom.

**644 Ecology of Soil-Borne Pathogens**
Fall.
M 4. E. B. Nelson.

**645 Plant Virology**
Fall.
F 12:20. S. M. Gray.

**646 Plant Nematology**
Fall and spring.
W 12:20. M. P. Ko, B. B. Brodie.

**647 Bacterial Plant Diseases**
Spring.
M 11:15. S. V. Beer.

**648 Molecular Plant Pathology**
Fall and spring.
R 12:20. H. D. VanEtten, O. C. Yoder.

**649 Mycology Conferences**
Spring. 2 credits.
Lec, F 10:10; lab, F 1:25. R. P. Korf.
Ascomytes, including lichens, Basidiomycota, excluding rusts.

**650 Diseases of Vegetable Crops**
Fall.
W 4. J. W. Lorbeer, T. A. Zitter.

**651 Diseases of Fruit-Tree Crops**
Fall. For graduate students and advanced undergraduates with a particular interest in fruit. Autotutorial slide and tape sets.
Hours to be arranged. P. A. Arneson.
Covers the economic importance, causal agents, symptoms, disease cycle, and control measures for the major diseases of tree fruit in the Northeast.

**652 Field Crop Pathology**
Spring.
W 8. G. C. Bergstrom.

**653 Dendropathology**
Spring.
W 4. G. W. Hudler, W. A. Sinclair.

**654 Diseases of Florist Crops**
Spring.
F 12:20. R. K. Horst.

**655 Plant Diseases in Tropical Agriculture**
Spring
T 12:20. H. D. Thurston.

**661 Diagnostic Lab Experience**
Summer and fall. 2 credits.
T. A. Zitter.
For graduate students and advanced undergraduates with a special interest in diagnosing plant diseases. Students will work in the Diagnostic Laboratory (Plant Pathology Department) under supervision of the diagnostician. Students may choose to work on a wide array of plant material or to concentrate on a particular commodity. Priority will be given to graduate students in plant pathology and plant protection.

**681 Plant Pathology Seminar**
Fall and spring. 1 credit. Required of all plant pathology majors. S-U grades only.
T 4:30–5:30. Staff.

**701 Concepts of Plant Pathology: Organismal Aspects**
Spring. 3 credits. For graduate students with majors or minors in plant pathology; others by permission. Prerequisites: Plant Pathology 301 or equivalent and permission of instructor.
Lecs, T R 9; lab-disc, R 2–4:25.
A. R. Collmer.
Concepts in host-pathogen relationships with emphasis on roles of molecules and cells in determining the outcome of an interaction. Genetic, molecular biological, physiological, and cell biological approaches to experimental analysis of exemplary host-pathogen systems will be considered. Historical perspectives and recent research will be reviewed and analyzed. Students prepare and review mock grant proposals.

**702 Concepts of Plant Pathology: Population Aspects**
Spring. 3 credits. For graduate students with a major or minor in plant pathology; others by permission. Prerequisite: Plant Pathology 301 and permission of instructor.
Lec, T R 8; lab, T 2–4:25.
M. G. Milgroom.
Theory and concepts in epidemiology and population biology of plant diseases. Topics include: population dynamics of pathogens in time and space, interactions of pathogen and plant populations, disease in natural communities, and applications of theory and modeling to disease management. The laboratory period will be for discussions and exercises that illustrate concepts introduced in lectures.

**[705 Phytovirology**
Spring. 2 credits. For graduate students with a major or minor in plant pathology; others by permission. Prerequisite: Plant Pathology 301 or equivalent. Offered alternate years. Not offered 1989–90.
Lec, T R 10:10. M. Zaitlin.
This course considers plant viruses and the diseases they cause. Consideration is given to virus structure and composition, classification, replication, effects on hosts, modes of transmission, and the relationships of these aspects to principles of diagnosis and control.]

**706 Phytonematology**
Fall. 2 credits. For graduate students with a major or minor in plant pathology; others by permission. Prerequisite: Plant Pathology 301 or equivalent or permission of instructor.
Lec, R 11:15; lab, R 1:25–4:25. M. P. Ko.
Deals with morphology, anatomy, biology, physiology, ecology, detection and identification of plant pathogenic nematodes, evaluation of population data, interactions between nematodes and other plant pathogens, and methods of assessment of pathogenicity and plant damage.

**707 Phytobacteriology**
Fall. 2 credits. Prerequisites: general microbiology, lectures and laboratory; Introductory Plant Pathology.
Lec, W 9:05; lab, W 1:25–4:25.
S. V. Beer.
A consideration of the prokaryotes that cause disease in plants and examples of the diseases they cause. The course emphasizes properties of bacterial pathogens that affect disease, methods for manipulation of the pathogens, and recent developments in phytobacteriology. The current state of knowledge of important phytopathogenic genera including their genetics and mechanisms of pathogenesis will be reviewed. Laboratory practice in isolation, inoculation, identification, genetics, and physiology is included.

**709 Phytomycology**
Spring. 2 credits. For graduate students with a major or minor in mycology or plant pathology; others by permission. Prerequisites: Plant Pathology 301 and 309 or equivalents, and permission of instructor.
Lec, F 1:25–2:30; lab, 2:30–4:30.
J. W. Lorbeer.
Provides basic information on the biology of plant pathogenic fungi with selected emphasis on the structure, ecology, genetics, life cycles, and disease cycles of representative genera and species.

**735 Advanced Plant Virology**
Spring. 3 credits. Prerequisite: permission of instructors. Offered alternate years.
3 lecs, hours to be arranged.
P. Palukaitis, M. Zaitlin.
Topics in plant virology, with an emphasis placed on student discussion of current literature. Topics included are viral infection process, viral and viroid replication, viral movement, viral genes and their products, cross protection, detection of viruses, and the use of viruses as vectors for introducing genetic material into plants.

**[738 Molecular Mechanisms of Pathogenesis**
Fall. 2 credits. For graduate students with a special interest in molecular mechanisms of pathogenesis. Prerequisite: permission of instructor. S-U grades only. Not offered 1989–90.
Hours to be arranged. O. C. Yoder and staff.
This course deals with the molecular properties of both microorganisms and higher plants that control the development of host-parasite relationships. Contemporary molecular hypotheses are related to genetic mechanisms of pathogenesis. Emphasis is placed on a critical evaluation of the data that are used to support each specific hypothesis.]

**739 Advanced Mycology**
Spring. 4 credits. Prerequisites: Plant Pathology 309 or equivalent, a course in genetics, and permission of instructor.
Lec, M 10:10; labs, M W 1:25–4:25, and an additional 3-hr. period to be arranged. R. P. Korf.
A detailed study of the taxonomy, nomenclature, and biology of two major groups of fungi (rusts and fungi imperfecti).

**[756 Advanced Plant Nematology**
Fall. 3 credits. For graduate students with a major in plant pathology and special interest in nematology. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
Hours to be arranged. M. P. Ko, B. B. Brodie.]

**797 Special Topics**
Fall or spring. 1–5 credits. S-U grades optional.
Hours to be arranged. Staff.
An opportunity for independent study of a special topic.

**799 Graduate Research**
Fall or spring. 1–5 credits. S-U grades optional.
Hours to be arranged. Staff.

## POMOLOGY: HORTICULTURAL SCIENCES

G. H. Oberly, chair; R. L. Andersen, G. D. Blanpied, S. K. Brown, L. L. Creasy, J. N. Cummins, A. N. Lakso, F. W. Liu, R. M. Pool, L. E. Powell, M. P. Pritts, W. C. Stiles

**200 Introductory Pomology**
Fall or spring. 3 credits. S-U grades only for graduate students.
Lecs, T R 8; lab, T 2–4:25. One half-day field trip required. G. H. Oberly.
A study of the general principles and practices of fruit culture and their relation to the underlying sciences. Included are tree fruits, grapes, and small fruits. Topics covered include propagation, varieties, crop management, and growth and fruiting habits. Practical work is presented in grafting, pruning, site and soil selection, and planting.

**215 Economic Fruits of the World**
Spring. 3 credits. S-U optional. Offered alternate years.
Lecs, M W 10:10; lab, R 1:25–4:25.
F. W. Liu.
A broad view of world pomology is given. The distribution, production, and utilization of about one hundred species of fruit crops are discussed. The more important subtropical and tropical fruits such as citrus, banana, pineapple, coconut, mango, avocado, coffee, and cacao are studied in more detail. Many other less important ones are studied briefly. Methods of fruit growing in tropical and subtropical regions are shown in slides. Laboratory studies include the morphology, anatomy, postharvest handling, and taste of many subtropical and tropical fruits.

**315 Postharvest Physiology and Storage of Horticultural Crops**
Fall. 3 credits. Prerequisite: one horticultural course or permission of instructor.
Lecs, M W 9:05; lab, W 1:30–4. F. W. Liu.
The physiology—transpiration, respiration, ethylene synthesis and action, maturation, ripening, and senescence—of fruits, vegetables, flowers, and ornamental crops is studied. Environmental factors influencing the physiological process, thus affecting the quality and marketability of the products, are considered. The principles and methods of harvesting, cleaning, grading, packing, precooling, waxing, sanitation, and transportation of the products are studied. Storage methods, including common storage, refrigerated storage, controlled-atmosphere storage, and hypobaric storage, are discussed.

**345 Fruit-Tree Nursery Operation**
Spring, first 4-1/2 weeks. 1 credit. Prerequisite: Horticultural Sciences 200 or permission of instructor. S-U grades optional. Offered alternate years.
Lecs, M W 9:05; lab, W 2–4:25.
J. N. Cummins.
This course is intended to familiarize the fruit producer with the operations and problems of the fruit-tree nursery. Topics include production objectives, management decisions, and cultural aspects of nursery operation. Techniques of grafting, budding, pest identification, inspection, and grading of fruit-free planting stocks are included.

**[350 Small Fruits**
Fall. 3 credits. Offered alternate years. Not offered 1989–90.
Lecs, M W 8; lab, M 2–4:25. M. P. Pritts.
A study of the evolution, breeding history, and biology of strawberries, raspberries, blueberries, and bushberries and of cultural practices used to maximize production. Emphasis will be placed on understanding how cultural practices influence growth, development, and fruiting and protect these species from diseases and insects.]

**355 Viticulture**
Fall. 3 credits. Prerequisite: Horticultural Sciences 200 or permission of instructor. Offered alternate years.
Lecs, T R 9:05; lab, R 2–4:25; S field trips in early fall will replace several laboratory meetings. R. M. Pool.
Viticulture, with emphasis on the viticulture of the Great Lakes region, is presented as a series of interrelated decisions on varieties, sites, vine management, and vine protection. Those decisions are based on ampelography, meteorology, soils, vine and grape anatomy and physiology, as well as protection of the vine and grapes from injuries, primarily from diseases and insects.

**[360 Fruit Crop Systematics**
Fall, first 4-1/2 weeks. 1 credit. Prerequisite: Horticultural Sciences 200 or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, T R 9:05; lab, R 2–4:25.
G. H. Oberly.
The classification of fruit species is considered from a botanical and production viewpoint. The course deals with the identification and naming of fruit species and varieties and their botanical classification.]

**[365 Utilization of Fruit Crops**
Fall, middle 4-1/2 weeks. 1 credit. Prerequisite: Horticultural Sciences 200 or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, T R 9:05; lab, R 1:30–4; 2 field trips, R 12:30–5:30. F. W. Liu.
A consideration of the fate of fruits produced for processing. The coverage of fruit products is generally limited to those commercially grown and processed in New York State. Although the discussion includes methods of canning, freezing, dehydration, and other types of processing, emphasis is on the quality requirement and proper handling of raw materials and how they affect the quality of end products.]

**[370 Fruit Variety Improvement**
Fall, last 4-1/4 weeks. 1 credit. Prerequisite: Horticultural Sciences 200 or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, T R 9:05; lab, R 2–4:25.
S. K. Brown and R. L. Andersen.
The techniques and limitations of producing new varieties of perennial fruit crops are considered.]

**[445 Orchard Management I**
Spring. 3 credits. Prerequisite: Horticultural Sciences 200. Offered alternate years. Not offered 1989–90.
Lecs, M W 8; lab, M 1:25–4:25.
L. E. Powell, W. C. Stiles.
A treatment of problems of concern to fruit growers, such as site selection, planting and pruning systems, water relations, cold hardiness, dormancy, flowering, and fruiting. Physiological and practical aspects are emphasized.]

**450 Orchard Management II**
Fall. 3 credits. Prerequisite: Horticultural Sciences 200. Offered alternate years.
Lecs, M W 8; lab, M 1:25–4:25.
G. H. Oberly, L. L. Creasy.
A continuation of the principles of pomology presented in Horticultural Sciences 445. Subjects include the later stages of fruit maturation, quality, harvesting, aspects of tree nutrition, protection from pests, and regulatory policies affecting fruit production and sale.

**[470 Special Topics in Experimental Pomology**
Spring. 3 credits. Open to undergraduates by permission. Offered alternate years. Not offered 1989–90.
Hours to be arranged. Staff.
Selected topics are considered with respect to the current literature or experimental techniques. Topics reflect the research interests of the professors who participate.]

**495 Undergraduate Seminar**
Spring. 1 credit (may be taken twice for credit). Prerequisite: a course in pomology. S-U grades only.
Hours to be arranged. Staff.
Seminar topics and speakers selected and arranged by the students on subject areas related to pomology.

**497 Independent Study in Pomology**
Fall or spring. 1 or more credits: may be repeated for credit. S-U grades optional. Prerequisite: a student must satisfy the faculty member with whom he or she will work that his or her background warrants the choice of project. Undergraduates must attach to their course enrollment materials written permission from the faculty member who will supervise their work and grade their project.
Staff.
Individual or small-group study and special projects in pomology and related areas.

**499 Undergraduate Research**
Fall or spring. 2 or more credits. Prerequisite: a course in advanced pomology. S-U grades optional. Students must attach to their course enrollment materials written permission from the staff member who will supervise the work and assign the grade.
Staff.

**500 Master of Professional Studies (Agriculture) Project**
Fall or spring. 1–6 credits. S-U grades optional.
Hours to be arranged. Staff.
A comprehensive project emphasizing the application of pomological principles and practices to professional pomology teaching, extension, and research programs. Required of Master of Professional Studies (Agriculture) candidates in the field.

**601 Graduate Seminar**
Fall. 1 credit. S-U grades only.
Hours to be arranged. Staff.
Reports by students on current research or literature in experimental pomology or related areas.

**610 Growth and Development of Woody Plants**
Spring. 2 credits. Prerequisite: introductory plant physiology. Offered alternate years.
T R 9:05. L. E. Powell.
An advanced course dealing with physiological, morphological, and biochemical changes during development, beginning with the seed and advancing through the mature reproductive plant. Hormonal control mechanisms are emphasized.

**620 Developing Effective Horticultural Research Programs**
Spring. 2 credits. Undergraduates admitted by permission of instructor. S-U grades optional. Offered alternate years.
Hours to be arranged. A. N. Lakso.
A course emphasizing the development and management of career-long research programs in horticulture for Ph.D. students. Invited faculty and administrators will lead discussions on topics such as grants, funding, and personnel management. Each student will be required to prepare a term paper and make an oral presentation on a grant proposal related to horticulture.

**630 Current Topics in Postharvest Horticulture**
Fall or spring. 1 credit. Prerequisite: permission of instructor.
Hours to be arranged. G. D. Blanpied.
Graduate students and staff report and discuss current topics in postharvest biology and technology of horticultural crops.

**700 Teaching Experience**
Fall or spring. 1 credit. S-U grades only. Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Designed to acquaint pomology graduate students with the methods and materials involved in teaching. The student participates in the design, delivery, and evaluation of segments of a departmental course.

**800 Master's Thesis Research**
Fall or spring. Credit to be arranged. S-U grades only.
Hours to be arranged. Staff.

**900 Doctoral Thesis Research**
Fall or spring. Credit to be arranged. S-U grades only.
Hours to be arranged. Staff.

**Related Courses in Another Department**

**General Horticulture (Horticultural Sciences 102)**

**Quality of Horticultural Crops During Marketing (Horticultural Sciences 330)**

**Advanced Postharvest Physiology of Horticultural Crops (Horticultural Sciences 625)**

## POULTRY AND AVIAN SCIENCES

R. E. Austic, chair; P. W. Aho, R. C. Baker, S. E. Bloom, G. F. Combs, Jr., R. R. Dietert, P. A. Johnson, I. K. Keshavarz, H. G. Ketola, C. C. McCormick, J. A. Marsh, J. M. Regenstein, G. L. Rumsey, C. S. Winstead

The faculty members in the Department of Poultry and Avian Sciences are responsible for courses taught in several areas, including animal sciences, biological sciences food science, and nutritional sciences. See the particular sections on those subjects for courses.

## RURAL SOCIOLOGY

D. L. Poston, chair; D. L. Brown, F. H. Buttel, E. W. Coward, Jr., P. R. Eberts, C. Erickson, S. Feldman, J. D. Francis, C. C. Geisler, D. T. Gurak, M. M. Kritz, T. A. Hirschl, T. A. Lyson, P. McMichael, J. M. Stycos, F. W. Young

*Note:* Students seeking to fulfill their group C requirements may do so through several courses: Rural Sociology 101, 102, 201, 205, 206 and 208. Rural Sociology 101, Rural Sociology 102, and Sociology 101 have very similar contents.

**101 Introduction to Sociology**
Fall or spring. 3 credits. (See Sociology 101 as an alternative.) May not be taken after RS 102.
Fall: Lecs, T R 10:10; disc and lab, M 9:05, 10:10, 12:20; R 11:15, 12:20; F 10:10, 12:20. E. C. Erickson and staff.
Spring: Lecs, T R 10:10; disc: M or F 9:05, 10:10, 11:15, 12:20, 1:25, or 2:30. T. A. Lyson.
A survey of major concepts and theories in sociology and an examination of major social forces and institutions shaping modern societies. The major topics include culture and socialization, social stratification and social class, age and gender inequality, economy and society, politics and the state, urbanization and demographic change, social change and international development, the rural-urban transition, and war and peace.

**[102 Introduction to Rural Sociology**
Spring. 3 credits. May not be taken after RS 101. S-U grades optional. Will not be offered 1989–90.
Lecs, T R 10:10; disc, M or F 9:05, 10:10, 11:15, 12:20, 1:25, or 2:30. T. A. Lyson.
This course provides a general introduction to the field of rural sociology. It is organized as a skills course as well as a survey course. The focus will be on giving students fundamental skills with which to decode the social world, including an understanding of the basic philosophical and theoretical underpinnings of the discipline and an exposure to the various types of data and methods sociologists use to describe and explain behavior. Special attention is paid to the agricultural sector and problems of rural development in the United States.]

**103 Introduction to Sociology with Computers**
Fall. 3 credits. Prerequisites: none; designed for students with computer interests and for social science majors. May not be taken after RS 101 or RS 102. Not approved for college distribution credit.
T R 11:15; lab T 12:20–1:10. P. Eberts.
Course examines major social institutions and processes and how they affect people as individuals and members of groups and societies. The social factors and institutions emphasized are family and marital conditions, racial stratification, religion, power structures and political participation, age and life course, sexual identity, bureaucracies and organizational affiliations, and social class and mobility. Weekly discussion and laboratory sessions provide students with computing skills for analyzing the influences of these factors on individuals and societies.

**104 Proseminar: Issues and Problems in Rural Society**
Fall. 1 credit. S-U grades only.
R 12:20–1:25. Staff.
Introduces students to subject matter of concern to both applied and academic rural sociologists. Focuses on such subjects as migrant workers, agribusiness, rural poverty, rural-to-urban migration, rural development, agricultural research and people, community development, and small farmers in the less-developed nations. These topics are explored through the use of films and group discussion.

**175 Issues in Contemporary American Indian Societies**
Spring. 3 credits. S-U grades optional.
W 7 p.m. R. Venables.
American Indian people are confronted with a myriad of special circumstances that impinge upon their everyday lives. The purpose of this course is to present background to these issues and give perspective from an American Indian point of view. Early history and the postcontact period will be reviewed with an emphasis given to developments since 1890. Topics such as land claims, treaties, education, mineral and water rights, social problems, militant organizations, and civil rights will be covered, with guest lecturers and media presentations giving added impact.

**201 Population Dynamics (also Sociology 205)**
Spring. 3 credits. S-U grades optional. ALS students must register for this course as Rural Sociology 201.
T R 1:25–2:40. J. M. Stycos.
An introduction to population studies, which include the determinants and consequences of population change. The primary focus is on the influences of demographic dynamics on society and the economy, with emphasis on marriage, family formation, mortality, crime and deviance, migration, and marketing behavior.

**205 Rural Sociology and International Development**
Spring. 3 credits.
M W F 10:10. P. McMichael.
This course is concerned with global food security issues. While our primary focus is on the varying capacities for food production and supply in Third World regions, we shall be taking into consideration the role of metropolitan agencies and the changing role of the U.S. as the world's "breadbasket." We consider food systems comparatively, in terms of differences among world regions and between peasant agricultures and modern "industrial" agricultures. We examine the nature of peasant society and consider how traditional rural systems have responded to their exposure to international forces—such as the expansion of export agriculture, development agencies, local bureaucracies, the current "debt crisis," and technologies such as the Green Revolution. The focus will be on the changing social organization of food systems, and the implications for food security.

**206 Gender and Society**
Fall. 3 credits.
M W F 10:10. B. Miller.
Course will familiarize students with social and behavioral similarities/differences between females and males and the degree that biological, psychoanalytic, social psychological, and sociological perspectives help understand the differences. Objectives will be met through lectures, readings, films, participant observations, and personal experiences. Special attention given to gender role behavior in the U.S. and China.

**[208 Technology and Society**
Fall. 3 credits. Not offered 1989–90.
M W F 10:10. C. G. Geisler.
The relationship between technology and society is among the most pervasive concerns of our time. Ultimately, what makes a technology useful or "appropriate" is a sociological question. Lectures and readings review classical debates regarding technology and society. Herein, students compare high technologies and appropriate technologies, identify problems associated with technology transfer to other societies, and create a list of important criteria by which technologies are judged appropriate or inappropriate using numerous case studies.]

**[213 Social Indicators and Data Management**
Spring. 3 credits. Not offered 1989–90.
M W F 11:15. F. W. Young.
A survey of definitions and measures of "social indicators." General principles of social-indicator research will be illustrated from data on both developed and less-developed countries in the areas of poverty and level of living, physical quality of life, inequality, and environmental problems. The course will examine measures based on census data, informant surveys, and household surveys, with an emphasis on simple and low-cost techniques. One-third of the course will be devoted to data management, using SPSS and microcomputers.]

**[242 American Indian Philosophies I: Power and World Views**
Fall. 3 credits. Enrollment limited to 20 students. Not offered 1989–90.
T R 10:10–11:25. Staff.
This course is designed to facilitate an understanding of the world views of American Indians of the past and present. The goal is to provoke edifying discourse that will enable American Indian beliefs concerning the workings of the universe and the relationship of human beings to nature to be understood on their own terms.]

**[243 American Indian Philosophies II: Native Voices**
Spring. 3 credits. Enrollment limited to 20 students. Not offered 1989–90.
T R 10:10–11:25. Staff.
An exploration of the diverse expressions of philosophy to be found in the words of American Indians. Novels, political treatises, speeches, autobiographies, and other sources reflecting Indian attitudes on a variety of subjects will be examined for beauty and power of expression as well as to identify recurring themes.]

**250 Farming as an Occupation**
Spring. 1 credit.
R 12:20–1:25. E. C. Erickson.
The occupation of farming will be examined through such topics as how farm and family tasks are coordinated, the most important decisions in farming, how a woman gets established in farming, what determines what can be done in a farm operation, how farm people retire, what constitutes success in farming, and how farming differs from other occupations.

**301 Theories of Society (also Sociology 401)**
Fall. 4 credits. Prerequisites: Rural Sociology 101 and 102, or Sociology 101. S-U grades optional.
T R 3:35–5:20. P. R. Eberts.
A seminar for juniors, seniors, and beginning graduate students, especially in rural sociology and sociology. A survey of major theoretical approaches to the study of society and social institutions, with emphasis on (1) the central concepts of the sociological tradition, (2) major classical theorists (Marx, Durkheim, Weber) and contemporary counterparts, and (3) application of the classical ideas in contemporary research. Applications of theories of society to current research and social problems will be stressed.

**[302 Population Problems**
Spring. 3 credits. Not offered 1989–90.
T R 10:35–12:10. Staff.
The practical and scientific significance of population growth and composition. Fertility, migration, and mortality in relation to social and cultural factors and in relation to questions of population policy. National and international data receive equal emphasis.]

**324 Environment and Society**
Fall. 3 credits.
M W F 1:25. F. H. Buttel.
An exploration of various sociological approaches to the study of society and its physical environment and an analysis of major issues relating to the interaction of societies and their resource bases—particularly overpopulation, the energy and food crises, the limits-to-growth debate, the conduct of political struggles over energy and environmental policy, and the impacts of technological and social change in agriculture on environmental quality.

**[367 American Indian Tribal Governments**
Fall. 3 credits. Not offered 1989–90.
W 7:30–9:55 p. m. Staff.
This course focuses on the structure of contemporary tribal governments and the ways in which those governments approach the issues confronting their constituents. The effects of European contact on traditional political organizations are detailed, as are the present-day relationships of tribal governments to federal and state governments.]

**[370 Social Structure of Industrial Change**
Fall. 3 credits. Not offered 1989–90.
M W F 11:15. T. A. Lyson.
The course is organized around four substantive themes. First, it begins with an examination of the social and economic structures of preindustrial, industrial, and postindustrial societies. The second part of the course looks at the linkages between industries and occupations. The third part of the course deals with patterns of regional industrial development and change in the United States. The fourth segment of the course introduces the student to a range of topics that are currently in vogue among researchers and policy makers in this area.]

**380 Independent Honors Research in Social Science**
Fall and spring. 1–6 credits. Limited to students who have met the requirements for the honors program. A maximum of 6 credits may be earned in the honors program.
Staff.
Students must submit written proposals by the third week of the semester of their senior year to the departmental honors committee representative, T. Hirschl.

**[405 Agriculture, Society, and Biotechnology (also Biology and Society 408)**
Spring. 3 credits. Prerequisites: two courses in the social sciences and three courses in the biological or agricultural sciences. Not offered 1989–90.
W 1:25–4:25. F. H. Buttel.
An examination of socioeconomic aspects of biotechnology in the context of historical patterns of technological change in agriculture in developed and developing countries. The major topics covered include the social organization of biotechnology research, industry-university relationships, and the potential socioeconomic impacts of biotechnology on agriculture.]

**408 Human Fertility in Developing Nations**
Fall. 3–4 credits. S-U grades optional.
R 3–5. J. M. Stycos.
A review of the major literature dealing with the social causation of variation in human fertility. Emphasis will be on international comparisons and on the methodology of field research.

**[418 Population Policy**
Fall. 3 credits. Not offered 1989–90.
R 1:25–4:25. J. M. Stycos.
The ways in which societies try to affect demographic trends. Special focus is on government policies and programs to reduce fertility.]

**[425 Gender Relations and Social Change**
Fall. 3 credits. Not offered 1989–90.
T R 1:25–3. S. Feldman.
A comparative analysis of women's contribution to domestic/household and agricultural labor as productive practices change. The course emphasizes the configuration of various economic and social sectors and their realignments within and between countries. Changes occur in response to technology transfer, the transformation of the labor market, the international division of labor, and changing family relations.]

**430 Migration and Population Distribution**
Fall. 3 credits.
T R 8–9:55. D. L. Brown.
This course analyzes the determinants and consequences of internal migration in urban and rural areas of the United States and other industrial nations. Economic and demographic inter-relationships will be emphasized as will implications of changes in population size and composition for labor supply, the demand for goods and services, and infrastructure. Public policy implications of the interrelationships will be investigated.

**[436 Small Towns in Metropolitan Society: Changing Structures and Quality of Life**
Spring. 2 or 3 credits. S-U grades optional. Prerequisite: a social science course. Not offered 1989–90.
T 3:35–5:20. P. R. Eberts.
Examination of recent social dynamics in small towns, including experiences of resurgence in attractiveness and a simultaneous transformation in small town character and quality of life. Analysis of data on personal computers is combined with theoretical explanations in exploring trends. Key analyses focus on causes and effects of new industrial and communication technologies, population migration, business locations, housing, family stresses, human service networks, educational attainment, local politics, and personal well-being, happiness, and satisfaction.]

**438 Social Demography**
Fall. 3 credits.
T R 11:15–12:30. D. T. Gurak.
A survey of the methods, theories, and problems of contemporary demography. Special attention is directed to the social determinants and consequences of fertility, mortality, and migration. The populations of both developed and developing areas are examined.

**[439 Social and Demographic Changes in Southeast Asia**
Spring. 3 credits. Prerequisite: Rural Sociology 201. Not offered 1989–90.
W 1:25–4:25. D. Poston.
The course will be devoted to demographic and social change in Asia, with special attention to China (PRC & ROC), India, Korea, and Thailand. The course will survey population trends, including fertility, mortality, marriage, migration, and urbanization in Asia, with special attention directed to the above four countries. Demographic and sociological theories and methods will be introduced to understand contemporary studies of demographic change in these four countries in particular and in Asia in general. A basic course in statistics is recommended.]

**[440 The Social Impact of Rapid Resource Development**
Spring. 3 credits. Not offered 1989–90.
T R 12:20–1:35. C. Geisler.
The seminar defines social-impact assessment (SIA), places it in the context of contemporary theories of development, and identifies alternative SIA models. Focus is on the SIA experiences of various groups and constituencies, including indigenous people at home and abroad. Students will learn certain practical research skills needed in doing SIA and will participate in an SIA simulation exercise.]

**442 American Indian Philosophies: Selected Topics**
Spring. 3 credits. S-U grades optional. Prerequisite: Rural Sociology or Anthropology 242 or 243, or Rural Sociology 175, or ALS 100, or permission of instructor.
Lec. T 1:25–4:25. R. Venables.
The course provides an opportunity for students to pursue topics of interest from American Indian Philosophies I and II or other introductory American Indian studies courses in greater depth. The specific topics to be investigated will be selected by the students in consultation with the instructor prior to the beginning of the semester.

**445 Rural Social Stratification**
Spring. 3 credits. Letter grades only.
T R 10:10–11:40. S. Feldman.
This course reviews the classical and contemporary theoretical debates in the areas of peasant studies and social stratification. Comparisons are drawn between agriculturally dominant and advanced industrial societies. Also examined are the social organization of agricultural enterprises; the relationship among market and nonmarket, and agricultural and nonagricultural activities; and the proletarianization debate.

**475 Global Patterns of International Migration**
Spring. 3 credits. Prerequisite: RS 101 or RS 102 or RS 103.
M W F 9:05–9:55. M. Kritz.
A comparative approach will be taken in looking at international migration patterns in different countries and regions, assessing how migration flows are changing in an increasingly interdependent world. Various types of international migration (e.g. permanent, refugee, labor, illegal, brain drain, etc.) will be looked at from the perspective of both the receiving and sending countries and their policy, economic, and social correlates reviewed.

**[481 Techniques of Demographic Analysis**
Spring. 3 credits. Not offered 1989–90.
M W F 11:15. Staff.
A description of the nature of demographic data and the specific techniques used in their analysis. Mortality, fertility, migration, and population projection are covered, as well as applications of demographic techniques to other types of data.]

**[490 Mortality and Morbidity**
Spring. 3 credits. Prerequisite: introductory sociology course or permission of instructor. Not offered 1989–90.
M W F 11:15. D. Gurak.
Course surveys existing theories, methodological techniques, and research results relating to how social, economic, and cultural structures and processes affect survival chances in diverse societies. A comparative framework is presented and the utility of existing knowledge for policy-related applications in different societies is assessed. Attention is given to the problems associated with imputing causality in morbidity and mortality data.]

**492 Contemporary Issues Seminars: Developments in the Pacific Rim**
Fall. 1–2 credits.
T 2:30–3:30. P. McMichael.
Pacific Rim dynamics challenge U.S. supremacy, Western conceptions of modernization, and "Third World" unity. We relate these trends to regional political, economic, and cultural forces, including the Japanese model, the "Newly Industrializing Countries" (e.g., South Korea, Taiwan), the "third tier" countries (e.g., Indonesia, the Philippines), and emerging Chinese markets.

**492 Contemporary Issues Seminars: Integrating Sociological and Biological Approaches to Natural Resource Management**
Fall. 2 credits.
Hours to be arranged. C. Geisler and T. Gavin.
Conservation biology is a rapidly spreading subfield of biology actively engaging professionals from the biological sciences in the conservation of endangered species and their habitats. This course examines such conservation from both biological and sociological perspectives in the belief that both are essential to successful conservation biology. Students will become sophisticated in social, cultural, and institutional factors which are integral though rarely explored dimensions of species and habitat protection policies.

**497 Informal Study**
Fall or spring. 3 credits (may be repeated for credit). Undergraduates must attach to their course enrollment materials written permission from the faculty member who will supervise the work and assign the grade. S-U grades optional.
Staff.
Informal study may include a reading course, research experience, or public service experience.

**[603 Classical Sociological Theory**
Fall. 4 credits. S-U grades optional. Prerequisites: open to graduate students and undergraduates with permission of instructor. Not offered 1989–90.
T R 3:35–5:30. F. Buttel.
An overview of the main streams of classical sociological thought, focusing on the work of Marx, Durkheim, and Weber. Emphasis is placed on the concepts, method, and ontological posture of the three major classical sociological theorists, on rival interpretations of their theoretical systems within the contemporary sociological community, and on the implications of classical thought for contemporary development theories.]

**606 Contemporary Sociological Theories of Development**
Fall. 3 credits.
M W F 11:15. F. W. Young.
A survey of theory, empirical studies, and policy prescriptions as applied to communities and regions, especially those in less-developed countries. Social ecology, the Weberian tradition, dependency/political economy, and structural theory are compared.

**[618 Research Design**
Fall. 4 credits. Prerequisite: a statistics course. Not offered 1989–90.
T R 1:25–3:30. J. D. Francis.
First of a two-semester sequence (may be taken individually) in introductory graduate methods. Discusses problems of measurement, the design of instruments, and problems of reliability and validity. Common forms of measuring instruments are discussed. Concludes with an introduction to factor analysis. Students apply principles to development of several common types of scales. Computers will be used extensively.]

**[619 Research Design II**
Spring. 4 credits. Prerequisite: an introductory methods course and a statistics course. Not offered 1989–90.
T R 1:25–3:30. J. D. Francis.
The second part of the two-semester sequence in introductory graduate methods deals with principles of design, especially nonexperimental designs, with emphasis on an intermediate-level treatment of the following topics: regression, analysis of variance, analysis of covariance, and causal models. Special emphasis is given to use of categorical variables in regression. Students develop and examine several analytical models using actual data to familiarize themselves with data handling and processing. Extensive use of computers.]

**640 Community and Changing Property Institutions**
Fall. 3 credits.
W 7:30–10:30. C. C. Geisler.
The seminar acquaints students with the evolution of property rights, beginning in antiquity, and with the close association between changing property forms and community types as recognized by both classical and contemporary sociologists. Readings will cover land-use regulation and property rights, common property issues and the land ethic.

**641 Politics and Economics of Rural and Regional Development**
Fall. 3 credits. Limited to upperclass or graduate students. S-U grades optional.
M 12:20–2:50. T. A. Lyson.
A survey of social, political, and economic factors in regional development. Theories and case studies from demography, human ecology, social organization, and planning are used to examine the emergence or retardation of regions and their implications for contemporary developing and developed societies.

**[642 Regional Systems and Policy Analysis**
Spring. 3 credits. Prerequisites: a social or economic theory course and statistics, or permission of instructor. S-U grades optional. Not offered 1989–90.
Lec, F 2:20–4:30; disc to be arranged.
P. R. Eberts.
A systems analysis of theoretical and research problems arising from localities' changing social organization. Major theories are examined with attention to their compatibility with modern policy analytic techniques. Topics covered center on the interplay of economic, social-class, and political activities in localities.]

**643 Land Reform Old and New**
Spring. 3 credits.
R 2:30–5. C. C. Geisler.
Land reform continues to be a major cornerstone of development planning. Between 1980 and 2000 the number of landless and near-landless in the Third World will approach one billion. Though land reform is a principal source of hope for the landless, its meanings are many and its models are controversial. The seminar acquaints students with land reform in antiquity as well as in contemporary settings (e.g., Japan, the Philippines, Israel, India, Brazil, Mexico, the Soviet Union, and the United States). Perennial issues of equity, efficiency, and sustainability will be discussed in each of these case study areas.

**645 Rural Social Stratification**
Spring. 3 credits.
T R 10:10–11:40. S. Feldman.
This advanced seminar examines theories of rural stratification in agricultural and advanced industrial societies, highlighting the classical and contemporary debates surrounding the relationships between agricultural and industrial productive relations. Theories of agrarian change are also examined, and discussion will draw on the role of state policy and practice in shaping agrarian relations.

**[650 Social Organization of Agriculture**
Fall. 3 credits. Not offered 1989–90.
W 1:25–4:25. Staff.
Concentrates on a small number of significant commercial crops, examining the institutions and relationships involved in the production process: research, credit, distribution of inputs, the farm operation, processing, transportation, and marketing. Patterns at the farm and community level, including topics such as settlement, land tenure, ethnic groups, class structures, methods of cooperation, small farmers, labor problems, and information networks. Ecological and physical constraints on production. Emphasis on the influence of national and international structures—political, social, and economic—on the production process, including the role of government and quasi-government units. Examines the historical circumstances giving rise to the present crop systems. Consideration of what rearrangement of the political, social, and economic structures, both domestic and international, are required for change in crop systems, improvement in production, and increased social welfare.]

**651 Sociology of Agriculture**
Fall. 3 credits. Prerequisite: graduate standing.
M 7:30–10:30 p.m. F. Buttel.
An analysis of the structural transformations of agriculture in advanced industrial countries during the nineteenth and twentieth centuries, particularly in terms of the role of the state and technical change in agricultural development. This course emphasizes the historical roots of the socioeconomic problems of contemporary agriculture and examines the prospects for, and limitations of, various strategies for ameliorating those problems.

**655 Advanced Techniques of Demographic Analysis**
Spring. 3 credits. Prerequisites: RS 481 or CEH 438, graduate standing or permission of instructor.
T R 11:15–12:30. D. T. Gurak.
An examination of analytical techniques that assumes a basic knowledge of demographic data and research methodology. Life tables, demographic estimates with incomplete data, survey techniques to supplement inadequate vital registration systems, and multivariate procedures are among the topics to be covered.

**675 The Political Economy of Policy and Planning in Third World States**
Fall. 3 credits.
T R 10:10–11:25. S. Feldman.
This course examines the structure and formation of national development priorities in Third World countries in the context of the internationalization and politicization of policy and planning agendas. The course draws on themes in development theory and theories of the state and social organization and is comparative in focus. Major topics considered are the role of international financial institutions and multinational corporations in shaping national policy, national fiscal and administrative crises, forms of colonial and authoritarian regimes, and the state-class relation in shaping policy and planning outcomes.

**690 Human Ecological Theory**
Spring. 3 credits. Prerequisite: graduate standing or permission of instructor.
W 1:25–3:55. D. L. Poston.
This course presents and reviews the theoretical perspective and tradition of human ecology in sociology, beginning with Durkheim, through the Chicago school (McKenzie, Park and Burgess), to the neo-orthodox positions of Hawley, Duncan, Schnore, Gibbs, Martin, and others. Similarities and differences between the ecological paradigm and Marxian theory are presented. Sociological and demographic research incorporating ecological theory is analyzed and reviewed. Employment of ecological approaches in other disciplines (principally anthropology and geography) is discussed. Application of the ecological orientation to social and economic development is presented.

**706 State, Economy, and Society**
Fall. 3 credits. Recommended: one graduate-level course in classical sociological theory.
W 1:25–4:25. P. McMichael.
Reviews major issues concerning the relations between political and economic institutions, including the political-economic methodologies of the classical sociological theorists, the instrumentalist-structuralist debate on the nature of the state, theories of crisis in advanced capitalism, and the controversies among theorists of unequal exchange, dependency, and imperialism in the world system.

**[715 Design and Data Analysis in Development Research**
Spring. 3 credits. Prerequisites: previous course work in scaling and statistics. Not offered 1989–90.
T R 1:25–3:30. F. W. Young.
This seminar/practicum focuses on the research sequence that leads to defensible conclusions. Topics include a review of classical research design and alternatives to it, the varieties of data for development research, measurement, controls, interactions and contexts, and organizing the argument. Illustrations and exercises will cover a range of data types and problems: subnational comparisons, informant surveys of rural communities, and household surveys of nutrition. The term paper is a research proposal.]

**718 Multidimensional Measurement and Classification**
Fall. 4 credits. Prerequisite: previous course work in scaling and statistics.,
T R 1:25–3:30. J. D. Francis.
An advanced course in measurement and scaling, building from work by Thurstone, Guttman, and Coombs to multidimensional measurements. Topics include philosophy of factor analysis, factor analytic models, factoring design, and comparison with factor analytic models. Cluster analysis, multidimensional scaling, and discriminate analyses are the other major topics discussed. As matrix algebra is an integral part of these procedures, class time is devoted to that topic. Computers are used to analyze fit to models.

**719 Regression and Path Analysis**
Spring. 4 credits. Prerequisites: two courses in statistics and one in methods.
T R 1:25–3:30. J. D. Francis.
The first part of the course reviews multiple regression theory and procedures, after which extensions of those models to categorical data are discussed. Consideration is given to violations of assumptions and their effects. Then more-advanced regression concepts and estimation techniques are discussed. The middle third of the course deals with logit, probit, and log linear models. The last part deals with recursive and nonrecursive path models. Time-series analysis is the last topic discussed. Computerized laboratories are an integral part of the course.

**[721 Ecological Perspectives on Social Change**
Spring. 3 credits. Not offered 1989–90.
Hours to be arranged. E. W. Coward, Jr.
Reviews major theoretical traditions in the analysis of societal-environmental relationships and applies these perspectives to public policy and development problems. The theoretical perspectives explored are drawn from human ecology, ecological anthropology, and environmental sociology. Policy issues from developed and developing country settings are examined using ecological perspectives.]

**[723 Social Movements in Agrarian Society**
Spring. 3 credits. Not offered 1989–90.
W 1:25–4. F. W. Young.
The seminar moves from a critical review of current explanatory formats (resource-mobilization, political economy, structuralist) to a research practicum focused on ethnoregional movements, illustrating the possibilities of comparative research based on descriptive accounts. Those movements are associated with agricultural and industrial change, as well as shifts in the regional ethnic/class system.]

**[730 Issues in the Sociology of Development**
Fall. 3 credits. S-U grades optional. Prerequisite: one graduate course in sociological theory. Offered alternate years. Not offered 1989–90.
W 1:25–4:25. P. McMichael.
This seminar examines emerging substantive issues in the sociology of development. The goal is twofold: (1) to analyze contemporary Third World trends (e.g., in development policy, agrarian reform, industrialization, state-building, food security), and world systemic trends influencing Third World development possibilities; and (2) to re-evaluate development theories in the light of current transformations.]

**[741 Community Development and Local Control**
Spring. 3 credits. Not offered 1989–90.
W 1:30–4:30. C. C. Geisler.
Theories of community growth and decline and the current debate over the place of local control in community development in general are considered. Salient themes include the role of neopopulism in community development, changing institutions of property as community development occurs, and changing definitions of *community*.]

**[751 Applications of Sociology to Development Programs**
Fall. 3 credits. Not offered 1989–90.
R 1:25–4:25. E. C. Erickson.
A consideration of problems of implementing change strategies at national, regional, and institutional levels, especially as they relate to rural development. Focus is also on institutional constraints on the sociologist as a researcher, as a strategist, and as a participant and on the different contexts within which developmental change occurs.]

**754 Sociotechnical Aspects of Irrigation (also Agricultural Economics 754 and Agricultural and Biological Engineering 754)**
Spring. 3 credits. S-U grades optional.
Hours to be arranged. R. Barker, N. T. Uphoff, M. Walter.
Examines irrigated agriculture and its relation to agricultural development. Emphasis on social processes within irrigation systems and interactions with the social setting. The seminar provides an opportunity to examine systematically the institutional and organizational policy issues associated with the design and operation of systems of irrigated agriculture.

**771 Special Seminar**
Fall or spring. Credit to be arranged. Limited to graduate students; others by permission of instructor.

**791 Teaching Experience**
Fall or spring. 1–3 credits. Limited to graduate students. S-U grades only.
Staff.
Participation in the ongoing teaching program of the department.

**792 Public Service Experience**
Fall or spring. Credit to be arranged. Limited to graduate students. S-U grades optional.
Staff.
Participation in the ongoing public service activities of the department.

**871–874 Informal Study**
Fall or spring. Credit to be arranged. Limited to master's and doctoral degree candidates with permission of the graduate field member concerned. S-U grades optional.

**871 Rural Sociology**

**872 Development Sociology**

**873 Organization Behavior and Social Action**

**874 Methods of Sociological Research**

**881 Research**
Fall or spring. Credit to be arranged. Limited to master's and doctoral degree candidates with permission of the graduate field member concerned. S-U grades optional.

## STATISTICS AND BIOMETRY

C. E. McCulloch, chair; N. S. Altman, G. C. Casella, C. Castillo-Chavez, S. J. Schwager, S. R. Searle

Courses in statistics and biometry are offered by the Department of Plant Breeding and Biometry.

**200 Statistics and the World We Live In**
Spring. 3 credits.
Lecs, T R 10:10–11:25; disc, T 1:25 or 2:30, or W 1:25 or 2:30, or R 9:05. Staff.
Major concepts and approaches of statistics are presented at an introductory level. Three broad areas are covered: collecting data, organizing data, and drawing conclusions from data. Topics include sampling, statistical experimentation and design, measurement, tables, graphs, measures of center and spread, probability, the normal curve, confidence intervals, and statistical tests.

**215 Introduction to Statistical Methods**
Fall. 3 credits. Prerequisite: Statistics 200 is recommended for students with no prior experience in data collection and interpretation.
Lecs, M W F 11:15; lab, 1 hr. to be arranged. Staff.
Statistical methods are developed and used to analyze data arising from the biological sciences. Topics include elementary statistical graphics, point and confidence interval estimation, hypothesis testing, t-tests, correlation, simple linear regression, and possibly analysis of variance and multiple regression. Statistical computing is taught and used throughout the course. Emphasis is on proper use of statistical methodology and interpretation of statistical analyses.

**408 Theory of Probability**
Fall. 4 credits. Prerequisite: Mathematics 112, 122, or 192, or permission of instructor.
Lecs, M W F 10:10; disc, M 3:35–5. Staff.
An introduction to probability theory: foundations, combinatorics, random variables and their probability distributions, expectations, generating functions, and limit theory. Biological and statistical applications are the focus. Can serve as either a one-semester introduction to probability or a foundation for a course in the theory of statistics.

**409 Theory of Statistics**
Spring. 4 credits. Prerequisite: Statistics 408 or equivalent.
Lecs, M W F 10:10; disc, M 3:35–5. Staff.
The concepts developed in Statistics 408 are applied to provide an introduction to the classical theory of parametric statistical inference. Topics include sampling distributions, parameter estimation, hypothesis testing, and linear regression. Students seeking applied courses in statistical methodology should consider Statistics 601–602.

**417 Matrix Algebra**
Fall. 3 credits. Prerequisite: precalculus mathematics.
Lecs, M W F 8; disc, M 1:25–3:10.
C. Cavillo-Chavez.
Definitions, basic operations and arithmetic, determinants, and the inverse matrix. Rank, linear dependence, canonical forms, linear equations, generalized inverses and eigenroots and vectors. Emphasis is on understanding basic ideas and on developing skills for applying matrix algebra.

**495 Statistical Consulting**
Fall. 2 credits. S-U grades only. Limited to undergraduates. Prerequisites: Statistics 409 and 602 and permission of instructor.
Lec, W 1:25–2:15 plus 1 hr. of consulting to be arranged. N. S. Altman.
Participation in the Biometrics Unit consulting service: faculty-supervised statistical consulting with researchers from other disciplines. Discussion sessions for joint consideration of selected consultations encountered during previous weeks.

**497 Special Topics**
Fall or spring. 1–3 credits. S-U grades optional.
Staff.
Can consist of individual tutorial study or a course of lectures (or both) selected by the faculty. Since topics may change from year to year, this course may be repeated for credit.

**498 Supervised Teaching**
Fall or spring. 2 credits. S-U grades only. Limited to statistics and biometry undergraduates.
Staff.
Students assist in teaching a course appropriate to their previous training. Students will meet with a discussion or laboratory section and regularly discuss objectives with the course instructor.

**499 Undergraduate Research**
Fall or spring. 1–3 credits. Limited to statistics and biometry undergraduates. Prerequisite: permission of faculty member directing research
Staff.

**600 Statistics Seminar**
Fall or spring. 1 credit. S-U grades only.
W 3–4:30. Staff.

**601 Statistical Methods I**
Fall. 4 credits. Limited to graduate students; others by permission of the instructor.
Lecs, M W F 12:20; lab, M 2:30–4, 7:30–9 p.m., or T 10:10–11:40, 12:20–1:50, 2:30–4. G. C. Casella.
Statistical methods are developed and used to analyze data arising from a wide variety of applications. Topics include descriptive statistics, point and interval estimation, hypothesis testing, inference for a single population, comparisons between two populations, one- and two-way analysis of variance, comparisons among population means, analysis of categorical data, and correlation and regression analysis. Interactive computing is introduced through MINITAB statistical software. Emphasis is on basic principles and criteria for selection of statistical techniques.

**602 Statistical Methods II**
Spring. 4 credits. Limited to graduate students; others by permission of instructor. Prerequisite: Statistics 601 or equivalent.
Lecs, M W F 11:15; lab, M 2:30–4:25 or 7:30–9:25 p.m., and T 10:10–12:05 or 12:20–2:15. N. S. Altman.
A continuation of Statistics 601. Emphasis is on the use of multiple regression analysis, analysis of variance, and related techniques to analyze data in a variety of situations. Topics include an introduction to data collection techniques; least squares estimation; multiple regression; model selection techniques; detection of influential points, goodness-of-fit criteria; principles of experimental design; analysis of variance for a number of designs, including multi-way factorial, nested, and split plot designs; comparing two or more regression lines; and analysis of covariance. Emphasis is on appropriate design of studies prior to data collection, and the appropriate application and interpretation of statistical techniques. For practical applications, computing is done with the SAS statistical package.

**[603 Statistical Methods III**
Fall. 3 credits. Prerequisite: Statistics 601 and 602 or permission of instructor. Offered if a sufficient number of students are interested. Offered alternate years. Not offered 1989–90. Principles of scientific experimentation, experiment design, sample surveys and questionnaire design, statistical aspects of survival analysis, life tables, statistical analyses for clinical trials; categorical data analysis, including logistic regression, loglinear models, combining contingency tables, and application to case control studies; multivariate analysis; and space-time clustering.]

**604 Statistical Methods IV: Applied Design**
3 credits. Prerequisites: Statistics and Biometry 601 and 602 or permission of instructor.
Lecs M W F 9:05; lab M 2:30–3:20.
G. C. Casella.
Applications of experimental design including such advanced designs as split plots, incomplete blocks, fractional factorials. Use of the computer for both design and analysis will be stressed, with emphasis on solutions of real data problems.

**605 Applied Regression Analysis**
Fall, 1/3 of the term. 1 credit. Prerequisites: Statistics 409 and 602. Offered alternate years.
N. S. Altman.
A continuation of Statistics 602, with emphasis on data analysis including logistic and nonlinear regression.

**[606 Sampling Biological Populations**
Fall. 1/3 of the term. 1 credit. Prerequisite: Statistics 601 or equivalent. Not offered 1989–90.
Standard methods of sample-survey design and estimation are presented, including stratified random sampling, cluster sampling, double sampling, and variable probability sampling. Special emphasis given to methods of particular utility or specifically designed for biological sampling. Examples are taken from forestry, fisheries, and other biological areas.]

**607 Nonparametric and Distribution-Free Statistical Methods**
Spring, 1/3 of the term. 1 credit. S-U grades optional. Prerequisite: Statistics 601 or equivalent.
Staff.
Nonparametric and distribution-free alternatives to normal-theory testing procedures are presented: sign or rank tests for one or two populations; analyses for completely randomized and randomized blocks designs; comparisons among several means; correlation and regression; goodness-of-fit; and tests based on randomization of the data.

**639 Epidemiology Seminar (also Nutritional Sciences 639)**
Fall and spring. 1 credit. S-U grades only. Limited to graduate students; others by permission of instructor
M 12:20. Staff.
This course will develop skills in the preparation and interpretation of epidemiological data by discussing current research topics and issues.

**[662 Mathematical Ecology (also Biological Sciences 662)**
Spring. 3 credits. Prerequisites: a year of calculus and a course in probability. Offered alternate years. Not offered 1989–90.
Lecs, M W F 12:20. C. Castillo-Chavez.
Mathematical and statistical analysis of populations and communities: theory and methods. Spatial and temporal pattern analysis, deterministic and stochastic models of population dynamics. Model formulation, parameter estimation, and simulation and analytical techniques.]

**697 Special Topics in Statistics and Biometry**
Fall, spring, or summer. 1–3 credits. S-U grades optional.
Staff.
Can consist of individual tutorial study or a course of lectures (or both) selected by the faculty. Since topics may change from year to year, this course may be repeated for credit.

**[701 Advanced Biometry**
Spring. 3 credits. Prerequisites: Statistics 409 and 602. Limited to graduate students; others by permission of instructor. Not offered 1989–90.
Bioassay methods, including parametric and nonparametric statistical analyses of quantal and graded response to controlled levels of single and multifactor stimuli; directional statistics as applied to animal orientation experiments; compartment models and analyses; enzyme kinetics and pharmacokinetic analysis; and bioavailability.]

**[717 Linear Models**
Spring. 3 credits. S-U grades only. Prerequisites: Statistics 409 or equivalent and Statistics 417 and 602. Offered alternate years. Not offered 1989–90.
Analysis of variance and estimation procedures for unequal-subclass-numbers data. Cell means models for the 1-way classification, nested classifications, and the 2-way crossed classification, both with and without interactions; introduction to multinormal variables and the distribution of quadratic forms. The general linear model (in matrix and vector form), estimable functions, and testable hypotheses. Overparameterized models, restricted models, multifactor cases, covariables, computing.]

**[718 Variance Components**
Spring. 2 credits. S-U grades only. Prerequisite: Statistics 717. Offered alternate years. Not offered 1989–90.
Several methods of estimating variance components are explained and compared: for balanced data (equal subclass numbers), the analysis of variance method; for unbalanced data (unequal subclass numbers), the three Henderson methods and the methods of maximum likelihood, restricted maximum likelihood, and minimum norm quadratic unbiasedness. Also included: estimation from mixed models, prediction of random variables, the dispersion-mean model, and computer package output for variance component estimation.]

**795 Statistical Consulting**
Fall. 2 credits. S-U grades only. Limited to graduate students.
Lec, W 1:25 and 1 hr. of consulting to be arranged. Staff.
Participation in the Biometrics Unit consulting service: faculty-supervised statistical consulting with researchers from other disciplines. Discussion sessions for joint consideration of selected consultations encountered by the service during previous weeks. Since consultations usually change from semester to semester, this course may be repeated for credit.

**899 Research**
Fall or spring. Credit to be arranged. S-U grades only. Limited to candidates for graduate degrees. Prerequisite: permission of the graduate field member concerned. Research at the M.S. level.

**999 Research**
Fall or spring. Credit to be arranged. S-U grades only. Limited to candidates for graduate degrees. Prerequisite: permission of the graduate field member concerned. Research at the Ph.D. level.

# VEGETABLE CROPS: HORTICULTURAL SCIENCES

E. E. Ewing, chair; R. R. Bellinder, L. Ellerbrock, D. Halseth, J. R. Hicks, D. Lisk, P. M. Ludford, P. L. Minotti, M. A. Mutschler, J. Sieczka, L. D. Topoleski, D. H. Wallace, H. C. Wien, D. A. Wilcox-Lee, D. Wolfe

**102 General Horticulture**
Spring. 4 credits. Each lab limited to 25 students.
Lecs, M W F 10:10; lab, M T W 2–4:25. L. D. Topoleski.
Acquaints the student with applied and basic horticulture. Primarily for students who want a general knowledge of the subject or who want to specialize in horticulture but have a limited background in practical experience or training in plant science. Includes flower, fruit, and vegetable growing and gardening techniques.

**220 Vegetable Types and Identification**
Fall. 2 credits.
T 2–4:25. L. D. Topoleski.
Acquaints the student with the vegetable species grown in the Northeast and the pests and disorders encountered in their production. Subjects covered include identification of economically destructive weeds, diseases and insects of vegetables, identification of vegetable and weed seeds, seedlings, nutrient deficiencies, vegetable judging, grading, and grade defects.

**225 Commercial Vegetable Crops**
Fall. 4 credits. Field trip fee, no more than $20.
Lecs, M W F 11:15; lab, W 2–4:25; 1 S field trip and 3 field trips (Sept.), W 11:15–6. L. A. Ellerbrock.
Intended for those interested in the commercial vegetable industry from the viewpoint of production, processing, marketing, or the related service industries. Topics included are techniques, problems, and trends in the culture, harvesting, and storage of the major vegetable crops, including potatoes and dry beans.

**315 Postharvest Physiology and Storage of Horticultural Crops**
Fall. 3 credits. Prerequisite: a course in floriculture, pomology, or vegetable crops, or permission of instructor.
Lecs, M W 9:05; lab, W 1:30–4. F. W. Liu.
The physiology—transpiration, respiration, ethylene synthesis and action, maturation, ripening, and senescence—of fruits, vegetables, flowers, and ornamental crops are studied. Environmental factors influencing the physiological process, thus affecting the quality and marketability of the products, are considered. The principles and methods of harvesting, cleaning, grading, packing, precooling, waxing, sanitation, and transportation of the products are studied. Storage methods, including common storage, refrigerated storage, controlled-atmosphere storage, and hypobaric storage, are discussed.

**325 Practical Aspects of Postharvest Handling of Horticultural Crops**
Spring. 3 credits.
Lecs, M W 9:05; lab, T 1:25–3:55.
J. R. Hicks.
A study of changes that occur in horticultural crops between harvest and consumer. Practices that affect the rate of change and the final effect on quality of the commodity are discussed. Maturity/quality indices, preharvest treatments, and harvesting/handling practices and storage/transportation requirements of selected horticultural crops are covered. The effect of marketing orders, marketing chains, market requirements, quarantine, and pest eradication procedures is emphasized.

**455 Vegetable Crop Physiology**
Fall. 5 credits. Prerequisites: Horticultural Sciences 225 and Biological Sciences 242, or equivalents.
Lecs, M W F 10:10; lab, M 2–4:25; disc, R or F 1, 2, or 3. H. C. Wien, P. L. Minotti.
Subjects include mineral nutrition as influenced by fertilization programs and crop sequence, nutrient interactions and induced deficiencies, growth and development, flowering, fruit setting, growth correlation, senescence, sex expression, photoperiodism, vernalization, and environmental factors affecting growth.

**460 Plant-Plant Interactions**
Spring. 3 credits. Prerequisite: any crop production course or permission of instructor.
Lecs, M W 8; disc, to be arranged. Each disc section limited to 6 students.
P. L. Minotti.
The manner in which plants interfere or positively interact with other plants is examined with primary emphasis on crop situations rather than natural plant communities. Competitive and chemical interactions are considered between weeds and crops, crops and associate crops, and between individuals in monoculture.

**[465 Vegetable Varieties and Their Evaluation**
Fall. Weeks 1–7. 2 credits. Prerequisite: Horticultural Sciences 225 or permission of instructor. S-U grades only. Offered alternate years. Not offered 1989–90.
Lecs, W F 8; lab, F 1:25–4:25.
D. W. Wolfe and H. C. Wien.
Principles of vegetable variety evaluation and selection of techniques in relation to program objectives. Morphology, yield, and quality of selected crops will be studied in the field. The seed industry will be briefly discussed.]

**495 Undergraduate Seminar**
Spring. 1 credit (may be taken twice for credit). Prerequisite: a course in vegetable crops. S-U grades only.
Hours to be arranged. Staff.
Seminar topics and speakers selected and arranged by the students on subject areas related to vegetable crops.

**496 Internship in Horticultural Sciences**
Fall or spring. Credit variable. S-U grades optional. Prerequisite: permission of student's adviser in advance of participation in internship programs. Students must attach to their course enrollment materials a "CALS Independent Study, Research, or Teaching" form signed by the staff member who will supervise their internship and assign their grade.
Staff.

**497 Independent Study in Horticultural Sciences**
Fall or spring. Credit variable. S-U grades optional. Prerequisite: permission of instructor(s). Students must attach to their course enrollment materials a "CALS Independent Study, Research, or Teaching" form signed by the staff member who will supervise their research and assign their grade.
Independent study in horticultural sciences under the direction of one or more staff members.

**498 Undergraduate Teaching Experience**
Fall or spring. Credit variable. S-U grades optional. Prerequisites: previous enrollment in course to be taught or equivalent, and written permission of the instructor. Students must attach to their course enrollment materials a "CALS Independent Study, Research, or Teaching" form signed by the staff member who will supervise their research and assign their grade.
Hours to be arranged.
Designed to give qualified undergraduate students teaching experience through actual involvement in planning and teaching horticultural science courses under supervision of departmental faculty. This experience may include leading discussion sections; preparing, assisting in, or teaching laboratories; and tutoring.

**499 Undergraduate Research**
Fall or spring. 1 or more credits, by arrangement. Written permission from staff member directing the work must be obtained before course enrollment.
Hours to be arranged. Staff.
Special problems may be elected in any line of vegetable work.

**500 Master of Professional Studies (Agriculture) Project**
Fall or spring. 1–6 credits. S-U grades optional.
Hours to be arranged. Graduate faculty.
A comprehensive project emphasizing the application of horticultural principles and practices to professional horticultural teaching, extension, and research programs and situations. Required of Master of Professional Studies (Agriculture) candidates in the field.

**602 Seminar in Vegetable Crops**
Fall or spring. 1 credit. Required of graduate students majoring or minoring in vegetable crops. Limited to graduate students. S-U grades only.
R 4:30. Staff.

**615 Quantitative Methods in Horticultural Research**
Spring. Weeks 1–9. 2 credits. Prerequisite: Statistics 601. Statistics 602 or permission of instructor. S-U grades only. Offered alternate years.
T R 10:10–12:05. D. W. Wolfe.
Advantages and limitations of conventional experimental designs and analyses of greenhouse and field (including on-farm) experiments. Use and interpretation of plant growth analysis techniques. Discussions will include critical analysis of published data and research in progress.

**[625 Advanced Postharvest Physiology of Horticultural Crops**
Spring. 3 credits. Prerequisite: Horticultural Sciences 315 (also Agricultural and Biological Engineering 319). Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10. Disc session to be arranged. P. M. Ludford.
Physiological and biochemical aspects of growth and maturation, ripening, and senescence of harvested horticultural plant parts. Topics include morphological and compositional changes during ripening and storage life, some physiological disorders, aspects of hormone action and interactions, and a consideration control.]

**629 Special Topics in Plant Science Extension (also Plant Breeding 629)**

**700 Graduate Teaching Experience**
Fall, spring. 1 or more credits by arrangement with instructor.
Hours to be arranged. Staff.
Participation in the teaching program of the department.

**800 (801) Thesis Research, Master of Science**
Fall or spring. Credit to be arranged. S-U grades only.
Hours to be arranged. Staff.

**900 (901) Thesis Research, Doctor of Philosophy**
Fall or spring. Credit to be arranged. S-U grades only.
Hours to be arranged. Staff.

## FACULTY ROSTER

Abawi, George S., Ph.D., Cornell U. Prof., Plant Pathology (Geneva)
Acree, Terry E., Ph.D., Cornell U. Prof., Food Science, and Technology (Geneva)
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Rakow, Donald A., Ph.D., Cornell U. Asst. Prof., Floriculture and Ornamental Horticulture
Ranney, Christine K., Ph.D., U. of California at Davis. Asst. Prof., Agricultural Economics
Rao, M. Anandha, Ph.D., Ohio State U. Prof., Food Science and Technology (Geneva)
Regenstein, Joe M., Ph.D., Brandeis U. Prof., Poultry and Avian Sciences
Rehkugler, Gerald E., Ph.D., Iowa State U. Prof., Agricultural and Biological Engineering
Reid, W. Shaw, Ph.D., Michigan State U. Prof., Agronomy
Reisch, Bruce, Ph.D., U. of Wisconsin. Assoc. Prof., Horticultural Sciences (Geneva)
Reissig, William H., Ph.D., Oregon State U. Prof., Entomology (Geneva)
Richmond, Milo E., Ph.D., U. of Missouri. Assoc. Prof., Natural Resources
Riha, Susan, Ph.D., Washington State U. Charles Lathrop Pack Professor, Assoc. Prof., Agronomy
Ripple, Richard E., Ph.D., U. of Wisconsin. Prof., Education
Rizvi, Syed S., Ph.D., Ohio State. Prof., Food Science
Robinson, Richard W., Ph.D., Cornell U. Prof., Horticultural Sciences (Geneva)
Robinson, Terence L., Ph.D., Washington State U. Asst. Prof., Horticultural Sciences (Geneva)
Roelofs, Wendell L., Ph.D., Indiana U. Liberty Hyde Bailey. Professor of Insect Biochemistry, Entomology (Geneva)
Rosenberger, David A., Ph.D., Michigan State U. Assoc. Prof., Plant Pathology (Geneva)
Roush, Richard T., Ph.D., U. of California at Berkeley. Asst. Prof., Entomology
Russell, James B., Ph.D., U. of California, Davis. Assoc. Prof., Animal Science
Rutz, Donald A., Ph.D., North Carolina State U. Assoc. Prof., Entomology
Sabin, Samuel W., Ph.D., Oregon State U. Prof., Animal Science
Sanderson, John P., Ph.D., U. of California at Riverside. Asst. Prof., Entomology
Sanford, John C., Ph.D., U. of Wisconsin. Assoc. Prof., Horticultural Sciences (Geneva)
Schaefers, George A., Ph.D., U. of California at Berkeley. Prof., Entomology (Geneva)
Scherer, Clifford W., Ph.D., U. of Wisconsin. Assoc. Prof., Communication
Schrader, Dawn E., Ph.D., Harvard U. Asst. Prof., Education
Schwager, Steven J., Ph.D., Yale U. Assoc. Prof., Plant Breeding and Biometry
Schwartz, Donald F., Ph.D., Michigan State U. Prof., Communication
Scott, Jeffrey G., Ph.D., U. of California at Berkeley. Asst. Prof., Entomology
Scott, Norman R., Ph.D., Cornell U. Prof., Agricultural and Biological Engineering
Scott, Thomas W., Ph.D., Michigan State U. Prof., Agronomy
Seaney, Robert R., Ph.D., Cornell U. Prof., Agronomy
Searle, Shayle R., Ph.D., Cornell U. Prof., Plant Breeding and Biometry
Seem, Robert C., Ph.D., Pennsylvania State U. Assoc. Prof., Plant Pathology (Geneva)
Setter, Timothy L., Ph.D., U. of Minnesota. Assoc. Prof., Agronomy
Shapiro, Michael A., Ph.D., U. of Wisconsin. Asst. Prof., Communication
Shelton, Anthony M., Ph.D., U. of California at Riverside. Assoc. Prof., Entomology (Geneva)
Sherbon, John W., Ph.D., U. of Minnesota. Prof., Food Science
Shields, Elson J., Ph.D., U. of Wisconsin. Asst. Prof., Entomology
Sieczka, Joseph B., M.S., Cornell U. Assoc. Prof., Vegetable Crops
Sinclair, Wayne A., Ph.D., Cornell U. Prof., Plant Pathology
Sisler, Daniel G., Ph.D., Cornell U. Prof., Agricultural Economics
Slack, Steven A., Ph.D., U. of California at Davis. Prof., Plant Pathology
Smith, Charles R., Ph.D., Cornell U. Asst. Prof., Natural Resources
Smith, Margaret E., Ph.D., Stanford U. Asst. Prof., Plant Breeding and Biometry
Smith, R. David, Ph.D., Cornell U. Assoc. Prof., Animal Science
Soderlund, David M., Ph.D., U. of California at Berkeley. Assoc. Prof., Entomology (Geneva)
Sorrells, Mark E., Ph.D., U. of Wisconsin. Assoc. Prof., Plant Breeding and Biometry
Splittstoesser, Don F., Ph.D., U. of Wisconsin. Prof., Food Science and Technology (Geneva)
Stanton Bernard F., Ph.D., U. of Minnesota. Prof., Agricultural Economics
Steenhuis, Tammo S., Ph.D., U. of Wisconsin. Assoc. Prof., Agricultural and Biological Engineering
Steffens, John C., Ph.D., U. of Virginia. Asst. Prof., Plant Breeding and Biometry
Steponkus, Peter L., Ph.D., Purdue U. Prof., Agronomy
Stewart, Valley J., Ph.D., U. of Virginia. Asst. Prof., Microbiology
Stiles, Warren C., Ph.D., Pennsylvania State U. Prof., Pomology
Stoewsand, Gilbert S., Ph.D., Cornell U. Prof., Food Science and Technology (Geneva)
Straub, Richard W., Ph.D., U. of Missouri. Assoc. Prof., Entomology (Geneva)
Streeter, Deborah H., Ph.D., U. of Wisconsin. Asst. Prof., Agricultural Economics
Strike, Kenneth A., Ph.D., Northwestern U. Prof., Education
Stycos, J. Mayone, Ph.D., Columbia U. Prof., Rural Sociology
Sutphin, H. Dean, Ph.D., Ohio State U. Assoc. Prof., Education
Tanksley, Steven D. Ph.D., U. of California at Davis. Assoc. Prof., Plant Breeding and Biometry
Tauber, Maurice J., Ph.D., U. of California at Berkeley. Prof., Entomology
Tauer, Loren W., Ph.D., Iowa State U. Assoc. Prof., Agricultural Economics
Taylor, Alan G., Ph.D., Oklahoma State U. Assoc. Prof., Horticultural Sciences (Geneva)
Thonney, Michael L., Ph.D., U. of Minnesota. Prof., Animal Science
Thurston, H. David, Ph.D., U. of Minnesota. Prof., Plant Pathology
Timmons, Michael B., Ph.D., Cornell U. Assoc Prof., Agricultural and Biological Engineering
Tingey, Ward M., Ph.D., U. of Arizona. Prof., Entomology

Tomek, William G., Ph.D., U. of Minnesota. Prof., Agricultural Economics
Topoleski, Leonard D., Ph.D., Purdue U. Prof., Vegetable Crops
Trancik, Roger T., M.L.A., Harvard U. Prof., Floriculture and Ornamental Horticulture
Trowbridge, Peter J., M.L.A., Harvard U. Assoc. Prof., Floriculture and Ornamental Horticulture
Trumbull, Deborah J., Ph.D., U. of Illinois. Asst. Prof., Education
VanBuren, Jerome P., Ph.D., Cornell U. Prof., Food Science and Technology (Geneva)
VanCampen, Darrell R., Ph.D., North Carolina State U. Assoc. Prof., Animal Science
VanEs, Harold M., Ph.D., North Carolina State U. Asst. Prof., Agronomy
VanEtten, Hans D., Ph.D., Cornell U. Prof., Plant Pathology
VanSoest, Peter J., Ph.D., U. of Wisconsin. Prof., Animal Science
VanWambeke, Armand R., Ph.D., U. of Ghent (Belgium). Prof., Agronomy
Via, Sara, Ph.D., Duke U. Asst. Prof., Entomology
Viands, Donald R., Ph.D., U. of Minnesota. Assoc. Prof., Plant Breeding and Biometry
Villani, Michael G., Ph.D., North Carolina State U. Asst. Prof., Entomology (Geneva)
Volmink, John D., Ph.D., Cornell U. Asst. Prof., Education
Wagenet, Robert J., Ph.D., U. of California at Davis. Prof., Agronomy
Walker, Larry P., Ph.D., Michigan State U. Assoc. Prof., Agricultural and Biological Engineering
Wallace, Donald H., Ph.D., Cornell U. Prof., Vegetable Crops
Walter Michael F., Ph.D., U. of Wisconsin. Prof., Agricultural and Biological Engineering
Walter, Reginald H., Ph.D., U. of Massachusetts. Assoc. Prof., Food Science and Technology (Geneva)
Wardeberg, Helen L., Ph.D., U. of Minnesota. Prof., Education
Warner, Richard G., Ph.D., Cornell U. Prof., Animal Science
Weeden, Norman F., Ph.D., U. of California at Davis. Assoc. Prof., Horticultural Sciences (Geneva)
Weiler, Thomas C., Ph.D., Cornell. Prof., Floriculture and Ornamental Horticulture
Weires, Richard W., Ph.D., U. of Minnesota. Assoc. Prof., Entomology (Geneva)
Welch, Ross M., Ph.D., U. of California at Davis. Asst. Prof., Agronomy
Wheeler, Quentin D., Ph.D., Ohio State U. Assoc Prof., Entomology
White, Gerald B., Ph.D., Pennsylvania State U. Assoc. Prof., Agricultural Economics
White, Shirley A., Ph.D., Michigan State U. Prof., Communication
Wien, Hans C., Ph.D., Cornell U. Assoc Prof., Vegetable Crops
Wilcox, Wayne F., Ph.D., U. of California at Davis. Asst. Prof., Plant Pathology (Geneva)
Wilcox-Lee, Darlene, Ph.D., U. of Florida. Assoc. Prof., Vegetable Crops
Wilkins, Bruce T., Ph.D, Cornell U. Prof., Natural Resources
Wilkinson, Antoinette M., Ph.D., Cornell U. Assoc. Prof., Communication
Wilks, Daniel S., Ph.D., Oregon State U. Asst. Prof., Agronomy
Willett, Lois S., Ph.D., U. of California at Davis. Asst. Prof., Agricultural Economics
Winans, Stephen C., Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Microbiology
Wing, Kenneth E., Ph.D., Cornell U. Prof., Agriculture
Wolfe, David W., Ph.D., U. of California at Davis. Asst. Prof., Vegetable Crops
Wright, Madison J., Ph.D., U. of Wisconsin. Prof., Agronomy
Wylie, Mary Jean, Ph.D., Texas A & M U. Asst. Prof., Animal Science
Yarbrough, J. Paul, Ph.D., Iowa State U. Prof., Communication
Yoder, Olen C., Ph.D., Michigan State U. Prof., Plant Pathology
Young, Frank W., Ph.D., Cornell U. Prof., Rural Sociology
Youngs, William D., Ph.D., Cornell U. Prof., Natural Resources
Zaitlin, Milton, Ph.D., U. of California at Los Angeles. Prof., Plant Pathology
Zall, Robert R., Ph.D., Cornell U. Prof., Food Science
Zinder, Stephen H., Ph.D., U. of Wisconsin. Assoc. Prof., Microbiology
Zitter, Thomas A., Ph.D., Michigan State U. Assoc. Prof., Plant Pathology
Zobel, Richard W. Ph.D., U. of California at Davis. Assoc. Prof., Agronomy

# COLLEGE OF ARCHITECTURE, ART, AND PLANNING

## ADMINISTRATION

William G. McMinn, dean

Ellen McCollister, director of external affairs

Cynthia K. Nordby, director of administrative operations

Donna L. Kuhar, registrar

Elizabeth A. Cutter, admissions coordinator

Margaret Webster, slide curator

Kim Alexander, career office coordinator

## FACULTY ADVISERS

Architecture students are assigned faculty advisers for their first year. Upperclass students have no regular assigned advisers and are free to seek assistance and advice from the most appropriate faculty member or college officer.

Freshmen in the fine arts department are assigned faculty advisers for the first year. Students may then choose advisers in their major area of concentration.

Undergraduate students in the Program of Urban and Regional Studies are assigned faculty advisers and may elect to change advisers at any time.

All students in the college are invited to share their concerns and seek advice from the volunteer student advisers at anytime.

Specific inquiries regarding rules, procedures, or deadlines should be addressed to:

Val K. Warke, chair, Department of Architecture

David B. Lewis, chair, Department of City and Regional Planning

Victor Kord, chair, Department of Art.

## DEGREE PROGRAMS

| | *Degree* |
|---|---|
| Architecture | B.Arch. |
| | B.F.A. |
| Fine Arts | B.F.A. |
| History of Architecture and Urban Development | B.S. |
| Urban and Regional Studies | B.S. |

The college offers programs leading to the bachelor's degree—the five-year program in architecture leads to the Bachelor of Architecture; four-year programs in art and architecture lead to the Bachelor of Fine Arts. In addition, four-year programs with a concentration in either urban and regional studies or history of architecture lead to the Bachelor of Science.

Graduate-level programs are offered in art, architectural design and urban and regional design, architectural sciences, history of architecture and urban development, historic preservation planning, city and regional planning, regional science, and landscape architecture.

Students in each of these programs work in physical proximity to one another and thus gain a broader understanding of their own special area of interest through contact with the students and faculty in other disciplines.

Early in its development the college set a limit on the number of students it would enroll and devised a selective method of admission. There are now more than 650 students and a full-time teaching staff of over fifty-five, supplemented by visiting professors and critics, part-time lecturers, and assistants. Teachers and students mix freely, and much instruction and criticism is on an individual basis.

The college's courses are integral parts of the professional curricula. Fundamental subjects are taught by faculty members whose experience provides them with professional points of view. The concentration of professional courses within the college is balanced by the breadth of view gained from courses and informal learning in the rest of the university. The college believes that this breadth is an essential element of professional education. This conviction is evident in the form of the curriculum, the methods of teaching, and the extracurricular life of teachers and students.

## FACILITIES

The college occupies Sibley Hall, Olive Tjaden Hall, Rand Hall, and the Foundry. In Sibley are the facilities for architecture, and city and regional planning, as well as certain administrative offices and the Fine Arts Library. The Department of Art is housed in Olive Tjaden Hall. Sculpture and shop facilities are in the Foundry. The Green Dragon, a student lounge, is located in the basement of Sibley Dome. The college has three darkrooms that are available for general use and serve as laboratories for the photography courses. A darkroom fee must be paid by each user. Information about darkroom rules and regulations, hours, and equipment is available in the slide library.

Through the generosity of the late Lillian P. Heller, the college also owns the home of William H. Miller, the first student to enroll for the study of architecture at Cornell and later a practicing architect in Ithaca. This building is used to house visiting teachers and guests of the college and for occasional receptions and social events.

### Libraries

The Fine Arts Library, in Sibley Dome, serves the College of Architecture, Art, and Planning through its collections on architecture, fine arts, city and regional planning and landscape architecture. The library, with more than 133,000 books, is capable of supporting undergraduate, graduate, and research programs. Some 1,900 serials are currently received and maintained.

A slide library in Sibley Dome contains the F. M. Wells Memorial Slide Collection, which consists of a large and growing collection of slides of architecture, architectural history, and art. The library now includes approximately 300,000 slides.

The facilities of the libraries of other schools and departments on campus and the John M. Olin Library, designed primarily as a research library for graduate students, are also available.

### Museums and Galleries

The Herbert F. Johnson Museum of Art was formally opened in May 1973. Although many of its exhibitions and activities relate directly to academic programs of the university, the museum has no administrative affiliation with any department. In this way, its programs freely cross academic boundaries, stimulating interchange among disciplines. With a strong and varied collection and a continuous series of high-quality exhibitions, it fulfills its mission as a center for the visual arts at Cornell. Art galleries are also maintained in Willard Straight Hall, where loan exhibitions of paintings and graphic work by contemporary artists are held. Current work of students in the College of Architecture, Art, and Planning is shown in the exhibition areas in Sibley Dome and the gallery in Olive Tjaden Hall.

### Rome Program

The College of Architecture, Art, and Planning's Rome Program was founded in the fall of 1986 to provide instruction in Italy for students seeking excellence in art, architecture, and other disciplines. The program offers an educational experience that draws upon the rich past of Rome, its resources in museums, its art and architecture, and its wide variety of cultural offerings. The school is located in the famous Palazzo Massimo in the center of the historical city next to such well-known Roman sights as Piazza Navona, the Pantheon, and Rome's famous outdoor market at the Campo dei Fiori.

The program in Rome offers components for students majoring in liberal arts, architecture, fine arts, and planning. Full course loads are available to all students in a curriculum that stresses the convergence of artistic, cultural, and architectural ideas vital to an understanding of the city. Students are responsible for planning course schedules that ensure their particular requirements can be met, since course offerings in Rome are limited.

# COLLEGE ACADEMIC POLICIES

## Ownership of Student Work

All drawings, models, paintings, graphic art, and sculpture done in the studios and drafting rooms as a part of the instructional program are the property of the college until they have been graded and released by the instructor. Certain works may be selected by the college for retention for academic purposes.

## Exhibitions of Student Work

Exhibitions of student work will be held each semester as part of the yearly schedule of the Olive Tjaden Hall gallery and the John Hartell Gallery. These may display the work of a specific course or exhibit examples of the best recent work done.

## Scholastic Standards

Term by term, a candidate for an undergraduate degree in this college is required to pass all courses in which the student is registered and have a weighted average for the term of not less than C (2.0). The record of each student who falls below the standard will be reviewed by the Student Records Committee for appropriate action, as described below:

1) **Warning** means that the student's performance is not up to expectations. Unless improvement is shown in the subsequent term, the student may be placed on final warning or may be suspended.

2) **Final Warning** indicates that the student's record is unsatisfactory. Unless considerable improvement is shown in the subsequent term, the student is subject to dismissal from the college.

3) **Suspended: Academic Deficiency** The student is dismissed from the college and may not continue studies in the college. A student who has been suspended may apply for readmission after an absence of at least two semesters. Application for readmission is made by letter, addressed to the department chair. The student must submit evidence that his or her time has been well spent since suspension, and, if employed, must submit a letter from an immediate superior. If a student chooses to register for courses, either extramurally at Cornell or at another institution, he or she should be advised that credit for these courses will not apply toward the degree but will appear on the student's transcript. The grades received for any courses taken while on suspension will not be counted into the grade point average. Readmission to the college after suspension is at the discretion of the Admissions Committee. Application for spring-term readmission must be made by November 15, and application for fall-term readmission must be made by April 15. Refer to the college handbook for further information regarding suspension.

4) **Dismissed: May Not Reregister, College of Architecture, Art, and Planning** The student is dismissed from the college and is permanently prohibited from continuing studies in it. This dismissal does not preclude the possibility of applying for admission to another division of the university.

The above actions are not necessarily sequential. A student who has received a warning may be suspended for academic deficiency at the end of the next term if performance during that time is deemed to be grossly deficient.

It is necessary to have a cumulative average of at least C– (1.7) for graduation.

# ARCHITECTURE

Val K. Warke, chair; M. Cohen, M. Dennis, W. Goehner, D. P. Greenberg, R. Hall, G. Hascup, L. F. Hodgden, M. Jarzombek, G. Jullian de la Fuente, A. Kira, D. Krall, M. Kubelik, B. G. MacDougall, A. B. Mackenzie, J. C. Miller, L. Mirin, V. Mulcahy, J. Ochshorn, J. Ostlund, C. F. Otto, A. Ovaska, C. W. Pearman, A. Pendleton, H. W. Richardson, C. Rowe, D. Salmon, M. L. Schack, J. P. Shaw, A. Simitch, J. Wells, M. Woods, J. Zissovici

## Professional Degree Program

The first professional degree in architecture is the Bachelor of Architecture. This degree counts toward the professional registration requirements established by the various states and the National Council of Architectural Registration Boards. The professional program is normally five years in length and is designed particularly for people who, before they apply, have established their interest and motivation to enter the field. It therefore incorporates both a general and professional educational base.

The program is oriented toward developing the student's ability to deal creatively with architectural problems on analytical, conceptual, and developmental levels. The sequence courses in design, consisting of studio work augmented by lectures and seminars dealing with theory and method, are the core of the program. Sequences of studies in human behavior, environmental science, structures, and building technology provide a base for the work in design.

In the first three years the student has the opportunity to establish a foundation in the humanities and sciences through electives. During the fourth and fifth years this base may expand through detailed further studies in these areas. Within the professional program a basis for understanding architecture in its contemporary and historical cultural contexts is established.

The structure of the program incorporates considerable flexibility for the individual student to pursue his or her particular interest in the fourth and fifth years. By carefully planning options and electives in the fifth year, it is possible for a qualified student to apply the last year's work for the Bachelor of Architecture degree to one of the graduate programs offered in the department. Some students are then able to complete the requirements for the master's degree in one additional year.

### Washington Program

Fourth- and fifth-year students in good standing who have completed the requirements of the first three years of the curriculum are eligible for a term of study in Washington, D.C. Outstanding third-year students are admitted to the Washington program only by petition and a review of their design record. Courses offered by the department include design, thesis, special problems in architectural design, a professional seminar, and professional studies. Additional courses are offered by other departments participating in the program. The program provides a period of intensive exposure to the characteristics of urban development within the framework of a design studio. Content concentrates on urban design issues, restraints relative to financing, zoning, development criteria, adaptive reuse, and multiuse developments.

### Rome Program

The program offers the opportunity for students from Cornell and other universities to spend one or two terms of study in Rome. This option is open to fourth- and fifth-year Cornell architecture students; outstanding third-year students are admitted by petition and a review of their design record. Courses offered by this department include design, thesis, thesis introduction, history, theory, architectural science, and design communication. In addition, courses are offered by other departments in Italian language, Italian culture, and history of art. The program provides a unique urban and architectural experience drawing from the rich past of the city for sources of instruction and inspiration.

### Overlap Program

For qualified students the department offers an option that combines the fifth year of the undergraduate program with the first year of the Master of Architecture program. In the fall of the fourth undergraduate year interested students petition the department to substitute Arch 601–602 for Arch 501–502. At the same time, they complete graduate school applications and submit them with fee and portfolio to the graduate field secretary for architecture. Students accepted into the program may not normally begin until the fall of their fifth year and, once enrolled, may not transfer back into the 501–502 sequence.

Following admission into the Overlap Program, students may petition to apply toward the requirements of the master's degree a maximum of 30 credits, including Arch 601–602 and other advanced courses taken in excess of distribution requirements for the Bachelor of Architecture degree.

### Curriculum

#### First Year

| *Fall Term* | *Credits* |
|---|---|
| 101 Design I | 6 |
| 181 History I | 3 |
| 151 Drawing I | 2 |
| Math III Calculus | 4 |
| Out-of-college elective | 3 |
| | 18 |
| *Spring Term* | |
| 102 Design II | 6 |
| 182 History of Architecture | 3 |
| 152 Drawing II | 2 |
| 122 Structural Concepts | 4 |
| Out-of-college elective (Freshman Seminar suggested) | 3 |
| | 18 |

**Second Year**

| *Fall Term* | *Credits* |
|---|---|
| 201 Design III | 6 |
| 221 Structural Systems I | 3 |
| 231 Architectural Elements and Principles | 2 |
| 261 Site Planning | 3 |
| Out-of-college elective | 3 |
| | 17 |
| *Spring Term* | |
| 202 Design IV | 6 |
| 222 Structural Systems II | 3 |
| 232 Design Methods and Programming | 2 |
| 262 Building Technology, Materials, and Methods | 3 |
| College elective | 3 |
| | 17 |

**Third Year**

| *Fall Term* | |
|---|---|
| 301 Design V | 6 |
| 361 Environmental Controls I—Lighting and Acoustics | 3 |
| Departmental elective | 3 |
| Out-of-college elective | 3 |
| Out-of-college elective | 3 |
| | 18 |
| *Spring Term* | |
| 302 Design VI | 6 |
| 362 Environmental Controls II—Mechanical and Passive Solar Systems | 3 |
| Departmental elective | 3 |
| Out-of-college elective | 3 |
| College or out-of-college elective | 3 |
| | 18 |

**Fourth Year**

| *Fall Term* | |
|---|---|
| 401 Design VII | 6 |
| 461 Professional Practice | 3 |
| Departmental elective | 3 |
| College elective | 3 |
| Out-of-college elective | 3 |
| | 18 |
| *Spring Term* | |
| 402 Design VIII | 6 |
| Departmental elective | 3 |
| Departmental elective | 3 |
| College or out-of-college elective | 3 |
| Out-of-college elective | 3 |
| | 18 |

**Fifth Year**

| *Fall Term* | *Credits* |
|---|---|
| 501 Design IX or 601 or 603 Overlap Program | 6 |
| Departmental elective | 3 |
| College or out-of-college elective | 3 |
| Out-of-college elective | 3 |
| Out-of-college elective | 3 |
| | 18 |
| *Spring Term* | |
| 502 Design X or 602 or 604 Overlap Program | 8 |
| Departmental elective | 3 |
| College or out-of-college elective | 3 |
| College or out-of-college elective | 3 |
| | 17 |

**Required Departmental Courses**

| *Terms* | *Subject* | *Course Number* | *Credits* |
|---|---|---|---|
| 10 | design | 101–504 | 62 |
| 1 | mathematics | Math 111 or approved elective | 4 |
| 3 | structures | 122, 221, 222 | 10 |
| 4 | technology | 261, 262, 361, 362 | 12 |
| 2 | architectural principles, theories, and methods | 231, 232 | 4 |
| 2 | history of architecture | 181, 182 | 6 |
| 1 | professional practice | 461 | 3 |
| 2 | drawing | 151, 152 | 4 |
| | | | 105 |

**Electives**

*Departmental*

| *Terms* | | *Credits* |
|---|---|---|
| 3 | history of architecture: 300-level | 9 |
| 1 | design communication: design communication, drawing, computer graphics | 3 |
| 2 | principles, theories, and methods | 6 |
| 1 | architectural science | 3 |
| | | 21 |

*College*

| *Terms* | | *Credits* |
|---|---|---|
| 2 | art: any courses | 6 |

*Out-of-College*

| *Terms* | | *Credits* |
|---|---|---|
| 1 | computer programming | 3 |
| 1 | Freshman Seminar (humanities) | 3 |
| 1 | social science | 3 |
| 1 | mathematics, physics, or biological sciences | 3 |
| 1 | humanities | 3 |
| | | 15 |

*Free*

Of the electives, 15 credits are to be taken outside the College of Architecture, Art, and Planning, and 15 credits may be taken either in or outside the college. 30

Total credits 177

### Transfer Students

Although the program leading to the Bachelor of Architecture is specifically directed to those who are strongly motivated to begin professional study when entering college, it is sufficiently flexible to allow transfers for students who have not made this decision until after they have been in another program for one or two years. Individuals who have already completed a nonprofessional undergraduate degree must also apply to transfer to the Bachelor of Architecture degree program, since the graduate program in architecture requires the Bachelor of Architecture degree or its equivalent for entrance.

Transfer students are responsible for completing that portion of the curriculum that has not been covered by equivalent work. Applicants who have had no previous work in architectural design must complete the ten-term design sequence. Since this sequence may be accelerated by attending summer terms, seven or eight regular terms and two or three summer terms are typically required.

For those who would benefit from an opportunity to explore the field of architecture before deciding on a commitment to professional education, the department offers an introductory summer program that includes an introductory studio in architectural design, lectures, and other experiences designed to acquaint the participants with opportunities, issues, and methods in the field of architecture.

Admission is offered to a limited number of transfer applicants who have completed a portion of their architecture studies in other schools. Each applicant's case is considered individually. Transfer students must complete a minimum of 70 credits and four terms in residence, taking 35 of the 70 credits (including four terms of design) in the Department of Architecture. Placement in the design sequence is based on a review of a representative portfolio of previous work.

## Alternative Programs

### Bachelor of Fine Arts

After completlng the first four years of requirements, thestudent may choose to receive the degree of Bachelor of Fine Arts (B.F.A.) in architecture. It is not a professional degree.

### Bachelor of Science in History of Architecture

The history of architecture major leads to a Bachelor of Science degree, conferred by the College of Architecture, Art, and Planning. The major is intended for transfer students from other programs at Cornell and from colleges and universities outside Cornell. Students in the College of Arts and Sciences may take the major as part of a dual-degree program. The course of study in this major, available to students from a variety of academic backgrounds, offers the opportunity for a vigorous exploration of architecture and its history.

**Admission requirements**. Two years of undergraduate study; Arch 181 and 182, or the equivalent; and one 6-credit studio in architecture (or Arch 103, which is available during the fall semester for students with no previous studio work) are required. Students transferring from a B.Arch. program must be in good standing in their design sequence.

**Procedure**. Students from Cornell who want to transfer to the program may do so at the beginning of the fall term of their third or fourth year of study. They submit a short application as prospective internal transfer students. It is crucial that, before applying, all prospective internal transfer students meet with a history of architecture faculty member to discuss procedural matters and program content.

Students who want to transfer to the program from outside Cornell must apply to the Department of Architecture by March 15. Applications can be considered after this date but are given lower priority. Applications for both internal and external transfer students are available from Elizabeth Cutter, Admissions Office, College of Architecture, Art, and Planning, Cornell University, 135 East Sibley Hall, Ithaca, New York 14853–6701.

**Curriculum**. A student entering the program selects an adviser from the history of architecture faculty in the Department of Architecture. Adviser and student together prepare an appropriate two-year course of study according to the following guidelines:

1) 29 credits of 300-level courses in architectural history: Arch 381, 382, 384, 385, 387, 388, 390, 391, and 393

2) 12 credits in 600-level architectural history seminars: Arch 681 through Arch 690; or 8 credits in a 600-level seminar plus Arch 499, offered for honors candidates only

3) 24 credits in electives selected in consultation with the student's adviser

4) Language requirement, to be met in the manner specified for students enrolled in the College of Arts and Sciences

**Honors program**. Students will graduate with honors if, during their two years of study in the program, they have a cumulative average of B or better in all courses, have no grade lower than A– in all history of architecture courses taken at the 300 level, and have completed an honors thesis (Arch 499) deemed to be of distinguished quality by the history of architecture faculty.

### Dual Degree Options

Students can earn both the B.S. and B.Arch. degrees either simultaneously or sequentially. Students who have transferred into the B.Arch. program at Cornell may find this to be a special opportunity for an enlarged and enriched program of study. Ordinarily this option requires five years of study and assumes the satisfactory fulfillment of requirements in both the B.S. and B.Arch. programs.

Students currently enrolled in the College of Arts and Sciences at Cornell can earn a B.A. in an arts college major and a B.S. in the history of architecture in five years. In this option, students complete a minimum of 150 credits, which includes the B.S. prerequisites and curriculum requirements and 100 credits of the usual distribution and major requirements in the College of Arts and Sciences. Further information about this option is available at the Admissions Office, 135 East Sibley Hall, and at the Academic Advising Center of the College of Arts and Sciences, 55 Goldwin Smith Hall.

Students may also elect to continue toward a Master of Arts degree in the history of architecture. The M.A. ordinarily requires a minimum of two years of graduate work beyond the bachelor's degree; with this special sequential degree arrangement that time is shortened by approximately one year.

### Summer Term in Architecture

The summer term offers students the opportunity of a concentrated period of design work. Design is offered at both undergraduate and graduate levels; the term is six to eight weeks in duration.

Undergraduate design sequence courses, including thesis, are offered at first- through fifth-year levels in Ithaca. Normally there is also a design program abroad for third-, fourth-, and fifth-year students.

Students from schools of architecture other than Cornell are welcome to apply to the college for admission to any summer programs.

At the graduate level the summer term is devoted to problems forming part of the student's program of work. The term may carry residence credit equal to that of a normal academic term. Participation in the program cannot be undertaken without the consent of the student's Special Committee.

### Architectural Design

**Numbers in parentheses are old course numbers.**

**Courses in brackets are not offered this year.**

**A studio fee** of $25 is charged each semester for every design course (these fees are subject to change).

### Elective Design Courses

**103–104 (111–112) Elective Design Studio**
103, fall; 104, spring. 6 credits each term. Limited to students from outside the department Prerequisite: permission of instructor.
M W F 2–6. Staff.

**303 (310) Special Problems in Architectural Design**
Fall or spring. Variable credit (maximum, 3). Prerequisite: permission of instructor
Hours to be arranged. Staff.
Independent study.

**200, 300, 400, 500 Elective Design**
Fall or spring. 6 credits each term. Open by permission to transfer students who have not been assigned to a sequence course. Prerequisite: permission of department office. Each student is assigned to a class of appropriate level.
M W F 2–6. Staff.

### Sequence Courses

**101 Design I**
Fall. 6 credits. Limited to department students.
Studios and lecs, M W F 2–6. Staff.
An introduction to design as a conceptual discipline directed at the analysis, interpretation, synthesis, and transformation of the physical environment. Exercises are aimed at developing an understanding of the issues, elements, and processes of environmental design.

**102 Design II**
Spring. 6 credits. Limited to department students. A continuation of Architecture 101.
Studios and lecs, M W F 2–6. Staff.
Human, social, technical, and aesthetic factors related to space and form. Design problems range from those of the immediate environment of the individual to that of small social groups.

**201–202 Design III and IV**
Fall and spring. 6 credits each term. Coregistration in Architecture 231–232 and completion of Architecture 151–152 required. Limited to department students.
Studios and sems, M W F 2–6. Staff.

**301–302 Design V and VI**
Fall and spring. 6 credits each term. Limited to department students.
Studios and sems, M W F 2–6. Staff.

**401–402 Design VII and VIII**
Fall and spring. 6 credits each term. Limited to department students.
Studios and sems, M W F 2–6. Staff.
Programs in architectural design, urban design, or architectural technology and environmental science, etc.

**501 Design IX**
Fall or spring. 6 credits. Limited to department students.
Studios and sems, M W F 2–6. Staff.
Programs in architectural design, building typology investigations, and research leading to complete development of the student's thesis program. General instruction in the definition, programming, and development of a thesis is followed by tutorial work with the student's advisory committee.

**502 Design X—Thesis**
Fall or spring. 8 credits. Prerequisite: Architecture 501. Required of B.Arch. candidates who must satisfactorily complete a thesis. Students accepted for admission to the Overlap Program are exempt from the thesis requirement.
Studios, M W F 2–6. Staff.

**510 Thesis Introduction**
Foreign summer programs and Washington program only. 3 credits. Must be taken in conjunction with Architecture 500. Architecture 500 will be considered equivalent to Architecture 501 when taken concurrently with Architecture 510 during a foreign summer program or in Washington.
Lecs and sems. Staff.
Lectures, seminars, and independent research leading to complete development of the student's thesis program. General instruction in the definition, programming, and development of a thesis.

**601–602 Special Program in Architectural Design**
Fall and spring. 9 credits each term. Limited to students who have been accepted into the Overlap Program. Registration by petition only.

**603–604 Special Program in Urban Design**
Fall and spring. 9 credits each term. Limited to students who have been accepted into the Overlap Program. Registration by petition only.

### Departmental Electives

**342 (162) Introduction to Social Sciences in Design**
Spring. 3 credits. Not offered every year.
Lecs, M W F 9:05. B. MacDougall.
An introduction to concepts and methods in the social sciences for architects; how approaches from anthropology, environmental psychology, and sociology can be used in the study and design of the built environment. *Note:* This course meets distribution requirements for architectural principles, theories, and methods.

**641–642 (611–612) Urban Housing Developments**
641, fall; 642, spring. 2 credits each term. Limited to fourth- and fifth-year students in architecture and graduate students. Prerequisite: permission of instructor. Not offered every year.
Staff.

**[643 (613) Transportation**
Fall. 2 credits. Prerequisite: permission of instructor. Not offered every year. Not offered 1989–90.
Sem, hours to be arranged. Staff.
The impact of various transportation forms on the environment is considered from the perspectives of architects, engineers, planners, and human ecologists. Readings and discussions of past, current, and future transportation modes focus on aesthetic and physical aspects.]

**644 (614) Low-Cost Housing**
Fall. 3 credits. Prerequisite: permission of instructor. Not offered every year.
T 2–4:30. H. W. Richardson.
Aspects of low-cost housing involving engineering technology, architecture, physical planning, economics, and sociology.

**648–649 (618–619) Seminar in Urban and Regional Design**
648, fall; 649, spring. 3 credits each term. Limited to fifth-year and graduate students. Not offered every year.
Hours to be arranged. Staff and guest lecturers.
A broad range of issues and problems of urban and regional development and the context in which the designer functions are surveyed. Selected case studies are presented by the participants and visitors.

### Graduate Courses

**701–702 (711–712) Problems in Architectural Design**
Fall and spring. 9 credits each term.
Studio and sem, hours to be arranged. Staff.
Basic first-year design course for graduate students whose major concentration is architectural design.

**703–704 (713–714) Problems in Urban Design**
Fall and spring. 9 credits each term.
Studio and sem, hours to be arranged. C. Rowe and staff.
Basic first-year design course for graduate students whose major concentration is urban design.

**801 (811) Thesis or Research in Architectural Design**
Fall or spring. 9 credits.
Hours to be arranged. Staff.
Second-year design course for graduate students whose major concentration is architectural design.

**802 (812) Thesis or Research in Urban Design**
Fall or spring. 9 credits.
Hours to be arranged. C. Rowe and staff.
Second-year design course for graduate students whose major concentration is regional design.

## Structures

**122 (222) Structural Concepts**
Spring. 4 credits. Prerequisite: Mathematics III or approved equivalent.
Lecs and sems, M W F 9–10:30. Salmon.
Fundamental concepts of structural behavior. Statics and strength of materials.

**221(321) Structural Systems I**
Fall. 3 credits. Prerequisites: Mathematics III and Architecture 122.
Lecs and sems, M W F 11:15–12:05. Salmon.
Structural design concepts and procedures for steel building construction.

**222 (322) Structural Systems II**
Spring. 3 credits. Prerequisite: Architecture 122.
**M W F 11:15–12:05. Salmon.**
Structural design concepts and procedures for reinforced concrete building construction.

**326 Building Substructure**
Spring. 3 credits. Prerequisites: Architecture 222 or concurrent registration and permission of instructor. Not offered every year.
Sem, hours to be arranged. Staff.
The principles of soil mechanics and subsurface exploration. Design of building foundations—footings, piles, and subgrade walls.

## Architectural Principles, Theories, and Methods

**131 An Introduction to Architecture**
Fall or spring. 3 credits. Open to out-of-department students only.
T R 11:15–1:10. Staff, guest lecturers.
Architecture for non-architects. Intended to familiarize non-architecture students with the profession of architecture through lectures, readings, and films. Examines past and present criteria for excellence in architecture and the notable designs and designers who achieve this. Related fields such as urban design, landscape architecture, structural design, interior design, computer graphics, and professional practice will be included.

**231 Architectural Elements and Principles**
Fall. 2 credits. Architecture students must register concurrently in Architecture 201.
Studios and lecs, T 1:30–3:25. Staff.
Theory of the order, perception, and function of architectural space. Discourse on the nature of architectural systems and the multiplicity of ways they can be used to solve architectural problems.

**232 Design Methods and Programming**
Spring. 2 credits. Architecture students must register for this course concurrently with Architecture 202.
Studios and lecs, T 1:30–3:25. Staff.
Basic methods for developing architectural programs. Programming as a conceptual as well as a descriptive task is emphasized. Basic methods of design. Analytic and synthetic skills are stressed.

**331 Special Problems in Principles, Theories, and Methods**
Fall or spring. Variable credit (maximum, 3). Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Independent study.

**335 Theory of Architecture**
Fall or spring. 3 credits. Prerequisite: Architecture 231–232 or permission of instructor. Not offered every year.
Lecs, T R 4:40–6:30. L. F. Hodgden.

**336 Theory of Architecture**
Fall or spring. 3 credits. Limited to third-year students and above. Not offered every year.
Lecs, T R 4:40–6:30. L. F. Hodgden.
Theories of modern architecture: De Stijl, cubist and purist painting, industrialized architecture, Le Corbusier's architecture and urban theories, architectural sequence, facades, the free plan,"DOM-INO" theory.

**337 Special Investigations in the Theory of Architecture I**
Fall or spring. Variable credit (maximum, 3). Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Independent study.

**338 Special Topics in the Theory of Architecture I**
Fall or spring. 3 credits. Prerequisite: permission of instructor. Not offered every year.
Hours to be arranged. V. Warke and visiting faculty.
Topic to be announced before preregistration.

**431 Theory of Architecture**
Fall. 3 credits. Prerequisite: third-year status. Not offered every year.
Lecs, T R 4:40–6:30. L. F. Hodgden.
Gardening and architecture: urban parks; villas and country houses; and Italian, French, and English landscape gardens. Site planning.

**432 Theory of Architecture**
Spring. 3 credits. Prerequisite: third-year status. Not offered every year.
Lecs, T R 4:40–6:30. L. F. Hodgden.
The development of urban form, urban intervention, contextualism, ideal cities, historic new towns, streets, piazzas, fortifications, public buildings and social housing types, site planning, and transportation.

**435 Architecture and Representation**
Fall. 3 credits. Limited to degree candidates in architecture. Prerequisite: successful completion of Architecture 231–232. Not offered every year.
Lecs, disc, and reviews, T R 2:30–4:30. V. Warke.
A study of architecture as it functions as a representational art, referring to its past while inferring its present.

**635 Critical Theory in Architecture**
Spring. 3 credits. Prerequisite: permission of instructor. Not offered every year.
Sem, hours to be arranged. V. Warke.
An inquiry into the fundamental principles of architectural criticism in theory and practice, with emphasis on the structures of criticism in the twentieth century.

**637 Special Investigations in the Theory of Architecture II**
Fall or spring. Variable credit (maximum, 4). Prerequisite: permission of instructor.
Hours to be arranged. Staff.
Independent study.

**638 Special Topics in the Theory of Architecture II**
Fall or spring. 3 credits. Prerequisite: permission of instructor. Not offered every year.
Hours to be arranged. V. Warke and visiting faculty.
Topic to be announced before preregistration.

**[639 Principles of Design Process**
Fall or spring. 3 credits. Limited to third-year architecture students and above; students in other colleges must have permission of instructor. Not offered every year. Not offered 1989–90.
Sems, M W 10:10–12:05. A. Mackenzie.
Analysis of the major theories and techniques of design developed during the past fifteen years, with special emphasis on application to the solution of whole problems in architectural design.]

*Note:* **667–668 Architecture in Its Cultural Context I and II** is accepted as a theory course. See the section "Architectural Science and Technology Courses" for description.

## Design Communication

**Darkroom fees for all photography courses** (these fees are subject to change):

In-college students—$55 per term

Out-of-college students—$55 plus $10 per term course fee

**151(191) Drawing I**
Fall. 2 credits.
Studios, T R 2:30–4:25. Staff.
Freehand drawing with emphasis on line and perspective representation of form and space.

**152(192) Drawing II**
Spring. 2 credits. Prerequisite: Architecture 151.
Studios, T R 2:30–4:25. Staff.
Freehand drawing as a means of conceiving and expressing spatial form; line weight, shades and shadows, and figure drawing.

**251 Introductory Photo I (also Art 161)**
Fall or spring. 3 credits each term.
Hours to be arranged. Staff.
For description see Art 161.

**351 Introductory Photo II (also Art 261)**
Spring. 3 credits. Prerequisites: Architecture 251 or Art 161, or permission of instructor.
Hours to be arranged. Staff.
For description see Art 261.

**353 Large-Format Architectural Photography**
Spring. 3 credits. Prerequisites: Architecture 251 or Art 161 or 261, or permission of instructor. Darkroom fee, $55/$65. Not offered every year.
Lec and studio, hours to be arranged. Staff.
The special uses of large-format view camera photography. Emphasis on the creative use of the view camera in architectural photography.

**355 Graphic Design Studio**
Fall or spring. 3 credits. Prerequisite: Architecture 151 or 152, or permission of instructor. Not offered every year.
Lec and studio, hours to be arranged. Staff.
Design and preparation of materials for reproduction in print media. Studio in typography, available printing processes, and photomechanical methods of reproduction.

**356 Architectural Simulation Techniques**
Fall or spring. 3 credits. Prerequisite: Architecture 151 or permission of instructor.
Lec and studio, hours to be arranged. G. Hascup.
Two- and three-dimensional simulation techniques in architecture. Emphasis on simulation of environment, space, materials, and lighting as visual tools for architectural design.

**457 Special Project in Photography**
Fall or spring. Variable credit (maximum, 3). Prerequisites: written proposal outlining the special project and permission of instructor. Not offered every year.
Hours to be arranged. Staff.
Independent study.

**458 Special Project in Design Communication**
Fall or spring. Variable credit (maximum, 4). Limited to undergraduates. Prerequisites: written proposal outlining the special project and permission of instructor.
Hours to be arranged. Staff.
Independent study.

## Architectural Science and Technology

**[160 The History of Architectural Technology**
Fall or spring. 3 credits. Not for students in the Department of Architecture. Not offered every year.
Staff.
Architectural technology is a seemingly illogical blend of scientific knowledge and empirical experience. Whereas it may seem chaotic to the nonprofessional, it is a product of logic in the widely differing areas of design, structure, installation, production and erection, material use, law, economics, and historical development. The evolution of this interdependence is treated using examples of architectural and civic engineering works and processes.]

**261 Environmental Controls—Site Planning**
Fall. 3 credits.
Lecs, T R 11:15–1:10. J. Ochshorn.
The basic principles involved in design in the outdoor environment. A brief historical perspective. A development of inventory including grading and drainage. Foundations, surfacing, and construction.

**262 Building Technology, Materials, and Methods**
Spring. 3 credits.
Lecs, T R 11:15–1:10. J. Ochshorn.
Properties of materials—their use and application to the design of buildings and building systems. Discussion of various methods of building construction and assembly.

**361 Environmental Controls—Lighting and Acoustics**
Fall. 3 credits.
Lecs, M W 9:05–11:00. R. Hall and staff.
Basic properties and principles of sound and light. Sound phenomena, noise control, absorption, acoustical design. Light, color, and form. Natural lighting possibilities and constraints. Good and bad examples of artificial lighting.

**362 Environmental Controls—Mechanical and Passive Solar Systems**
Spring. 3 credits.
Lecs, M W F 9:05–11:00. Staff.
Basic thermal analysis of buildings, human comfort criteria, energy conservation, passive solar design, HVAC distribution systems, overview of mechanical conveying systems and plumbing.

**367 Contemporary Italian Culture**
Fall or spring. Variable credit (maximum, 3). For students in the Rome program only.
Staff and visiting faculty.
This course provides a broad view of the culture and social structure of Italy, drawing from Italian literature, history, and current events.

**371 Environmental Technology Workshop I**
Fall or spring. 2 credits. Not offered every year.
Studio, hours to be arranged. Staff.
The mechanical engineer's task and its relation to the architectural design process. Full-scale and model studies of the role of air movement and temperature in building design. Passive and active solar energy design.

**372 Environmental Technology Workshop II**
Fall or spring. 2 credits. Prerequisite or corequisite: Architecture 362. Not offered every year.
Studio, hours to be arranged. Staff.
The tasks of the acoustical consultant, the electrical engineer, and the illumination consultant in relation to the architect's work. Acoustical and lighting design studies using full-scale mock-ups and specific building type studies. Cost factors.

**374 (334) Computer Graphics (also Computer Science 417)**
Spring. 3 credits. Prerequisites: two terms of calculus and Computer Science 211, or equivalent. Not offered every year.
2 lecs, 1 lab. D. P. Greenberg.
Introduction to the principles of interactive computer graphics, including input techniques, display devices, display files, interactive graphic techniques, two- and three-dimensional computer graphics, perspective transformations, hidden line and hidden surface algorithms, and color-picture generation.

**375 Practicum in Computer Graphics (also Computer Science 418)**
Spring. 2 credits. Prerequisite: Computer Science 211. Recommended: Computer Science 314. Corequisite: Architecture 374. Not offered every year.
1 lab.
Two or three programming assignments dealing with sophisticated interactive vector graphics programs on calligraphic displays and solid-image generation on raster graphics displays.

**378 (338) Computers in Architecture Seminar**
Fall or spring. 2 credits. Prerequisites: Computer Science 100 or equivalent. Not offered every year.
Hours to be arranged. Staff.
Exploration of the use of computers in a variety of ways encompassing architectural practice and education. Use of the computer is not required for this course.

**379 (339) Architectural Computer Applications**
Fall or spring. 3 credits. Prerequisites: Computer Science 100 or second-year standing. Not offered every year.
Hours to be arranged. Staff.
Introduction to the use of the computer as a tool in the architectural design process Experience with computer applications will be offered.

**461(481) Professional Practice**
Fall or spring. 3 credits each term.
T 9:05–11:00. M. Schack and staff.
An examination of organizational and management theories and practices for delivering professional design services. Included is a historic overview of the profession and a review of the architect's responsibilities from the precontract phase through construction. Application of computer technology in preparing specifications.

**462 Professional Seminar**
Fall or spring. 3 credits. Washington Program only.
M. Schack and staff.
Visits to public and private agencies and architectural firms in Washington and Baltimore. Discussions relative to the various aspects of each firm's practice and the identification of agency roles.

**477–478 (437–438) Special Projects in Computer Graphics**
477, fall; 478, spring. Variable credit (maximum, 4). Limited to third-year students and above. Prerequisites: Architecture 374 plus concurrent registration in Computer Science 314 or equivalent, and permission of instructor.
Hours to be arranged. D. P. Greenberg.
Advanced work in computer graphics input and display techniques, including storage tube, dynamic vector and color raster displays.

**561 Special Problems in Architectural Science**
Fall or spring. Variable credit (maximum, 3). Prerequisite: permission of science staff instructor.
Hours to be arranged. Staff.
Topics to be announced. Independent study.

**563 Emerging Methods in Energy-Efficient Design**
Fall. 3 credits. Prerequisite: Architecture 362. Not offered every year.
Sem, T R 9:05. Staff.
State-of-the-art energy-efficient building design strategies and computational methods to model the thermal performance of buildings, presented through case studies of exemplary designs and application of selected analytical methods to exercises in building design development.

**[564 Earth-sheltered Architecture**
Fall or spring. 3 credits. Not offered 1989–90.
Hours to be arranged. Staff.]

**571–572 (531–532) Computer-aided Structural Design**
571, fall; 572, spring. 4 credits each term. Limited to fourth-year students and above. Prerequisites: Architecture 374 and Civil and Environmental Engineering 371–372, concurrent registration in Civil and Environmental Engineering 673, and permission of instructor. Not offered every year.
D. P. Greenberg.
Advanced topics involving interactive computer graphics and advanced structural analysis techniques.

**[573–574 (533–534) Computer-aided Environmental Design**
573, fall; 574, spring. 4 credits each term. Limited to students in their fourth or later year. Prerequisites: Architecture 374 and 362, one year of college physics, and permission of instructor. Not offered every year.
Staff.
Advanced topics involving interactive computer graphics and advanced environmental design techniques. Topics may include acoustics, lighting, and energy analyses.]

**[662 Environmental Control Systems**
Fall or spring. 3 credits. Prerequisite: Architecture 362. Not offered every year.
Lec and sem, hours to be arranged. Staff.
The influences of the environment on the design of buildings and urban developments. Lecture and workshop exercises use the wind tunnel and artificial sun.]

**667–668 Architecture in Its Cultural Context I and II**
667, fall; 668, spring. 4 credits each term. Prerequisite: permission of instructor. Not offered every year.
Sem, M W F 11:15. B. MacDougall.
Fall term, theory; spring term, problem solving and method. An examination of the relationship between architecture and other aspects of culture. Emphasis on the motivations for particular architectural forms and especially on theories of architecture. Examples from the United States and Asia.

### Graduate Courses

**761–762 Architectural Science Laboratory**
761, fall; 762, spring. 6 credits each term. Open to architectural science graduate students only.
Hours to be arranged. Staff.
Projects, exercises, and research in the architectural sciences.

**763–764 Thesis or Research in Architectural Science**
763, fall; 764, spring. Variable credit (maximum, 12). Limited to architectural science graduate students.
Hours to be arranged.
Independent study.

### Architectural History

The history of the built domain is an integral part of all aspects of the architecture curriculum, from design and theory to science and technology. Incoming students take Architecture 181–182 in the first year, and three additional courses from the 380–390 series, preferably in the third and fourth years. Seminars are intended for advanced undergraduate and graduate students and do not satisfy undergraduate history requirements. Courses, seminars, and special investigations focus on the Western tradition, which constitutes the most immediate setting for contemporary practice. Building cultures from other parts of the world, often more extensive and far older than those of the West, are studied in special offerings as opportunities in faculty resources become available.

### Sequence Courses

**181 History of Architecture I**
Fall. 3 credits. Required of all first-year students in architecture; open to all students in other colleges with an interest in the history of the built domain.
T R 11:15–1:10. Staff.
The history of the built environment as social and cultural expression in Western civilization from earliest times to the present. In the fall, themes, theories, and ideas in architecture and urban design are considered on the basis of selected instances from the civilization of Mesopotamia to the seventeenth century.

**182 History of Architecture II**
Spring. 3 credits. Required of all first-year students in architecture. Open to all students in other colleges with an interest in the history of the built domain; may be taken independently of Architecture 181.
T R 11:15–1:10. Staff.
The history of the built environment as social and cultural expression in Western civilization from earliest times to the present. In the spring, themes, theories, and ideas are addressed in greater detail for architecture and urban design from the eighteenth century to the 1980s.

### Freshman Writing Seminars

**190 The Language of Architecture**
Fall or spring. 3 credits. Not for students in the Department of Architecture.
Staff.
The metaphor of language is used to discuss works of architecture both as formal objects and as carriers of meaning when seen in their cultural contexts. Contemporary and historical examples, including local buildings, are examined to develop skills in visual analysis and in "reading the messages" in architectural design.

**191 The Literature of Architecture**
Fall or spring. 3 credits. Not for students in the Department of Architecture.
Staff.
The literature of architecture, understood as the testimony of the architects themselves, is drawn on to examine major themes of twentieth-century architecture. Texts are presented according to rhetorical mode within a framework of thematic categories. For example, narrative, descriptive, and polemical readings address the birth of the skyscraper. Three salient themes in modern architecture are explored in the seminar: the impact of technology and revolution, the skyscraper and dwelling as new types for new needs, and the aesthetic of modern architecture.

### Directed Electives

**[381 Architecture of the Classical World**
Spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor. Not offered every year. Not offered 1989–90.
Hours to be announced. M. Jarzombek.
The history of architecture and urban design in ancient Mediterranean civilizations, with emphasis on Greece and Rome. The course considers change and transformation of building types and their elements within the general context of social demands.]

**382 Architecture of the Middle Ages**
Fall. 4 credits. (Credit for this course may be obtained by taking History of Art 332.) Prerequisites: Architecture 181–182 or permission of instructor. Not offered every year.
M W F 12:20. R. G. Calkins.
A survey of medieval architecture from the Early Christian period to the late Gothic (A.D. 300–1500). Emphasis is given to the development of structural systems, form, function, and meaning of important medieval buildings.

**384 The Renaissance**
Fall. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor.
T R 9:05–11. M. Jarzombek.
History of European architecture and city planning of the fifteenth and sixteenth centuries. Special consideration is given to building types and to internal changes in architecture and urban design, as well as to external influences such as social, economic, and political factors.

**385 The Baroque**
3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor. Not offered every year.
M W 11:15–1:10. C. F. Otto.
History, ideas, and theories of architecture and urban design in Europe between 1600 and 1800. Special consideration is given to the contribution and significance of major architects of the time.

**386 English Architecture: 1688–1892**
Fall. 3 credits. Not offered every year.
Hours to be arranged. C. Rowe and staff.
An investigation of English architecture from the revolution of 1688 to the appearance of the parliamentary Labour party in 1892.

**387 The Nineteenth Century**
Spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor.
T R 11:15–1:10. M. Woods.
Examination of the leading trends in Western architectural theory and practice from the rationalist traditions through art nouveau.

**388 The Twentieth Century**
Fall. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor. Not offered every year.
M W 11:15–1:10. C. F. Otto.
The history, ideas, and theories of architecture and urban design in Europe and America during the course of the twentieth century, beginning with reform efforts of the 1890s and concluding with work from the 1980s.

**390 American Architecture I**
Fall. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor.
M W 9:05–11. M. Woods.
History of American architecture and urbanism from the late seventeenth century to the Civil War, with emphasis on stylistic trends, practitioners, and social and aesthetic ideals of the time.

**391 American Architecture II**
Spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor.
M W 9 :05–11. M. Woods.
A continuation of Architecture 390 but may be taken independently. The history of American architecture and urbanism from the Civil War to 1960. Special attention is paid to the dominant cultural, technical, and aesthetic determinants of form as manifested in the work of the major architects of the time.

**393 The American Planning Tradition (also City and Regional Planning 462)**
Spring. 4 credits. Prerequisites: Architecture 181–182 or permission of instructor.
Hours to be announced.
S. Christopherson.
A systematic review of American city planning history, beginning with the earliest colonial settlements and ending with the era of the New Deal. An introductory lecture course requiring no previous exposure to planning or architecture, and a prerequisite for students intending to take advanced seminars or independent studies in planning history.

**396 Special Topics in Architectural History**
Spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor. Not offered every year.
T R 9:05–11. M. Jarzombek.
Topic to be announced by preregistration.

**397 Special Topics in Architectural History**
Spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor. Not offered every year.
M W 11:15–1:10. M. Kubelik.
Topic to be announced by preregistration.

**[398 Special Topics in Architectural History**
Spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor. Not offered every year.
M W 11:15–1:10. M. Woods and staff.
Topic to be announced by preregistration.]

**399 Special Topics in Architectural History**
Fall or spring. 3 credits. Limited to 30 students. Prerequisites: Architecture 181–182 or permission of instructor.
Hours to be announced. Staff.
Topic to be announced by preregistration.

### Courses in Preservation

**583 (543) Measured Drawing (also City and Regional Planning 567)**
Fall. 3 credits. For undergraduate architecture students and graduate students in history and preservation. Prerequisite: permission of instructor.
Hours to be announced. M. A. Tomlan.
Combines study of architectural drawings as historical documents with exercises in preparing measured drawings of small buildings. Presents the basic techniques of studying, sketching, and measuring a building and the preparation of a finished drawing for publication.

**584 (544) Problems in Contemporary Preservation Practice (also City and Regional Planning 563)**
Spring. Variable credit (maximum, 3).
Hours to be announced. M. A. Tomlan.
A review and critique of ongoing preservation projects and an investigation of areas of expertise currently being developed, presented by staff and guest lecturers.

**585 (545) Perspectives on Preservation (also City and Regional Planning 562)**
Fall. 3 credits.
Hours to be announced. M. A. Tomlan and visiting lecturers.
Introductory course for preservation planning. The rationale for, and methods of, using existing cultural and aesthetic resources in the planning and design of regions and cities.

**586 (546) Documentation for Preservation Planning (also City and Regional Planning 560)]**
Fall. 3 credits.
Hours to be announced. M. A. Tomlan and visiting lecturers.
Methods of collecting, recording, processing, and analyzing historical architectural and planning materials.

**587 (547) Building Materials Conservation (also City and Regional Planning 564)**
Spring. 3 credits. Open to juniors, seniors, and graduate students.
Hours to be announced. M. A. Tomlan.
A survey of the development of building materials in the United States, chiefly during the nineteenth and early twentieth centuries, and a review of the measures that might be taken to conserve them.

**588 (548) Historic Preservation Planning Workshop: Surveys and Analyses (also City and Regional Planning 561)**
Fall or spring. 4 credits.
Hours to be announced. Staff.
Techniques for the preparation of surveys of historic structures and districts; identification of American architectural styles, focusing on upstate New York; explorations of local historical resources, funding sources, and organizational structures. Lectures and training sessions. Emphasis on fieldwork with individuals and community organizations.

### Seminars in Architectural History

**681 Seminar in the Architecture of the Classical World**
Fall or spring. 4 credits. Prerequisites: Architecture 381 or permission of instructor. Not offered every year.
Hours to be announced. Staff.
Issues in Greek and Roman architectural history. Specific topic to be announced.

**684 Seminar in the Renaissance**
Fall or spring. 4 credits. Prerequisites: Architecture 384 or permission of instructor. Not offered every year.
Hours to be announced. M. Kubelik.
Issues in European architecture and city planning of the fifteenth and sixteenth centuries. Specific topic to be announced.

**685 Seminar in the Baroque**
Fall or spring. 4 credits. Prerequisites: Architecture 385 or permission of instructor. Not offered every year.
Hours to be announced. C. Otto.
Special topics in the history of European architecture and urban design between 1600 and 1800. Specific subject to be announced.

**687 Seminar in Nineteenth-Century Architecture**
Fall or spring. 4 credits. Prerequisites: Architecture 387 or permission of instructor. Not offered every year.
Hours to be announced. M. Woods and staff.
Historical topics in European architecture and urbanism in the nineteenth century. Specific subject to be announced.

**688 Seminar in Twentieth-Century Architecture**
Fall or spring. 4 credits. Prerequisites: Architecture 388 or permission of instructor. Not offered every year.
Hours to be announced. C. Otto.
Special topics in the history of architecture and urban design in Europe and America during the twentieth century. Specific subject to be announced.

**690 Seminar in American Architecture**
Fall or spring. 4 credits. Prerequisites: Architecture 390–391 or permission of instructor. Not offered every year.
Hours to be announced. M. Woods and staff.
Historical topics in the architecture of the nineteenth and twentieth centuries in the United States. Specific subject to be announced.

**693 Seminar in the History of American City Planning (also City and Regional Planning 660)**
Fall. 3 credits. Prerequisites: Architecture 393 or permission of instructor.
Hours to be announced. Staff.
A research seminar in which each student selects a topic for oral presentation followed by the completion of a research paper. Early sessions examine the scope of planning history, its relations to other disciplines, sources of written and graphic materials, and the uses of historical evidence in interpreting urban planning and development.

**696 Seminar in the History of Architecture and Urban Development**
Fall or spring. 4 credits. Prerequisites: permission of instructor. Not offered every year.
Hours to be announced. Staff.
Topic to be announced.

**697 Seminar in the History of Architecture and Urban Development**
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.
Hours to be announced. C. Otto.
Topic to be announced.

**698 Seminar in the History of Architecture and Urban Development**
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.
Hours to be announced. M. Woods.
Topics to be announced.

**699 Seminar in the History of Architecture and Urban Development**
Fall or spring. 4 credits. Prerequisite: permission of instructor.
Hours to be announced. Staff.
Topic to be announced.

### Independent Study, Thesis, Dissertation

**299 Undergraduate Independent Study in the History of Architecture**
Fall or spring. Variable credit (maximum, 3). Prerequisite: permission of instructor. May not be taken by students in design to satisfy undergraduate history requirements.
Hours to be announced. Staff.
Independent study for undergraduate students.

**499 Undergraduate Thesis in the History of Architecture**
Fall or spring. 4 credits. For B.S. honors candidates in history only.
Hours to be arranged. Staff.

**799 Graduate Independent Study in the History of Architecture and Urban Development**
Fall or spring. Variable credit. Prerequisite: permission of instructor.
Hours to be announced. Staff.
Independent study for graduate students.

**899 M.A. Thesis in History of Architecture and Urban Development**
Fall or spring. Variable credit.
Hours to be announced. Staff.
Independent study for the master's degree.

**999 Ph.D. Dissertation in History of Architecture and Urban Development**
Fall or spring. Variable credit.
Hours to be announced. Staff.
Independent study for the doctoral degree.

# ART

R. Bertoia, Z. Blum, S. Bowman, J. Cole, N. D. Daly, M. Hitchcock, V. G. Kord, J. N. Locey, E. Meyer, E. Mikus, G. Page, B. Perlus, S. Poleskie, J. L. Squier, W. S. Taft, K. WalkingStick, and visiting critics.

## Undergraduate Program

The undergraduate curriculum in art, leading to the degree of Bachelor of Fine Arts, provides an opportunity for the student to combine a general liberal education with the studio concentration required for a professional degree. During the first three semesters all students follow a common course of study designed to provide a broad introduction to the arts and a basis for the intensive studio experience in the last three years. Beginning with the fourth term, students concentrate on painting, sculpture, photography, or printmaking. They may elect additional studio work in any of these subjects during the last two years, with the consent of the instructor, providing the courses are taken in sequence and at the hours scheduled. These courses are designed to promote a knowledge and critical understanding of these arts and to develop the individual student's talent. All members of the faculty in the Department of Art are active, practicing artists, whose work represents a broad range of expression.

Studio courses occupy approximately one-half of the student's time during the four years at Cornell; the remainder is devoted to a diversified program of academic subjects with a generous provision for electives.

The curriculum in art is an independent program of study within the College of Architecture, Art, and Planning. However, the intimate relationships between the fine arts and training in architecture and city planning is a source of special strength in the Cornell program and affords unusual benefits to the students in these three disciplines.

Although the undergraduate curriculum in art is an excellent background for a career in applied art and offers courses in the use of graphics in modern communications, no specific technical courses are offered in such areas as interior design, fashion, or commercial art.

The department discourages accelerated graduation. However, a student may petition for consideration of early graduation by submission of a petition to the faculty before course enrollment in the spring semester of the student's junior year.

A candidate for the B.F.A. degree who also wants to earn a Bachelor of Arts degree from the College of Arts and Sciences can arrange to do so. This decision should be made early in the candidate's career (no later than the third semester), so that he or she can petition to be registered in both colleges simultaneously. Each student is assigned an adviser in the College of Arts and Sciences to provide needed guidance. Those students who are interested primarily in the history rather than in the practice of art should apply for admission to the College of Arts and Sciences with the objective of pursuing a major in the Department of History of Art in that college. Department of Art studio courses may then be taken as electives.

The B.F.A. program is designed so that students may fulfill the degree requirements of 130 credits with a minimum of 64 credits taken in the Department of Art and a minimum of 50 credits taken outside the department. Within these ranges, students may design their own programs subject to the following limitations:

1) Of the minimum of 50 elective credits to be taken outside the Department of Art, 12 credits must be in English, history, or other humanities offered in the College of Arts and Sciences. In the first two years 9 credits in history of art at the 200 level or higher or in architectural history must be completed. An additional 12 credits in art history at the 200 level or higher or in architectural history must be completed in the last two years. Also, 12 of the total 21 required credits must be in introduction to art history courses at the 200 level.

2) Students must also plan their programs to complete 30 credits in courses in one of the following studio areas: painting, sculpture, printmaking, or photography, or they should plan to complete 20 credits in each of two of the above areas. Drawing may be taken for 20 credits along with any of the other disciplines as part of a dual concentration. In the area of photography, students must also complete Art 263 and 264. Students should plan to complete all fourth-year studio concentration courses. Students must also complete a senior thesis in one area of concentration and are required to participate in the Senior Exhibition.

The university requirement of two terms in physical education must be met.

A candidate for the B.F.A. degree at Cornell is required to spend the last two terms of candidacy in residence at the university, subject to the conditions of the Cornell faculty legislation of November 14, 1962.

Students who transfer into the undergraduate degree program in art must complete a minimum of four terms in residence at Cornell and a minimum of 60 credits at the university, of which 30 credits must be taken in the Department of Art, including four terms of studio work. No student may study in absentia for more than two terms.

### Rome Program

Students in good standing who have completed the requirements of the first two years of the curriculum are eligible for participation in the Rome Program. Students are admitted to the program by application and review of their record. The Rome studio is offered by the Department of Art. Additional courses in art and architectural history, contemporary Italian culture, and Italian language are offered by other departments participating in the program.

### Curriculum

Students are expected to take an average course load of 16 credits per semester during their four years. They must complete a minimum of two courses each in painting, sculpture, printmaking, and photography and four in drawing by the end of the third year. All studio courses may be repeated for credit.

**First Year**

| *Fall Term* | *Credits* |
|---|---|
| 110 Color, Form, and Space | 3 |
| 111 Introductory Art Seminar | 1 |
| 121 Introductory Painting | 3 |
| 141 Introductory Sculpture | 3 |
| 151 Introductory Drawing | 3 |
| Elective | 3 |
| *Spring Term* | |
| One of the following: | 3 |
| 131 Introductory Etching<br>132 Introductory Graphics<br>133 Introductory Lithography | |
| 151 Introductory Drawing | 3 |
| 161 Introductory Photography | 3 |
| Art history elective | 3 or 4 |
| Elective | 3 or 4 |

**Second Year**

| *Fall Term* | *Credits* |
|---|---|
| Art studio (two courses) | 6 |
| Art history elective | 3 or 4 |
| Elective(s) | 6 or 7 |
| *Spring Term* | |
| Art studio (two courses) | 6 |
| Art history elective | 3 or 4 |
| Elective(s) | 6 or 7 |

**Third Year**

| *Fall Term* | *Credits* |
|---|---|
| Art studio (one course minimum) | 3–8 |
| Issues of Contemporary Art | 3 |
| Electives | 5–10 |
| *Spring Term* | |
| Art studio (one course minimum) | 3–8 |
| Art history elective | 3 or 4 |
| Electives | 4–10 |

**Fourth Year**

| *Fall Term* | *Credits* |
|---|---|
| Fourth-year studio concentration | 6 |
| Art history elective | 3 or 4 |
| Electives | 5 or 6 |
| *Spring Term* | |
| Senior thesis studio concentration | 6 |
| Art history elective | 3 or 4 |
| Electives | 5 or 6 |

## Course Information

Most courses in the Department of Art are open to students in any college of the university who have fulfilled the prerequisites and who have permission of the instructor.

*Fees are charged for all Department of Art courses.* For fine arts majors the fee is $20 each semester. Students from outside the department are charged $10 a course. In addition, *there are darkroom fees for all photography courses* (these fees are subject to change): for in-college students the fee is $55 each semester, and for out-of-college students the fee is $55 plus $10 per term course fee.

To take advantage of the special opportunities afforded by summer study, the department has developed several summer-only courses. Students wanting to satisfy Cornell degree requirements may petition to have these courses substituted for fall- or spring-term required courses.

## Courses in Theory and Criticism

**110 Color, Form, and Space**
Fall or spring. 3 credits. Fall enrollment limited to B.F.A. candidates.
M 9:30–11. N. Daly.
A study of traditional and contemporary ways of drawing and painting. An analysis of color theory and pictorial space.

**111 Introductory Art Seminar**
Fall. 1 credit. Limited to B.F.A. candidates.
F 1:25–3.
Students meet for one hour each week with a different member of the faculty. The varying artistic interests of the staff are presented and discussed.

**311 Issues in Contemporary Art**
Fall. 3 credits.
Hours to be arranged. S. Poleskie.
A seminar course in issues of contemporary art, including lectures by visiting artists.

**610 Seminar in Art Criticism**
Fall or spring. 2 credits; may be repeated for credit. Four terms required for M.F.A. candidates.
Hours to be arranged. Staff.
Historical and modern critical opinions and their relation to problems in the theory of art are studied.

## Studio Courses in Painting

**121 Introductory Painting**
Fall, spring, or summer. 3 credits.
Hours to be arranged. Staff.
An introduction to the problems of artistic expression through the study of pictorial composition; proportion, space, shapes, and color as applied to abstract and representational design.

**123 Landscape Painting**
Summer. 3 credits.
Class meets outdoors at selected sites in the Ithaca area. A different motif is explored each week. Pen, pencil, and water- or oil-based colors (optional) are the materials employed. Analysis and discussion of the landscape work of Corot, Cézanne, van Gogh, Seurat, and others are included.

**124 Painting and Drawing**
Variable credit (maximum 5). Summer only.
A special summer abroad course with emphasis on artistic expression and techniques, for students at all levels of skill. Included will be a mixture of painting and drawing assignments, self-initiated projects, and drawing sessions with a live model.

**221 Painting II**
Fall or spring. 3 credits. Prerequisite: Art 121 or permission of instructor.
Hours to be arranged. Staff.
A continuation of Art 121.

**321 Painting III**
Fall. 4 credits. Prerequisite: Art 221 or permission of instructor.
Hours to be arranged. Staff.
Continued study of the principles of painting and the selection and expressive use of materials and media. Group discussions and individual criticism.

**322 Painting IV**
Spring. 4 credits. Prerequisite: Art 321 or permission of instructor.
Hours to be arranged. Staff
Continued study of the principles of painting and the selection and expressive use of materials and media. Group discussions and individual criticism.

**421 Painting V**
Fall. 6 credits. Prerequisite: Art 322 or permission of instructor.
Hours to be arranged. Staff.
Further study of the art of painting through both assigned and independent projects executed in various media. Instruction through group discussions and individual criticism.

**422 Senior Thesis in Painting**
Fall or spring. 6 credits. Prerequisite: Art 321 or 322 or permission of instructor.
Hours to be arranged. Staff.
Advanced painting project to demonstrate creative ability and technical proficiency.

**721–722, 821–822 Graduate Painting**
721 and 821, fall; 722 and 822, spring. Credit as assigned. May be repeated for credit. Limited to M.F.A. students in painting.
Staff.
Students are responsible, under staff direction, for planning their own projects and selecting the media in which they are to work. All members of the staff are available for individual consultation.

## Studio Courses in Graphic Arts

**131 Introductory Intaglio**
Fall, spring, or summer. 3 credits.
Hours to be arranged. E. Meyer.
A basic introduction to etching techniques, with emphasis on engraving, lift ground, relief printing, monotypes, and experimental techniques.

**132 Introductory Graphics**
Fall, spring, or summer. 3 credits.
Hours to be arranged. S. Poleskie.
An introduction to the two-dimensional thought process and the language of vision. Students will explore design projects and the use of graphic materials, including collage, pochoir, and screen printing.

**133 Introductory Lithography**
Fall, spring, or summer. 3 credits.
Hours to be arranged. G. Page.
The theory and practice of lithographic printing, using limestone block and aluminum plate. Basic lithographic techniques of crayon, wash, and transfer drawing are studied.

**231 Intaglio Printing II**
Fall or spring. 3 credits. Prerequisite: Art 131 or permission of instructor.
Hours to be arranged. E. Meyer.
Continuation of the study and practice of methods of intaglio printing, with emphasis on techniques and color.

**232 Advanced Screen Printing (Book Arts)**
Spring. 3 credits. Prerequisite: Art 132 and Art 161 or permission of instructor.
Hours to be arranged. S. Poleskie.
Students will expand their knowledge of screen printing to include photo stencil and printing on diverse materials such as cloth and plastic with the goal of producing a book or a portfolio of prints by the end of the semester.

**233 Lithography II**
Fall or spring. 3 credits. Prerequisite: Art 133 or permission of instructor.
Hours to be arranged. G. Page.
Continuation of the study and practice of lithographic printing, with emphasis on color.

**331 Printmaking III**
Fall or spring. 4 credits. Prerequisite: Art 231, 232, or 233 or permission of instructor.
Hours to be arranged. Staff.
Study of the art of graphics through both assigned and independent projects. Work may concentrate in any one of the graphic media or in a combination of media.

**332 Printmaking IV**
Fall. 4 credits. Prerequisite: Art 331 or permission of instructor.
Hours to be arranged. Staff.
Continuation and expansion of Art 331.

**431 Printmaking V**
Spring. 6 credits. Prerequisites: Art 332 or permission of instructor.
Hours to be arranged. Staff.
Further study of the art of graphics through both assigned and independent projects executed in various media. Instruction through group discussions and individual criticism.

**432 Senior Thesis in Printmaking**
Fall or spring. 6 credits. Prerequisite: Art 331 or 332 or permission of instructor.
Hours to be arranged. Staff.
Advanced printmaking project to demonstrate creative ability and technical proficiency.

**731–732, 831–832 Graduate Printmaking**
731 and 831, fall; 732 and 832, spring. Credit as assigned; may be repeated for credit. Limited to M.F.A. candidates in graphic arts. Prerequisite: permission of instructor.
Staff.
Students are responsible, under staff direction, for planning their own projects and selecting the media in which they will work. Members of the staff are available for consultation; discussion sessions of work in progress are held.

## Studio Courses in Sculpture

**141 Introductory Sculpture**
Fall, spring, or summer. 3 credits.
Hours to be arranged. Staff.
A series of studio problems introduce the student to the basic considerations of artistic expression through three-dimensional design, i.e., modeling in Plasteline, building directly in plaster, casting in plaster, and constructing in wood and metal.

**241 Sculpture II**
Fall or spring. 3 credits. Prerequisites: Art 141 or permission of instructor.
Hours to be arranged. Staff.
Various materials, including clay, plaster, wood, stone, and metal, are used for exercises involving figurative modeling, abstract carving, and other aspects of three-dimensional form and design. Beginning in the second year, students are encouraged to explore the bronze casting process. The sculpture program, which is housed in its own building, contains a fully equipped bronze casting foundry.

**341 Sculpture III**
Fall. 4 credits. Prerequisite: Art 241 or permission of instructor.
Hours to be arranged. Staff.
Continued study of the principles of sculpture and the selection and expressive use of materials and media. Group discussions and individual criticism.

**342 Sculpture IV**
Spring. 4 credits. Prerequisite: Art 241 or permission of instructor.
Hours to be arranged. Staff.
Continuation and expansion of Art 341.

**441 Sculpture V**
Fall. 6 credits. Prerequisite: Art 342 or permission of instructor.
Hours to be arranged. Staff.
Further study of the art of sculpture through both assigned and independent projects executed in various media. Instruction through group discussions and individual criticism.

**442 Senior Thesis in Sculpture**
Fall or spring. 6 credits. Prerequisite: Art 341 or 342 or permission of instructor.
Hours to be arranged. Staff.
Advanced sculpture project to demonstrate creative ability and technical proficiency

**741–742, 841–842 Graduate Sculpture**
741 and 841, fall; 742 and 842, spring. Credit as assigned. May be repeated for credit. Limited to M.F.A. students in sculpture.
Staff.
Students are responsible, under staff direction for planning their own projects and selecting the media in which they are to work. All members of the staff are available for individual consultation. Weekly discussion sessions of works in progress are held.

## Studio Courses in Photography

**Darkroom fees for all photography courses** (these fees are subject to change):

In-college students $55 per term

Out-of-college students—$55 plus $10 per term course fee.

**161 Introductory Photography I (also Architecture 251)**
Fall, spring, or summer. 3 credits.
Hours to be arranged. Staff.
A basic lecture-studio course in black and white photography for beginners. Emphasis is on basic camera skills, darkroom techniques, and understanding of photography imagery.

**167 Photography**
Variable credit (maximum 5). Summer only.
A special summer-abroad course with emphasis on both the techniques and aesthetics of black-and-white photography, for students at all levels of skill. Initial photographic assignments will be followed by other projects of the student's own choosing.

**168 Black-and-White Photography**
Summer. 3 credits. Fee, $60.
Intended for students at all levels, from introductory to advanced. Emphasis on camera skills, darkroom techniques, and the content of black-and-white photographic imagery.

**169 Color Photography**
Summer. 3 credits. Fee, $60.
Intended for students at all levels, from introductory to advanced. Emphasis on camera skills, darkroom techniques, and the content of color photographic imagery.

**261 Photography II (also Architecture 351)**
Fall, spring, or summer. 3 credits. Prerequisites: Art 161 or Architecture 251, or permission of instructor.
Hours to be arranged. Staff.
A continuation of Introductory Photography I.

**263 Color Photography**
Fall or spring. 3 credits. Prerequisite: Art 161 or permission of instructor.
Hours to be arranged. Staff.
A studio course in color photographic processes, including color film developing and color printing. Emphasis is on camera skill, color techniques, image content, and creative use of color photography.

**264 Photo Processes**
Fall or spring. 3 credits. Prerequisite: Art 161 or permission of instructor.
Hours to be arranged. Staff.
A studio course in alternate and nonsilver photographic, processes. Emphasis is on camera skill, basic techniques and processes, image content, and creative use of photo processes.

**265 Studio Photography**
Fall or spring. 3 credits. Prerequisite: Art 161 or permission of instructor.
Hours to be arranged. Staff.
A course in the use of medium- and large-format cameras that explores technique, lighting, and the use of larger-format cameras for personal expression both in the studio and outdoors.

**361 Photography III**
Fall or summer. 4 credits. A studio course intended for photography majors and other qualified students. Prerequisite: Art 261, 262, or 263 or permission of instructor.
Hours to be arranged. Staff.
Continued study of creative use of photography, with emphasis on specialized individual projects.

**362 Photography IV**
Spring. 4 credits. A studio course intended for photography majors and other qualified students. Prerequisite: Art 361 or permission of instructor.
Hours to be arranged. Staff.
A continuation of Art 361.

**379 Independent Studio**
Summer. Credit by arrangement.
Hours by arrangement. Staff.
Students who have the interest and ability to progress beyond the problems of their particular course may register for additional credits. Students plan courses of study or projects that must meet the approval of the instructors they have selected to guide their progress and criticize the results. A course fee may be charged.

**461 Photography V**
Fall. 6 credits. Prerequisite: Art 361 or permission of instructor.
Hours to be arranged. Staff.
A studio course intended for photography majors and other qualified students.

**462 Senior Thesis in Photography**
Fall or spring. 6 credits. Prerequisite: Art 461 or permission of instructor.
Hours to be arranged. Staff.
A studio course intended for photography majors and other qualified students. Advanced photography project to demonstrate creative ability and technical proficiency.

**751–752, 851–852 Graduate Photography**
751 and 851, fall; 752 and 852, spring. Credit as assigned. May be repeated for credit. Limited to M.F.A. students in photography. Prerequisite: permission of instructor.
Staff.
Students are responsible, under staff direction, for planning their own projects and selecting the media in which they will work. Members of the staff are available for consultation. Discussion sessions of work in progress are held.

## Studio Courses in Drawing

**151 Introductory Drawing**
Fall, spring, or summer. 3 credits.
Hours to be arranged. Staff.
A basic drawing course in the study of form and techniques. Contemporary and historical examples of figure, still life, and landscape drawing are analyzed in discussion.

**158 Conceptual Drawing**
Summer. 3 credits.
Emphasis on drawing from the imagination. The generation of ideas and their development in sketches is stressed. The intent is not to produce finished art but rather to experience a series of problems that require image and design concepts different from those of the artist working directly from nature.

**159 Life and Still-Life Drawing**
Summer. 3 credits.
The human figure and still life are studied both as isolated phenomena and in relation to their environment. Focuses on helping the student observe and discover.

**251 Drawing II**
Fall or spring. 3 credits. Prerequisites: Art 151 or permission of instructor.
Hours to be arranged. Staff.
A continuation of Art 151 but with a closer analysis of the structure of the figure and a wider exploitation of its purely pictorial qualities.

**[351 Drawing III**
Fall or spring. 3 credits. Prerequisite: Art 251. Not offered 1989–90.
Staff].

**352 Anatomy for Artists**
Spring. 3 credits. Prerequisites: Art 151, 159, and 251 or permission of instructor.
Hours to be arranged. S. Taft.
Develops basic understanding of the structure of the human figure as it is relevant to artists through an in-depth study of the skeleton and muscle-tendon system. Focuses on improving understanding and skill in design and observation, as well as gaining an understanding of how the materials may be relevant to making art through the study of works by the masters.

## Graduate Thesis

**712 Graduate Thesis**
Spring. Credit as assigned.
Staff.
For graduate students in their last term in the programs in painting, sculpture, printmaking, and photography.

## Special Studio Courses

**171 Computer Art**
[Fall], spring, or summer. 3 credits. Not offered fall 1989.
Hours to be arranged. S. Bowman.
Introduction to the use of the microcomputer, various graphic art programs, and methods for the generation of abstract color images. Emphasis on the computer as a tool for making art.

**371 Independent Studio**
Fall, spring, or summer. Variable credit (maximum, 5). Students may register for two studios in a semester. May be repeated for credit. Prerequisite: written permission of instructor.
Department staff.

**372 Special Topics in Art Studio**
Fall, spring, or summer. Variable credit (maximum, 6).
Hours to be arranged. Staff.
An exploration of a particular theme or project.

**400 Rome Studio**
Fall or spring. 6 credits. Prerequisite: permission of instructor.
Staff.
The content for the Rome studio will be determined by the instructor. Emphasis will be divided between work accomplished in the studio and work executed outdoors in the environs of Rome. Media will consist primarily of painting, drawing, sculpture, and photography, or those assigned by the instructor

**471 Independent Studio**
Fall, spring, or summer. Variable credit (maximum, 6). Students may register for two studios in a semester. May be repeated for credit. Prerequisite: written permission of instructor.

Department staff.

# CITY AND REGIONAL PLANNING

D. B. Lewis, chair; L. Beneria, R. S. Booth, S. Christopherson, P. Clavel, S. Czamanski (emeritus), J. F. Forester, W. W. Goldsmith, W. Isard, B. G. Jones, B. Kelly (emeritus), D. McClive, P. Olpadwala, K. C. Parsons, J. W. Reps (emeritus), S. Saltzman, S. W. Stein, M. A. Tomlan, R. T. Trancik, T. Vietorisz (visiting), M. Wilder

The department offers several programs of study at both the undergraduate and graduate levels.

### The Undergraduate Program in Urban and Regional Studies

The four-year Bachelor of Science program in urban and regional studies offers students an opportunity to direct their education toward an understanding of urban and regional problems and solutions. The curriculum acquaints students with the physical, social, political, economic, and environmental forces that confront cities and regions and contribute to their growth and decline. The curriculum draws on strengths in the department and is supplemented by course work in related areas in other departments at Cornell.

The first two years in this program are a general education in the liberal arts and sciences. Writing and quantitative skills are developed, and an exposure is provided to course work in the natural and social sciences, the expressive or design arts, and the humanities. Two introductory courses in urban and regional issues are also taken during the first two years. During the junior and senior years ten specific courses are taken to provide a significant foundation of knowledge in the major. Additional directed electives will permit the student to gain greater depth of knowledge and acquire a broader understanding of topics of individual interest. These courses may be in any related subject, including, for example, housing, urban design, neighborhoods, energy, environmental controls, economic development, architecture, land use, social policy, and international planning.

### Basic Requirements for Graduation

1) **General education** (during the first four terms)

a. Freshman writing seminars: 6 credits

b. Foreign language: qualification in one foreign language

c. An approved course sequence (minimum of 6 credits) in each of the five categories below: 30 credits

1. a. Biological sciences or
   b. Physical sciences
2. a. Social sciences (other than economics) or
   b. History
3. a. Humanities or
   b. Expressive arts or design arts
4. Mathematics
5. Economics

2) **Major concentration:** 50 to 52 credits

a. Specific course requirements (38 to 40 credits)

CRP 100, The American City

CRP 101, The Global City

CRP 314, Planning, Power, and Decision Making, *or* Government 311, Urban Politics

CRP 315, The Progressive City

CRP 320, Introduction to Quantitative Methods I

CRP 321, Introduction to Quantitative Methods II

CRP 361, Seminar in American Urban History, *or* History 332 or 333, The Urbanization of American Society

CRP 400, Introduction to Urban and Regional Theory

CRP 401, Urban Political Economy

CRP 480, Environmental Politics

CRP 481, Principles of Spatial Design and Aesthetics

CRP 482, Urban Land Use Concepts

b. Directed electives (related to urban and regional studies): 12 credits (at least 6 credits to be taken outside CRP)

3) **Free electives:** 26 to 28 credits

a. 12 credits during first four terms

b. 14 to 16 credits during last four terms

**Required courses for graduation:** 34

**Required Credits:** 120

The university requirement of two terms of physical education must be met during the first two terms.

### Honors Program

Each year a small number of well-qualified junior-year students will be accepted into the honors program. Each honors student will develop and write a thesis under the guidance of his or her faculty adviser. There will be a seventy-five-page limit on each honors thesis.

### Off-Campus Opportunities

**Cornell-in-Washington Program.** Students in good standing may be eligible to earn degree credits in the Cornell-in-Washington program through course work and an urban-oriented internship in Washington, D.C. Students may work as interns with congressional offices, executive-branch agencies, interest groups, research institutions, and other organizations involved in the political process and public policy. Students also select one or two other seminars from such fields as government, history, economics, human development and family studies, architectural history, and agricultural economics. All seminars are taught by Cornell faculty members and carry appropriate credit toward fulfillment of major, distribution, and other academic requirements.

**Cornell Abroad.** Cornell encourages qualified undergraduates to study abroad in the belief that exposure to foreign cultures is an important component of a good education. In an increasingly interdependent world, the experience of living and learning in a foreign country is invaluable. With this in mind, the university is continuing to develop study abroad opportunities. Current programs are available in Great Britain, Spain, and Germany. Opportunities in Asia, the Mideast, and France should be forthcoming. The department encourages its students to explore these opportunities.

**Cornell-in-Rome Program.** The College of Architecture, Art, and Planning has a teaching facility in Rome located in the sixteenth-century Palazzo Massimo. Students in good standing are eligible to earn degree credits through course work undertaken with Cornell faculty assigned to Rome and with accredited instructors. Courses are available in areas of urban development, regional development, and architecture and art.

**Research and fieldwork.** Students are welcome to work with department faculty members on research or other opportunities that are appropriate to their particular interests. Fieldwork and community-service options also exist for students in the Urban and Regional Studies Program.

### Additional Degree Options

**Linked degree options.** Urban and regional studies students have the opportunity to earn both a Bachelor of Science degree and a Master of Regional Planning (M.R.P.) degree in a fifth year of study. Ordinarily the professional M.R.P. degree requires two years of work beyond that for the bachelor's degree. This arrangement shortens that time by about one year. A minimum of 30 credits and a master's thesis or thesis project are required for the M.R.P. degree. Students apply to the Graduate School, usually in the senior year.

**Dual degree option.** A student in the Cornell College of Arts and Sciences currently can earn both a B.A. in an arts college major, plus a B.S. in urban and regional studies in a total of five years. Special requirements have been established for this dual degree program. Cornell students interested in pursuing the dual degree program should contact either the director of the Urban and Regional Studies Program or the appropriate dean of the College of Arts and Sciences for further information.

### Admissions Requirements and Procedures

Among the most important criteria for admission to the Urban and Regional Studies Program are intellectual potential and commitment—a combination of ability, achievement, motivation, diligence, and use of educational and social opportunities. Nonacademic qualifications are important as well. The department encourages students with outstanding personal qualities, initiative, and leadership ability. Above all, the department seeks students with a high level of enthusiasm and depth of interest in the study of urban and regional issues. Applicants must complete a university admission application.

### Transfer Students

In most cases, transfer applicants should no longer be affiliated with a high school and should have completed no fewer than 12 credits of college or university work at the time of application. A high school student who has completed graduation requirements at midyear and is taking college courses for the rest of the academic year should apply as a freshman. Prospective candidates who believe that their circumstances are exceptional should consult with the director of admissions in the Cornell division of interest to them before filing an application.

Forms for transfer application and financial aid are available from the Cornell University Office of Admissions, 410 Thurston Avenue, Ithaca, New York 14850–2488. Official transcripts of all high school and college work must be submitted along with SAT or ACT scores and letters of recommendation.

It is desirable for prospective transfers to have taken at least 6 credits in English. In addition, students should have taken basic college-level courses distributed across the natural and social sciences, humanities, and mathematics. Those applicants whose previous course work closely parallels the general education portion of the urban and regional studies curriculum will have relative ease in transfer. However, as there are no specific requirements for transfer, students with other academic backgrounds, such as engineering, architecture, fine arts, management, and agriculture, are eligible to apply.

Although an interview is not required, applicants are urged to visit the campus. Applicants who want further information regarding urban and regional studies may contact Professor Richard S. Booth, Program Director, Urban and Regional Studies, Cornell University, 106 West Sibley Hall, Ithaca, New York 14853–6701 (telephone: 607/255–4613).

## The Graduate Program in City and Regional Planning

Planning seeks to guide the development of the economic, social, natural, and built environments so that the needs and aspirations of all people may be better satisfied.

The major concentrations of course work in city and regional planning are in the following areas:

**Built environment and urban development planning** is concerned with physical facilities; the social, economic, and environmental forces that affect their design; and the process of development, plan making and administration.

**History and historic preservation planning** is a special program of study preparing students for work in history, analysis, and preservation of buildings, urban environments, and neighborhoods, including downtown business areas.

**Regional planning and regional science** are concerned with socioeconomic issues and functional planning at the regional level, the forces that generate economic growth and social development, and the ways in which resources can best be used.

**Local and regional economic development** is concerned with understanding and influencing how economic change may be harnessed to the benefit of communities, counteracting plant closings and more general regional decline and stimulating more equitable programs of socioeconomic change and development.

**International planning** offers a broad range of courses in international economic development, development planning, and political economy.

**Quantitative methods and policy analysis** courses are offered to prepare planners and researchers for a variety of situations and problems.

**Complementing these concentrations, planning theory and political economy** courses examine the organizational and planning processes and the political and economic conditions in which planning and international development operate.

Several graduate degrees are offered: the Ph.D.; the Master of Regional Planning (M.R.P.), for a two-year program; the Master of Arts (M.A.) in historic preservation planning, for a two-year program; and, in special cases, the Master of Professional Studies (International Development) [M.P.S.(I.D.)], for the twelve-month international planning program.

### Off-Campus Opportunities

**Rome Program.** Graduate students have the opportunity to spend one or two semesters in Rome, studying at Cornell's center at the Palazzo Massimo. Instruction is given by Cornell professors-in-residence and by other faculty. The program is structured to include work assignments in one of the international development organizations headquartered in Rome.

## Course Information

Most courses in the Department of City and Regional Planning are open to students in any college of the university who have fulfilled the prerequisites and have the permission of the instructor.

The department attempts to offer courses according to the information that follows. However, students should check with the department at the beginning of each semester for late changes.

### Undergraduate Program in Urban and Regional Studies

**100 The American City**
Fall. 3 credits.
M W F 9:05. M. Wilder.
An introductory course on the urban problems and opportunities facing the majority of this country's population as we approach the last decade of the twentieth century. Readings, discussions, and brief papers exploring topics ranging from suburban development to central city poverty, from environmental threats to downtown revitalization, and from municipal finance to the new position of women in the urban economy.

**101 The Global City: People, Production, and Planning in the Third World**
Spring. 3 credits.
T R 10:10–11:25. P. Olpadwala.
A critical look at the physical and social development of giant cities in the Third World. Their origins, roles, contributions, and shortcomings are examined. Their place in world political economy is evaluated. Policy prescriptions for their principal problems are discussed.

**108 FWS: Environment and Society: The Delicate Balance**
Fall. 3 credits.
M W F 11:15. R. S. Booth.
This freshman writing seminar addresses the delicate balance that must be maintained between societal needs and demands and environmental quality. It uses several important texts that examine and challenge society's widespread and deep-rooted tendencies to ignore the social, economic, and environmental consequences of degrading the natural environment. Students work extensively on improving writing skills.

**109.01 Freshman Writing Seminar**
Fall or spring. 3 credits.
Hours to be arranged. Staff.
Topic to be announced.

**109.02 FWS: In Search of American Cities**
Spring. 3 credits.
M. Wilder.
An unusual course structure is used to give students broad exposure to ongoing changes in the social, political, economic, and physical character of U.S. cities. Each week students will "visit" a different city by way of readings, oral presentations, discussions, and brief papers that touch on major aspects of the city's economic, social, and political history; the city's physical character and regional context; and recent planning or policy issues.

**218 Economics of Gender**
Spring. 3 credits.
T R 3:35–5:30. L. Beneria.
The emphasis in this course will be on the economic aspects of women and work: What are the consequences of women's concentration in reproductive work? What economic role does domestic work play within the larger economy? What are the consequences of occupational segregation by gender? Why is the wage gap between men and women not disappearing? What is the role of discrimination? What is the condition of women in other countries? Throughout the course we will examine different analytical frameworks and distinguish between different feminist perspectives dealing with those questions.

**314 Planning, Power, and Decision Making**
Fall 3 credits.
M 1:25–3:20. J. Forester.
This seminar examines various bases of political and professional power. We ask, What do professionals who want to serve the public need to know about power and decision-making processes in the institutional settings in which they operate? How and why can professionals make a difference when facing problems characterized by great complexity and severe inequalities among affected groups?

**315 The Progressive City**
Spring. 3 credits.
T R 1:25–3:20. P. Clavel.
A review of attempts to incorporate the interest of working-class and poor constituencies through majority control of local governments. Topics to be covered include the role of the city in class formation; historical perspectives on urban political administration; contemporary populist, socialist, and progressive urban governments; and the search for an economic basis for progressive reforms.

**320 Introduction to Quantitative Methods I**
Fall. 3 credits.
M W 3:35–5. Staff.
An introduction to the role and use of quantitative methods in the study of urban and regional issues. Emphasis will be on statistical, mathematical, and computer methods for the formulation, analysis, and testing of hypotheses and models of social, economic, and physical phenomena of cities and regions. The first semester will cover applicable methods in probability, descriptive statistics, estimation, hypothesis testing, and regression.

**321 Introduction to Quantitative Methods II**
Spring. 3 credits.
M W 3:35–5. Staff.
A continuation of City and Regional Planning 320. The second semester will focus on regression and other methods commonly used to analyze urban and regional phenomena, including techniques for decision analysis, linear programming, and cost-benefit analysis and simulation, among others. Strengths and weaknesses of those methods will also be considered.

**361 Seminar in American Urban History (also CRP 662)**
Spring. 3 credits. Prerequisite: permission of instructor.
W 2:30–4:30. K. C. Parsons.
Seminar in the historical evolution of the American city. Emphasis on factors in urban growth, the process of urbanization, the urban reform movement, and intellectual and social responses to the city.

**382 Urban Housing: Sheltered vs. Unsheltered Society (also CRP 582)**
Fall. 4 credits.
M. Wilder.
Homelessness is the latest in a continuing list of terms to describe unmet housing needs. To understand how and why such needs persist, even in good economic times, one must examine the nature of interactions between housing policies and housing market forces. This course examines the complex interaction of public and private actions in the development and redevelopment of urban housing. More specifically, the course seeks to investigate the many ways in which private and public policy decisions determine which groups in society will have access to housing. This course is appropriate for students with an interest in urban housing and a background in any of the following areas: urban economics, urban sociology, anthropology, history, or geography. The course will consist of lectures, a wide variety of readings, and guest speakers. Students will be evaluated on the basis of class discussions, two exams, a 15–20 page paper, and an oral presentation.

**[387 Urbanization and the Environment**
Fall. 4 credits. Offered alternate years. Not offered 1989–90.
R. S. Booth.
This seminar explores a series of issues related to the impacts of urbanization on the natural environment. Examples of these issues include: waste management, water supply, transportation, energy generation, and maintenance of open spaces. The seminar will include discussion sessions and a series of field trips. Students will prepare short reports, work on a team project, and make class presentations.]

**400 Introduction to Urban and Regional Theory**
Fall. 4 credits. Open to juniors and seniors.
M W F 11:15. B. G. Jones.
Introductory review of theories dealing with the spatial distribution of population and economic activity, drawn from various social science disciplines such as geography, economics, and sociology. Review of recent research dealing with such topics as population distribution, migration, location of industry and economic activity, and the spatial organization of urban and regional social systems.

**401 Seminar in Urban Political Economy**
Spring. 4 credits. Prerequisites: for URS students, CRP 400; for other students, permission of the instructor.
W. W. Goldsmith.
The world economy, the global city, and social change. Population, technology, and work in industrial and developing countries. Race, ethnicity, and nationality. Profits, subsistence, and poverty. Students will read and direct discussions on outstanding texts, write book reviews, and complete a research paper comparing one issue in two cities.

**404 Urban Economics (also CRP 604)**
Fall. 4 credits. Prerequisite: basic economics.
T 10:10–12:05. Staff.
Urban phenomena are analyzed from an economic point of view. Areas examined include economic aspects of urbanization processes and policies, determinants of urban growth and decline, urban land and housing markets, urban transportation, and urban public services. Some time will be spent in discussing problems of cities in developing countries.

**[413 Planning and Political Economy I**
Fall. 4 credits. Not offered 1989–90.
T 1:25–3:20. Staff.
This course deals with Marx's methodological approach and his elaboration in volume one of *Capital.* Topics will cover Marx's method, the labor theory of value, the labor process and surplus value, absolute and relative surplus value, the general law of capital accumulation, and the transition from feudalism to capitalism. Basic texts will be supplemented with readings and discussion about current urban problems.]

**[414 Planning and Political Economy II**
Spring. 4 credits. Prerequisites: students must have read volume one of Capital and be generally familiar with Marx's approach. Not offered 1989–90.
T 1:25–3:20. Staff.
Introduction to volumes two and three of Marx's Capital and his Theories of Surplus Value. Discussion of selected topics among the circulation of capital, productive and unproductive labor, reproduction schemes, accumulation, the transformation of surplus value into profits, the transformation of value into prices of production, the tendency of the rate of profit to fall, and crises. Emphasis on interpretation of current urban problems.]

**415 Gender Issues in Planning and Architecture**
Spring. 3 or 4 credits.
T R 10:10–11:25. Staff.
In this course we will examine the role of gender in relation to urban policy, regional planning, and architecture. The course has two major objectives: (1) to provide a theoretical and empirical context for understanding how gender influences the form and allocation of space and (2) to explore concrete ways to address and ameliorate gender inequalities in the practice of planning and architecture.

**417 Industrial Restructuring: Implications for State and Local Policy (also CRP 517)**
Fall. 4 credits.
T R 10:10–11:25. Staff.
A basic introduction to new issues arising from the way in which national and international economic shifts are affecting diverse United States localities. The course will focus on intra-industry restructuring, the location of economic activities, and state and local economic policy. Cases will be drawn from a variety of industries and national situations, with specific application to New York and other Northeast locations.

**421 Introduction to Computers in Planning (also CRP 522)**
Fall. 4 credits.
Staff.
Students learn how to use microcomputers and software packages in the planning and problem-solving processes. Included are word processing, spreadsheets, mapping, and other types of packages that are useful for other classes and for professional work in the field. (WordPerfect, Lotus 1-2-3, dBase and MacGIS are examples of packages that have been taught in previous years.)

**442 Social and Political Studies of Science (also Sociology 355)**
Spring. 3 credits.
W 2:30–4:25. Staff.
A view of science less as an autonomous activity than as a social and political institution. We will discuss such issues as secrecy in science, ethical and value disputes, and the limits to scientific inquiry in the context of the changing relations between science and the public.

**[452 Urban Policy, Planning, and Design in Practice**
4 credits. Fall or spring. Cornell-in-Washington course. Not offered 1989–90.
Hours to be arranged. K. C. Parsons.
Study and discussion of selected policy-issue areas and programs in city and regional planning and urban design. The historical context of ideas and issues will be covered in addition to critical reviews of specific programs such as equal access to housing, central city revitalization, neighborhood planning, urban aesthetics, transportation policy, etc. Field trips to selected projects in Washington and Baltimore.]

**462 The American Planning Tradition (also Architecture 393)**
Spring. 4 credits.
Staff.
A systematic review of American city planning history beginning with the earliest colonial settlements and ending with the era of the New Deal. An introductory lecture course requiring no previous exposure to planning or architecture. A prerequisite for students intending to take advanced seminars or independent studies in planning history.

**480 Environmental Politics**
Spring. 3 credits.
M W F 11:15. R. S. Booth.
Examines the politics of public decisions affecting the environment. Focuses on the roles played by different political actors, the powers of various interest groups, methods for influencing environmental decisions, and the political and social impacts of those decisions.

**481 Principles of Spatial Design and Aesthetics (also Landscape Architecture 220)**
Fall. 3 credits.
M W F 10:10. R. T. Trancik.
A lecture course that introduces the spatial and visual design vocabularies of cities. Aesthetic principles and theories of design are investigated for different types of urban spaces drawn from a variety of international examples, historic and modern. Included in the course are design methods and applications in the contemporary urban context of Europe and North America.

**482 Urban Land Use Concepts.**
Spring. 3 credits.
S. Stein.
Explorations of the use of land in urban areas, with an emphasis on the experience of North American cities. The course reviews use types, use characteristics, and use relationships in terms of conflicting social and economic demands. Concepts of organizing urban space in the past and present are reviewed. Physical planning and aesthetic issues are also discussed.

**490 Student-Faculty Research**
Fall or spring. 1–4 credits. Limited to undergraduate students in the Urban and Regional Studies Program. S-U grades only.
Hours to be arranged. Staff.
Research, reading, and/or writing project in which a student and faculty member choose a topic related to urban and regional studies.

**492 Honors Thesis Research**
Fall or spring. 4 credits. Limited to Urban and Regional Studies Program majors who have been selected as honor students by the department faculty.
Hours to be arranged. Staff.
Each selected student works with his or her thesis adviser.

**493 Honors Thesis Writing**
Fall or spring. 4 credits. Prerequisite: Completion of CRP 492.
Hours to be arranged. Staff.
Each selected student works with his or her thesis adviser.

**495 Special Topics**
Fall or spring. 3 credits. Hours to be arranged.
Staff.

## Graduate Courses and Seminars

Courses numbered from 500 to 599 and 600 to 699 are generally considered introductory or first-year courses; those numbered from 700 to 799 and 800 to 899 are generally considered more advanced. Upperclass undergraduate courses are numbered from 300 to 499. (Undergraduate students with the necessary prerequisites and permission of the instructor may enroll in courses numbered 500 and above.)

**500 Urban and Regional Theory**
Spring. 4 credits. Prerequisite: intermediate-level economics or sociology, or CRP 400.
T R 3:35–5:30. W. W. Goldsmith.
A review of attempts by the various social sciences to understand the contemporary city and its problems, particularly as seen by planners. Material is drawn from urban and regional economics, human ecology, urban sociology, psychology, anthropology, and geography in order to explain the location, size, form, and functioning of cities. Traditional and contemporary critical theory is examined as it applies to physical, social, and economic problems of the modern city. Major texts will be read, criticized, and discussed in seminars.

**501 Introduction to Economics and Political Economy**
Fall. 2 or 4 credits.
F 4:30–6:30, alternate S 10–12.
T. Vietorisz.
This course introduces students to the fundamentals of economics from the *user's* point of view. The course compares two major schools of thought that take a conflicting approach to political-economic problems of society: the mainstream school of traditional economics and the Marxian school of political economy. Concrete planning problems, with which the course illustrates theoretical points, appear in a very different light from these two perspectives. The course provides bases for independent judgment in assessing conflicting interpretations likely to be encountered in students' professional careers.

**511 Concepts and Issues in Planning Practice**
Fall. 4 credits.
T 3:35–5:30. P. Clavel.
A seminar for graduate students and others interested in an in-depth introduction to the main ideas and concepts that underlie the practice of city and regional planning. Weekly discussions will focus on selected articles and books. Interrelations between national, state, and local practices and policies, and developments in methodology, organization, and the political environment, will be explored.

**[512 Introduction to Planning Theory**
Spring. 4 credits. Not offered 1989–90.
M 11:15–1:10. J. Forester.
Planning is a form of social intervention. It parallels and complements other important decision-making institutions such as voting, interest-group bargaining, and market exchange. This course provides cases and analysis describing examples of alternative forms of planning and the various arguments used to justify planning: market failure, democratic participation, advocacy, and expert judgment. Political, organizational, and practical-ethical aspects of planning practice are explored. The course covers the work of Dyckman, Piven, Krumholz, Marcuse, Lindblom, Friedmann, March, and others.]

**513 Political Economy of Women and Work I**
Fall. 4 credits.
W 7–10 p.m. L. Beneria.
This course deals with the question of how to understand and analyze the economic condition of women. Starting with general issues about the "question of origins," reproduction, and production, it then deals with different approaches to the analysis of women's work in the household and in the labor market. The empirical material will mostly concentrate on the United States, with some glances at other industrialized countries and the international economy.

**514 Political Economy of Women and Work II**
Spring. 4 credits.
W 7–10 p.m. L. Beneria.
Continuation of CRP 513. Focusing mostly on Third World countries, this course deals with the impact of economic development on women. In particular it deals with how changing economic structures affect household organization, labor-market dynamics, the division of labor, and women's condition in different societies. Topics include the analysis of current international development, such as the commoditization of life, globalization of production, the crisis of development, population growth, and foreign debt.

**515 Gender Issues in Planning and Architecture (also CRP 415)**
Spring. 3 or 4 credits. Offered alternate years.
T R 10:10–11:25. S. Christopherson.
In this course we will examine the role of gender in relation to urban policy, regional planning, and architecture. The course has two major objectives: (1) to provide a theoretical and empirical context for understanding how gender influences the form and allocation of space and (2) to explore concrete ways to address and ameliorate gender inequalities in the practice of planning and architecture.

**517 Industrial Restructuring: Implications for State and Local Policy (also CRP 417)**
Fall. 4 credits.
Staff.
A basic introduction to new issues arising from the ways in which national and international economic shifts are affecting diverse United States localities. The course will focus on intraindustry restructuring, the location of economic activities, and state and local economic policy. Cases will be drawn from a variety of industries and national situations, with specific application to New York and other locations in the Northeast.

**520 Statistical and Mathematical Concepts for Planning**
Fall. 4 credits.
Staff.
An introduction to statistical and mathematical concepts and methods of importance in planning policy analysis. Topics will include matrix algebra, probability, sampling, estimation, and regression as well as the use of a microcomputer statistical package.

**521 Mathematical Foundation for Planning Analysis.**
Spring. 1 credit. S-U only. Meets for two hours, once each week, for approximately half the semester.
Staff.
Review of mathematical foundations for planning analysis. Topics include probability statistics, mathematical functions, and matrix algebra. Intended for students with prior course work as a refresher course in preparation for higher-level courses in planning analysis. Departmental permission required.

**522 Introduction to Computers in Planning (also CRP 421)**
Fall. 4 credits.
Staff.
Students learn how to use microcomputers and software packages in the planning and problem-solving processes. Included are word processing, spreadsheets, mapping, and other types of packages that are useful for other classes and for professional work in the field. (WordPerfect, Lotus 1-2-3, dBase, and MacGIS are examples of packages that have been taught in previous years.)

**541 The Politics of Technical Decisions I (also Government 628 and Sociology 515)**
Fall. 4 credits. Cosponsored by the Program on Science, Technology, and Society.
W 2:30–4:25. Staff.
Political aspects of decision making in technical areas. Drawing from recent risk disputes, we will examine the origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system. Alternatives to current decision-making procedures are explored.

**542 The Politics of Technical Decisions II (also Government 629)**
Spring. 4 credits. Prerequisite: CRP 541 or permission of instructors. Cosponsored by the Program on Science, Technology, and Society.
Hours to be arranged. Staff.
A continuation of City and Regional Planning 541, focusing on political aspects of decision making in technical areas. Drawing from recent risk disputes, we will examine the origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system.

**[545 Introduction to Public Policy Analysis and Management**
Fall or spring. 3 credits. Not offered 1989–90.
S. Saltzman or staff.
Introduction to systematic methods and processes for analyzing issues and problems of public policy and management. Roles of economic analysis and of analytic techniques in public sector decision making will be reviewed and their respective strengths and weaknesses evaluated. Applications to a variety of public sector problem areas will be explored.]

**546 Conflict Resolution in the Public Sector**
Fall. 3 credits.
T 1:30–3:20, R 10:10–12:05. J. Forester.
This course will explore the theories and techniques of conflict resolution that are appropriate to the public sector. We will consider principles and strategies of negotiation, mediation, and collaborative problem solving. Authors to be read include Axelrod, Pruitt, Rubin, Raiffa, Fisher, Ury, and Susskind.

**552 Urban Land-Use Planning I**
Fall. 3 credits.
T R 2:30. S. Stein.
Surveys, analyses, and plan-making techniques for guiding physical development of urban areas; location requirements, space needs, and interrelations of land uses. Emphasis on residential, commercial, and industrial activities and community facilities; housing and neighborhood conditions. Lectures, seminars, and field exercises.

**553 Urban Land-Use Planning II**
Spring. 3 credits. Prerequisite: CRP 552 or permission of instructor.
TR 12:20. Staff.
In-depth consideration of special issues in urban land-use planning, such as industrial districts, large-scale integrated development, Planned Unit Development, public and institutional facilities, open space, land banking, central business districts, neighborhoods, energy impacts, transportation impacts, and others.

**[554 Introduction to Planning Design**
Fall. 3 credits. Not offered 1989–90.
T R 12:20. Staff.
Lectures, seminars, readings, and design exercises explore basic concepts and issues related to urban planning, urban design, site planning, and environmental awareness. Emphasis is on professional practice. Intended for students without design backgrounds, but others may enroll.]

**555 Urban Systems Studio (also Landscape Architecture 602)**
Spring. 6 credits. Prerequisite: permission of instructor.
M T R 1:25–4:25. R. T. Trancik.
Application of urban-design and town-planning techniques to specific contemporary problems of city environments. Issues of urbanism are investigated and applied to physical design interventions involving the street, square, block, garden, and park systems. Topics covered in the studio include urban land-use development, spatial systems and aesthetics, and public and private implementation of urban-design plans. This is a specially arranged collaborative studio with the Landscape Architecture Program.

**556 Built-Environment Education Workshop**
Spring. 4 credits.
Fieldwork hours to be arranged.
S. Stein.
Interdisciplinary teams of students from planning, architecture, landscape architecture, historic preservation, and other environmental design disciplines work in classrooms with schoolchildren and teachers to deepen their understanding of the built environment and to encourage their participation in the shaping of their own environment. Work in local schools is emphasized.

**[557 Small-Town Community Design Workshop**
Fall or spring. 2 or 4 credits. Not offered 1989–90.
Fieldwork hours to be arranged.
S. Stein.
An in-depth approach to specific problems facing the small town or small city. Various aspects of planning, historic preservation, landscape architecture, and design, including "Main Street" revitalization, street scape planning, storefront rehabilitation, signage, and comprehensive planning, are explored in a workshop setting. Working with real clients in nearby communities.]

**558 City and Regional Planning Workshop**
Fall or spring. 4 credits. S-U only. Fieldwork hours to be arranged.
S. Stein.
Students will work on urban issues, such as housing, traffic and parking, economic development, zoning, and related planning issues, with public or non-profit organizations in New York State. Projects are undertaken on a community-service basis for "clients" who specifically request planning assistance. Students work individually or in teams.

**560 Documentation for Preservation (also Architecture 586)**
Fall. 3 credits.
M 2:30–5:30. M . A. Tomlan.
Methods of identifying, recording, collecting, processing, and analyzing information dealing with historic and architecturally significant structures, sites, and objects.

**561 Historic Preservation Planning Workshop: Surveys and Analyses (also Architecture 588)**
Fall or spring. 4 credits.
Fall, T 2:30–5:30; spring, T 2:30–5:30. D. McClive.
Techniques for the preparation of surveys of historic structures and districts; identification of American architectural styles, focusing on upstate New York; and explorations of local historical resources, funding sources, and organizational structures. Lectures and training sessions. Emphasis on fieldwork with individuals and community organizations.

**562 Perspectives on Preservation (also Architecture 585)**
Fall. 3 credits.
T 1:25–4:25. M. A. Tomlan.
Introductory course for preservationists. A survey of the historical development of preservation activity in Europe and America leading to a contemporary comparative overview. Field trips to notable sites and districts.

**563 Problems in Contemporary Preservation Practice (also Architecture 584)**
Spring. Variable credit.
T 12:20–2:15. M. A. Tomlan.
A review and critique of ongoing preservation projects and an investigation of areas of expertise currently being developed. Presented by staff and guest lecturers.

**564 Building Materials Conservation (also Architecture 587)**
Spring. 3 credits. Open to juniors, seniors, and graduate students.
R 12:20–2:15. M. A. Tomlan.
A survey of the development of building materials in the United States, chiefly during the nineteenth and early twentieth centuries, and a review of the measures that might be taken to conserve them.

**565 Fieldwork or Workshop in History and Preservation**
Fall or spring. Variable credit.
M W 7–9 p.m. M. A. Tomlan.
Work on applied problems in history and preservation planning in a field or laboratory setting or both.

**567 Measured Drawing (also Architecture 583)**
Fall. 3 credits. For undergraduate architecture students and graduate students in history and preservation. Prerequisite: permission of instructor.
R F 11:15–1:10. M. A. Tomlan.
Combines study of architectural drawing as historical documents with exercises in preparing measured drawings of small buildings. Presents the basic techniques of studying, sketching, and measuring a building and the preparation of a finished drawing for publication.

**[568 Introduction to American Decorative Arts and Historic Interiors**
Spring. 3 credits. Not offered 1989–90.
W 2:30–4:25. Staff.
An introductory survey of the design and evolution of the style of domestic furnishings and related utilitarian objects made in or imported for use in America from 1670 to 1900. Categories to be covered include furniture, glass, ceramics, metals, prints, and textiles. Objects of national significance as well as common items created in relative abundance outside the major urban style centers will be covered.]

**582 Urban Housing: Sheltered vs. Unsheltered Society (also CRP 382)**
Fall. 4 credits.
M. Wilder.
Homelessness is the latest in a continuing list of terms to describe unmet housing needs. To understand how and why such needs persist, even in good economic times, one must examine the nature of interactions between housing policies and housing market forces. This course examines the complex interaction of public and private actions in the development and redevelopment of urban housing. More specifically, the course seeks to investigate the many ways in which private and public policy decisions determine which groups in society will have access to housing. This course is appropriate for students with an interest in urban housing and a background in any of the following areas: urban economics, urban sociology, anthropology, history, or geography. The course will consist of lectures, a wide variety of readings, and guest speakers. Students will be evaluated on the basis of class discussions, two exams, a 15–20 page paper, and an oral presentation.

**[604 Urban Economics (also CRP 404)**
Fall. 4 credits. Prerequisite: basic economics. Not offered 1988–89.
T 10:10–12:05. Staff.
Urban phenomena are analyzed from an economic point of view. Areas examined include economic aspects of urbanization processes and policies, determinants of urban growth and decline, urban land and housing markets, urban transportation, and urban public services. Some time will be spent in discussing problems of cities in developing countries.]

**609 Special Topics in Urban and Regional Theory**
Fall or spring. 1–4 credits.
Hours to be announced. Staff.

**615 The Politics of Planning**
Fall. 4 credits.
P. Clavel.
This graduate-level seminar explores the relationship between the persons who do planning and the community, political, and social movement context for planning. A range of political models is addressed, and literature in politics, sociology, and organizational theory is part of the coverage. Methodology of field research is part of the course, and students will be encouraged to design research that puts them in touch with actual cases, persons, and recent local histories.

**619 Special Topics in Planning Theory and Politics**
Fall or spring. 1–4 credits.
Hours to be arranged. Staff.

**620 Planning Analysis**
Spring. 4 credits.
Lec, M W F 10:10–11:00; lab, to be arranged. B. G. Jones.
A survey of commonly used techniques for analyzing various aspects of subnational socioeconomic systems. Emphasizes planning applications.

**[621 Planning Research Methods**
Fall. 3 credits. S-U grades only. Not offered 1989–90.
W 2:30–4:25. S. Christopherson.
For master's degree students, to write thesis project proposals. Four parts: theory, formulation of research questions and working hypothesis, guide to methods and techniques in social science research, and the role of the expert. The final proposal must also be approved by the thesis adviser.]

**622 Information Systems and Microcomputers for Planning and Policy Analysis**
Spring. 3 credits. Prerequisite: CRP 522 or equivalent, or permission of instructor.
T R 3:35–5:25. S. Saltzman.
An introduction to the design and use of computer-based information systems for planning and policy analysis. The focus of the course will be on the design and use of database systems for organizing, storing, retrieving, and analyzing information using microcomputers and, secondarily, mainframe computers. Applications of information systems in public and not-for-profit institutions will be reviewed. Students will be expected to complete a term project on a microcomputer using an appropriate programming language.

**629 Special Topics in Quantitative Methods and Analysis**
Fall or spring. 1–4 credits.
Hours to be arranged. Staff.

**630 Local Economic Development Policy—Seminar**
Spring. 4 credits.
M. Wilder.
The politics and administration of economic development programs. Theory case studies and policy issues treating the evolution of local development efforts in the transition from the high-growth post-World War II economy to contemporary and classic situations of regional decline.

**631 Local Economic Policy—Field Workshop**
Spring. 4 credits.
W 3:35–5:30. P. Clavel.
A group policy analysis exercise in an upstate New York city. Students do a combination of data analysis; interviews with labor, business, and public leaders; and problem papers addressed to current issues presented by a client group. Individual work is synthesized into a comprehensive report at the end of the semester.

**639 Special Topics in Regional Development Planning**
Fall or spring. 1–4 credits.
Hours to be arranged. Staff.

**642 Critical Theory and the Foundation of Planning Analysis**
Spring. 1–4 credits.
R 11:15–1:10. J. Forester.
Problems of social action are studied in the traditions following Marx, Weber, and Durkheim. Analyses of reproduction and resistance, normative order and power, meaning systems, and organizational action provide the bases for a consideration of Habermas's synthetic critical communications theory of society. Implications for planning practice, education, and research are drawn.

**649 Special Topics in Social-Policy Planning**
Fall or spring. 1–4 credits.
Hours to be arranged. Staff.

**652 The Urban Development Process**
Fall. 2 credits. Enrollment limited.
R 12:20–2:15. K. C. Parsons.
Examination of the goals, strategies, methods, and achievements of major participants in the urban land and building market: landowners, speculators, real estate brokers, developers, bankers, lawyers, nonprofit builders, and government agencies. Primarily visiting speakers.

**[653 Legal Aspects of Land-Use Planning**
Offered alternate spring semesters. 3 credits.
M W F 9:05–9:55. R. S. Booth.
Survey of leading cases and legal concepts in land-use planning, with particular attention to zoning, subdivision control, condemnation, and growth-control issues.]

**[654 Real Estate Development I: Analysis and Critique**
Fall. 4 credits. Not offered 1989–90. Limited to 20 students with permission of instructor. Prerequisite: Hotel Administration 300 or equivalent or permission of instructor.
TR 12:20–1:10. S. Stein.
The course will investigate many aspects of real estate development. Areas covered will include acquisition, finance, valuation, construction, design and marketing, and the interplay of those variables.]

**[655 Real Estate Development II: Advanced Analysis and Critique**
Spring. 4 credits. Limited to 20 students with permission of instructor. Prerequisite: CRP 654 or equivalent. Not offered 1989–90.
Staff.
A continuation of City and Regional Planning 654.]

**656 Land Resources Protection Law**
Fall. 3 credits.
M W F 9:05–9:55. R. S. Booth.
Examines legal issues raised by government efforts to protect critical land resources such as tidal wetlands, flood plains, forests and agricultural lands, and large resource areas such as the coastal zone. Students will use a broad selection of legal materials and learn to use the basic resources of a law library.

**659 Special Topics in Urban Development Planning**
Fall or spring. 1–4 credits.
Hours to be arranged. Staff.

**[660 Seminar in the History of American City Planning (also Architecture 693)**
Fall. 3 credits. Prerequisite: CRP 462 or permission of instructor. Not offered 1989–90.
M 1:25–3:20. Staff.
A research seminar in which each student selects a topic for oral presentation followed by the completion of a research paper. Early sessions examine the scope of planning history, its relations to other disciplines, sources of written and graphic materials, and the uses of historical evidence in interpreting urban planning and development.]

**661 Historic Preservation Planning Workshop: Plans and Programs**
Fall or spring. 1–4 credits. Prerequisite: CRP 561.
F 2:30–5:30. D. McClive.
Preparation of elements of historic preservation plans, designs, legislation, and special studies. Individual or group projects are selected by students. Fieldwork is emphasized.

**662 Seminar in American Urban History (also CRP 361)**
Spring. 3 credits. Prerequisite: permission of instructor.
T 10:10–12:05. Staff.
Seminar in the historical evolution of the American city. Emphasis on factors in urban growth, the process of urbanization, urban reform movement, and intellectual and social responses to the city.

**663 Historic Preservation Law**
Spring. 3 credits. Offered alternate years.
M W F 9:05–9:55. R. S. Booth.
Law of historic district and landmark designation, tools for preservation (such as police power, taxation, eminent domain), and recent developments in state and federal historic preservation mandates.

**664 Economics and Financing of Neighborhood Conservation and Preservation**
Fall. 3 credits.
W 1:25–3:20. B. G. Jones.
The economic and financial aspects of historic preservation and neighborhood conservation. Topics include public finance, selected issues in urban economics, real estate economics, and private financing of real estate projects.

**[665 Preservation Planning and Urban Change**
Fall. 3 credits. Not offered 1989–90.
T 11:15–1:10. Staff.
An examination of fundamental planning concepts and issues as they relate to historic preservation. Neighborhood revitalization, federal housing programs, the role of public and private institutions, displacement, and other social issues are among the primary topics.]

**669 Special Topics in History and Preservation**
Fall or spring. 1–4 credits.
Hours to be arranged. Staff.

**670 Regional Planning and Development in Developing Nations**
Fall. 4 credits. Prerequisite: second-year graduate standing.
R 2:30–5. W. W. Goldsmith.
Extensive case studies of development planning are analyzed. Focus is on a Marxist critique of the process of regional development through urbanization and in particular on the concepts of equity and efficiency, external economies, export linkages, and internal self-sufficiency and integration. Resource development, national integration, human development, and migration problems are discussed.

**671 Seminar in International Planning**
Spring. 1 credit. S-U grades only.
F 12:20–1:35. P. Olpadwala.
The international planning lecture series sponsors lectures by visiting scholars or professionals in the field of international development and planning. The only formal requirement for the course is a brief evaluation of the series at the end of the semester.

**673 Economics of Regional Development**
Spring. 2 or 4 credits.
F 4:30–6:30, alternate S 10–12.
T. Vietorisz.
This course deals with the historical process of regional and metropolitan development, emphasizing Third World problems. While its basic approach is mode-of-production analysis, it also critically surveys location, comparative advantage, and feedback system theories. Development is interpreted as the penetration of the capitalist mode of production into precapitalist societies. Its features are analyzed both in terms of the historical stages of expanding capitalism (mercantile phase, imperialism, multinationals) and in terms of the pre-existing (feudal, Asiatic) precapitalist mode of production. Regional and urban development planning problems are discussed in the light of the contradictions of the above process, as well as in the context of newly emerging Third World socialist countries.

**679 Special Topics in Planning and Developing Regions**
Fall or spring. 1–4 credits.

**[687 Urbanization and the Environment**
Fall. 4 credits. Offered alternate years. Not offered 1989–90.
R. S. Booth.
This seminar explores a series of issues related to the impacts of urbanization on the natural environment. Examples of these issues include: waste management, water supply, transportation, energy generation, and maintenance of open spaces. The seminar will include discussion sessions and a series of field trips. Students will prepare short reports, work on a team project, and make class presentations.]

**689 Special Topics in Environmental Planning**
Fall or spring. Variable credit.
Hours to be arranged. Staff.

**699 Special Topics in Regional Science**
Fall. Variable credit.
Staff.

**711 Planning and Organization Theory**
Fall. 4 credits.
R 3:35–5:30. P. Clavel.
Advanced seminar on theoretical models of planning, organization, and urban structure. The first part of the course, which may be taken separately for one credit, provides an overview of administrative issues affecting planning. Next, attention is given to theories of organizational structure, growth, and change. Final sessions are devoted to the influence of urban and regional structures as context. Critical reading, short papers, and seminar discussion characterize the course.

**719 Special Topics in Planning Theory and Politics**
Fall or spring. Variable credit.
Staff.

**720 Quantitative Techniques for Policy Analysis and Program Management**
Fall. 4 credits.
M W F 9:05–11. D. Lewis.
Selected analytical techniques used in the planning and evaluation of public policy and public investments are examined. Topics include simulation modeling, benefit-cost and cost-effectiveness analysis (including capital budgeting), and optimization strategies.

**730 Methods of Regional Science and Planning I**
Fall. 4 credits. Prerequisite: CRP 520 and CRP 620 or equivalent.
S. Saltzman.
An introduction to some of the major methods and models used in regional science and planning. This is the first semester of a two-semester sequence (see CRP 731). Both courses will cover topics related to the structure and assumptions of the models, model development, and their applications in regional science and planning. Where appropriate, computer implementation will be considered. The fall semester will emphasize statistical and econometric methods.

**731 Methods of Regional Science and Planning II**
Spring. 3 credits. Prerequisite: CRP 730 or equivalent.
S. Saltzman.
A continuation fo CRP 730. The spring semester will provide an introduction to deterministic methods and models such as input/output, social accounting matrices, and optimization models.

**[732 Regional Industrial Development**
Fall. 4 credits. Prerequisites: basic economics and elementary calculus. Not offered 1988–89.
T 7–9 p.m. Staff.
The course focuses on issues of industrial, as distinct from agricultural, development. Material includes theory of production, elements of growth theory, interindustry relations and formation of industrial complexes, locational attractiveness, and interregional flows of goods, services, and factors of production.]

**746 Informal Seminar in Planning Theory: Philosophy, Ethics, and Values in Planning**
Fall or spring. Variable credit.
J. Forester.
An informal seminar to discuss problems of values, ethics, and alternative philosophical positions that are inherent in various planning proposals or perspectives.

**772 Advanced Topics on International Development and Women**
Spring. 4 credits. Offered alternate years.
L. Beneria.
A seminar to explore theoretical and empirical issues of interest to M.A. and Ph.D. students working on topics related to gender and international development. The focus will be on a few narrow topics such as the effect of the foreign debt crisis on women, the informal sector and women's work, and gender aspects in demographic change, to be explored in depth in preparation for research and thesis writing. Students will be encouraged to explore and exchange ideas, and to provide mutual support and criticism.

**773 Seminar in Project Planning in Developing Countries**
Spring. 4 credits.
W 3:35–5:30. D. Lewis.
An examination of the problems and issues involved in preparing project proposals for presentation to funding agencies. Topics include technical design, financial feasibility, social impact analysis, and policy relevance, as well as techniques for effective presentation of proposals. The course is organized as a seminar-workshop providing both an analysis of the critical elements of effective proposals and an opportunity to use those elements in the preparation of proposals. A multidisciplinary perspective is emphasized.

**774 Science, Technology, and Development**
Fall. 3 credits. Offered alternate years.
T 9:05–11. P. Olpadwala.
The place and role of science and technology as a factor in socioeconomic growth is examined with special reference to developing regions. The social underpinnings and linkages of science and technology are studied and their role explored as a nonneutral and dynamic social force that primarily serves the ends of particular groups in societies. Current issues such as technological development, technology transfer, and appropriateness of technology are discussed in this context, with attention given to both rural and industrial development. Third World science and technology policy-planning options are considered throughout the course.

**775 Transnational Corporations and Developing Regions**
Fall. 3 credits. Offered alternate years.
T 9:05–11. P. Olpadwala.
Transnational corporations are studied in the context of socioeconomic development. Contending theories of the international firm are examined as a starting point for evaluating contradictory claims and counter claims of proponents and detractors of transnational corporations. Advantages and disadvantages for developing regions are considered and Third World planning and policy options discussed on an ongoing basis.

**776 Seminar in Urban Policy and Planning in Developing Countries**
Fall or spring. 3 credits.
K. C. Parsons.
The national urban development policy and planning efforts of selected developing countries are examined in the context of urbanization theory and national spatial planning. Recent descriptive and critical literature is explored. Topics include secondary cities policies, national and urban transportation planning, city planning, sites and services project planning, housing, land policy, and urban development control systems.

**777 Theories of Development and Underdevelopment**
Spring. 3 credits.
R 1:25–3:20. P. Olpadwala.
Various theories attempting to analyze and explain the phenomena of underdevelopment are examined. Although a range of thought and approaches is considered, the accent is on aspects of political economy revolving around concepts of class and exploitation. Topics include the transition to capitalism; dependent and uneven development; various issues of growth and fluctuation under contemporary capitalism, including crises; rural and industrial development in less-developed countries; and planning for development.

**790 Professional Planning Colloquium I**
Fall. 1 credit.
F 12:20–2. Staff.
Visiting lecturers treat problems and opportunities in the practice of planning. Topical focus to be announced. The only formal requirements for the course are attendance and a brief evaluation at the semester's end.

**792 Master's Thesis, Project, or Research Paper**
Fall or spring. 1–10 credits.
Hours to be arranged. Staff.

**794 Planning Internships**
Fall, spring, or summer. 1–12 credits.
Hours to be arranged. Staff.
Combines a professional planning internship in a metropolitan area with academic study to provide experience and understanding of the planner's role in formulating and implementing plans and policies. Salaried internships in federal or state agencies, legislative offices, and comparable settings include development of research, analysis, and other technical skills. Weekly seminars draw on student field experiences, assigned readings, and guest speakers to examine current issues of federal, urban, and regional policy from the perspective of planning practice.

**795 Master's Thesis in Preservation Planning**
Fall or spring. 1–6 credits.
Hours to be arranged. Staff.

**796 Colloqui Journal Publication Workshop**
Fall or spring. 2 credits. S-U grades only.
P. Clavel, J. Forester.
Individual and group projects culminating in the production of a professional journal.

**800 Advanced Seminar in Urban and Regional Theory I**
Fall. 3 credits. Prerequisite: CRP 500.
M 3:35–5:30. B. G. Jones.
The theory of urban spatial organization. Economic, technological, and social factors leading to urbanization and various kinds of spatial organizations are explored. Major theoretical contributions to the understanding of intraregional and intraurban distribution of population and economic activity are reviewed.

**801 Advanced Seminar in Urban and Regional Theory II**
Spring. 3 credits. Prerequisite: CRP 800.
M 3:35–5:30. B. G. Jones.
A continuation of City and Regional Planning 800, concentrating on recent developments.

**810 Advanced Planning Theory**
Fall. 3 credits. Prerequisite: CRP 500 or 710.
F 3:35–5:30. B. G. Jones.
A survey of the works of scholars who have contributed to current thinking about planning theory. Alternative assumptions concerning models of man and theoretical concepts concerning the nature of planning today are considered.

**830 Seminar in Regional Sciences, Planning, and Policy Analysis (run jointly with Economics 505: Interdependent Decision Making)**
Fall or spring. 4 credits.
S. Saltzman.
This seminar will provide an opportunity to review some of the literature and current research in regional science, planning, and policy analysis. Specific topics covered will vary each year. Empirical and analytical research will be emphasized. Students will be expected to prepare and present a research paper during the semester on some aspect of the topics under review.

**890 Planning Research Seminar I**
Fall or spring. 2 credits.
W 12:20. Staff.
Intended for doctoral candidates in city and regional planning; other students welcome. Presentation and discussion of current problem areas and research by advanced doctoral students, faculty members, and visitors.

**892 Doctoral Dissertation**
Fall or spring. 1–2 credits.
Hours to be arranged. Staff.

# LANDSCAPE ARCHITECTURE

The Landscape Architecture Program at Cornell is jointly sponsored by the College of Agriculture and Life Sciences (in association with the Department of Floriculture and Ornamental Horticulture) and the College of Architecture, Art, and Planning.

## The Program

*Program faculty:* M. I. Adleman, T. H. Johnson, D. W. Krall, A. S. Lieberman, L. Mirin, R. T. Trancik, P. J. Trowbridge.

The Landscape Architecture Program offers three professional degree alternatives: a two-year graduate curriculum directed to those who have undergraduate degrees in landscape architecture or architecture, a three-year graduate curriculum directed to those who have undergraduate degrees in other fields, and a four-year undergraduate curriculum. Graduate studies in landscape architecture are administered through the Graduate School and lead to a Master of Landscape Architecture degree. Undergraduate studies in landscape architecture are administered through the College of Agriculture and Life Sciences and lead to a Bachelor of Science degree.

## Course Information

***100 Landscape Architecture Freshman Orientation**
Fall. 1 credit.
M. I. Adleman.

***140 Landscape Design Studio**
Spring. 4 credits.
D. W. Krall.

***201 Theory and Application Studio**
Fall. 6 credits.
M. I. Adleman.

***202 Project Design and Site Planning Studio**
Spring. 6 credits.
T. H. Johnson.

***205 Graphic Communication**
Fall. 3 credits.
T. H. Johnson.

***220 Principles of Spatial Design and Aesthetics**
Fall. 3 credits.
R. T. Trancik.

***301 Natural Systems and Planting Design Studio**
Fall. 6 credits.
D. W. Krall

**302 Urban Landscape Systems Studio**
Spring. 6 credits. Prerequisite: LA 301 with a grade of C or better. Lab fee, $20; cost of drafting supplies, about $100.
Lecs, M W F 1:25; studios, M W F 2:30–4:25. L. Mirin.
Projects in landscape architecture at the site scale as determined by constraints and opportunities of an urban environment. Emphasis on integration of site and historical analysis in formulation of physical design solutions.

***310 Site Construction**
Spring. 4 credits.
P. J. Trowbridge.

***312 Site Engineering for Landscape Architects**
Spring. 4 credits.
M. I. Adleman.

***401 Advanced Project Design and Graphics Studio**
Fall. 6 credits.
R. T. Trancik.

***402 Senior Project Studio**
Spring. 6 credits.
M. I . Adleman.

***412 Professional Practice**
Spring. 1 credit.
Lec F 11:15. Staff.

**490 Special Topics in Landscape Architecture**
Fall or spring. 1–3 credits; may be repeated for credit. S-U grades optional.
Staff.
Topical subjects in landscape architectural design, theory, history, or technology. Group study of topics not considered in other courses.

**497 Independent Study in Landscape Architecture**
Fall or spring. 1–5 credits; may be repeated for credit. S-U grades optional.
Staff.
Work on special topics by individuals or small groups.

**501 Theory and Application Studio**
Fall. 6 credits. Lab fee, $20; cost of basic drafting equipment and supplies, about $200.
Lecs, M W F 1:25; studios, M W F 2:30–4:25. L. Mirin.
Introduction to basic concepts of site analysis and physical design of landscape. Exercises and projects explore the relationship between natural features, functional demands, professional traditions, and the creation of spatial form.

***502 Project Design and Site Planning Studio**
Spring. 6 credits.
D. W. Krall.

**520 Contemporary Issues in Landscape Architecture**
Fall. 2 credits. S-U grades only.
Lec, F 11:15–1:10. L. Mirin.
Presentations on topics that are current and significant to the environmental design and planning fields. Issues are discussed from a landscape architecture point of view by practitioners and researchers representing a range of professions.

**521 History of European Landscape Architecture**
Fall. 3 credits.
Lecs,T R 11:15–1:10; discs to be arranged. L. Mirin.
A survey from classical times to the present, emphasizing design principles and techniques that have established the landscape architecture tradition in Europe. Particular reference is made to the manner in which environments such as gardens, streets, plazas, parks, and new towns reflect in their built form a range of response to demands of culture, economics, technology, security, the law, and ecology.

**522 History of American Landscape Architecture**
Spring. 3 credits.
Lecs, T R 11:15–1:10; discs to be arranged. L. Mirin.
Landscape architecture in the United States from Jefferson to the present is examined as a unique expression of the American experience. Influences exerted by the physical landscape, the frontier and utopian spirit, and the cultural assumptions of democracy and capitalism are traced as they affect the forms of urban parks, private and corporate estates, public housing, transportation planning, national parks, and other open-space designs.

***531 Regional Landscape Planning I**
Fall. 4 credits.
A. S. Lieberman.

**[*532 Regional Landscape Planning II**
Spring. 3 credits. Not offered 1989–90.
Staff.]

***601 Advanced Project Design Studio**
Fall. 6 credits.
T. H. Johnson.

***602 Urban Systems Studio (also CRP 555)**
Spring. 6 credits.
R. T. Trancik and staff.

***611 Site Engineering for Landscape Architects**
Fall. 4 credits.
M. I. Adleman.

**621 Summer Internship Seminar**
Fall. 2 credits. S-U grades only.
Hours to be arranged. L. Mirin.
Presentation and discussion of projects developed during summer internships.

***634 Landscape Architectural Research**
Spring. 3 credits.
T. H. Johnson.

**650 Fieldwork or Workshop in Landscape Architecture**
Fall or spring. 1–5 credits; may be repeated for credit. S-U grades optional.
L. Mirin.
Work on applied problems in landscape architecture in a field or studio setting or both.

***690 Independent Study in Landscape Ecology and Regional Landscape Planning**
Fall. 1–3 credits.
A. S. Lieberman.

***701 Natural Systems and Planting Design Studio**
Fall. 6 credits.
P. J. Trowbridge.

**800 Master's Thesis in Landscape Architecture**
Fall or spring. 9 credits.
Hours to be arranged. Staff.
Independent research under faculty guidance, leading to the development of a comprehensive and defensible design or study related to the field of landscape architecture. Work is expected to be completed in the final semester of residency.

*Offered through the College of Agriculture and Life Sciences.

## FACULTY ROSTER

Beneria, Lourdes, Ph.D., Columbia U. Prof., City and Regional Planning
Bertoia, Roberto, M.F.A., Southern Illinois U. Asst. Prof., Art
Blum, Zevi, B.Arch., Cornell U. Assoc. Prof., Art
Booth, Richard S., J.D., George Washington U. Assoc. Prof., City and Regional Planning
Bowman, Stanley J., M.F.A., U. of New Mexico. Assoc. Prof., Art
Christopherson, Susan M., Ph.D., U. of California at Berkeley. Asst. Prof., City and Regional Planning
Clavel, Pierre, Ph.D., Cornell U. Prof., City and Regional Planning
Cohen, Michael, M.S., Cornell U., Asst. Prof., Architecture
Colby, Victor E., M.F.A., Cornell U. Prof. Emeritus, Art
Cole, James, M.F.A., Cornell U. Asst. Prof., Art
Crump, Ralph W., B.Arch., Cornell U. Prof. Emeritus, Architecture
Czamanski, Stan, Ph.D., U. of Pennsylvania. Prof. Emeritus, City and Regional Planning
Daly, Norman, M.A., Ohio State U. Prof. Emeritus, Art
Dennis, Michael D., B.Arch., U. of Oregon, Prof., Architecture
Evett, Kenneth W., M.A., Colorado Coll. Prof. Emeritus, Art
Forester, John, Ph.D., U. of California at Berkeley. Assoc. Prof., City and Regional Planning
Goehner, Werner H., Dipl. Ing., Technical U. Karlsruhe (Germany), M.Arch., Cornell U. Assoc. Prof., Architecture
Goldsmith, William W., Ph.D., Cornell U. Prof., City and Regional Planning
Greenberg, Donald P., Ph.D., Cornell U. Prof., Architecture
Hall, Roy A., M.S., Cornell U., Asst. Prof., Architecture
Hascup, George E., B.Arch., U. of California at Berkeley. Assoc. Prof., Architecture
Hitchcock, Miriam C., M.F.A., Yale U., Asst. Prof., Art
Hodgden, Lee F., M.Arch, Massachusetts Inst. of Technology. Assoc. Prof., Architecture
Isard, Walter, Ph.D., Harvard U. Prof., City and Regional Planning
Jarzombek, Mark, Ph.D., Massachusetts Inst. of Technology. Visiting Asst. Prof., Architecture
Jones, Barclay G., Ph.D., U. of North Carolina. Prof., City and Regional Planning
Jullian de la Fuente, Guillaume, M.S. Arch., U. Catalica de Chile. Visiting Prof., Architecture
Kelly, Burnham, M.C.P., Massachusetts Inst. of Technology. Prof. Emeritus, City and Regional Planning
Kira, Alexander, M.R.P., Cornell U. Prof., Architecture
Kord, Victor, M.F.A., Yale U. Prof., Art
Kubelik, Martin, Dr. Ing, Rheinisch-Westfalische Technische Hochschule (Germany). Assoc. Prof., Architecture
Lewis, David B., Ph.D., Cornell U. Assoc. Prof., City and Regional Planning
Locey, Jean N., M.F.A., Ohio U. Assoc. Prof., Art
MacDougall, Bonnie G., Ph.D, Cornell U. Asst. Prof., Architecture
Mackenzie, Archie B., M.Arch., U. of California at Berkeley. Assoc. Prof., Architecture
McClive, Dana M., M.A., Cornell U. Lecturer, City and Regional Planning
Meyer, Elisabeth H., M.F.A., U. of Texas. Asst. Prof., Art
Mikus, Eleanore, M.A., U. of Denver. Assoc. Prof., Art
Miller, John C., M.Arch., Cornell U. Assoc. Prof., Architecture
Mirin, Leonard J., M.L.A., U. of Michigan. Assoc. Prof., Landscape Architecture
Mulcahy, Vincent J., M.Arch., Harvard U. Asst. Prof., Architecture
Ochshorn, Jonathan, M. Urban Design, City College of New York, Asst. Prof., Architecture
Olpadwala, Porus, Ph.D., Cornell U. Assoc. Prof., City and Regional Planning
Ostlund, John P., M.Arch., Harvard U. Asst. Prof., Architecture
Otto, Christian F., Ph.D., Columbia U. Prof., Architecture
Ovaska, Arthur, B.Arch., Cornell U. Asst. Prof., Architecture
Page, Gregory, M.F.A., U. of Wisconsin. Assoc. Prof., Art
Parsons, Kermit C., M.R.P., Cornell U. Prof., City and Regional Planning
Pearman, Charles W., B.Arch., U. of Michigan. Prof., Architecture
Pendleton, Ann M., M. Arch., Princeton U., Asst. Prof., Architecture
Perlus, Barry A., M.F.A., Ohio U., Asst. Prof., Art
Poleskie, Stephen F., B.S., Wilkes Coll. Prof., Art
Reps, John W., M.R.P., Cornell U. Prof. Emeritus, City and Regional Planning
Richardson, Henry W., M.R.P., Cornell U. Assoc. Prof., Architecture
Rowe, Colin F., M.A., U. of London (England). Prof., Architecture
Salmon, David, Ph.D, Cornell U. Asst. Prof., Architecture
Saltzman, Sid, Ph.D., Cornell U. Prof., City and Regional Planning
Saul, Francis W., M.S., Harvard U. Assoc. Prof. Emeritus, Architecture
Schack, Mario L., M.Arch., Harvard U. Prof., Architecture
Shaw, John P., M.Arch., Massachusetts Inst. of Technology. Prof., Architecture
Simitch, Andrea, B.Arch., Cornell U. Asst. Prof., Architecture
Singer, Arnold. Prof. Emeritus, Art
Squier, Jack L., M.F.A., Cornell U. Prof., Art
Stein, Stuart W., M.C.P., Massachusetts Inst. of Technology. Prof., City and Regional Planning
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Wells, Jerry A., B.Arch., U. of Texas. Nathaniel and Margaret Owings Distinguished Alumni Professor of Architecture, Architecture
Wilder, Margaret G., Ph.D., U. of Michigan. Asst. Prof., City and Regional Planning
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# PROGRAM OF STUDY

## Introduction

The College of Arts and Sciences at Cornell is a traditional liberal arts college. It is composed of those departments that teach and study the humanities, the basic sciences, mathematics, the social sciences, and the expressive arts. It is also a college within a university, and this wider community provides strength and diversity not available in an isolated undergraduate institution. Students may draw upon the knowledge and facilities of the other undergraduate colleges at Cornell to supplement their studies. Finally, the college is a graduate school and research center attracting faculty whose writing and research require first-rate academic facilities and whose participation in undergraduate teaching brings to their students the most current ideas in modern scholarship. It is this abundant variety that gives the college its distinctive character.

The richness of the curriculum is extraordinary; there is no course that all students must take, and there are several hundred from which they may choose. By choosing courses each semester, students design their own education. They strike a balance between developing known interests and exploring new subjects. They sharpen their verbal and quantitative skills. They also come to understand more thoroughly our common Western tradition and learn something about the non-Western world and its peoples. An education in the liberal arts means honing one's critical capacities, learning more about oneself in nature and culture, and gaining real experience of views of the world radically unlike one's own. All this is highly individual, and the college relies on each student and faculty adviser to select sensible, challenging, and appropriate courses.

Yet the faculty believes that each student's education should have certain common qualities. These include familiarity with several different ways of knowing that are reflected in the natural sciences, in the social sciences, and in those achievements of intellect and imagination that are the focus of the humanities and the expressive arts. In addition to these general areas of knowledge, students study foreign languages, acquire effective writing skills, and concentrate on one particular field to develop, as fully as possible, the powers of imaginative and critical thinking. To accomplish these objectives, the college has certain requirements for graduation.

## Summary of Basic College Requirements for Graduation

1) **Freshman writing seminars:** Two.
2) **Foreign language:** Up to four courses to obtain qualification in two languages or proficiency in one.
3) **Distribution:** Four approved sequences of two full-semester courses.
4) **Major**
5) **Electives:** Four or five courses (or 15 credits) in courses not used to fulfill other requirements and not in the major field.
6) **Residence:** Eight full-time semesters, unless a student can successfully complete the other requirements in fewer than eight semesters, maintain a B average, and is allowed to accelerate graduation.
7) **Minimum number of courses:** Thirty-four courses. A 2-credit course counts as half a course; a 6-credit language course counts as one and one-half courses.
8) **Credits:** A total of 120 credits, of which 100 must be taken in the College of Arts and Sciences.
9) **Physical education:** Completion of the university requirement. Please note that physical education credit does not count toward graduation or toward the 12-credit minimum required for good standing each semester. See p. 31.
10) **Application to graduate.**

## Freshman Writing Seminars

See "John S. Knight Writing Program," p. 21 and p. 319.

## Language Requirement

The faculty considers competence in a foreign language essential for an educated person. Studying another language helps students understand language itself, our fundamental intellectual tool, and opens another culture for exploration. The sooner the student acquires competence, the more useful it will be. Hence work toward the foreign language requirement should be undertaken in the freshman and sophomore years.

The following departments teach foreign languages or literature or both in the College of Arts and Sciences: Africana Studies and Research Center, Asian Studies, Classics, German Literature, Modern Languages and Linguistics, Near Eastern Studies, Romance Studies, and Russian Literature.

The language requirement may be satisfied in one of two ways:

1) by attaining *proficiency* in one language or
2) by attaining *qualification* in two languages.

### Proficiency

Proficiency is attained by passing a 200-level course (or Chinese or Japanese 161) or by equivalent achievement, to be determined by examination; see below under "Advanced Standing Credit."

### Qualification

Qualification may be attained in any of the following four ways.

1) Three years of high school study in any one language gives qualification in that language. Note, however, that this route to qualification does not guarantee entrance into a 200-level course. The student who wants to continue in this language must be placed by examination.
2) Passing the requisite course: 102, 123, or 134 in languages taught by the Department of Modern Languages and Linguistics; Chinese 112–114 or Japanese 160, Japanese 141–142–241; Near Eastern Studies 102 or 122 in Hebrew, 112 in elementary classical Arabic, 214 in Egyptian Arabic, or 138 in Turkish; Classics 103 or 104 in Greek; Classics 106 or 107 or 108 in Latin; Classics 112 in modern Greek; 132 in Sanskrit; AS&RC 134 in Swahili.
3) A score of 560 or better on the College Placement Test (CPT).
4) Placement in a 200-level course by special examination (in cases where no CPT is available).

A student may submit a 560 CPT score at the end of a course numbered 122, thus attaining *qualification* without taking 123. This procedure is optional: the student with a score of 560 or better may want to take 123 to be better prepared for the 200-level courses.

*Note:* Completion of 131–132 language course sequences does not constitute qualification.

**Speakers of languages other than English** may be awarded credit for their bilingual ability. Their English achievement is measured by the Test of English as a Foreign Language (TOEFL), a requirement for matriculation. Their performance in one other language learned outside the academic environment is measured by examination, and evidence of abilities in reading and writing, as well as speaking, is required. A maximum of 6 advanced placement credits is granted to students who demonstrate *proficiency* equivalent to course work at the 200 level or above at Cornell. Students may not earn credit both for proficiency in their native language and for studying English as a second language at Cornell.

### Language Course Placement and Credit

Students who have had two or more years of high school study in a language may not enroll in any course in that language without being placed by examination. Nor may transfer students register without examination, even though they may have been given credit for language work elsewhere.

The type of examination depends upon the language course and the level of achievement:

1) French, German, Italian, Russian, and Spanish courses: the standardized College Placement Test. Entering students who have not taken the CPT in high school and

who want to continue their language study must take the CPT at Cornell during orientation week. Students may retake this examination at Cornell if they have studied the language a year or more since last taking the test. To do this, students register with the Academic and Career Counseling services, 203 Barnes Hall, and pay a fee.

2) Latin (all courses except 105 and 107): departmental examination.
3) Greek (all courses except 101,104, and 111): departmental examination.
4) Arabic: departmental examination.
5) Hebrew: departmental examination.
6) Other languages: special examinations; Turkish: department examination; see the professor in charge.
7) High achievement (students with a CPT score of 650 or better in French, German, Hebrew, Italian, Russian, and Spanish): the Cornell Advanced Standing Examination (CASE).

An entering or continuing student with high achievement scores should take the Cornell Advanced Standing Examination (CASE); even if the student does not want to do any further work in the language, the CASE may provide proficiency status for the language requirement, and it may provide up to 6 advanced standing credits. Students who do not have high achievement scores are eligible for the courses listed in the charts below, depending on their CPT scores. For other languages, or for special problems, students should see the professor in charge.

**French**

| *CPT Reading Score* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 121 or 122 | |
| 450–559 | 123 | |
| 560–649 | 203 | 200 |
| | | 201 |
| | | 211 |
| 650 and above AP 4 or 5 in language | Apply for the Cornell Advanced Standing Examination (CASE) | |

**German**

| *CPT Reading Score* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 121 | |
| 450–559 | 123 | |
| 560–649 | 203 | 201 |
| 650 and above AP 4 or 5 in language | Apply for the Cornell Advanced Standing Examination (CASE) | |

**Italian**

| *CPT Reading Score* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 121 | |
| 405–559 | 123 | |
| 560–649 | 203 | 201 |
| 650 and above | Apply for the Cornell Advanced Standing Examination (CASE) | |

**Russian**

| *CPT Reading Score* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 101 | |
| | 121 | |
| 450–559 | 102 | |
| | 123 | |
| 560–649 | 203 | 201 |
| 650 and above | Apply for the Cornell Advanced Standing Examination (CASE) | |

**Spanish**

| *CPT Reading Score* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 121 | |
| 450–559 | 123 | |
| 560–649 | 203 | 201 |
| | 211 | |
| 650 and above AP 4 or 5 in language | Apply for the Cornell Advanced Standing Examination (CASE) | |

**Arabic**

Placement by departmental examination.

**Hebrew**

Placement by departmental examination.

**Turkish**

Placement by departmental examination.

**Advanced Standing Credit**

Advanced standing credit may be entered on a student's record as follows: Credit may be granted for high school work for the equivalent of language courses numbered 203, 204. The amount of credit is based on performance on one or more of the following examinations:

a) CPT Advanced Placement Examination. *French, Spanish, and German:* A score of 4 or 5 yields 3 credits on the French, Spanish, or German language examinations and literature examinations. *Hebrew:* Up to 6 credits may be granted, depending on the student's score on the departmental examination. *Latin:* Students should consult the Department of Classics, 120 Goldwin Smith Hall. They must take the department's own placement examination during orientation week. A student who is permitted to register in a 300-level course on the basis of this examination will be given 6 advanced standing credits. *Greek and Modern Greek:* For information concerning advanced placement, student should consult the Department of Classics, 120 Goldwin Smith Hall.
b) Cornell Advanced Standing Examination (CASE). To be eligible for this examination the student must have achieved a score of 650 on the CPT. For details on registration, see "Language Course Placement and Credit," above. The maximum amount of credit is 6 credits.
c) Special examinations are given for languages where no CPT exists.

## Distribution Requirement

The purposes of the distribution requirement are to acquaint students with a broad range of subject matter in the liberal arts and to provide them with the opportunity to explore new areas. Accomplishing these purposes is part of the task of freshmen and sophomores. Although completion of the requirements may be spread over the eight semesters, successful introductory course work can be followed up with advanced courses only if undertaken early. For purposes of distribution, subjects are divided into four groups. Each of the first three groups has two subdivisions.

**Group 1**
a. Physical sciences
b. Biological sciences

**Group 2**
a. Social sciences
b. History

**Group 3**
a. Humanities
b. Expressive arts

**Group 4**
a. Mathematics and computer science
b. One of the subdivisions not used in fulfillment of groups 1, 2, or 3.

In each of groups 1, 2, and 3, students must take a sequence of two courses (6 or more credits) approved by the department in one subject chosen from either subdivision. For group 4, students are strongly urged to take two courses in mathematics or one in mathematics and Computer Science 100. Those who choose not to satisfy the group 4 requirement with mathematics must choose two courses in one subject from an unused subdivision in group 1, 2, or 3. For example, a student who fulfills group 1 with biology, group 2 with psychology, and group 3 with theatre arts could then complete group 4 with a sequence of two courses from the list below in the physical sciences, history, or the humanities.

Courses fulfilling the distribution requirement must be taken in the College of Arts and Sciences and may be taken for S-U grades. Students may petition to take Architecture 181–182, History of Architecture I and II, in the Department of Architecture of the College of Architecture, Art, and Planning, to fulfill the requirement in expressive arts.

**Advanced Placement Credit**

AP credit is meant to place students into the appropriate level of study and to give them credit for their advanced standing. AP credit counts towards the 120 credits and thirty-four course units required for graduation. The use of AP credit to satisfy distribution requirements is different for each group.

**Freshman Writing Seminars.** Students who score 5 on the AP exam in English are exempt from one writing seminar and are awarded three credits. A score of 4 will receive three credits but *no* exemption from a seminar. These students, as well as those who score 700 or better on the College Placement Test in literature or composition, are eligible to enroll, space permitting, in the following freshman writing seminars: English 270, 271, 272.

**Science.** Beginning with the class of 1990, AP credit may be used to fulfill *half* the distribution requirement in science. Students who place out of two semesters of introductory science may satisfy the distribution requirement with one semester of advanced work in that science or with an introductory sequence of two semesters in another science.

**Social sciences or history.** AP credit may not be used to satisfy this requirement.

**Humanities or expressive arts.** AP credit may not be used to satisfy this requirement.

**Mathematics.** AP credit may be used to fulfill the requirement in mathematics.

Here is a complete list of the courses that fulfill distribution requirements.

### Group 1: Physical or Biological Sciences

**a. Physical Sciences**

**Astronomy:** 101 or 211, plus 102 or 212; or Astronomy 102 or 212, plus Astronomy 332. Astronomy 103–104, identical to Astronomy 101–102 except for the omission of the laboratories, cannot be used to satisfy the distribution requirement for students in the College of Arts and Sciences.

**Chemistry:** 103, 207, 211, or 215 followed by 104, 208, or 216.

**Geological Sciences:** 101, 103, or 111; plus 102, 104, or 202.

**Physics:** Any two sequential courses such as 101–102, 207–208, or 112–213, or any combination of the first term of one sequence and the second term of another. The requirement is also met by any two general education courses from the group 201–206 or by a combination of 101, 112, or 207 with 204, 205, or 206.

**b. Biological Sciences**

A two-semester introductory biology sequence selected from Biological Sciences 109–110, or 105-106, or 101/103 plus 102/104, or any two of Anthropology 101, 275, 371, 390, 474, 490. Biological Sciences 107–108, offered during the eight-week Cornell Summer Session for 8 credits, satisfies the distribution requirement. Advanced placement in biology with a score of 4 or 5 (6 or 8 credits, respectively) satisfies half the distribution requirement in the biological sciences. The second half of the distribution requirement must be fulfilled by an upper-level biological sciences course.

### Group 2: Social Sciences or History

**a. Social Sciences**

**Africana Studies:** Any two of 171, 172, 190, 191, 208, 231, 280, 290, 301, 302, 344, 345, 346, 351, 352, 400, 410, 420, 460, 481, 484, 485, 495, 550, 551, 571.

**Anthropology:** Any two courses (for 3 or 4 credits) in the Department of Anthropology, or Archaeology 100 and any 3- or 4-credit anthropology course.

**Archaeology:** Archaeology 100 and any one of the following: Archaeology 201, 203, 308, 309, 317, 358, 361, 402, 404, 496, or Anthropology 203, 216, 250, 352, 354, 355, 356, 358, 359, 361, 402, 404, 435, 456, 493, 494, 496, 656, 663, 664, 666, 667.

**Asian Studies:** Any two courses in Asian anthropology, economics, government, linguistics, or sociology given by the Department of Asian Studies or listed there under the areas of China, Japan, South Asia, and Southeast Asia, excluding only Freshman Writing Seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the same area, or by taking AS 211, 212, 215, or 218, followed by a social science course in that area. Alternative sequences will, under special circumstances, be considered but require the permission of the director of undergraduate studies.

**Economics:** 101–102 or a combination of one of these courses and any course for which it is a prerequisite if the course is taught by a member of the Department of Economics.

**Government:** Any two of 111, 131, 161, 181; or any one of these courses followed by a 300-level course in the same area.

**Linguistics:** 101 and (1) any other course in linguistics or (2) any other course offered by the Department of Modern Languages and Linguistics for which this introductory linguistics course is a prerequisite.

**Near Eastern Studies:** Any two NES archaeology courses at the 200 or 300 level that form a reasonable sequence or combination. NES 197 or 198 plus an NES archaeology course will also satisfy the social sciences requirement.

**Psychology:** Any two courses in psychology with the exception of Psychology 123, 307, 322, 324, 326, 350, 361, 396, 422, 425, 429, 471, 472, 473, 475, 476, 479, 491, 492.

**Sociology:** Any two of 101, 103, 104, 106, or 101, followed by any course at the 200 level or above in sociology.

**Women's Studies:** (a) Any two of 208, 218, 238, 244, 277, 297, 305, 321, 353, 363, 366, 406, 408, 425, 428, 450, 468, 480; or (b) any one of 210, 365, 454, plus one course from list a. (Appropriate courses in women's studies taken previously may be approved by the program.)

**City and Regional Planning:** 100 and 101.

**b. History**

**Africana Studies:** Any two of 203, 204, 231, 283, 344, 350, 360, 361, 370, 381, 405, 460, 475, 483, 490, 510.

**Asian Studies:** Any two courses in Asian history given by the Department of History and listed under the Department of Asian Studies under the areas of China, Japan, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the same area, or by taking AS 211, 212, 215, or 218 followed by a history course in that area.

**History:** Any two courses in the Department of History.

**History of Science and Technology:** Any two of the following courses: History 281, 282, 286, 287, 288, 380, 447, 448, 482; also Engineering 250 and 292.

**Near Eastern Studies:** Any two NES history courses at the 200 or 300 level that form a reasonable sequence or combination. NES 197 or NES 198 plus an NES history course will also satisfy the history requirement.

**Women's Studies:** Any two of 227, 238, 273, 357, 426. (Appropriate courses taken previously may be approved by the program.)

### Group 3: Humanities or Expressive Arts

**a. Humanities**

**Africana Studies:** Any two of 211, 219, 422, 425, 431, 432, 455.

**Archaeology:** Archaeology 100 and any of the following: Archaeology 221, 233, 250, 275, 308, 310, 356, 358, 360, 362, 402, 403, 406, 413, 423; Classics 219, 220, 221, 232, 233, 237, 239, 250, 309, 319, 320, 321, 322, 323, 325, 326, 327, 329, 330, 350, 356, 358, 360, 423, 431, 432, 434, 450, 629, 630; Near Eastern Studies 243, 261, 263, 264, 267, 361, 362, 364, 365, 366, 367, 461, 463, 601; English 401, 406, 413, 601, 603.

**Asian Studies:** Any two courses in Asian art, literature, or religion given by the Department of Asian Studies or listed there under the areas of China, Japan, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by any two courses in the same area, or by taking AS 211, 212, 215, or 218, either using two of these courses as a sequence or by following one with a course in the humanities in that area.

**Classics:** (a) any two courses in Greek beginning with 201 or in Latin beginning with 205 that form a reasonable sequence, or (b) any two of the following: Classics 206, 211, 212, 217, 218, 219, 220, 221, 222, 224, 225, 232, 233, 235, 236, 237, 238, 239, 245, 250, 300, 309, 319, 320, 321, 322, 323, 326, 327, 329, 330, 331, 333, 336, 337, 339, 340, 350, 356, 363, 366, 368, 380, 382, 390, 423, 434, 435.

**Comparative Literature:** Any two comparative literature courses at the 200 level or above, including 150; 400-level courses with permission of the instructor or the director of undergraduate studies.

**English**: Any two courses in English at the 200 level or above. If students have used English courses to satisfy the expressive arts requirement, they should not take courses numbered in the 80s (e.g., 281, 382) to satisfy the humanities requirement.

**French Literature:** Any two courses from 200, 201, 202, 222, or 300-level literature courses.

**German Literature:** Any two courses at the 200 level or above.

**Italian Literature:** Any two literature courses at the 200 level or above.

College Scholars must complete 120 credits of course work (100 in the college), 34 courses, and, unless they receive special permission from the program to accelerate, eight full terms of undergraduate study. They must complete the physical education requirement. All College Scholars must complete a senior project. They are not required to complete or fulfill the distribution requirements, although members of the College Scholar Advisory Board believe that the spirit of the requirement is a good one.

Each applicant to the College Scholar Program is asked to write an essay, which is due in April or May of the freshman year. Students should contact the Academic Advising Center, 55 Goldwin Smith Hall, for further information.

#### Double Majors

A student may complete a double major by fulfilling the major requirements in any two departments of the college. No special permission or procedure is required. Students need, however, to become accepted into both majors and be assigned an adviser in each department. Both majors will be posted on the official transcript.

#### Dual Degree Programs with Other Colleges

Especially ambitious and diligent students may earn both a Bachelor of Arts degree from the College of Arts and Sciences and (1) a Bachelor of Science degree from the College of Engineering or (2) a Bachelor of Fine Arts degree from the Department of Art in the College of Architecture, Art, and Planning or (3) a Bachelor of Science degree in urban and regional studies from the Department of City and Regional Planning in the College of Architecture, Art, and Planning or (4) a Bachelor of Science degree in architectural history from the College of Architecture, Art, and Planning. The dual degree program ordinarily takes five years to complete. Students enter one of these colleges as freshmen and begin the dual degree program with the second college in the second or, in some cases, the third year. For further information students should contact assistant dean Rosenberg, Academic Advising Center, 55 Goldwin Smith Hall.

#### Double Registration with Professional Schools

Double registration in the College of Arts and Sciences and with the Cornell Law School and Cornell Medical College is possible. A few exceptionally well prepared students who have earned 105 credits before the start of the senior year and have been accepted by one of the above-named professional schools may be permitted to register simultaneously in the college and in one or another of these professional schools during the seventh and eighth terms.

Students interested in the joint program with the Law School should see assistant dean Buettner, Academic Advising Center, 55 Goldwin Smith Hall.

Students registering in the college and in the Cornell Medical College receive the Bachelor of Arts degree after the first year of medical studies and the Doctor of Medicine degree after the remaining three years of medical college are completed. Interested students should contact Jane Crawford, health careers coordinator, 203 Barnes Hall.

Double-registered students must, of course, complete all requirements for the B.A. degree, including 100 credits in College of Arts and Sciences courses.

## Special-Interest Options

The following options do not alter the college's requirements but enable students to pursue special interests within the usual program. Independent course work is involved in independent study and in the Undergraduate Research Program; premedical and prelaw counseling help students make appropriate use of the regular curriculum.

#### Independent Study

Independent study affords students the opportunity to pursue special interests not treated in regularly scheduled courses. A faculty member, who becomes the student's instructor for the course, must approve the student's program of study and agree to provide continuing supervision of the work. Students must prepare a proposal for independent study. Consult the Office of Records and Scheduling, M46 Goldwin Smith Hall, for information. In one semester students may earn up to 6 credits with one instructor or up to 8 credits with more than one instructor.

#### Undergraduate Research Program

The Undergraduate Research Program enables students to gain firsthand experience in scholarly research by participating in a faculty member's research project. Participation is recognized by course credit, since the program emphasizes what students will learn rather than what they will contribute to the project. However, students sometimes make contributions of a very high order and publish the results of their work.

Besides learning research methods that are appropriate to the discipline, students gain awareness of their own research interests and abilities, self-discipline, new insight into the subject matter, and the pleasure of working as scholar-apprentices with professors and other students who share a common interest.

Students interested in this program should see assistant dean Williams, Academic Advising Center, 55 Goldwin Smith Hall.

#### Language Study

More than forty languages are taught in the College of Arts and Sciences; some of them are available only at Cornell. A full range of language, literature, and cultural courses are available in most of the major ancient and modern languages through the joint efforts of the Department of Modern Languages and Linguistics and the departments that specialize in literary and cultural study: the departments of Asian Studies, Classics, German Literature, Near Eastern Studies, Romance Studies, and Russian Literature. Semi-intensive courses afford students the option of accelerating the development of language skills.

**FALCON Program (Full-Year Asian Language Concentration).** FALCON allows students who are interested in the Far East to study Chinese, Japanese, or Indonesian exclusively for one year. They gain proficiency in the language and familiarity with the culture. Students who are interested in the Far East should be aware of the opportunities here to pursue rapid and thorough beginning studies on campus with the objective of studying abroad later—in China, Japan, or Southeast Asia.

**Language House Program** (136 Goldwin Smith Hall)
Beatrice B. Szekely, academic administrator

A complement to classroom cultural and linguistic instruction, the Language House Program combines residential and academic opportunities for developing and practicing conversational skills in French, Spanish, German, and Mandarin Chinese. It provides preparation for students who plan to study abroad and serves as a place for returning students to share their cultural experiences while further increasing their language skills.

#### Prelaw Study

Law schools neither require nor prefer any particular program of study; they do seek students with sound training in the liberal arts. It is important that students plan a program in which they are interested and do well. Beyond that, students are advised to take courses that will develop the powers of precise, analytical thinking and proficiency in writing and speaking.

The college offers a concentration in law and society. Students should work towards completion of this concentration because they are interested, not because they believe it will convince law schools of their interest.

The adviser for students in the College of Arts and Sciences who are applying to law school is assistant dean Buettner, Academic Advising Center, 55 Goldwin Smith Hall.

#### Premedical Study

The breadth and depth afforded by a liberal arts education are invaluable for people who plan medical careers, whether they intend to practice or go into medical research. Such training has a profound effect on the doctor's usefulness to patients, and it affords the flexibility of mind that is needed for major research undertakings. Medical and dental schools do not prescribe or even prefer a particular major; they do, however, require particular undergraduate courses. Students who are interested in medical careers are urged to visit the Health Careers Office, 203 Barnes Hall.

The adviser for students in the College of Arts and Sciences who are planning careers in medicine is assistant dean Turner, Academic Advising Center, 55 Goldwin Smith Hall.

## Off-Campus Programs

Many students find it important to their majors or to their overall academic programs to study abroad for one or two semesters. When it makes academic sense, the college encourages its students to pursue such studies and grants credit toward the degree for work satisfactorily completed.

#### Study Abroad

In 1988–89, 189 students in the college studied abroad. Cornell has established affiliations with several universities and programs in Australia, Britain, Denmark, Egypt, Indonesia, Israel, and Sweden, as well as its own programs in France, Germany, Italy, Japan, Spain, and Switzerland. Students have studied in those countries and in others all over the world. Before planning a program for study

while the summer Falcon Programs in Asian languages count as 10 credits and 2 1/2 courses each. Biology 364, for 6 credits, and most other 5- or 6-credit courses count as one course.

Students must also complete 120 credits, 100 of which must be from courses taken in the College of Arts and Sciences, to earn the Bachelor of Arts degree. Credits earned from advanced placement examinations, courses approved for study abroad, and courses taken in certain off-campus residential programs may be counted towards the 100 credits required within the college and also toward the required thirty-four courses. Credits earned in other colleges at Cornell, or in any subject at U.S. institutions other than Cornell, do not count as part of the 100. The only exception is for courses (usually no more than three) that a department accepts from other colleges at Cornell as fulfulling major requirements.

### Application to Graduate

In the first semester of their senior year, students must complete an application to graduate so that the college can check each student's plan for fulfilling college requirements. This process is intended to help seniors identify problems early enough in the final year so that they may make any necessary changes in course selection to satisfy requirements. *Meeting graduation requirements is the student's responsibility;* problems that are discovered, even late in the final term, must be resolved before the degree can be granted. Seniors will receive applications and instructions with their preregistration materials for the final semester.

### Courses, Credit, and College Requirements

A course may not be used to fulfill more than one college requirement, with the following exceptions.

1) A course may be used to fulfill a distribution requirement, and also a major requirement, provided that the major adviser agrees.
2) A one-semester course in foreign literature that is acceptable for achieving proficiency in that language may also be used as a partial fulfillment of the distribution requirement in the humanities.
3) Students whose native language is not English who take English 211–212 may fulfill both the freshman writing seminar requirement and the appropriate distribution requirement by taking two freshman writing seminars offered in English, history, history of art, classics, philosophy, romance studies, Russian literature, German literature, or comparative literature.
4) Courses used to fulfill college requirements (but not major requirements) may be taken for S-U grades.

**Repeating courses.** Students may repeat courses. If the instructor certifies that the course content has been changed, credit may be granted a second time. If the content has not changed, both grades will appear on the transcript and will be included in any average that is calculated, but credit will be counted toward the degree only once. Students who plan to repeat a course should submit a petition to the Office of Records and Scheduling, M46 Goldwin Smith Hall.

**Attendance** in classes is a matter between students and their instructors. If a student cannot attend classes because of illness or family crisis, the Academic Advising Center will notify instructors when requested to do so, but students must arrange for making up examinations or other work with their instructors. When students will be absent because of religious holidays, they must discuss arrangements for making up their work with their instructors. Students who must miss an examination should be sure to contact the professor in advance. Alternative arrangements are at the discretion of the instructor.

**Transferring credit.** The college evaluates credit received from either another school or college at Cornell University or another accredited institution of collegiate rank to determine the number of courses the student may apply toward the Bachelor of Arts degree. Tentative credit evaluations are normally provided to external transfers at the time of the notification of their admission. No more than 20 credits in courses not commonly given by the College of Arts and Sciences may be applied toward the degree.

Transfer students must successfully complete at least 60 credits and sixteen courses at Cornell; they must be in residence for four regular semesters. Summer session does not count toward the residence requirement. Advanced placement credit awarded by other colleges, either at Cornell or elsewhere, will be re-evaluated by the college and may not be accepted.

**Advanced placement credit.** See pp. 23–26.

**Summer session credit.** A student may earn credit toward the degree by completing courses in Cornell's summer session or by petitioning to take courses at other colleges. Students should consult their advisers regarding summer study plans.

Credit for summer courses not taken at Cornell must be approved in advance by the director of undergraduate studies in the appropriate Cornell department and the student's faculty adviser. The college Office of Records and Scheduling, M46 Goldwin Smith Hall, can supply forms and information. Credit earned in summer courses other than those at Cornell will not count toward the 100 credits required in the college except for summer programs abroad if sponsored by Cornell Abroad, for which from 4 to 8 credits may be earned and counted as in-college credit. Transcripts from other institutions should be sent to the Office of Records and Scheduling, M46 Goldwin Smith Hall.

Entering students who want to receive credit toward the degree for courses completed in a summer session at Cornell or elsewhere should have transcripts sent to the Office of Records and Scheduling, M46 Goldwin Smith Hall, during the summer before matriculation.

Summer session at Cornell or elsewhere does not count toward the eight-semester residence requirement.

**Non-credit courses.** The college does not grant credit toward the degree for every course offered by the university. Courses in remedial or developmental reading (for instance, Human Ecology 100) and mathematics, and supplemental science courses offered by the Learning Skills Center, carry credits that are counted toward good standing in a given semester but not toward graduation. Physical education, typing, shorthand, and military training courses are among those for which credit is not given. Faculty legislation strictly prohibits granting credit toward the degree for service as an undergraduate teaching assistant.

**Auditing.** The college encourages its students to take advantage of its rich curriculum by sitting in on courses that interest them but do not fit into their schedules for credit. As long as the instructor agrees, students are welcome to visit courses. Small seminars and language courses are sometimes not open to casual visitors. Audited courses do not, of course, appear on the student's schedule or transcript.

### Physical Education

See "University Requirements for Graduation," p. 31. The college does not count physical education credit toward the 120 credits required for graduation.

## SPECIAL ACADEMIC OPTIONS

### Degree Programs

The following programs allow students to work toward more than one degree or to alter the regular college requirements or departmental requirements for the major.

#### Independent Major Program

The Independent Major Program allows students to design their own interdisciplinary majors if they want to pursue an interest that cannot be met within an established major. Proposals for an independent major must be supported by a faculty adviser and are assessed by a board of faculty members. Board members consider whether the plan is equivalent in coherence, breadth, and depth to a departmental major, whether it is well suited to the student's academic preparation, and whether it provides a liberal education. Independent majors substitute for established majors, but students must still satisfy all the other requirements for the baccalaureate degree. Students should contact the director of the Independent Major Program, Academic Advising Center, 55 Goldwin Smith Hall, for further information. Deadlines for submitting independent major proposals are listed on the calendar supplement for the College of Arts and Sciences.

#### College Scholar Program

The College Scholar Program frees no more than forty students in each freshman class from the usual college requirements for a degree and allows them to design their own academic programs. It is meant to serve students whose interests and talents do not easily fit into the usual departmental majors, who demonstrate exceptional promise, and who show the maturity to plan and carry out, with the help of their adviser, a well-designed program of studies. College Scholars do not all design the same kind of program: Some, for instance, pursue diverse interests, while others integrate a variety of courses with a common theme.

College Scholars must complete 120 credits of course work (100 in the college), 34 courses, and, unless they receive special permission from the program to accelerate, eight full terms of undergraduate study. They must complete the physical education requirement. All College Scholars must complete a senior project. They are not required to complete or fulfill the distribution requirements, although members of the College Scholar Advisory Board believe that the spirit of the requirement is a good one.

Each applicant to the College Scholar Program is asked to write an essay, which is due in April or May of the freshman year. Students should contact the Academic Advising Center, 55 Goldwin Smith Hall, for further information.

#### Double Majors

A student may complete a double major by fulfilling the major requirements in any two departments of the college. No special permission or procedure is required. Students need, however, to become accepted into both majors and be assigned an adviser in each department. Both majors will be posted on the official transcript.

#### Dual Degree Programs with Other Colleges

Especially ambitious and diligent students may earn both a Bachelor of Arts degree from the College of Arts and Sciences and (1) a Bachelor of Science degree from the College of Engineering or (2) a Bachelor of Fine Arts degree from the Department of Art in the College of Architecture, Art, and Planning or (3) a Bachelor of Science degree in urban and regional studies from the Department of City and Regional Planning in the College of Architecture, Art, and Planning or (4) a Bachelor of Science degree in architectural history from the College of Architecture, Art, and Planning. The dual degree program ordinarily takes five years to complete. Students enter one of these colleges as freshmen and begin the dual degree program with the second college in the second or, in some cases, the third year. For further information students should contact assistant dean Rosenberg, Academic Advising Center, 55 Goldwin Smith Hall.

#### Double Registration with Professional Schools

Double registration in the College of Arts and Sciences and with the Cornell Law School and Cornell Medical College is possible. A few exceptionally well prepared students who have earned 105 credits before the start of the senior year and have been accepted by one of the above-named professional schools may be permitted to register simultaneously in the college and in one or another of these professional schools during the seventh and eighth terms.

Students interested in the joint program with the Law School should see assistant dean Buettner, Academic Advising Center, 55 Goldwin Smith Hall.

Students registering in the college and in the Cornell Medical College receive the Bachelor of Arts degree after the first year of medical studies and the Doctor of Medicine degree after the remaining three years of medical college are completed. Interested students should contact Jane Crawford, health careers coordinator, 203 Barnes Hall.

Double-registered students must, of course, complete all requirements for the B.A. degree, including 100 credits in College of Arts and Sciences courses.

## Special-Interest Options

The following options do not alter the college's requirements but enable students to pursue special interests within the usual program. Independent course work is involved in independent study and in the Undergraduate Research Program; premedical and prelaw counseling help students make appropriate use of the regular curriculum.

#### Independent Study

Independent study affords students the opportunity to pursue special interests not treated in regularly scheduled courses. A faculty member, who becomes the student's instructor for the course, must approve the student's program of study and agree to provide continuing supervision of the work. Students must prepare a proposal for independent study. Consult the Office of Records and Scheduling, M46 Goldwin Smith Hall, for information. In one semester students may earn up to 6 credits with one instructor or up to 8 credits with more than one instructor.

#### Undergraduate Research Program

The Undergraduate Research Program enables students to gain firsthand experience in scholarly research by participating in a faculty member's research project. Participation is recognized by course credit, since the program emphasizes what students will learn rather than what they will contribute to the project. However, students sometimes make contributions of a very high order and publish the results of their work.

Besides learning research methods that are appropriate to the discipline, students gain awareness of their own research interests and abilities, self-discipline, new insight into the subject matter, and the pleasure of working as scholar-apprentices with professors and other students who share a common interest.

Students interested in this program should see assistant dean Williams, Academic Advising Center, 55 Goldwin Smith Hall.

#### Language Study

More than forty languages are taught in the College of Arts and Sciences; some of them are available only at Cornell. A full range of language, literature, and cultural courses are available in most of the major ancient and modern languages through the joint efforts of the Department of Modern Languages and Linguistics and the departments that specialize in literary and cultural study: the departments of Asian Studies, Classics, German Literature, Near Eastern Studies, Romance Studies, and Russian Literature. Semi-intensive courses afford students the option of accelerating the development of language skills.

**FALCON Program (Full-Year Asian Language Concentration).** FALCON allows students who are interested in the Far East to study Chinese, Japanese, or Indonesian exclusively for one year. They gain proficiency in the language and familiarity with the culture. Students who are interested in the Far East should be aware of the opportunities here to pursue rapid and thorough beginning studies on campus with the objective of studying abroad later—in China, Japan, or Southeast Asia.

**Language House Program** (136 Goldwin Smith Hall)
Beatrice B. Szekely, academic administrator

A complement to classroom cultural and linguistic instruction, the Language House Program combines residential and academic opportunities for developing and practicing conversational skills in French, Spanish, German, and Mandarin Chinese. It provides preparation for students who plan to study abroad and serves as a place for returning students to share their cultural experiences while further increasing their language skills.

#### Prelaw Study

Law schools neither require nor prefer any particular program of study; they do seek students with sound training in the liberal arts. It is important that students plan a program in which they are interested and do well. Beyond that, students are advised to take courses that will develop the powers of precise, analytical thinking and proficiency in writing and speaking.

The college offers a concentration in law and society. Students should work towards completion of this concentration because they are interested, not because they believe it will convince law schools of their interest.

The adviser for students in the College of Arts and Sciences who are applying to law school is assistant dean Buettner, Academic Advising Center, 55 Goldwin Smith Hall.

#### Premedical Study

The breadth and depth afforded by a liberal arts education are invaluable for people who plan medical careers, whether they intend to practice or go into medical research. Such training has a profound effect on the doctor's usefulness to patients, and it affords the flexibility of mind that is needed for major research undertakings. Medical and dental schools do not prescribe or even prefer a particular major; they do, however, require particular undergraduate courses. Students who are interested in medical careers are urged to visit the Health Careers Office, 203 Barnes Hall.

The adviser for students in the College of Arts and Sciences who are planning careers in medicine is assistant dean Turner, Academic Advising Center, 55 Goldwin Smith Hall.

## Off-Campus Programs

Many students find it important to their majors or to their overall academic programs to study abroad for one or two semesters. When it makes academic sense, the college encourages its students to pursue such studies and grants credit toward the degree for work satisfactorily completed.

#### Study Abroad

In 1988–89, 189 students in the college studied abroad. Cornell has established affiliations with several universities and programs in Australia, Britain, Denmark, Egypt, Indonesia, Israel, and Sweden, as well as its own programs in France, Germany, Italy, Japan, Spain, and Switzerland. Students have studied in those countries and in others all over the world. Before planning a program for study

abroad, students should consult assistant dean Rosenberg, in the Academic Advising Center, 55 Goldwin Smith Hall, who will help them find the program most appropriate to their academic goals.

A request to study abroad must have the support of the faculty adviser, and the college. A maximum of 30 credits for a year or 15 credits for a semester may be earned abroad. These credits may count as part of the 100 credits required within the College of Arts and Sciences. On returning, students must seek approval of the courses completed abroad from the appropriate departments. Normally, transfer students entering as juniors will not be allowed to study away from Cornell.

Students studying abroad must be in good academic standing the semester prior to departure. No more than two semesters abroad are allowed.

Seniors who wish to study abroad during their *final semester* must petition the college for permission to do so.

#### Summer Residential Programs in Archaeology

During the summer months students may participate in a Cornell-sponsored archaeological project. In recent years the program has organized archaeological projects in New York State, Central America, South America, and the Mediterranean region. Students should contact the Archaeology Program for information about the sites available this summer.

#### Marine Science

Shoals Marine Laboratory is a seasonal field station designed to introduce undergraduates to the marine sciences. The laboratory is located on Appledore Island, six miles off the Maine and New Hampshire coasts. Students should contact the Division of Biological Sciences for further information.

#### Cornell-in-Washington

The Cornell-in-Washington program enables a limited number of advanced students to study questions of public policy and to do supervised research during a term of residence in the capital. Students choose among several seminars. They become familiar with the various sources of information and develop research techniques. The program also offers a unique internship program. Students who want to serve an internship in a federal agency or congressional office take part in a public-policy seminar. They define and carry out individual research projects that explore the connections between abstract policy issues and the day-to-day activities of the office. Potential internships are arranged through, and approved by, the Cornell-in-Washington program. Students are admitted to the Cornell-in-Washington program by the Department of Government. For further information, see p. 00 or inquire at 134 McGraw Hall.

#### Fieldwork

Sometimes it is appropriate for students to include fieldwork as part of their major. A three-member faculty committee helps the student plan the project, arranges for ongoing supervision, and evaluates the project at the end of the term. Fieldwork almost always involves writing a long paper or several short ones, as well as practical experience. All proposals for fieldwork must be presented in advance to the Academic Records Committee for approval. A maximum of 15 credits in fieldwork may be earned. For further information students should contact assistant dean Unsworth, Academic Advising Center, 55 Goldwin Smith Hall.

## ADVISING

The following advisers and offices provide information on college procedures and regulations, academic advising, or counseling.

### Faculty Advisers

Faculty advisers help students design programs of study and advise students about ways to achieve their academic goals. Faculty members volunteer to act as advisers to new students in the college; advisers and advisees meet during orientation week to plan the student's program. Students are encouraged to see their advisers again early in the term, before it is too late to drop courses and before signing into courses for the following term, to discuss their academic program and to become better acquainted. Academic difficulties may frequently be solved or avoided if students and advisers recognize problems early.

Students who would like to petition for an exception to college rules should discuss the matter with their advisers.

Advisers may also help students with study or personal problems or direct them to other offices on campus where help is available.

### Student Advisers

Each new student is also assigned a student adviser who can provide information about the college's requirements, courses and instructors and about life at Cornell.

### Major Advisers

After acceptance into a major program, students are assigned a major adviser, a faculty member in the major department, with whom they make many of their most important decisions at Cornell. The adviser eventually certifies the completion of the major. The major adviser should be consulted by the student about all academic plans, including study abroad, acceleration, and graduate study. The adviser's support is especially important if a student petitions for an exception to the requirements for the degree.

### Academic Advising Center

The Academic Advising Center, 55 Goldwin Smith Hall, serves as a resource for faculty and student advisers and for students themselves and their parents. The assistant deans (one for each class, one for minority students, and two for special programs) are available there to help students define their academic and career goals and to help with special academic options such as study abroad, undergraduate research, fieldwork, and exceptions to college rules.

## REGISTRATION AND COURSE SCHEDULING

### Registration with the University

All students must register with the university at the beginning of each semester. Students may register if they are academically eligible and have satisfied the payment of their tuition. Registration materials are available at a time and place announced each term by the Office of the University Registrar.

### Enrollment in Courses in the College of Arts and Sciences

Students must enroll in courses through the Office of Records and Scheduling in the college, M46 Goldwin Smith Hall.

#### New Students

The Academic Advising Center conducts briefings during orientation week for incoming freshmen and transfer students about procedures for scheduling courses.

#### Continuing Students

Continuing students are expected to select and schedule courses in advance during the previous term. Students who fail to sign into courses during the designated period must wait until the beginning of the semester and may have difficulty securing places in the courses they desire. Students may schedule up to five courses during the pre–course enrollment (pre-registration) period. Information and materials will be available in the Records and Scheduling Office, M46 Goldwin Smith Hall. Before signing into courses, students should make appointments with their faculty advisers to plan their programs. Pre–course enrollment (pre-registration) is the best time to discuss long-range goals with faculty advisers. Student advisers will also assist students. All students are welcome to discuss programs and plans with an assistant dean in the Academic Advising Center, 55 Goldwin Smith Hall. The Records and Scheduling Office issues a supplement to *Courses of Study* showing last-minute changes in courses; the supplements of other divisions of the university are also available for reference in the Office of Records and Scheduling. Continuing students receive their course schedules at university registration. In the fall they also receive a copy of their transcript and a record of their progress toward the degree, which shows the courses taken, grades received, graduation requirements fulfilled, and academic actions. These are not official transcripts, but they reflect the official record and should be corrected in the Records and Scheduling Office if they are incorrect.

#### Limits on Courses and Credits

Students must take four or five courses (15 credits) each semester in order to graduate in eight terms. At a minimum, students must carry three or four courses (12 credits); if for compelling personal or academic reasons students need to carry fewer than 12 credits, they should consult their faculty adviser and the assistant dean of their class. Permission is by petition only. Completion of fewer than 12 credits without permission results in unsatisfactory academic standing. First-term freshmen may not register for more than 18 credits; other students may register for more

than 18 credits a term only if their previous term's average was a B or higher. No more than 22 credits may be taken in a regular semester without permission of the Committee on Academic Records.

*Any student who is not officially enrolled in a schedule of courses by the end of the third week of classes may be withdrawn from the college.*

#### Forgery on Forms

Forging signatures or credentials on college forms is an academic offense; sometimes it constitutes academic fraud. In all cases of forgery on academic forms, the effect of the forged documents shall be negated. Students may then petition properly to do whatever they attempted to do improperly. Such incidents will be recorded in the Academic Integrity Hearing Board confidential file for forgeries. If a student forges more than once or if the forgery would advance the student's academic standing unfairly or fraudulently or if, for any other reason, the situation requires some other response in addition to the uniform penalty, the Academic Integrity Hearing Board might make a different recommendation, such as a notation on the student's transcript, suspension, or dismissal.

## Special Registration Options

#### Adding and Dropping Courses

After advance course enrollment, students may not add or drop courses until the new term begins. All program changes must be approved by the department and by the faculty adviser (for juniors and seniors only). During the first three weeks of the semester, course changes may be made without fees. Add/drop forms are availalble in the Records and Scheduling Office, M46 Goldwin Smith Hall.

After the third week of classes courses may be added, and after the eighth week courses may be dropped, *only* by petition. Students may withdraw from courses between the ninth and twelfth weeks of the term *only* if (1) the instructor certifies the student has worked hard to master the material and has completed assigned work and taken exams, (2) the instructor approves, and (3) no issue of academic integrity is at stake. Students who want to withdraw from a course after the eighth week of the term must meet with an assistant dean and submit a petition by the end of the twelfth week of the semester. The records of students whose course loads drop below 12 credits will be reviewed at the end of the semester.

Courses dropped after the eighth week will be noted on the transcript by a "W" where the grade would normally appear. No petitions to withdraw from courses may be submitted after the end of the twelfth week in the term. Deadlines for short courses will be adjusted according to the length of the courses. After the midpoint of a short course, students who wish to add or drop the course must petition to do so.

For each course change approved after the third week there is a $10 fee.

#### Leaves of Absence

Taking time off from college to think about goals and progress, to gain additional experiences or funds, or just to take a break from studying is sometimes useful to students. Those in good standing who take a leave by the end of the eighth week of the semester are welcome to register in the college the following semester. Five years is the maximum length of time a student may be on leave and return without special permission. Leaves of absence are of four types.

1) *Personal leaves* impose no conditions concerning the right to reenter the college except for the five-year limit. Readmission is automatic if a written request is made one month before the beginning of the term in which the student wishes to return.
2) *Medical leaves* are granted by the college only on recommendation by a physician from Gannett Health Center. Such leaves are granted for an unspecified length of time (up to five years) with the understanding that the student may return at the beginning of any term after the medical condition in question has been corrected. In some cases students must satisfy the Gannett Health Center that the condition has been corrected before they may return. The student's academic standing will also be subject to review at the time of the leave and on return.
3) *Conditional leaves* may be granted if the student is not in good standing or, in unusual circumstances, after the eighth week of the term. Normally students may not return from conditional leaves for at least two terms or until specific and individual conditions, such as completing outstanding work, have been met.
4) *Required leaves:* The Academic Records Committee may require a leave of absence if a student is in academic difficulty. See the section "Academic Actions."

Any student who wishes to take a leave of absence should consult an assistant dean in the Academic Advising Center. On readmission, the student's graduation date will be recalculated according to the number of terms completed, the number of acceptable credits earned toward the degree, and the requirements for graduation. *Students who take courses elsewhere while on leave, may petition to have credits accepted as part of the 20 out-of-college credits of the 120 credits needed for graduation. Approval depends on the judgment of the relevant departments and acceptable grades.* Credits earned on leave do not count toward the eight semesters of residence unless a student petitions successfully to accelerate. See the section "Residence."

#### Withdrawals

A withdrawal is a voluntary severance of connection with the university. If a student wants to withdraw after registering for the term, the withdrawal must be requested before the end of the eighth week of classes. A notation of "W" will appear on the transcript for any course dropped after the eighth week. On withdrawal it is assumed that the student will not want to reregister in the college. Students who seek readmission after withdrawing from the college write an appeal to the Committee on Academic Records. *If a student fails to register for a term and does not request a leave, the student will be withdrawn from the college for failure to register.*

#### Transferring within Cornell (Internal Transfer)

Internal transfer from one college or school at Cornell into another is attractive for many students whose intellectual interests change. Students who want to transfer should discuss their eligibility with a counselor at the new school or college.

In some cases students who want to transfer into the College of Arts and Sciences may transfer directly. In other cases they may be referred to the Division of Unclassified Students. During the term immediately preceding transfer into the College of Arts and Sciences, students should complete at least 12 credits of courses in the College of Arts and Sciences with superior grades and without any grades of *Incomplete*, any S-U grades (unless only S-U grades are offered for that particular course), or any grades below C. Satisfying this minimum requirement does not, however, guarantee admission. Admission to the college is based on consideration of the student's entire record at Cornell and the high school record, not just the work of one semester. Interested students should see assistant dean Unsworth, in the Academic Advising Center, 55 Goldwin Smith Hall.

#### Part-Time Study

The college ordinarily expects its students to be full-time students. Except in the case of Ithaca residents who are twenty-three years of age or older, part-time attendance is permitted only in unusual circumstances.

In certain circumstances seniors who are completing their final term in the college may be allowed to register in the Division of Extramural Study for fewer than 12 credits. Tuition is charged per credit. The guidelines for granting this permission are adhered to strictly.

Guidelines for part-time study:

1) A student who has completed all degree requirements by the end of the seventh term, and could have received permission to accelerate, may receive permission to study part-time during the eighth term.
2) A student who has completed all degree requirements in seven terms but is majoring in a department that requires candidates for honors to complete the thesis in the eighth term may be permitted to register for fewer than 12 credits.
3) A student who has received permission to accelerate, but who has been forced to drop a course (for reasons beyond his or her control) and has not been able to complete the course work on schedule, may be able to complete the requirements as a part-time student.
4) A student who is pursuing honors work and must complete extensive research away from the campus, which precludes registering for additional courses, may be allowed to register for fewer than 12 credits.

## ACADEMIC STANDING

Students are in good standing for the term if they successfully complete at least 12 credits by the end of the term and receive no more than one D and no F or U grades. If a student completes only three courses, all grades must be above D. In addition, students are

expected to make satisfactory progress toward satisfying requirements for the degree. They are expected to earn grades of C (not C–) or better in at least 100 of the total credits for the degree.

## Honors

### Dean's List

Inclusion on the Dean's List for academic excellence is an honor bestowed by the dean of the college. The criteria are subject to change from semester to semester and are available in the Office of Records and Scheduling, M46 Goldwin Smith Hall.

### Bachelor of Arts with Honors

Almost all departments offer honors programs for students who have demonstrated exceptional ability in the major and who seek an opportunity to explore branches of their subject not represented in the regular curriculum or to gain experience in original research. The honors programs are described by individual departments in the following sections. The degree of Bachelor of Arts with honors will be conferred upon students who, in addition to having completed the requirements for the degree of Bachelor of Arts, have satisfactorily completed the honors program in their major and have been recommended for the degree by their major department, the Independent Major Program, or the College Scholar Program.

### Bachelor of Arts with Distinction

The degree of Bachelor of Arts with distinction in all subjects will be conferred on students who, in addition to having completed the requirements for the degree of Bachelor of Arts, have:

1) completed at least 60 credits while registered in regular sessions at Cornell;
2) ranked in the upper 30 percent of their class at the end of their seventh semester, or next-to-last semester for transfers and accelerants;
3) received a grade below C– in no more than one course;
4) received no failing grade;
5) maintained good standing in each of their last four terms; and
6) have no *Incompletes* remaining on their records.

## Failure to Maintain Good Standing

Students are not in good standing if they complete fewer than 12 credits, except for second-semester seniors who need fewer credits and courses to graduate; if they have more than one D, or one D in a schedule with only three courses, or any F or U grades; if they have not made satisfactory overall progress in grades or credits (whether due to failures or *Incompletes)* or in the requirements of the college or the major. Such students will be considered for academic action by the Committee on Academic Records or one of the deans of the college.

### Academic Actions

**Warning.** Any student who fails to maintain good standing will at least be warned. The warning may be given by an assistant dean in the college or by the faculty's Committee on Academic Records. A warning is posted on a student's unofficial college transcript but is not reported to the university registrar and does not appear on official transcripts.

**Required leave of absence.** A student in serious academic difficulty may be required by the Committee on Academic Records to take a leave of absence, normally for a full year. Usually, but not necessarily, the Committee on Academic Records warns a student before suspending her or him. Before being allowed to return and reregister in the college, students must submit a plan for completing the degree. In some cases the students will be required to furnish evidence that they are ready to return before being allowed to reregister in the college. Students who request to return in less than a year must present to the committee exceptionally strong evidence of their readiness to return. "Required Leave of Absence" is posted on the student's unofficial college transcript; the university registrar is notified and, "Leave of Absence" and the date will appear on the student's official transcript.

**May not reregister.** The Committee on Academic Records may dismiss a student from the college because of a highly unsatisfactory record for one term or for failure to make satisfactory overall progress in grades, credits, or the requirements of the major. This action expels the student permanently from the college. "May Not Reregister" is posted on the student's unofficial college transcript, the university registrar is notified, and "May Not Reregister in the College of Arts and Sciences" and the date will appear on the official transcript.

Students being reviewed for academic action are urged to present evidence that will help explain their poor academic performance. Students may appeal a decision or action of the committee if they have new relevant information to present.

# GRADES

## Letter Grades

See Grading Guidelines.

## S-U Grades

The S-U option allows students to explore unfamiliar subject areas without being under pressure to receive high grades. It is not meant to reduce the amount of work a student completes in a course or the amount of effort a student devotes to a course. *Students may elect during the first three weeks of the term* to receive a grade of S (satisfactory) or U (unsatisfactory) instead of one of the letter grades (A+ through F), provided that the instructor is willing to assign such grades. *Students may not elect the S-U option after the third week of the term.* A grade of S is equivalent to a grade of C– or higher; a grade of U, which is equivalent to any grade below C–, is a *failing* grade equal to an F. S means the student receives the credit specified for the course. U means no credit is given. A few courses in the college are graded exclusively S-U; in that case, the final grade appears on the transcript as SX or UX.

Courses that will count toward satisfaction of major requirements should not be taken for an S or U grade unless the department grants permission. Students may elect the S-U option in courses used to satisfy the distribution and language requirements, provided that such courses do not also count toward major requirements or serve as prerequisites for admission to the major. Students are advised to use the S-U option sparingly if they intend to apply to graduate school or for transfer to another college. There is no limit on the number of courses each term for which students may elect the S-U grade, but within the 120 credits required for the degree, a minimum of 80 credits must be in courses for which a letter grade was received.

With special permission students may change from S-U to a letter grade within the first five weeks of the term, although a $10 fee is charged after the third week.

## Grades of Incomplete

A grade of incomplete signifies that a course was not completed before the end of the term for reasons beyond the student's control that are acceptable to the instructor. Students must have substantial equity in the course; that is, they must be able to complete the remaining work without further registration and must have a passing grade for the completed portion. When a grade of incomplete is reported, the instructor will state what work must be completed, when it must be completed, and the grade earned if the work is not completed by that date. Unless the instructor stipulates otherwise, students will be allowed one term plus one summer to make up the work. When a final grade is reported, it is recorded on the official transcript with an asterisk and a footnote explaining that this grade was formerly an incomplete.

Once a grade of incomplete is assigned, the college does not change it unless and until the faculty member submits a change of grade form or gives written permission to "freeze" it as an incomplete.

Students must consult the instructors to resolve any incompletes before graduation.

## R Grades

R designates two-semester or year-long courses. The R is recorded on the student's transcript at the end of the first term. The grade recorded at the end of the second term shows the student's level of performance in the course for the entire year. The total credits that will be earned for the whole course are listed each term.

## Grade Reports

Grade reports for the fall term are included in spring-term registration materials; grade reports for the spring term are mailed to students at their home addresses.

The college does not compute class rank.

## CALENDAR SUPPLEMENT

All of the dates in the university calendar at the front of this volume apply to all Cornell students. Listed below are some additional dates that are of importance for students in the College of Arts and Sciences.

| | *Fall* | *Spring* |
|---|---|---|
| First deadline for submitting independent major requests. Go to Academic Advising Center, 55 Goldwin Smith Hall, for further information. | Sept. 27 | Feb. 28 |
| Last day for adding courses without petition. | Sept. 22 | Feb. 9 |
| Last day for dropping courses without $10 fee. | Sept. 22 | Feb. 9 |
| Last day for changing grade option (S-U). | Sept. 22 | Feb. 9 |
| Second deadline for submitting independent major requests. Go to Academic Advising Center, 55 Goldwin Smith Hall, for further information. | Nov. 27 | April 18 |
| Last day for requesting leave of absence or withdrawal for the current term. | Oct. 27 | March 16 |
| Last day for dropping courses without petition. | Oct. 27 | March 16 |
| Deadline for applying to study abroad. | See assistant dean Rosenberg, Academic Advising Center | |
| Pre–course enrollment (pre-registration) for the following term (tentative). | Oct. 25–Nov. 8 | March 28–April 11 |
| Last day to petition to drop a course. | Nov. 17 | April 17 |
| Deadline for applying to the College Scholar Program. | | April 25 |
| Deadline for requesting internal transfer to the College of Arts and Sciences for the following term. | Dec. 1 | June 1 |

## ADMINISTRATION

Geoffrey V. Chester, dean

Lynne S. Abel, associate dean

Glenn C. Altschuler, associate dean and director of academic advising and dean for freshmen

Thak Chaloemtiarana, associate dean and director of admissions

Jane V. Pedersen, director of finance and administration

Rosemary Silbey, director of development

Bonnie Buettner, assistant dean for seniors and career programs and prelaw adviser

Beatrice G. Rosenberg, assistant dean for study abroad, dual degree programs, and fellowships and scholarships

Janice Turner, assistant dean for minority affairs and premedical adviser

Margaret C. Unsworth, assistant dean for sophomores and juniors

Marilyn Williams, assistant dean for undergraduate research and academic integrity

Patricia Dougherty, college registrar

Michele T. Crane, associate registrar

# Courses and Departments

## SPECIAL PROGRAMS AND AREAS OF CONCENTRATION

The college offers a number of special and interdisciplinary programs that are described following the departmental program descriptions. Students may devise an independent major with the aid of any of these programs or develop an informal minor field. (Informal minors are not listed on the student's official record.)

## GENERAL EDUCATION COURSES

See also "Common Learning Courses," p. 15.

The introductory and advanced courses offered by departments in their respective disciplines and fields comprise the bulk of the curriculum in the College of Arts and Sciences. Most of these courses are accessible to almost all students who are interested in them. However, the faculty of the college also offers general education courses, including interdisciplinary courses for a broad audience, courses that provide insight into a particular discipline for students who are not specializing in that field, and courses for advanced students who consider a discipline in terms of its history, its presuppositions, or its relation to other branches of knowledge. The following courses have been identified by the various departments of the College of Arts and Sciences as particularly appropriate, by that definition, for general education. For full course descriptions consult the departments' sections of the catalog.

### American Studies

Some professors in English and history with an interest in American studies regularly teach courses that emphasize the interconnections of literary and historical materials. Some courses focus on these interconnections with a nonspecialist audience in mind; others aim at an upper-level audience to put literature and history in a comparative perspective with respect to a common subject. These purposes may suit not only American studies, English, or history majors, but the general-education interests of nonmajors. Members of the American Studies Committee can be consulted about the pertinence of their courses to general education.

### Archaeology

Several members of the Archaeology Program offer general education courses suitable for nonmajors. These are listed under the departments that offer archaeology courses, such as the departments of Anthropology, Classics, History of Art, and Near Eastern Studies. The Archaeology Program itself also offers:

**203 Early People: The Archaeological and Fossil Record (also Anthropology 203)**
Fall. 3 credits.
T R 11:40–12:55. T. P. Volman.

### Asian American Studies

**110 Introduction to Asian American Studies**
See Special Programs and Interdisciplinary Studies.

### Asian Studies

**211 Introduction to Japan**
Fall. 3 credits.
M W 11:15 plus disc, R 1:25–2:30, or F 10:10, 11:15 or 12:20. N. Sakai.

**212 Introduction to China**
Spring. 3 credits (4 credits with a special project; consult instructor for information).
T R 1:25 plus disc, R 2:30 or F 10:10, 11:15 or 1:25. J. Zeitlin.

**215 Introduction to South Asian Civilizations**
Fall. 3 credits (4 credits with a special project; consult instructor for information).
M W F 11:15. D. Gold.

**[218 Introduction to Korea**
Spring. 3 credits. Not offered 1989–90.
D. McCann.]

**[220 The Poet in Asia**
Spring. 3 credits. Not offered 1989–90.
D. McCann.]

### Astronomy

**[490 Senior Seminar—Critical Thinking**
Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. C. Sagan.]

### Classics

**211 The Greek Experience**
Fall. 3 credits.
T R 10:10–11:25. F. Ahl.

**212 The Roman Experience**
Spring. 3 credits.
M W F 1:25. J. Ginsburg.

**217 Initiation to Greek Culture**
Fall. 4 credits.
M W F 10:10, plus 1 hr. to be arranged.
J. Coleman, J. Romm.

**218 Initiation to Roman Culture**
Spring. 4 credits.
M W F 10:10, plus 1 hr. to be arranged.
D. Mankin, J. Whitehead.

**219 Mediterranean Archaeology (also Near Eastern Studies 267)**
Fall. 3 credits.
M W F 12:20. J. Coleman.

**220 Introduction to Art History: The Art of the Classical World (also History of Art 220)**
Spring. 3 credits.
M W F 10:10. J. Coleman.

**[221 Minoan-Mycenaean Art and Archaeology (also Archaeology 221 and History of Art 221)**
Fall. 3 credits. Not offered 1989–90.]

**[225 Hellenistic and Roman Philosophy**
4 credits. Not offered 1989–90.
P. Mitsis.]

**235 Modern Greek Poetry and Politics (also Comparative Literature 235 and Government 335)**
Fall. 3 credits.
T R 1:25–2:40. G. Holst-Warhaft.

**236 Greek Mythology (also Comparative Literature 236)**
Fall. 3 credits.
T R 11:40–12:55. D. Mankin.

**[237 Greek Religion and Mystery Cults**
Spring. 3 credits. Not offered 1989–90.
T R 11:40–12:55. K. Clinton.]

**238 The Ancient Epic**
Spring. 3 credits.
M W F 10:10. H. Pelliccia.

**[239 Greek and Roman Mystery Cults and Early Christianity**
3 credits. Not offered 1989–90.
K. Clinton.]

**[250 Etruscan Art and Archaeology**
Fall. 3 credits. Not offered 1989–90.
J. Whitehead.]

**[300 Greek and Roman Drama (also Comparative Literature 300)**
4 credits. Not offered 1989–90.]

**[337 Ancient Philosophy of Science**
Spring. 4 credits. Not offered 1989–90.]

**[339 Ancient Wit (also Comparative Literature 339)**
Fall. 4 credits. Not offered 1989–90.
F. Ahl.]

**346 The Classical Influence on Renaissance Literature (also Comparative Literature 346)**
Spring. 3 credits.
T R 10:10–11:25. J. Romm.

**363 Representations of Women in Ancient Greece and Rome (also Women's Studies 363)**
Fall. 4 credits.
M W 2:30–3:45. L. S. Abel, J. Ginsburg.

## English

See, in the department's listing, "Courses Primarily for Nonmajors."

## Geological Sciences

**101 Introductory Geological Sciences**
Fall, spring. 3 credits.
2 lecs, 1 lab, field trips, evening exams in the fall term. Fall, J. M. Bird, D. L. Turcotte; spring, W. B. Travers.
To better harmonize human endeavor with the natural earth we need to know what is natural on earth. This course teaches observation and understanding of landscape, including coasts, rivers, valleys, and glaciated regions; the genesis of earthquakes, volcanoes, and mountains; evidence for the drifting of continents and its consequences; and the origin, discovery, and development of mineral and water resources. The lab teaches use of topographic and geologic maps and recognition of minerals and rocks and includes field trips to Cascadilla Gorge, Fall Creek, and Enfield Glen.

**102 Introduction to Historical Geology**
Spring. 3 credits. Prerequisite: Geological Sciences 101 or permission of instructor.
2 lecs, 1 lab, evening exams. J. L. Cisne.
A continuation of Geol 101. History of the earth and life in terms of evolutionary processes. The geologic record, its formation, and interpretation of earth history. Introduction to the evolution of life and to fossils and their use in reconstructing past environments and dating rocks.

**103 Geology in the Field**
Fall. 3 credits. Limited to 35 students.
1 lec, 1 field trip or lab, 1 rec.
A. L. Bloom.
The subject matter of Geol 101, Introductory Geological Sciences, taught as much as possible by field trips in the campus and vicinity on foot and by bus. Weekly field trips until November introduce most of the major topics of the course, supplemented by lectures, recitations, and labs (later in the term).

**104 Introduction to Oceanography**
Spring. 3 credits. Prerequisites: high school physics, chemistry, biology, and earth science or permission of instructor.
2 lecs, 1 lab. W. M. White.
The oceans remain one of the last frontiers for man, yet they affect our lives in many subtle ways. This course presents a survey of what is known of the physics, chemistry, geology, and biology of the oceans and is intended for both science and non-science majors. Topics include: sea-floor spreading and plate tectonics; geology and biology of mid-ocean ridges; biological and geological controls on the chemistry of seawater; ocean currents and circulation; the oceans and climate, including El Niño, the greenhouse effect, and the Ice Ages; ecology of open ocean, ocean bottom, and near-shore communities; coastal processes; marine pollution and waste disposal; mineral and biological resources of the sea; Law of the Sea. Presented at the level of *Scientific American*.

**111 To Know the Earth**
Fall. 3 credits.
2 lecs, 1 lab, and field trips. J. E. Oliver.
A course to acquaint the non-scientist with the earth. Geology as an intellectual challenge, a provider of resources, an environment, a danger, a base for culture, and a science among sciences. The story behind landscapes, mountains, earthquakes, volcanoes, oceans, gold, petroleum, and icecaps. The record of the past, the context of the present, the forecast for the future.

**202 Environmental Geology**
Spring. 3 credits.
2 lecs, 1 rec, lab or field trip. D. E. Karig, A. L. Bloom.
In-depth introduction to geologic processes that affect or are affected by human society, including stream behavior and floods, earthquakes, land stability and mass-wasting, and volcanic hazards. This material provides an application of geology to engineering, natural resources, and land-use planning. Local examples will be discussed and visited on short field trips. The course can be taken as an introduction to geology, but also serves as a continuation to Geol 101.

## German Literature

**283 Contemporary European Society and Politics (also History 283 and Government 343)**
Fall. 4 credits.
T R 2:55–4:10. N. Karwan, J. Pontusson, G. Waite.

**322 Medicine and Civilization (also Biology and Society 322 and HPST 322)**
Spring. 4 credits.
T R 1:25–2:40. S. L. Gilman.

**347 Reading Freud: Race, Gender, and Psychoanalysis (also Comparative Literature 347, English 347, HPST 347, and Psychology 389)**
Fall. 3 credits.
F 1:25–3:20. S. L. Gilman.

**349 Anti-Semitism in Germany and the Jewish Response (also Near Eastern Studies 349)**
Fall. 3 credits.
M 1:25–3:20. S. L. Gilman.

## History of Art

All 200-level courses and some 300-level courses. See department listing.

## Psychology

**326 Evolution of Behavior**
Fall. 4 credits.
T R 2:30–4. R. Johnston.

**418 Psychology of Music**
Spring. 3 or 4 credits.
T R 1:25–2:40. C. Krumhansl.

## Russian Literature

**307 Readings from Russian Culture**
Fall. 4 credits.
M W F 9:05. G. Shapiro.

**[329 Eastern Europe Today: Economics, Government, Culture (also Economics 329 and Government 326)**
Fall. 4 credits. Not offered 1989–90.
T R 2:55–4:10. G. Gibian, M. Rush, G. Staller.]

**[350 Education and the Western Literary Tradition (also Comparative Literature 350 and College Scholar 350)**
Spring. 4 credits. Not offered 1989–90.
M W F 10:10. P. Carden.]

**367 The Russian Novel (also Comparative Literature 367)**
Fall. 4 credits.
T R 9:05 plus one hour to be arranged.
G. Gibian.

**[373 Chekhov**
Fall. 4 credits. Not offered 1989–90.
T R 11:40–12:55. S. Senderovich.]

## Sociology

**101 Introduction to Sociology**
Fall or spring. 3 credits.
M W 11:15–12:05 plus one section.
Fall, S. Caldwell; spring, M. Hannan.
With a focus on public issues that might in any semester include collective violence, markets and organizations, and social policies aimed at lowering the rate of poverty, this course provides an introduction to theory and research in sociology and demonstrates how the insights and methods of sociological analysis can be brought to bear in understanding major issues of public life. The goal is to convey a sense of the interrelations between the formulation of theories about social behavior and the collection and analysis of data in order to evaluate those theories. Instead of simply describing research, this course provides "hands-on" experience in analyzing sociological problems. Students undertake guided research exercises that involve using computers to analyze actual data. No prior background is presumed; necessary skills are covered in class and section meetings.

**103 Introduction to Sociology: Microsociology**
Fall. 3 credits.
M W F 9:05–9:55. D. P. Hayes.
An introduction to microsociology, focusing on concepts and theory of social processes within small groups, including the family. Emphasis is on leadership, conformity, social influence, cooperation and competition, distributive justice, and micro-analyses of interaction.

**104 Class, Race and Ethnicity**
Spring. 3 credits.
T R 10:10–11:25. S. Olzak.
What is the relationship between race and social class? To what extent does discrimination produce barriers to achievement and attainment for African Americans, Hispanics, Asians, and other immigrants in American society? Why are some groups more likely to be the target of ethnic and racial hostility than others? This course uses sociological analyses to answer these questions about the nature of race, ethnicity, and social class in our society and others. This course is designed as an introduction to the sociology of inequality and is primarily for freshmen and sophomores.

**106 Family and Work**
Spring. 3 credits.
T R 10:10–11:25. L. Smith-Lovin.
The events of the past 30 years have profoundly transformed arrangements governing love, work, and their routinization in households and employment. In this course, students will look at data from census and time use studies showing what has changed and what has remained relatively stable. Sociological theories that explain these trends will be examined. Students will have the opportunity to test their own ideas with analyses of data from a national survey. The impact of sociological ideas for public issues like child care, welfare policy, sex discrimination statutes, and comparable worth will be discussed. This course is primarily for freshmen and sophomores.

**202 Writing in the Social Sciences (also Writing 202)**
Fall or spring. 3 credits. Limited to 17 students each section. Prerequisite: one social sciences course.
T R 11:40–12:55. K. Hjortshoj.
This course helps students write and read with more confidence and skill, especially in the social sciences. The course investigates the ways in which social scientists use language. How and why does their writing vary? How do their theories, objectives, methods, and audiences affect their writing? We will address these questions through discussion and writing about works by social scientists in various fields. Both discussion and writing will aim to strengthen the composition skills that are important in academic work: analysis, comparison, and summary of texts; description and argument; handling of evidence, references, and quotations; and strategies for revision. Instruction will include frequent individual conferences on finished essays and work in progress. Students will write, and often revise, eight to ten papers—about 30 pages of finished work.

**310 Sociology of War and Peace**
Fall. 4 credits. Prerequisite: a course in sociology of government.
T R 1:25–2:40. R. M. Williams, Jr.
Every human group, community, or society presents many examples of altruism, helping, cooperation, agreement, and social harmony. Each grouping or society also manifests numerous examples of competition, rivalry, opposition, disagreement, conflict, and violence. Both conflict and cooperation are permanent and common aspects of the human condition. Collective conflicts, especially wars and revolutions, are frequent and dramatic events. But "peace" and "war" are equally active social processes, not passive happenings. This course describes various commonly accepted but erroneous notions of the causes and consequences of war and deterrence. It deals with the major theories concerning the sources of war in international and intranational social systems. The last half of the course analyzes the modes, techniques, and outcomes of efforts to restrict, regulate, and resolve international conflicts.

**335 Industrial and Post-Industrial Society**
Spring. 4 credits. Open to juniors and seniors in any department. No prerequisites.
T R 1:25–2:40. D. Weakliem.
Service and information based industries are steadily growing in all modern societies. Many people claim that this development fundamentally changes social structure, social conflict, politics, and culture. Others say that post-industrial society is just a continuation of industrial society. This course will explore issues concerning post-industrial society: for example, are traditional social categories such as class or religion giving way to new divisions? It will explore theories of post-industrial society and allow students to test them with data on recent changes in social conditions.

**365 Comparative Perspectives on Socialist Societies and Economies**
Fall. 3 credits. Open to juniors and seniors in any department. No prerequisites.
W 2:30–4:25. V. Nee.
This course focuses on analyzing the relationship between state, economy, and society in socialist societies. Particular attention is given to the tensions between planning and market, equality and equity, center and locality, bureaucratic domination and individual choice, and ideology and dissent. What are the problems in state-socialist societies and what are the dynamics and limits of reform movements? What are the areas of difference and convergence in the patterns of state, market, and household relations in capitalist and socialist societies? Readings will draw primarily on case studies of the Chinese, Eastern European, and Soviet experiences.

# AKKADIAN

See Department of Near Eastern Studies.

# AMERICAN STUDIES

J. Porte (260 Goldwin Smith Hall, 255-8349), chair and director of undergraduate studies; S. Blumin, H. L. Gates, M. Kammen, D. McCall, R. L. Moore, R. Polenberg, S. Samuels, F. Somkin, S. C. Strout (Emeritus)

## The Major

The major in American studies, appropriate for a wide variety of future vocations, is basically a program of coordinated study in the history and literature of the United States. It is not a "double major." The prerequisites are minimal: one course in European, British, or American history at the 100 or 200 level and one course in British or American literature at the 200 level. The major itself is structured and demanding, and students who expect to become American studies majors should apply to the chair to arrange for a major adviser.

In consultation with their advisers, American studies majors elect 32 credits (or eight courses) of work in the history and literature of all three large periods into which an account of the nation's development can be divided, defined for the purposes of the program as colonial, nineteenth century, and twentieth century. To gain both depth and breadth, they select as an area of concentration either a single period (or the connections between two of the periods) and take either 16 credits in one period and 8 credits in each of the other two, or 12 credits in each of the two periods whose connections constitute the focus of the study and 8 credits in the third. In addition, they take one of the adviser-approved interdisciplinary seminars at the 400 or 600 level. When the subject matter is appropriate, such a seminar may count toward the satisfaction of the period requirements. Students may divide the work between history and literature in whatever proportion serves their interests, provided that they take no more than two-thirds of their courses in any one department.

Beyond the basic requirements in American history and American literature, 12 credits above the elementary level are required in allied subjects. Eight credits of work are in the history or literature, or both, of another related culture; and 4 credits are in American thought, society, or culture studies from the perspective of another discipline such as anthropology, economics, government, history of art, or sociology. (This last 4-credit requirement may be satisfied outside the college.)

Courses in American history that will satisfy the 32-credit requirement described in the second paragraph are offered by the Department of History; those in American literature are offered by the Department of English, the Department of Theatre Arts, and the Africana Studies and Research Center. Occasionally a course that fits an individual student's program may be offered elsewhere. Substitution will depend on the adviser's approval. Advisers determine what courses count for the interdisciplinary seminar.

**Honors**. Candidates for honors must maintain an average of B+ in courses pertinent to the major. To be eligible for a degree with honors in American studies, a student must in the senior year either write an honors essay for American Studies 493, Honors Essay Tutorial, or submit to the American Studies Committee three term papers written for courses in the major and take an oral examination in the declared area of special interest.

**465 Proseminar in American Studies (also English 465)**
Spring. 4 credits.
W 1:25–3:35. J. Porte and members of the American Studies Program.
Selected topics in American history, literature, the arts, and politics. Recommended for American Studies majors.

**493 Honors Essay Tutorial**
Fall or spring. Up to 4 credits each semester.
See J. Porte for appropriate advisers.

# ANTHROPOLOGY

A. T. Kirsch, chair; R. Ascher, J. Fajans, C. J. Greenhouse, D. J. Greenwood, J. S. Henderson, D. H. Holmberg, B. J. Isbell, B. Lambert, T. F. Lynch, K. S. March, C. Morris, P. S. Sangren, J. T. Siegel, M. F. Small, R. J. Smith

Anthropology is unique in that it takes humanity in its broadest sense as its subject matter. It is a discipline that stresses the world's cultural diversity by means of a comparative perspective. This means that anthropologists are interested in cultural differences in and among modern societies as well as cultural change over time. As we look ahead to the 21st century, anthropology prepares students to think globally about humankind as thinkers, actors, builders, and as living organisms in a complex and fragile ecosystem.

The three branches of anthropology are archaeology, biological anthropology, and sociocultural anthropology. Archaeologists collect and interpret the record of the past to extend our understanding of human history and social change. That record tells the story not only of "ancient" societies, but also of the rise of civilizations that were the direct forebears of the contemporary nations that we know today. Archaeology also tells the story of human origins, the invention of farming and settled life, the rise of complex social institutions and technologies, and the worldviews of the past, among other themes. Biological anthropologists consider human experience from the perspective of questions of evolution, anatomy, genetics, cognition, nutrition, disease, medicine, ecology, and primate studies, offering multiple approaches to the question of human beings' "humanness." Some essential human attributes (complex thinking and communication, social organization, among other things) are shared with other higher primates. Sociocultural anthropology, like archaeology, looks at the worlds humans make for themselves. Sociocultural anthropologists examine the diversity of behaviors, relationships, economies, political and legal orders, worldviews, logics, languages, symbols, myths, and religions—among the many other means human beings invent to create and reproduce social life around the world. Sociocultural anthropologists collect data primarily through ethnographic fieldwork, that is, months or years participating and observing in the societies they study.

Together, the three branches of the discipline offer an integrated approach to the immense diversity of human experience. Through its subject matter, theories, and methods, anthropology also offers students a chance to integrate the three divisions of the university: the humanities, social sciences, and natural sciences. Each branch of anthropology involves these three subject areas in different ways. For purposes of distribution requirements in the College of Arts and Sciences, courses in anthropology count toward the social science requirement.

The major is designed to offer students opportunities to study all three branches of anthropology, through courses on particular topics (e.g., agriculture, religion, or economics), on world areas, and on theoretical problems. The requirements for majors are outlined below. Within the major, students may design their own specialties in consultation with a faculty adviser. Specialties may be developed through any combination of 300- and 400-level courses in the department, independent study, courses in related fields, and honors work.

## The Distribution Requirement

The social science requirement is met by completing Anthropology 102 and any full course (3 or 4 credits) in categories III, IV, V, and VI from the listings below, or any two courses in those categories.

The biological science requirement is met by completing any two of Anthropology 101, 275, 371, 390, 474, or 490.

The expressive arts requirement is met by completing any two of Anthropology 450, 451, 452, 453, or 455.

## The Major

1) Applicants for the major in anthropology must complete Anthropology 101 and 102. Preferably, these courses will be taken in the freshman or sophomore years.

2) Students who major in anthropology:

   a) Take Anthropology 300, preferably no later than their sophomore year.

   b) Take Anthropology 420, preferably in the fall term of their senior year.

   c) Take at least one course at the 200 level or above in each of categories III, IV, V, and VI from the listing below.

   d) Develop one or more areas of specialization within the discipline in consultation with his or her faculty adviser. Examples of such specializations include sociocultural anthropology, anthropological archaeology, theory and history, and biological anthropology.

   e) Take a total of 32 credits of course work, in addition to Anthropology 300 and above the 100 level. Up to 8 credits of course work in cognate disciplines related to the student's specialization may be accepted for the major with the permission of the faculty adviser.

   f) When appropriate, special provisions for meeting major requirements may be arranged with the faculty adviser's approval.

**Honors**. Anthropology majors interested in the honors program should consult the director of undergraduate studies before the beginning of their senior year and apply for admission to the program. Candidates for the degree of Bachelor of Arts with honors in anthropology must complete a thesis in the final term of the senior year. Students may enroll in Anthropology 491 or 492, Honors Thesis, after obtaining the consent of the Honors Committee. The decision to award honors and in what degree is based on the quality of the thesis and the student's overall record.

## Facilities

The anthropology laboratory contains a small statistical and reference library as well as basic drafting and photographic equipment. In addition, the department has a collection of archaeological and ethnological materials used in teaching and research.

## Special Programs

Specialized individual study programs are offered in Anthropology 497–498, Topics in Anthropology, open to a limited number of juniors and seniors who have obtained consent of the instructor. Undergraduates should also note that most 600-level courses are open to them if consent of the instructor is obtained.

The Department of Anthropology holds colloquia throughout the academic year. Faculty members from Cornell and other universities participate in discussions of current research and problems in anthropology. Students are encouraged to attend.

Anthropology majors have also established an anthropology club, which sponsors educational and social events in conjunction with graduate students and faculty in the department.

## I. Introductory Courses (including Freshman Writing Seminars)

*Note:* For additional freshman writing seminars in anthropology, see "Freshman Writing Seminars" and the John S. Knight Writing Program's special brochure.

**101 Introduction to Anthropology: Biological Perspectives on the Evolution of Humankind**
Fall. 3 credits (4 by arrangement with instructor).
M W 12:20 plus disc, F 9:05, 11:15, or 12:20. M. F. Small.
The evolution of humankind is explored through the fossil record, studies of the biological differences among current human populations, and a comparison with our closest relatives, the primates. This course investigates the roots of human biology and behavior with an evolutionary framework.

**102 Introduction to Anthropology: The Comparison of Cultures**
Spring. 3 credits (4 by arrangement with instructor).
M W 12:20 plus disc, F 11:15, 12:20, or 2:30. D. H. Holmberg.
An introduction to cultural anthropology through ethnographies, or the descriptive accounts of anthropologists. Through readings and lectures students acquaint themselves with a number of cultures from several parts of the world. The cultures range in form from those of small-scale tribal societies to those of state societies. Throughout the course we attempt to make sense of exotic cultures in their own terms. Attention is focused on variation in cultural patterns as they are expressed in social, economic, and ritual practices. In this encounter the principles of anthropology, as a comparative enterprise that poses distinct cultural systems in relief, will be developed. Fiction, films, and exercises supplement the formal anthropological materials.

**[121 Encounters with Other Cultures**
Spring. 3 credits. Freshman writing seminar. Not offered 1989–90.]

## II. Courses Intended Primarily for Majors

**300 The Discipline of Anthropology**
Fall. 4 credits. Limited to, and required of, anthropology majors, who must take this course in their sophomore year or no later than the fall term of the junior year.
T R 1:25–2:40. A. T. Kirsch with the anthropology faculty.
The course is an overview of the field of anthropology; it provides a systematic treatment of the discipline, the concepts that are used, the persistent questions that are asked, the specializations within the field, and the shared goals and differing viewpoints. The course is intended to help majors plan their course work.

**[420 Development of Anthropological Thought**
Spring. 4 credits. Not offered 1989–90.]

**491 Honors Thesis**
Fall. 4 credits. Prerequisite: consent of the Honors Committee. Intended for majors graduating in mid year.
Hours to be arranged. Staff.
Independent work under the close guidance of a faculty member selected by the student.

**492 Honors Thesis**
Spring. 4 credits. Prerequisite: consent of the Honors Committee.
Hours to be arranged. Staff.
Independent work under the close guidance of a faculty member selected by the student.

**495 Social Relations Seminar (also Sociology 497)**
Spring. 4 credits. Limited to seniors majoring in social relations.
R 2:30–4:30. A. T. Kirsch.

**497–498 Topics in Anthropology**
497, fall; 498, spring. Credit to be arranged.
Hours to be arranged. Staff.
Independent reading course in topics not covered in regularly scheduled courses. Students select a topic in consultation with the faculty member who has agreed to supervise the course work.

## III. Archaeological Courses

See also courses listed under Archaeology.

**203 Early People: The Archaeological and Fossil Record (also Archaeology 203)**
Fall. 3 credits.
T R 11:40–12:55. T. P. Volman.
A survey of the archaeological and fossil record of human evolution. Contributions by researchers from a variety of scientific disciplines are highlighted, as are the discoveries, personalities, and controversies that have enlivened the study of human evolution for more than a century. Critical evaluation of evidence and interpretations will be stressed. Demonstrations and films supplement the lectures.

**[216 Ancient Societies**
Fall. 3 credits (4 by arrangement with instructor). Not offered 1989–90.]

**[352 Interpretation of the Archaeological Record**
Fall. 4 credits. Not offered 1989–90.]

**354 The Peopling of America**
Fall. 4 credits.
T R 8:40–9:55. T. F. Lynch.
Prehistoric discovery of the New World, beginning with American Indian origins in Asia and ending with the largely unrecorded European medieval contact with North America. Major topics include crossing the Bering land bridge, big-game hunting and extinctions, postglacial adaptations to changing environments, diversified subsistence in the eastern woodlands, agricultural civilizations of the Midwest and Southwest, and Eskimo and Norse exploration and settlement across the Arctic and North Atlantic.

**[355 Archaeology of Mexico and Central America**
Spring. 4 credits. Not offered 1989–90.]

**356 The Archaeology of South America**
Spring. 4 credits.
T R 8:40–9:55. T. F. Lynch.
Origins and development of South American peoples, subsistence systems, cultures, and civilizations, with special attention to Peru, Bolivia, Chile, and Ecuador. Major topics include the question of the first inhabitants, the domestication of plants and animals, the rise of temple-based religions and great art styles, regional interaction, and the formation of militaristic polities and the Inca state.

**[358 Archaeological Research Methods (also Archaeology 358)**
Spring. 4 credits. Not offered 1989–90.]

**[361 Field Archaeology in South America (also Archaeology 361)**
Spring. 10 credits. Not offered 1989–90.]

**[402 Archaeological Research Design (also Archaeology 402)**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.]

**404 Approaches to Archaeology (also Archaeology 404)**
Fall. 4 credits.
W 2:30–4:25. J. S. Henderson, T. P. Volman.
An exploration of the concepts that have shaped modern archaeology. The course briefly examines the history of theoretical orientations in archaeology, then considers the variety of perspectives and interpretive frameworks that guide present-day investigations. Case studies illustrate the implications of the nature of the archaeological record for reconstructing subsistence and economic systems, trade, social and political organization, demography, and ideology. An undergraduate seminar especially recommended for undergraduate majors and graduate archaeologists but open to anyone with a serious interest in archaeology.

**[435 Investigation of Andean Institutions: Archaeological Strategies**
Fall. 4 credits. Not offered 1989–90.]

**[493 Seminar in Archaeology**
Fall. 4 credits. Not offered 1989–90.]

**[494 Seminar in Archaeology**
Spring. 4 credits. Not offered 1989–90.]

**[496 Public Archaeology (also Archaeology 496)**
Spring. 4 credits. Not offered 1989–90.]

## IV. Biological and Ecological Anthropology

**208 Gender, Race, and Medical "Science" (also Africana Studies 208 and Women's Studies 208)**
Fall. 3 credits.
T R 11:40–12:55. G. Fraser.
The course will examine the social construction of race and gender in the medical sciences from the turn of the century to the present. Beginning with readings that propose a new view of scientific medicine as a system of signs and symbols and as culturally embedded, we will proceed to an examination of some of the following topics: racism and experimentation—the treatment of venereal disease and tuberculosis; the demise of social childbirth; the body as a medical product; menstruation as pathology; the monitored mind—women and psychiatry; the political economy of health care; medical authority—the training of medical students; political anatomy of the body; sites of resistance; and alternative systems—cross-cultural case studies.

**[214 Humankind: The Biological Background**
Spring. 3 credits (4 by arrangement with instructor). Not offered 1989–90.]

**275 Human Biology and Evolution (also Biological Sciences 275)**
Fall. 3 or 4 credits (4 credits with discussion). S-U grades optional, with permission of instructor.
M W F 10:10, optional disc, day and time to be arranged. K. A. R. Kennedy, J. D. Haas.
An introduction to the biology of *Homo sapiens* through an examination of human evolution, biological diversity, and modes of adaptation to past and present environments. Evolutionary theory is reviewed in relation to the current evidence from the fossil record and studies of the evolution of human behavior. A survey of human adaptation covers a complex of biological and behavioral responses to environmental stress. Human diversity is examined as the product of long-term evolutionary forces and short-term adaptive responses. Topics such as creationism, the Piltdown fraud, the sociobiology debate, genetic engineering, race and IQ, and racism are presented as examples of current issues in human biology. These topics and others are the focus of the optional one-hour weekly discussions.

**371 Human Paleontology (also Biological Sciences 371)**
Fall. 4 credits. Prerequisite: one year of introductory biology or Anthropology 101 or permission of instructor.
M W F 2:30; lab, 1 hr. each week to be arranged; occasional field trips.
K. A. R. Kennedy.
A broad survey of the fossil evidence for human evolution with special attention to skeletal and dental anatomy, geological contexts, paleoecology, dating methods, archaeological associations, and current theories of primate phylogeny.

**390 Primate Behavior and Ecology**
Spring. 4 credits. Prerequisite: Anthropology 101 or permission of instructor.
M W F 9:05. M. F. Small.
The course will investigate all aspects of nonhuman primate life. Based on the fundamentals of evolutionary theory, group and inter-individual behaviors will be presented. In addition, an understanding of group structure and breeding systems will be reached through an evaluation of ecological constraints imposed on primates in different habitats. Subjects include: primate taxonomy, diet and foraging, predation, cooperation and competition, social ontogeny, kinship, and mating strategies.

**[474 Laboratory and Field Methods in Human Biology (also Biological Sciences 474)**
Spring. 4 credits. Not offered 1989–90.]

**490 Primates and Evolution**
Spring. 4 credits. Prerequisite: Anthropology 390 or permission of instructor.
M W F 11:15. M. F. Small.
This seminar will focus on one current controversy in primatology. Through readings and discussion the issues will be subject to critical evaluation. Current topics might include: social intelligence, primates as predators and prey, primate conversation, sexual selection theory, reproductive success, dominance, etc.

## V. Sociocultural Anthropology

**205 Ethnographic Films**
Fall or spring. 2 credits.
W 7:30–9:25 p.m. Staff.
Human cultural and social variability is explored through a series of ethnographic films, and readings and lectures relating to these films. The films are chosen to show peoples living in a variety of ecological situations and at different levels of social complexity in various parts of the world (i.e., Africa, Asia, Australia, the Americas). Readings and lectures will use the concepts and theories of cultural anthropology to interpret the significance of the different modes of life shown in the films.

**211 Nature and Culture**
Spring. 3 credits (4 by arrangement with instructor).
M W F 9:05. P. S. Sangren.
Cultural anthropology, because it encompasses the comparative study of man in society, provides a unique vantage on the nature of man. One of the focal questions of the discipline is the relationship between the physical/biological and symbolic/moral worlds in which we live. This inquiry places anthropology squarely at the center of social theory, since all social theories and political ideologies are founded on premises regarding human nature. Through study of a variety of issues and debates (e.g., "sociobiology," the origin and meaning of the incest tabu), this course examines a variety of past and current attempts to explain the relationships between nature and culture in human life.

**[212 Social Anthropology**
Fall. 3 credits (4 by arrangement with instructor). Not offered 1989–90.]

**[301 Biology and Society: The Biocultural Perspective (also Biological Sciences 301 and Biology and Society 301)**
Fall. 3 credits (4 by arrangement with instructor). Not offered 1989–90.]

**305 Emotion, Cognition, and Culture (also Women's Studies 305)**
Fall. 4 credits.
T R 2:55–4:10. B. J. Isbell.
This course introduces students to the current anthropological perspective on the following topics: (1) cultural shaping of emotion, (2) acquisition and production of gender and sexuality, and (3) cognition and classification in cross-cultural contexts. It is appropriate for students majoring in anthropology, psychology, cognitive studies, and human development and family studies.

**[306 Ethnographic Description**
Spring. 4 credits. Not offered 1989–90.]

**[313 Anthropology of the City**
Spring. 4 credits. Not offered 1989–90.]

**[314 Applied Anthropology**
Fall. 4 credits. Not offered 1989–90.]

**321 Sex and Gender in Cross-Cultural Perspective (also Women's Studies 321)**
Fall. 4 credits.
M F 12:20 plus disc, W 9:05, 10:10, 11:15, 12:20, 1:25, 2:15. K. S. March.
An introduction to the study of sex roles cross-culturally and to anthropological theories of sex and gender. The course examines various aspects of the place of the sexes in social, political, economic, ideological, and biological systems to emphasize the diversity in gender and sex-role definition around the world.

**[322 Magic, Myth, Science, and Religion**
Spring. 4 credits. Not offered 1989–90.]

**[323 Kinship and Social Organization**
Spring. 4 credits. Not offered 1989–90.]

**326 Economic Anthropology**
Fall. 4 credits.
T R 8:40–9:55. P. S. Sangren.
Economic anthropology is the study of the organization of production, distribution, and associated values in radically different primitive and peasant societies. The course introduces the major competing stances—formalist (neoclassical), substantivist, and Marxist—that have developed frameworks for analysis of exotic economic systems. Other topics include the integration of local communities with larger economic systems, the articulation of capitalist and noncapitalist modes of production, and a critique of theories of value from an anthropological perspective.

**328 Law and Culture**
Spring. 4 credits.
M W F 11:15. C. J. Greenhouse.
Anthropologists' interests in the sociocultural context of human experience have shaped questions that center on the foundations of social order in human communities. People everywhere have ways of expressing and resolving conflict, although the cultural meanings of conflict and harmony differ around the world. This course examines the cross-cultural literature on interpersonal conflict and disputes, conflict resolution, and cultural constructions of accountability. We consider the role of law in these processes and the significance of access to law. Comparative discussions include ethnographic studies of modern communities in Africa, Asia, Europe, Latin America, Oceania, and the United States.

**[329 Power and Culture**
Spring. 4 credits. Not offered 1989–90.]

**406 The Culture of Lives (also Women's Studies 406)**
Spring. 4 credits.
R 1:25–3:20. K. S. March.
This seminar will look at persons, lives, cultures, and methods in anthropological life history materials. Throughout the seminar we will attend to the evolution of interest in, forms of, and uses for life history materials in anthropology, with special attention to differences in men's and women's lives and life (re)presentations.

**408 Gender Symbolism (also Women's Studies 408)**
Spring. 4 credits.
T 12:20–2:15. K. S. March
This seminar explores the propositions that gender is (1) not a collage of cultural universals, but nevertheless is elemental to the construction of culture, and (2) is not simply or transparently about the sexes, but still is integral to the construction of self and society. We will look at various cultures of gender, the processes and concomitants of their formation, and the place of the people who live and believe in them. In particular we will try to look beyond Western constructions of mutually exclusive, hierarchically related, and universally applied gender.

**412 Contemporary Anthropological Theory**
Fall. 4 credits.
M W F 11:15. B. Lambert.
A survey of the assumptions anthropologists make concerning the nature of society and culture, and the explanations they have proposed for social behavior, values, belief systems, and ritual. Problems of order in society will be approached through processual analysis and the concept of transaction; problems of understanding other cultures, through interpretative and structural studies of cultural logic and symbolism. Examples will be drawn from Western and non-Western societies, past and present.

**[414 Anthropology and History**
Spring. 4 credits. Not offered 1989–90.]

**424 Myth, Ritual, and Sign**
Fall. 4 credits.
T R 10:10–11:25. J. T. Siegel.
We will treat myth, ritual, and sign in their theoretical and practical dimensions, looking at them in the views of various social theorists and as described by ethnographers.

**426 Ideology and Social Reproduction**
Spring. 4 credits.
M 7:30–9:30 p.m. P. S. Sangren.
What is the logic of the process that links culture and social institutions? Why do all cultural systems (including "science") embody an element of logical circularity or delusion? How do theories of society, economy, and nature relate to values, authority, power, and legitimacy? Anthropology's comparative perspective on these questions is the focus of this course. Students will read and evaluate analyses of both familiar and exotic societies that focus on the dialectical relationship between ideas and institutions. The course will maintain a critical perspective toward contending theoretical positions (e.g., structuralist, Marxist, deconstructive) and encourage attention to the ideological dimensions of critical theory itself.

**[427 The Anthropology of Everyday Life**
Fall. 4 credits. Not offered 1989–90.]

**[428 Spirit Possession, Shamanism, Curing, and Witchcraft (also Women's Studies 428)**
Spring. 4 credits. Prerequisite: background in anthropology or women's studies. Enrollment limited. Not offered 1989–90.]

**434 Anthropology and Colonialism**
Spring. 4 credits.
T 2:30–4:30. J. T. Siegel
At the turn of the last century, literature in Malay, the lingua franca of the Netherlands East Indies was published, usually anonymously, by Dutch, as well as by Chinese born in the Indies and those whose first language was indigenous to the archipelago. We will look at the interplay of this literature and at its political consequences. Some reading will be in Dutch or Malay.

**450 Seminar on Ethnographic Film**
Spring. 4 credits. Enrollment limited by appropriate screening space.
T 10:10–12:35. R. Ascher.
When the first ethnographic film was screened in 1895, its maker saw in motion pictures a promise for the greater understanding among peoples. Has the promise been fulfilled? Responses to this question are examined through study of the debates about the place of film within what Margaret Mead called "a discipline of words." Going further, we enlarge the frame and consider ethnographic film in the light of general film theory, history, criticism, aesthetics, and ethics. Selected, relatively short films are viewed, leaving ample time for discussion and the development of a critical vocabulary.

**[451 Anthropological Boundaries**
Fall. 4 credits. Not offered 1989–90.]

**[452 Portraits, Profiles, and Life Histories**
Spring. 4 credits. Not offered 1989–90.]

**453 Visual Anthropology**
Fall. 4 credits. Enrollment limited by appropriate space for showing work. S-U grades only.
T 10:10–12:35. R. Ascher.
The expression of ideas about the human condition through original drawings, graphics, paintings, photographs, cinema, sculpture, and video *that take the person as subject.* Writing can be combined with visual expression, as, for example, in concrete poetry or photographic essays. Projects must conform to two general guidelines: (1) the student must have prior knowledge of the medium chosen or concurrent course work in it, and (2) the project must be one that can be developed throughout the course and benefit from its particular setting. In the first half, the creative work of others is studied. For example, we read Spiegelman's MAUS and view films made by both anthropologists and the people whom they visit. The second half is devoted to hour-long progress reports and discussions of the work of people in the course.

**[455 Theatre of Anthropology**
Spring. 4 credits. Not offered 1989–90.]

**480 Toward an Anthropology of the Female Body (also Women's Studies 480)**
Spring. 4 credits. Prerequisite: at least two social science courses.
Hours to be arranged. G. Fraser.
The main purpose of this course is to create a context for the discussion of central issues in the cross-cultural literature on the relationship between the female self, her body-mind, and the wider social order(s). All too easily Western feminists acknowledge but neglect to incorporate into their theoretical framework the perspectives of women from non-Western societies, from different historical periods, and from divergent classes. Do these differences challenge or support our vision of gender as a unifying category? By focusing on women's embodied selves, the hope is that we will begin to develop a critical theory that will reshape the boundaries of our old assumptions.

## VI. Area Courses

**230 Cultures of Native North America**
Fall. 4 credits.
M W F 2:30. B. Lambert.
A survey of the principal Eskimo and American Indian culture areas north of Mexico. Selected cultures will be examined to bring out distinctive features of the economy, social organization, religion, and worldview. Although the course concentrates on traditional cultures, some lectures and readings deal with changes in native ways of life that have occurred during the period of European-Indian contact.

**331 The United States**
Spring. 4 credits.
M W F 10:10. C. J. Greenhouse.
How do Americans define their own culture, and how do they learn how to "be" American? This course examines central images of American identity—freedom, equality, and individualism and explores their relationship to major social institutions: the family, the marketplace, social control, the political process, and religion. Readings combine contemporary American ethnography, popular social commentary, and comparative perspectives from sociocultural anthropology. Field assignments and discussion supplement the readings.

**[333 Ethnology of the Andean Region**
Spring. 4 credits. Not offered 1989–90.]

**334 Ethnology of Island Southeast Asia**
Spring. 4 credits.
T R 10:10–11:25. J. T. Siegel.
Peoples and cultures of Indonesia and the Philippines will be discussed, focusing on politics in its linguistic dimensions, as well as economic and cultural processes.

**[335 Peoples and Cultures of Mainland Southeast Asia**
Fall. 4 credits. Not offered 1989–90.]

**[336 Ethnology of Oceania**
Fall. 4 credits. Not offered 1989–90.]

**339 Peoples and Cultures of the Himalayas**
Fall. 4 credits.
M W F 3:35. K. S. March.
A comprehensive exploration of the peoples and cultures of the Himalayas. Ethnographic materials draw on the lifeways of populations living in the Himalayan regions of Bhutan, India, Nepal, and Tibet. Some of the cultural issues to be examined through these sources include images of the Himalayas in the West, forms of social life, ethnic diversity, political and economic history, and religious complexity.

**[342 Cultures and Societies of India, Nepal, and Sri Lanka**
Fall. 4 credits. Not offered 1989–90.]

**343 Religion, Family, and Community in China**
Fall. 4 credits.
T R 2:55–4:10. P. S. Sangren.
This course provides anthropological perspectives on family and kinship, religion and values, economy and polity, and social organization in China. Both traditional society and culture and transformations in the Peoples' Republic of China are considered. A major goal of the course is to provide a deeper understanding of the social and cultural fabric of the world's largest and longest-lived civilization.

**345 Japanese Society**
Fall. 4 credits.
T R 10:10–11:25. R. J. Smith.
A survey of the social structure of Japan and a discussion of trends in urban and rural life during the past century. Topics to be emphasized include the family, ancestor worship, community and social organization, and urbanism and modernization.

**[433 Andean Thought and Culture**
Spring. 4 credits. Not offered 1989–90.]

**[443 Religion and Ritual in Chinese Society**
Fall. 4 credits. Prerequisites: Anthropology 343 and background in the study of Chinese society. Not offered 1989–90.]

**[456 Mesoamerican Religion, Science, and History**
Fall. 4 credits. Not offered 1989–90.]

## VII. Graduate Seminars

600-level courses are open to undergraduates who have fulfilled the prerequisites or by consent of the instructor.

**601–602 The Teaching of Anthropology**
601, fall; 602, spring. 2 credits. Enrollment limited. Letter grade only.
Hours to be arranged. D. H. Holmberg, M. F. Small.
This seminar is designed for graduate teaching assistants in Anthropology 101 and 102. The pedagogical goals and techniques for labs and sections are discussed at length. The fall term class is taught in conjunction with Anthropology 101 and is directed toward teaching of biological anthropology. The spring term class is taught in conjunction with Anthropology 102 and is directed toward issues in the teaching of sociocultural anthropology.

**Southeast Asia Seminar: Vietnam (Asian Studies 601)**

**Southeast Asia Seminar: Upland Peoples of Mainland Southeast Asia (Asian Studies 602)**

**Contemporary Sociological Theories of Development (Rural Sociology 606)**

**607–608 Special Problems in Anthropology**
607, fall; 608, spring. Credit to be arranged. Hours to be arranged. Staff.

**[610 Myth and Mythology**
Spring. 4 credits. Not offered 1989–90.]

**[612 History of Anthropological Thought**
Spring. 4 credits. Not offered 1989–90.]

**Methods of Assessing Physical Growth in Children (Nutritional Sciences 612)**

**[614 Reading Ethnography**
Spring. 4 credits. Not offered 1989–90.]

**619 Anthropological Approaches to the Study of Buddhisms in Asia**
Fall. 4 credits.
W 1:30–3:30. A. T. Kirsch.
This seminar will examine the various conceptual and analytical strategies employed by social scientists in the study of Buddhism, especially in South and Southeast Asia. Problems of religious complexity, the social correlates of Buddhism, and the role of Buddhism in social change will be explored.

**[623 Himalayan Issues, Problems, and Prospects**
Spring. Credit to be arranged. Not offered 1989–90.]

**[626 Problems in Economic Anthropology**
Fall. 4 credits. Not offered 1989–90.]

**627 The Anthropology of Law (also Law 702)**
Fall. 4 credits. Enrollment limited.
W 9:05–11. C. J. Greenhouse.
Anthropologists concerned with "law" focus on the cultural and institutional strategies involved in the improvisation, negotiation, contestation, and reproduction of social order. This seminar introduces students to both classic and contemporary monographs from the anthropology of law, emphasizing the perspectives afforded by current debates on the coherence of culture, the nature of legal pluralism, the historicity of "custom," the comparability of legal systems, and experiential aspects of official and unofficial law. Readings draw primarily from ethnography, with particular emphasis on materials from the United States, Africa, and Melanesia.

**628 Political Anthropology**
Fall. 4 credits.
T 3:30–5:30. J. T. Siegel.
A comparison of political rhetoric in the Indonesian Old and New Orders. The bearing of such phenomena as newspapers, magazines, television, and various types of theater, music, and fiction, on the shaping of accommodation or opposition to the political order will be examined. A reading knowledge of Indonesian is required.

**Anthropometric Assessment (Nutritional Sciences 630)**

**631 Kingship and Cultural Identity in Mesoamerica: Interpretive and Comparative Issues**
Fall. 4 credits.
M 1:30–3:30. C. J. Greenhouse, J. S. Henderson
This seminar examines problems of interpretation and comparison in the anthropology of Mesoamerica. In particular, we explore tensions between the archaeological and ethnographic records in the domains of state formation, cosmology, politics, and cultural identity. Readings and discussions juxtapose Mesoamerican materials with a variety of other texts on the following topics: literacy and orality, kingship, state formation and temporal charters of power; historicity and problems of ethnographic analogy; ethnicity and identity; visual aesthetics and culture. Our dual aim is to expose students to central issues in the Mesoamerican region, as well as to consider—in the context of a single region—the limits of cultural interpretation and comparison.

**632 Andean Symbolism**
Spring. 4 credits. Prerequisites: reading knowledge of Spanish and permission of instructor.
Hours to be arranged. B. J. Isbell.
This year the seminar will focus on the symbolism of violence in Andean culture. Topics include the language and metaphors of violence, messianic and utopian movements, and Andean concepts of order and disorder. The course will cover material from the present to the Incas.

**633 Andean Research**
Fall or spring. 4 credits.
Hours to be arranged. B. J. Isbell.

**634–635 Southeast Asia: Readings in Special Problems**
634, fall; 635, spring. Credit to be arranged. Hours to be arranged. Staff.

**[636 Cognition and Classification**
Fall. 4 credits. Not offered 1989–90.]

**640–641 South Asia: Readings in Special Problems**
640, fall; 641, spring. Credits to be arranged. Hours to be arranged. D. H. Holmberg, K. S. March.
Selected readings in society, religion, and culture in South Asia.

**645 Japanese Ethnology**
Spring. 4 credits.
Hours to be arranged. R. J. Smith.
This seminar is designed for advanced students who plan to conduct social science research in Japan. It deals with questions of historical continuity the relationship of the individual to society, and the nature of contemporary Japanese social organizations. A reading knowledge of Japanese is strongly recommended.

**[651 Anthropological Boundaries: Seminar on Film**
Spring. 4 credits. Not offered 1989–90.]

**653 Myth onto Film (also Theatre Arts 653)**
Fall and spring. 4 credits. Open to undergraduates and graduate students with permission of instructor. Prerequisite: some knowledge of one of the following: anthropology, filmmaking, mythology, graphics, drawing, or painting.
T 2–4:25. R. Ascher.
In myths, whales fly, pebbles throw themselves across streams, and trees are transformed into women. Toward the end of visualizing myths—in particular the myths of other people—we explore the possibilities of animated film. The technique used is cameraless animation; that is, we draw and paint, frame by frame, directly onto movie film. The intellectual problem is to visualize the myths of others so that they are comprehensible to us but are not thought to be of us. Reading includes introductory works on both myth and animation and there is background reading on the particular myth that is committed to film.

**[656 Maya History**
Fall. 4 credits. Not offered 1989–90.]

**663 Hunters, Gatherers, and the Origins Of American Agriculture**
Fall. 4 credits. Prerequisite: Anthropology 356. Open to qualified undergraduates.
W 12:20–2:15. T. F. Lynch.
The transition from hunting and gathering to agricultural subsistence, with particular attention to demographic, ecological, and coevolutionary factors. Topics to be emphasized are the history of thought on agricultural origins, archaeological evidence bearing on these theories, contrasts and conflicts between Western and non-Western systems, and the effects of agricultural instability and environmental degradation, particularly in the Americas.

**664 Problems in Archaeology: "Early Man" in America**
Spring. 4 credits. Open to qualified undergraduates. Prerequisite: Anthropology 354.
W 12:20–2:15. T. F. Lynch.
The peopling of the Western Hemisphere will be considered in historical perspective, as it has been dealt with by archaeologists, geologists, and paleoecologists. Emphasis will be on contextual analysis and environmental adaptations, as well as chronology, with topics drawn from both North and South American archaeology.

**[673 Human Evolution: Concepts, History and Theory (also Biological Sciences 673)**
Fall. Not offered 1989–90.]

**Design and Data Analysis in Development Research (Rural Sociology 715)**

**901–902 Field Research**
901, fall; 902, spring. Credit to be arranged. Hours to be arranged. Staff.

## ARABIC AND ARAMAIC

See Department of Near Eastern Studies.

# ARCHAEOLOGY

A. L. Bloom (geological sciences), R. G. Calkins (history of art), K. M. Clinton (Classics), J. E. Coleman (Classics), R. T. Farrell (English), J. S. Henderson (anthropology), P. I. Kuniholm (archaeology/Classics), T. F. Lynch (anthropology), D. I. Owen (Near Eastern Studies), A. Ramage (history of art; director, Archaeology Program), B. S. Strauss (history), T. P. Volman (archaeology; director of undergraduate studies)

Archaeology is an interdisciplinary field at Cornell, which is one of the few universities in the United States to offer a separate archaeology major. Program faculty members, affiliated with several departments, coordinate course offerings and help students identify opportunities for fieldwork, graduate study, and professional positions.

## The Major

The basic introductory course for both majors and nonmajors is Archaeology 100. This course covers the broadest range of archaeology in terms of area and time and deals with method as well as results. Those with a fairly serious interest, particularly prospective majors, are encouraged to take the optional one-hour section, Archaeology 101, which provides practical experience with archaeological materials. Archaeology 402, which considers research design, and Archaeology 404, which examines interpretive frameworks, are especially recommended for majors.

Since the major draws on the teaching and research interests of faculty from many departments in order to present a broad view of the archaeological process, a student interested in the archaeology major should discuss his or her course of study with a participating faculty member as early as possible. In some areas of specialization, intensive language training should be coordinated with other studies as early as the freshman year.

As prerequisite to the major a student must complete Archaeology 100. Once admitted to the major, the student must take an additional 36 credits in courses from the archaeology list, chosen in consultation with the major adviser. These courses should provide exposure to a broad range of archaeologically known cultures and the methods of revealing and interpreting them. They must be distributed as follows:

1) At least two courses from each of the categories below (totaling at least 30 credits, including 16 at the 300 level or above):

   Theory and Interdisciplinary Approaches (B)

   Old World Archaeology (C)

   New World Archaeology (D)

2) At least two related courses (list available in Archaeology Program office)

**Honors**. Honors in archaeology is awarded on the basis of the quality of an honors essay and the student's overall academic record. Prospective honors students should have a 3.5 gradepoint in the major and a 3.0 gradepoint overall. They should consult with the director of undergraduate studies before the beginning of the senior year. The honors essay is normally prepared in consultation with a faculty adviser during the senior year; students may enroll in Archaeology 481, fall; 482, spring for this purpose.

**Fieldwork**. Every student should gain some practical experience in archaeological fieldwork on a project authorized by his or her adviser. This requirement may be waived in exceptional circumstances. The Jacob and Hedwig Hirsch bequest provides support for a limited number of students to work at excavations sponsored by Cornell and other approved institutions.

## The Concentration

Students in Cornell schools and colleges other than Arts and Sciences may elect a concentration in archaeology. To concentrate in archaeology, the student must complete Archaeology 100 with a grade of C or better and at least four advanced courses in archaeology, distributed among the three groups stipulated in (1) in the description of the major above. Concentrators are eligible for Hirsch Scholarships in support of fieldwork.

## Freshman Writing Seminars

For course descriptions, see the freshman writing seminar brochure.

## A. Introductory Courses and Independent Study Courses

**100 Introduction to Archaeology**
Spring. 3 credits.
M W F 1:25. 2 evening prelims.
T. P. Volman.
A broad introduction to archaeology—the study of material remains to answer questions about the human past. The history, methods, and interpretive frameworks of archaeology are presented, followed by a survey of the archaeological record from human origins, through the development of food production, to the rise and spread of civilizations. Guest lectures by members of the Cornell Archaeology Program are an integral part of the course.

**101 Introduction to Archaeology, Section**
Spring. 1 credit. Limited to 35 students.
Optional section to be taken concurrently with Archaeology 100. Prospective archaeology majors are encouraged to participate in this section, although it is open to all interested students.
R 11:40. T. P. Volman.
A series of practical and special topics. The section includes analysis of archaeological materials, demonstrations, and visits to campus facilities.

**300 Individual Study in Archaeology and Related Fields**
Fall or spring. Credit to be arranged.
Prerequisite: Archaeology 100 or permission of instructor.
Hours to be arranged. Staff.
Students pursue topics of particular interest with the guidance of a faculty member.

**481 Honors Thesis**
Fall. 4 credits. Prerequisite: admission to Honors Program.
Hours to be arranged. Staff.
The student, under faculty direction, will prepare a senior thesis.

**482 Honors Thesis**
Spring. 4 credits. Prerequisite: admission to Honors Program.
Hours to be arranged. Staff.
The student, under faculty direction, will prepare a senior thesis.

## B. Theory and Interdisciplinary Approaches

**203 Early People: The Archaeological and Fossil Record (also Anthropology 203)**
Fall. 3 credits.
T R 11:40. T. P. Volman.
A survey of the archaeological and fossil record of human evolution. Contributions by researchers from a variety of disciplines are highlighted, as are the discoveries, personalities, and controversies that have enlivened the study of human evolution for more than a century. Critical evaluation of evidence and interpretations will be stressed. Demonstrations and films supplement the lectures.

**285 Art, Isotopes, and Analysis (also MSE 285 and Eng 285)**
Spring. 3 credits.
J. W. Mayer.

**[308 Dendrochronology of the Aegean (also Classics 309)**
Fall or spring. 4 credits. Limited to 10 students. Prerequisites: Archaeology 100 or Classics 220, and permission of instructor. Not offered 1989–90.
P. I. Kuniholm.
Participation in a research project of dating modern and ancient tree-ring samples from the Aegean and Mediterranean. Supervised reading and laboratory work. A possibility exists for summer fieldwork in Greece or Turkey.]

**[317 Stone Age Archaeology**
Fall. 4 credits. Not offered 1989–90.
T. P. Volman.
A survey of current approaches to the archaeological record of Stone Age peoples, from the earliest sites to those of recent times. Case studies are used to illustrate the nature of archaeological occurrences, excavation procedures, and analytical methods. Multidisciplinary efforts to expand our knowledge of prehistoric lifeways and behaviors are a major concern of the course.]

**356 Practical Archaeology (also Classics 356)**
Spring. 4 credits. Prerequisite: one course in archaeology.
M W F 11:15, plus lab to be arranged.
J. Coleman.
The fundamentals of archaeological fieldwork, including techniques of excavation and recording. Hands-on experience in cataloging of ancient objects in the Herbert F. Johnson Museum of Art and the collection of the Department of Classics and with surveying equipment such as the dumpy level. No previous fieldwork background required. Especially recommended for those planning to participate in summer field programs such as the Cornell project at Halai and East Lokris in Greece.

**[358 Archaeological Research Methods (Anthropology 358)**
Not offered 1989–90.]

**[402 Archaeological Research Design (also Anthropology 402)**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
J. S. Henderson, T. P. Volman.
Archaeological practice demands careful definition of research objectives and appropriate strategies before excavation or other fieldwork begins. Critical information lies in the arrangement and associations of objects and structures; this context should be a basic concern of any field investigation, particularly when it is destroyed by excavation. The course relies on case studies to illustrate how surveys, excavations, and analytical techniques must be tailored to solving specific problems. A seminar especially recommended for undergraduate majors and graduate archaeologists but open to anyone with a serious interest in archaeology.]

**404 Approaches to Archaeology (also Anthropology 404)**
Fall. 4 credits. Prerequisite: permission of instructor.
W 2:30–4:25. J. S. Henderson, T. P. Volman.
An exploration of the concepts that have shaped modern archaeology. The course briefly examines the history of theoretical orientations in archaeology, then considers the variety of perspectives and interpretive frameworks that guide present-day investigations. Case studies illustrate the implications of the nature of the archaeological record for reconstructing subsistence and economic systems, trade, social and political organization, demography, and ideology. An undergraduate seminar especially recommended for undergraduate majors and graduate archaeologists but open to anyone with a serious interest in archaeology.

**[Seminar in Archaeology (Anthropology 493)**
Fall. Not offered 1989–90.]

**[Seminar in Archaeology: The Maya (Anthropology 494)**
Spring. 4 credits. Not offered 1989–90.
W 2:30–4:25. J. S. Henderson.
An exploration of continuities in the Maya cultural tradition from pre-Columbian times through the period of European invasion to the present. A central theme is combining archaeological, ethnohistorical, and ethnographic information and approaches to reconstruct pre-Columbian cultural patterns and processes. The focus for 1989 is Maya farming systems and their evolution.]

**Hunters, Gatherers, and the Origins of American Agriculture (Anthropology 663)**
Spring. 4 credits. Prerequisite: Anthropology 356. Open to qualified undergraduates.
W 12:20–2:15. T. F. Lynch.
The transition from hunting and gathering to agricultural subsistence, with particular attention to demographic, ecological, and coevolutionary factors. Topics to be emphasized are the history of thought on agricultural origins, archaeological evidence bearing on these theories, contrasts and conflicts between Western and non-Western systems, and the effects of agricultural instability and environmental degradation, particularly in the Americas.

**Problems in Archaeology: "Early Man" in America (Anthropology 664)**
Fall. 4 credits. Prerequisite: Anthropology 354. Open to qualified undergraduates.
W 12:20–2:15. T. F. Lynch.
The peopling of the Western Hemisphere will be considered in historical perspective, as it has been dealt with by archaeologists, geologists, and paleoecologists. Emphasis will be on contextual analysis and environmental adaptations, as well as chronology, with topics drawn from both North and South American archaeology.

**Geomorphology (Geological Sciences 441)**
Fall. 3 credits. Prerequisites: any combination of the following: (fall) Geological Sciences 101, 103, 111, Engineering 201; (spring) Geological Sciences 102, 104, 202, or permission of instructor.
Lec, T R 9:05; lab, T 2–4:30.
A. L. Bloom.
Origin of landforms and description in terms of structure, process, and stage.

**Glacial and Quaternary Geology (Geological Sciences 442)**
Spring. 3 credits. Prerequisite : (fall) Geological Sciences 441 or permission of instructor.
Lec, T R 9:05; lab, T 2–4:30.
A. L. Bloom.
Glacial processes and deposits and the stratigraphy of the Quaternary period.

**[Methodology Seminar II (History of Art 595)**
Spring. 4 credits. Not offered 1989–90.
R. G. Calkins.
An examination of various methods of investigation in the history of art and architecture. A requirement for all graduate students.]

## C. Old World Archaeology

**[221 Minoan-Mycenaean Art and Archaeology (also Classics 221 and History of Art 221)**
Fall. 3 credits. Students may not obtain credit for both this course and Classics 319. Not offered 1989–90.
P. I. Kuniholm.
The birth of civilization in Greece and the Aegean Islands during the Bronze Age. The main focus is on the rise and fall of Minoan Crete and Mycenaean Greece, with consideration given to the nature and significance of Aegean interactions with Egypt, the Near East, and Anatolia ]

**[233 Archaeology in Action II (also Classics 233)**
Spring. 3 credits. Prerequisites: Archaeology 100 or Classics 220, and permission of instructor. Not offered 1989–90.
P. I. Kuniholm.
Objects from the Classical, Hellenistic, and Roman periods are "dug" out of Cornell basements, identified, cleaned, restored, cataloged, and photographed and are considered in their appropriate historic, artistic, and cultural contexts.]

**[250 Etruscan Art and Archaeology (also Classics 250 and History of Art 223)**
Fall. 3 credits. Not offered 1989–90.
J. Whitehead.
An examination of Etruscan culture for both its uniqueness and its diversity. The first part of the course will trace the history and the art of the Etruscans, beginning with questions of their origins and ending with their assimilation into the Roman state. Developments in artistic style run parallel to those in Greek art and illuminate the unique Etruscan character. The second half will focus on the individual cities and how strongly they differed from one another in their art, customs, practices, and relationship to Rome.]

**[275 Ancient Seafaring (also Near Eastern Studies 261)**
Fall. 3 credits. Not offered 1989–90.
D. I. Owen.]

**406 The Archaeology of Early Christian England and Ireland (English 406)**
Spring. 4 credits.
M W F 11:15. R. T. Farrell.
This course is intended as a study in depth of the recent advances of our understanding of a fascinating period, England and Ireland from ca. 400–1100. Architecture, both secular and sacred, will play a large part in the course, as will a close examination of the span of material evidence from excavation. Attention will also be paid to the far-flying external trade/exchange relations England and Ireland enjoyed in this period. Frequent oral reports, a take-home mid-term and final, and/or a significant term paper will be expected. While there is no absolutely firm prerequisite, knowledge of Latin and/or Anglo-Saxon will be helpful, as would a grounding in such disciplines as history, archaeology, or art history.

**[413 Sutton Hoo: Past, Present, and Future (also English 413/603)**
4 credits. Spring. Prerequisite: some knowledge of the early Middle Ages. Not offered 1989–90.
R. T. Farrell.
The Sutton Hoo ship burial, excavated in 1939, is without doubt the most important early medieval site to have come to light in the present century. Not only was the splendor of an early seventh-century king brought to light, but an astonishing range of grave-goods in the ship showed the broad trade contacts, from Scandinavia to Byzantium, that existed then. This ship burial is closely associated with *Beowulf* and throws light on all of Old English literature. The course is structured as an interdisciplinary seminar open to those interested in English, medieval studies, history of art, history, and associated disciplines. Students will be encouraged to follow individual lines of inquiry in oral reports and papers; a substantial research paper will be required of graduate students.]

**[423 Ceramics (also History of Art 423 and Classics 423)**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
A. Ramage.
Greek and Roman pottery specimens from several Near Eastern and Mediterranean sites will be studied to provide direct experience in one of the basic prerequisites of archaeological excavation—the identification and dating of pottery types. A report, delivered in class, will concern ancient ceramic materials or particular types and periods. Practical experience in making and decorating pottery will be encouraged.]

**[434 The Rise of Classical Greece (also Classics 434 and History of Art 434)**
Spring. 4 credits. Prerequisite: Classics 220 or 221 or History of Art 220 or 221 preferred. Not offered 1989–90.
P. I. Kuniholm.
The art and archaeology of the Greek dark ages. Topics include site reports, pottery, metalworking, the introduction of the alphabet, the beginnings of coinage and links with Anatolia and the Near East.]

**Mediterranean Archaeology (Classics 219 and Near Eastern Studies 267)**
Fall. 3 credits.
M W F 12:20. J. Coleman.
An examination of the archaeological bases of ancient Mediterranean civilization with special focus on contacts and interrelations in the Bronze Age (ca. 3500–1100 B.C.). Topics include the Neolithic of Anatolia, Greece, and the Near East; the rise of civilization in Egypt; the Bronze Age states of Syro-Palestine (Ebla, Ugarit, Byblos, etc.); Cyprus, copper, and the Alasia question; the Hittites and Bronze Age Anatolia; the early Bronze Age in Greece; Minoans, Mycenaeans, and their eastern and western contacts; the Bronze Age in the western Mediterranean; and ancient ships and trade in the late Bronze Age.

**[Minoan-Mycenaean Archaeology (Classics 319)**
Spring. 4 credits. Prerequisite: participants are expected already to have completed some course work in Mediterranean or classical archaeology (e.g., Classics 219/Near Eastern Studies 267 or Classics/History of Art 220). Students may not obtain credit for both this course and Archaeology/Classics/History of Art 221. Not offered 1989–90.
J. Coleman.
The art and archaeology of Greece and the Aegean in the Bronze Age (ca. 3500–1100 B.C.). Detailed treatment is given to the Minoan and Mycenaean civilizations of the middle and late Bronze Age. Other topics include the Neolithic "background" of Aegean civilization; the early Bronze Age in Greece, Crete, and the Cycladic islands; the volcanic eruption of Thera; Aegean interconnections with Cyprus and the Near East; and, in particular, the evidence for Mycenaean shipping, trade, and immigration from 1400–1100 B.C. Two papers will be presented in class, and these will subsequently be handed in and graded.]

**[Arts and Monuments of Athens (Classics 320 and History of Art 320)**
Spring. 4 credits. Prerequisite: Classics 220 or permission of instructor. Not offered 1989–90.]

**[Greeks and Their Neighbors (Classics 322 and History of Art 328)**
Fall. 4 credits. Prerequisite: Classics/History of Art 328; Classics/History of Art 220 or Classics/History of Art 221, or permission of instructor. Not offered 1989–90.]
J. Coleman.
A study of the archaeological and other evidence for the interaction between Greek civilization and the eastern and western Mediterranean from the thirteenth to the fourth centuries B.C.E. The course will focus on Greek relationships with Phoenicia and the rest of the Levant, Cyprus, Anatolia, and the Etruscans in the post-Bronze Age period.]

**Seminar on Roman Art (Classics 435 and History of Art 427)**
Fall. 4 credits. Prerequisite: permission of insturctor.
M 2:30–4:30. J. Whitehead.
Topic for fall 1989: Social Stratification in Roman Art.
Roman art has been described as the first "modern" art in history. Uniquely among ancient cultures, Rome offered its art patrons a wide variety of styles and motifs to express the diverse ideals of its highly complex and mobile society.

The course begins with a chronological overview of Roman art and with concepts of *romanitas*: underlying all this diversity is there an essence that can be considered purely Roman? The rest of the course will explore the dichotomies, the contrasting ideals and ideologies as expressed in the art of the different segments of society: artisan and aristocrat, freedmen and emperor, provincial and urbanite, foreign and domestic, rich and nouveau riche. It seeks to define the degree to which artistic taste is bound to social class.

**[Graduate Seminar in Bronze Age Archaeology (Classics 629)**
Fall. Not offered 1989–90.
J. Coleman.]

**[Seminar in Classical Greek Archaeology: Graduate (Classics 630)**
Fall. 4 credits. Not offered 1989–90.]

**Ancient Greece from Homer to Alexander the Great (History 265)**
Fall. 4 credits. Open to freshmen.
T R 10:10 plus sec. B. Strauss.
A survey of Greece from the earliest times to the end of the Classical period in the late fourth century B.C. The course focuses on the Greek genius: its causes, its greatness, its defects, and its legacy. The Heroic Age, the city-state, ancient democracy, and the intellectual ferment of the Greek Enlightenment are the main topics of study. Readings in translation from Homer, Aristophanes, Sophocles, Herodotus, Thucydides, Plato, Aristotle, and from the evidence of ancient inscriptions, coins, art, and architecture.

**Introduction to Classical Archaeology (Classics 220 and History of Art 220)**
Spring. 3 credits.
M W F 10:10. J. Coleman
The archaeology of the ancient Greeks and Romans as seen from a critical perspective. Major developments in Classical archaeology will be traced, from treasure hunting to modern scientific research. Examples illustrating various approaches will be chosen: sculpture, vase painting, and architecture of the ancient Greeks, from the Geometric period through the Hellenistic; and the art of the Romans from the early Republic to the late Empire.

**Introduction to Art History: Monuments of Medieval Art (History of Art 230)**
Spring. 3 credits.
M W F 12:20. R. G. Calkins.
An introduction to the approaches to art history through a study of selected works of art from the Middle Ages: architecture, sculpture, painting, manuscript illumination, metal work, and ivory.

**[Arts of the Roman Empire (History of Art 322)**
Fall. 4 credits. Prerequisite: History of Art 220 or permission of instructor. Not offered 1989–90.
A. Ramage.
The visual arts in the service of the first world state. The course starts with the Etruscan and Republican period but concentrates on monuments of the Imperial era in Italy and the provinces until the time of Constantine.]

**Greek Vase Painting (History of Art 325 and Classics 325)**
Spring. 4 credits. Prerequisite: previous enrollment in a History of Art or Classics course or permission of instructor.
M W F 10:10–11. A. Ramage.
A stylistic and iconographical approach to an art in which the Greeks excelled. The course will be arranged chronologically from the early (eleventh century B.C.), anonymous beginnings to the "personal" hands of identifiable masters of the fifth and fourth centuries B.C. Styles other than Attic will be stressed.

**Greek and Roman Coins (History of Art 327 and Classics 327)**
Fall. 4 credits. Prerequisite: History of Art 220 or permission of instructor.
M W F 11:15. A. Ramage.
The varied issues of Greek cities and the Roman state are examined. Coins are considered as art objects as well as economic and historical documents. The changes in design, value, and metals from the origins of coinage to the late Roman period are studied. Lectures, student presentations, and work with actual examples.

**Architecture of the Middle Ages (History of Art 332 and Architecture 382)**
Fall. 4 credits.
M W F 12:20. R. G. Calkins.
A survey of medieval architecture from the Early Christian period to the late Gothic (A.D. 300–1500). Considerable emphasis will be placed on the development of structural systems and upon the form, function, and meaning of important medieval buildings.

**[Seminar in Greek Sculpture (History of Art 431 and Classics 431)**
Not offered 1989–90.]

**Sardis and the Cities of Asia Minor (History of Art 432 and Classics 432 and Archaeology 432)**
Fall. 4 credits. Prerequisite: permission of instructor.
T 2:30. A. Ramage.
The growth and interaction of the Greek and Roman cities and their art will be studied using the finds and conclusions from the Cornell-Harvard excavations at Sardis as a focal point. The magnificent works of art and architecture will be set beside domestic remains and objects of daily life. We shall examine local themes in the context of the history, the topography, and the larger political and economic scene in Asia Minor. We shall concentrate on the Golden age of Lydia and Ionian Greece.

**Problems in Medieval Art and Architecture (History of Art 531)**
Spring. 4 credits. Prerequisite: permission of instructor.
M 2:30–4:30. R. G. Calkins.
Topic for spring 1990: Narrative on Medieval Illumination.

**[The History and Archaeology of Ancient Israel to 450 B.C.E. (Near Eastern Studies 243)**
Spring. 4 credits. Not offered 1989–90.
D. I. Owen.]

**Agriculture and Society in the Ancient Near East (Near Eastern Studies 264)**
3 credits. Spring.
T R 2:55–4:10. D. I. Owen.

**[History and Archaeology of Ebla (Near Eastern Studies 362 and Archaeology 362)**
Fall. 4 credits. Not offered 1989–90.
D. I. Owen.]

**History and Archaeology of Ancient Egypt (Near Eastern Studies 367)**
4 credits. Fall.
T R 11:40–12:55. D. I. Owen.

**[International Trade, Market, and Politics in the Ancient Near East (Near Eastern Studies 463 and Society for the Humanities 425)**
Fall. 4 credits. Not offered 1989–90.]

### D. New World Archaeology

**[361 Field Archaeology in South America (also Anthropology 361)**
Spring. 10 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged (off campus in Chile). T. F. Lynch.]

**The Peopling of America (Anthropology 354)**
Fall. 4 credits.
T R 8:40–9:55. T. F. Lynch.
Prehistoric discovery of the New World, beginning with American Indian origins in Asia and ending with the largely unrecorded European medieval contact with North America. Major topics include crossing the Bering land bridge, big-game hunting and extinctions, postglacial adaptations to changing environments, diversified subsistence in the eastern woodlands, agricultural civilizations of the Midwest and Southwest, and Eskimo and Norse exploration and settlement across the Arctic and North Atlantic.

**[Archaeology of Mexico and Central America (Anthropology 355)**
Spring. 4 credits. Not offered 1989–90.
J. S. Henderson.
A survey of the cultural history of ancient Mexico and Central America, emphasizing Aztec and Maya civilizations. The use of ethnographic and historical information to enrich archaeological interpretation is a general theme. Specific topics include the emergence of settled farming life, the rise of civilization and the state, and the development of mechanisms that linked the many societies in the region into a single sphere of interaction.]

**The Archaeology of South America (Anthropology 356)**
Spring. 4 credits.
T R 8:40–9:55. T. F. Lynch.
Origins and development of South American peoples, subsistence systems, cultures, and civilizations, with special attention to Peru, Bolivia, Chile, and Ecuador. Major topics include the question of the first inhabitants, domestication of plants and animals, the rise of temple-based religions and great art styles, regional interaction, and the formation of militaristic polities and the Inca state.

**[Mesoamerican Religion, Science, and History (Anthropology 456)**
Fall. 4 credits. Not offered 1989–90.
J. S. Henderson.
An introduction to belief systems in ancient Mexico and Central America, emphasizing the blending of religion, astrology, astronomy, myth, history, and prophecy. Using ethnohistorical information to interpret pre-Colombian books is a primary focus.]

**[Maya History (Anthropology 656)**
Fall. 4 credits. Not offered 1989–90.
J. S. Henderson.]

## ASIAN STUDIES

E. M. Gunn, chair and director of undergraduate studies (388 Rockefeller Hall, 255-5095); B. R. Anderson, R. Barker, M. G. Bernal, K. Brazell, T. Chaloemtiarana, M. C. Chou, S. Cochran, R. D. Colle, E. W. Coward, Jr., B. de Bary, G. Diffloth, E. C. Erickson, S. Feldman, G. Fields, J. W. Gair, M. D. Glock, D. Gold, M. Hatch, D. Holmberg, J. Huang, J. Jasanoff, M. Katzenstein, K. A. R. Kennedy, A. T. Kirsch, J. V. Koschmann, L. C. Lee, T. Lyons, D. R. McCann, J. McRae, B. G. MacDougall, K. March, T. L. Mei, G. M. Messing, C. Minkowski, S. Mohanty, V. Nee, S. J. O'Connor, T. J. Pempel, C. A. Peterson, T. Poleman, D. Poston, N. Sakai, P. S. Sangren, C. L. Shih, T. Shiraishi, V. Shue, J. T. Siegel, R. J. Smith, J. Swanberg, K. Taylor, W. Uphoff, J. Wheatley, C. White, J. Whitman, J. U. Wolff, D. Wyatt, M. W. Young, A. Yee, J. Zeitlin

The Department of Asian Studies encompasses the geographical areas of East Asia, South Asia, and Southeast Asia and offers courses in most of the disciplines of the social sciences and the humanities. Asian studies courses through the 400 level are taught in English and are open to all students in the university. Some of these courses may be counted toward majors in other departments; others fulfill the humanities distribution requirement.

### The Major

The applicant for admission to the major in Asian studies must have completed at least one area studies course selected from among those listed under the Department of Asian Studies and must receive permission for admission to the major from the director of undergraduate studies. The student must have received a minimum grade of C in this course and in all other courses counted toward the major.

A student majoring in Asian studies is required to complete two courses at the 200 level (a minimum of 6 credits with a grade of C or better) in one of the Asian languages offered at Cornell. The major consists of at least 30 additional credits (which may include up to 6 credits of further language study) selected by the student in consultation with his or her adviser from among the courses listed under the Department of Asian Studies and numbered 250 and above. Majors in Asian studies normally specialize in the language and culture of one country and often choose an additional major in a traditional discipline.

### Concentration in Southeast Asia Studies

A candidate for the Bachelor of Arts or Bachelor of Science degree at Cornell may take a concentration in Southeast Asia studies by completing 15 credits of course work, including a history course and three courses or seminars at the intermediate or advanced level, two of which may be Southeast Asian language courses. Students taking a concentration in Southeast Asia studies are members of the Southeast Asia Program and are assigned an adviser from the program faculty. Such students are encouraged to commence work on a Southeast Asian language and to take advantage of summer intensive language training.

### Distribution Requirement for Nonmajors

**Humanities:** any two courses in Asian art, literature, or religion given by the Department of Asian Studies or listed there under the areas of China, Japan, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the same area or by taking AS 211, 212, 215, 218, either using two of these courses as a sequence or by following one with a course in the humanities in that area.

**Social Sciences:** any two courses in Asian anthropology, economics, government, linguistics, or sociology given by the Department of Asian Studies or listed there under the areas of China, Japan, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the same area or by taking AS 211, 212, 215, or 218, followed by a social science course in that area.

**History:** any two courses in Asian history given by the Department of History and listed under the Department of Asian Studies under the areas of China, Japan, South Asia, and Southeast Asia, excluding only freshman writing seminars and courses given outside the College of Arts and Sciences. A reasonable sequence is formed by taking any two courses in the same area or by taking AS 211, 212, 215, or 218, followed by a history course in that area.

**Honors.** To be eligible for honors in Asian studies, a student must have a cumulative grade average of B+ in all Asian studies courses and must successfully complete an honors essay during the senior year. Students who wish to be considered for honors should apply to the director of undergraduate studies during the second term of their junior year. The application must include an outline of the proposed project and the endorsement of a faculty adviser. During the first term of the senior year the student does research for the

essay in conjunction with an appropriate Asian studies course or Asian Studies 401. Students of China and Japan must also complete Asian Studies 611. By the end of the first term the student must present a detailed outline of the honors essay and have it approved by the faculty sponsor and the director of undergraduate studies. The student is then eligible for Asian Studies 402, the honors course, which entails writing the essay. At the end of the senior year, the student has an oral examination (with at least two faculty members) covering both the honors essay and the student's area of concentration.

## Intensive Language Program (FALCON)

For those students desiring to accelerate their acquisition of Chinese, Japanese, or Indonesian, Cornell offers a full-time intensive language program, the Full-Year Asian Language Concentration (FALCON). FALCON students spend six hours a day, five days a week, for periods of up to a full year studying only the language and thus are able to complete as many as twelve hundred hours of supervised classroom and laboratory work in one year. For further information, students should contact the FALCON Program Office, Department of Modern Languages and Linguistics, 203 Morrill Hall (telephone: 607/255-6457).

## Study Abroad

Cornell is a member of the Inter-University Centers for Chinese Language Study in Taipei and for Japanese Language Study in Yokohama and a member of the Council on International Educational Exchange offering study in China. These centers offer intensive training in both spoken and written forms of the languages. The Kyoto Center for Japanese Studies (KCJS) is an undergraduate program for students who want to spend a year in Japan studying both language and culture.

Cornell is a class-A member of the American Institute of Indian Studies, which offers fellowships in India for intensive language study in Hindi, Bengali, and Tamil. Cornell also offers study abroad opportunities in South Asian studies at the School of Oriental and African Studies at the University of London. For further details, contact the South Asia Program office, 170 Uris Hall (telephone: 607/255-8493).

Other opportunities include a junior year abroad at IKIP-Malang, in Indonesia, or at the School of Oriental and African Studies, University of London. Many other options for study in Asia exist. Undergraduates should consult the Cornell Abroad program; graduate students should inquire at the East Asia Program, the South Asia Program, or the Southeast Asia Program offices.

## Freshman Writing Seminars

**[101 Women and Social Transitions in the Twentieth Century**
Fall. 3 credits. Not offered 1989–90.]

**103 Revolutions and Social Values in Modern Chinese Literature**
Fall. 3 credits.
Sec 1 M W F 1:25–2:15; sec 2 T R 1:25–2:40. E. M. Gunn.
Revolutions in twentieth-century China have involved criticism of both pre-modern Chinese culture and innovative concepts from foreign societies. The course will introduce these issues through works of modern Chinese literature.

**[104 Three Ways of Thought**
Not offered 1989–90.]

**[105 Feminine and Masculine Ideals in Japanese Culture (also Women's Studies 105)**
Spring. 3 credits. Not offered 1989–90.]

**108 Reality Criteria in Contemporary Vietnam**
Fall. 3 credits.
T R 8:40–9:55. K. Taylor.
This course will offer participants an opportunity to develop their writing skills while reading and responding to literary texts written by Vietnamese and by Americans that claim to represent something about the reality of modern Vietnam. Students will be encouraged to establish criteria for determining what is "real" and what is not in twentieth-century Vietnam while learning to write focused, analytical prose.

**110 People and Nature in East Asia (Japan)**
Fall. 3 credits.
M W F 9:05. J. Swanberg.
Students explore their own ideas of self, society, and nature in the light of East Asian (primarily Japanese) human experience. Major perspectives from both east and west will be presented in readings and lectures.

**[111 Perspectives on South Asia**
Fall. 3 credits. Not offered 1989–90.]

**[144 Plain Tales from the Raj: Language, Literature, and Experience in British India**
Spring. 3 credits. Not offered 1989–90.]

**[146 Travel, Exploration, and the Literature of Passage**
3 credits. Not offered 1989–90.]

### Related Freshman Writing Seminar in Another Department

**[Comparative Literature 141 Sanskrit Masterpieces in Translation**
Not offered 1989–90.
V. Koschmann.]

## General Education Courses

**211 Introduction to Japan**
Fall. 3 credits.
M W 11:15; disc, see roster. N. Sakai.
An interdisciplinary introduction to Japanese culture especially designed for students not majoring in Asian studies. The first part of the course focuses on traditional aspects of Japanese culture that are still important today, while the second part analyzes contemporary society from a variety of perspectives. Guest lecturers from five or six departments speak on their areas of expertise.

**212 Introduction to China**
Spring. 3 credits (4 credits with a special project; consult instructor for information).
T R 1:25; disc, R 2:30 (3 sections), F 10:10 (2 sections), F 11:15 (2 sections), or F 1:25 (1 section). J. Zeitlin.
An interdisciplinary introduction to Chinese culture especially designed for students not majoring in Asian studies.

**215 Introduction to South Asian Civilization**
Fall. 3 credits (4 credits with a special project; consult instructor for information).
M W F 11:15. D. Gold.
A general introduction to the civilizations of South Asia designed for nonmajors. Faculty members from several departments will focus on integrative themes in the study of South Asia: ethnic and linguistic diversity, tradition, and change. The course will provide an introduction to the geography, arts, religions, and history of India, as well as to those of other modern states of South Asia that share its cultural heritage.

**[218 Introduction to Korea**
Spring. 3 credits. Not offered 1989–90.]

**[220 The Poet in Asia**
Spring. 3 credits. Not offered 1989–90.]

## Asia—Literature and Religion Courses

The following courses are taught entirely in English and are open to any Cornell student.

**250 Introduction to Asian Religions**
Fall. 3 credits.
T R 10:10–11:25. J. McRae.
A general introduction to the major religions of Asia (Hinduism, Buddhism, Taoism, and Shinto), their local interaction, and their impact on the cultures of India, China, and Japan. Based on readings of English translations of the canonical texts (*Bhagavad-Gita, Dhammapada, Lotus Sutra, Tao-te ching, Kojiki*), discussion will stress the relationships between the symbolic and mythological systems, as well as the rituals and the contemplative practices of each tradition. Two guided papers.

**[307 Asian Dance and Dance Drama (also Theatre Arts 307)**
Fall or spring. 3 credits. May be repeated for credit. [Section 1: Indian Dance. Fall. Hours to be arranged. D. Sudan. Not offered 1989–90.] [Section 2: Japanese Noh Theatre. Not offered 1989–90.] [Section 3: Indonesian Dance Theatre. Not offered 1989–90.] [Section 4: topic to be announced. Not offered 1989–90.]

**[310 Readings in Modern Korean Literature**
Fall. 3 credits. Limited to 25 students. Not offered 1989–90.
T R 10:10. D. McCann.]

**313 The Japanese Film**
Spring. 4 credits.
Screenings, M W 4:30; lec, W 11:15; sec F 11:15, 12:20, or 1:25. B. de Bary.
After an introduction to methods of film analysis, the course presents a sequence of ten films by noted Japanese directors. The aim of the course is twofold: to enhance appreciation of film as an art form and to use the formal analysis of films to yield insights into Japanese society and culture. Particular attention is

given to areas in which Japanese film, influenced by traditional arts and aesthetic principles, has resisted Hollywood editing codes.

**[338 Japanese Theatre (also Theatre Arts 338)**
4 credits. Not offered 1989–90.
K. Brazell.]

**[349 Myth and Literature in India**
Spring. 4 credits. Not offered 1989–90.
D. Gold.]

**351 The Religious Traditions of India**
Fall. 4 credits.
M W F 2:30–3:25. D. Gold.
A study of the relationships between the main currents of Indian religion. The course will first focus on the Hindu tradition and its holistic worldview within the context of the caste system. It will then describe the rise of Jainism and Theravada and Mahayana Buddhism, as well as Hindu and Buddhist Tantrism, as religious phenomena reflecting the emergence of individualism.

**[352 East Asian Buddhism**
Spring. 4 credits. No prerequisites: Asian Studies 250 or 351 strongly recommended. Not offered 1989–90.]

**355 Japanese Religions**
Spring. 4 credits.
Hours to be arranged. J. Swanberg.
A historical and phenomenological approach to the Japanese religious traditions with an emphasis on a system of interaction, in order to attempt to establish the form of the major forces that have shaped Japanese culture.

**357 Chinese Religions**
Fall 4 credits.
T R 2:55–4:10. J. McRae
An in-depth examination of religious ideas, practices, and institutions as they evolved through Chinese history: cosmological assumptions and ritual systems of the earliest Chinese state, religious implications of Confucianism and philosophical Taoism, and the maturation of religious Taoism; the influx and impact of Buddhist doctrine, and the emergence of the Sui-T'ang schools; Ch'an, Pure Land, and the transformation of medieval Chinese religion and society; and the emergence of premodern forms of Syncretism, Millenarian sects, and popular cults from the Sung onward.

**[371 Chinese Philosophical Literature**
Spring. 4 credits. Not offered 1989–90.
T. L. Mei.]

**[372 Chinese Poetry**
Spring. 4 credits. Not offered 1989–90.
T. L. Mei.]

**373 Twentieth-Century Chinese Literature**
Spring. 4 credits.
M W F 2:30. E. M. Gunn.
A survey of the principal works in English translation, the course introduces fiction, drama, essay, and poetry of China beginning with the Republican era and continuing up to the present in the People's Republic and Taiwan, with attention to social and political issues and literary theory. One session each week will be devoted to discussion.

**374 Chinese Narrative Literature**
Fall. 4 credits.
T R 1:25–2:40. J. Zeitlin.
Selected works in classical Chinese fiction are read in translation. Major novels, such as *The Dream of the Red Chamber* and *Water Margin*, are emphasized.

**[375 Japanese Poetry and Poetic Prose**
Spring. 4 credits. Alternates with Asian Studies 377. Not offered 1989–90.
N. Sakai.]

**376 Modern Japanese Literature: From Meiji through the Pacific War**
Fall. 4 credits. .
T R 10:10–11:15. B. de Bary.
The course examines developments in Japanese literature from the Meiji restoration (1868) onward. Topics will include the interaction of popular and "pure" literature, the Edo revival of the 1890s, the social context of the Meiji psychological novel, poetry and prose by women writers, the modernists and proletarian literature movements, writings of Hiroshima and Nagasaki, and the postwar vision of Ishimure, Morisaki, Mishima, Oe, and others. Special attention will be given to the revision of modern Japanese literary history recently articulated by Japanese postmodern critics.

**[377 Japanese Narrative Literature**
Spring. 4 credits. Not offered 1989–90.]

**[378 The Postwar and the Postmodern in Japanese Literature**
Fall. 4 credits. Not offered 1989–90.
B. de Bary.]

**[379 Southeast Asian Literature in Translation**
Fall or spring. 4 credits. Not offered 1989–90.]

**380 Vietnamese Literature in Translation**
Spring. 4 credits.
Hours to be arranged. K. Taylor.
This is a survey of Vietnamese literature in translation from the tenth century to the present. Attention will be given to different ways of reading this literature. Format will be primarily readings and discussion with some lecture-style presentations.

**390 Comparative Sanskrit Myth and Epic (also Classics 390)**
Spring. 4 credits.
T R 1:25–2:40. C. Minkowski.
Readings in translation from the two Sanskrit epics, the *Mahabharata* and *Ramayana*, and from the main cycles of the *Puranas*, the Sanskrit mythological literature. Special attention will be given to parallels and comparisons with Greek myth and epic, especially Homer and Hesiod. Classics 236 or 238 would be useful as background, but not presupposed.

**[386 Folk Literature of East Asia**
Spring. 4 credits. Not offered 1989–90.]

**388 Asian-American Literature**
Spring. 3 credits.
Hours to be arranged.

**400 The Japanese Noh Theater and Modern Dramatists (also Comparative Literature 400)**
4 credits. Fall.
MW 2:30–4:30. K. Brazell.
Several weeks will be spent studying the literary, performance, and aesthetic aspects of the noh theater. Emphasis will be on noh as a performance system, a total theater in which music, dance, text, costume, and props all interact to create the total effect. Then attention will turn to modern theater people who have reacted to noh in some creative way. Choice of dramatists will depend partly on student interests but will probably include Yeats, Brecht, Britten, Claudel, Grotowski, and Mishima. All readings may be done in English translation.

**410 Chinese Performing Arts**
Spring. 4 credits.
Hours to be arranged. E. M. Gunn.
The course will survey drama, music theater, and film in twentieth-century China. Some material will require knowledge of Chinese.

**440 Meditation Schools of East Asian Buddhism**
Spring.
TR 1:25–2:40. J. McRae.
Study of the Ch'an, Son, and Zen schools of China, Korea, and Japan, focusing on the basic themes of pre-Ch'an Buddhist meditation practice; the early, and classical, and Sung dynasty phases of Ch'an practice, encounter dialogue, and the use of precedent (*kung-an* or *koan*) anthologies; the formation of the Son school in Korea with its particular emphasis on the *Flower Garland Sütra*; the pinnacle of Soto Zen philosophy in the writings of Dogen; and the impact of Rinzai Zen on Japanese culture. Special attention to the relationships between the meditation schools and their social, intellectual, and religious contexts.

**[450 Thailand: A Buddhist Society**
Summer. 4–5 credits (5 credits with research paper). Prerequisite: permission of instructor. Not offered 1989–90.
T. Chaloemtiarana.]

**454 Women, Revolution, and Socialism (also Women's Studies 454)**
Spring. 4 credits.
T R 2:55–4:10. C. White.
The course will examine the theory and practice of revolution and socialist development from the viewpoint of women revolutionaries and socialist thinkers as well as male socialist writers on "the woman question." The theoretical focus will be on the articulation of revolution in gender relations with the other revolutionary struggles against colonial, class, and ethnic domination, and the subsequent interaction between socialist development and women's liberation. There will be a detailed case study of Vietnam. In addition, material on women, revolution, and socialism in the Soviet Union, China, Africa (Mozambique), and Latin America (Cuba and Nicaragua) will deal with such concrete issues as land reform, agrarian transformation, family law, literacy and education, and political leadership.

**[457 Human and Divine Beings**
Spring. 4 credits. Not offered 1989–90.
M W 2:30–3:45. D. Gold.]

**460 Indian Meditation Texts**
Spring. 4 credits.
M W 2:30–3:45. D. Gold.
Since texts that record visionary experience, prescribe the practice of contemplation, and present enigmatic utterances are highly valued in Indian tradition, they need to be taken seriously by students of Indian—and world—civilization. Yet the special problems of interpretation that they present have often caused meditation texts to be passed over in embarrassed, sometimes reverent silence. In this course we will draw on approaches from literary criticism, anthropology, and religious studies to explore a number of the problems to which these texts give rise: In what ways are the apparent differences in experience presented in meditation texts shaped by different cosmologies and ritual practice? Do different literary genres have particular religious implications? What are the relations between convention and experience in the creation of the texts? Readings will be drawn from the Upanishads and Tantras, devotional verse in the vernaculars, and the classical meditation manuals of Hinduism and Buddhism. Some attention may be given to Indian Sufi materials. No knowledge of Indian languages is required.

**470 Vietnamese Literature: Cultural and Intellectual History**
Spring. 4 credits.
T R 2:55–4:10. K. Taylor.
A study of the Vietnamese intellectual tradition, its sources and its idiom, as it has developed into modern times, including attitudes toward religion, social organization, authority, cultural identity, and the process of defining and enforcing the borders of what is "Viet" and what is not. Participants must have, or be in an advanced stage of acquiring, a reading knowledge of Vietnamese, as readings will be original Vietnamese texts. Format will be primarily readings and discussion with some lecture-style presentations.

**[496 Tokugawa Thought and Culture: Otherness, Text, and Body**
Spring. 4 credits. Not offered 1989–90.]

*Note:* For complete descriptions of courses numbered 600 or above, consult the graduate faculty representative.

**601 Southeast Asia Seminar: Vietnam**
Fall. 4 credits.
W 3–5. K. Taylor.

**602 Southeast Asia Seminar: Upland Peoples of Mainland Southeast Asia**
Spring. 4 credits.
Hours to be arranged. Staff.

**[604 Southeast Asia Seminar**
Not offered 1989–90.]

**[607–608 The Plural Society Revisited (also Government 653)**
Fall. 4 credits. 607 may be taken independently for credit; 607 is a prerequisite for 608. Not offered 1989–90.]

**611 Chinese and Japanese Bibliography and Methodology**
Spring. 1 credit. Prerequisite: permission of instructor. Required of honors students and M.A. candidates.
Sec 1: Chinese, F 1:25, M. C. Chou; sec 2: Japanese, F 2:30, S. Akiba.

**621 South Asia Seminar**
Fall.
Not offered in the fall semester at Cornell, but as a seminar at Syracuse University; Cornell students can take it under a consortium arrangement. A companion course, AS 621, will be offered in the spring semester with the theme of "State and Society in South Asia." The fall course focuses on state-society relations with regard to natural resource management, looking at how communities undertake this "in the shadow of the state." Cornell faculty will participate. The spring course will focus on state-society relations from above, with regard to the role of bureaucracy and various political interests and ideologies affecting people's development, freedom, and personal fulfillment. For further information, please contact the South Asia Program Office, 170 Uris Hall.

**622 Seminar on South Asia: State Policy and State Practice: Views of the Subcontinent.**
Spring.

**650 Seminar on Asian Religions**
2–4 credits. Prerequisite: permission of instructor.
Fall, M W 12:20–1:10, J. Swanberg; spring, hours to be arranged, J. McRae.

**676 Southeast Asia Research Training Seminar**
Contact the Southeast Asia Program, 120 Uris Hall, 255-2378, for more information.

**701–702 Seminar in East Asian Literature**
701, fall; 702, spring. 1–4 credits.
Hours to be arranged. Staff.

**703–704 Directed Research**
For additional courses on Asian religion, see "Related Courses" in the China and Japan area courses listing.

## Asia—General Courses

**401 Asian Studies Honors Course**
Fall. 4 credits. Intended for seniors who have been admitted to the honors program.
Staff.
Supervised reading and research on the problem selected for honors work.

**402 Asian Studies Honors: Senior Essay**
Fall or spring. 4 credits. Prerequisite: admission to the honors program.
The student, under faculty direction, prepares an honors essay.

**403–404 Asian Studies Supervised Reading**
Fall, spring, or both. Credit to be arranged. Prerequisite: permission of instructor. Open to majors and other qualified students.
Intensive reading under the direction of a member of the staff.

**[403.1 Readings in Modern Korean Literature**
Fall. 4 credits. Limited to 10 students. Prerequisite: permission of instructor. Not offered 1989–90.
D. McCann.]

**605–606 Master of Arts Seminar in East Asian Studies**
605, fall; 606, spring. 2–4 credits.
Hours to be arranged. Staff.

**703–704 Directed Research**
703, fall or spring; 704, fall or spring. Credit to be arranged.
Staff.

## Literature in Chinese

**213–214 Introduction to Classical Chinese**
213, fall; 214, spring. 3 credits each term. Prerequisite: qualification in Chinese or permission of instructor. May be taken concurrently with Chinese 101–102, 201–202, 301–302.
M W F 12:20. J. Zeitlin.

**[313 Chinese Philosophical Texts**
Spring. 4 credits. Prerequisite: Chinese 214. Not offered 1989–90.
T. L. Mei.]

**[314 Classical Narrative Texts**
4 credits. Prerequisite: Chinese 214.
Not offered 1989–90.]

**[420 T'ang and Sung Poetry**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
T. L. Mei.]

**421–422 Directed Study**
Fall or spring. 2–4 credits each term. Prerequisite: permission of instructor.
Staff.

**[424 Readings in Literary Criticism**
Fall or spring. 4 credits. Prerequisite: permission of instructor.
Not offered 1989–90.]

**427 Approaches to *Jin ping mei***
Fall. 4 credits.
T R 11:40–12:55. A. Yee.
The course will read the *Jin ping mei*, the most controversial major work of pre-modern fiction in China. Controversies persist to the present day reflecting major cultural issues in Chinese society, including the nature and role of social classes and gender relations, and literature as a presentation of these.

**428 Approaches to *Hung lou meng***
Spring. 4 credits.
A. Yee.
Students will read critical theories interpreting the *Hung lou meng* through biographical, textual, Marxist, allegorical, psychological, and structural approaches. These introduce major examples of Western and Chinese discourse on Chinese literature. There will be a 20-page term paper.

**[430 Readings in Folk Literature**
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.]

*Note:* For complete descriptions of courses numbered 600 or above, consult the appropriate instructor.

**603 Seminar in Chinese Fiction and Drama**
Fall or spring. 4 credits. Prerequisite: permission of instructor.

**[605 Seminar in Chinese Fiction and Drama**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
E. M. Gunn.]

**609 Seminar in Chinese Folk Literature**
Fall or spring, according to demand. 4 credits. Prerequisite: permission of instructor.
Staff.

**610 Chinese Cultural Criticism**
Fall. 4 credits.
Hours to be arranged. E. M. Gunn.
The course develops questions about cultural criticism of China through reading and discussions of modern critiques of Chinese culture, primarily from the late Qing to the post-Mao era, selected from the work of both Chinese and Western critics. Particular emphasis is placed on the role of cultural criticism in producing literature.

**621–622 Advanced Directed Reading**
2–4 credits. Prerequisite: permission of instructor.
Staff.

## Literature in Japanese

**406 Introduction to Classical Japanese**
Fall. 4 credits. Prerequisite: permission of instructor.
Hours to be arranged. N. Sakai.

**421–422 Directed Readings**
421, fall; 422, spring; credits to be arranged. Prerequisite: for Japanese 421, Japanese 402 or equivalent; for Japanese 422, Japanese 421 or equivalent.
Hours to be arranged. Staff.

*Note:* For complete descriptions of courses numbered 600 or above, consult the appropriate instructor.

**[611 Seminar in Classical Japanese Literature**
Fall or spring. 2–4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
K. Brazell.]

**[612 Seminar in Medieval Japanese Literature**
Fall or spring. 2–4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
K. Brazell.]

**[613 Seminar in Tokugawa Literature**
Fall or spring. 2–4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
N. Sakai.]

**614 Seminar in Modern Japanese Literature**
Fall or spring. 2–4 credits. Prerequisite: permission of instructor. Offered alternate years.
B. deBary, K. Brazell, N. Sakai.

**[621 Advanced Readings in Pre-Modern Japanese Narrative Literature**
Fall or spring. 4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
K. Brazell.]

### Graduate-Level Reading Courses

**[622 Advanced Readings in Pre-Modern Japanese Poetry**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
K. Brazell.]

**[623 Advanced Readings in Pre-Modern Drama**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
K. Brazell.]

**624 Advanced Readings in Modern Literature**
Fall. 4 credits. Prerequisite: permission of instructor. Offered alternate years.
T R 1:25–2:40. B. de Bary.

*Note:* See courses listed under Asia—Literature and Religion Courses for Japanese literature courses in translation.

### Japanese Language

See Modern Languages and Linguistics.

### FALCON Program

255-6457; R. Sukle, 412 Morrill Hall, 255-0734; J. Whitman, 308 Morrill Hall, 255-0736.

## Literature in Sanskrit

**467–468 Reading in Sanskrit Literature: The Vedas**
Fall. 3 credits.
M W F 9:05–9:55. C. Minkowski.
Readings in translation; readings in the original Vedic. Both courses must be taken as a sequence: 467, fall; 468, spring. 467 offered only in the fall; [468 not offered 1989–90].

### Related Courses in Other Departments

**[Meaning across Cultures (Anthropology 220)**
Not offered 1989–90.]

**[Anthropology of the City (Anthropology 313)**
Not offered 1989–90.]

**[Histories of Ideas of Exotica (Anthropology 325)**
Not offered 1989–90.]

**[Balinese Culture: Description and Comparison (Anthropology 410)**
Not offered 1989–90.]

**[Hierarchies, Ritual, and History (Anthropology 611)**
Not offered 1989–90.]

**Anthropological Approaches to the Study of Buddhism in Asia (Anthropology 619)**

**[Government and Politics of Southeast Asia (Government 344)**
Not offered 1989–90.]

**Politics in Contemporary Japan (Government 346)**

**Politics of Industrial Societies (Government 348)**

**[Political Role of the Military (Government 349)**
Not offered 1989–90.]

**[Comparative Revolutions (Government 350)**
Not offered 1989–90.]

**[Contemporary Revolutions (Government 355)**
Not offered 1989–90 ]

**[The United States and Asia (Government 387)**
Not offered 1989–90.]

**Graduate Seminar in Political Economy of Change: Rural Development in the World (Government 648)**

**[Seminar in International Relations of Asia (Government 687)**
Not offered 1989–90.]

**Introduction to Asian Civilizations (History 190)**

**Introduction to Asian Civilizations in the Modern Period (History 191)**

**[Introduction to Art History: Asian Traditions (History of Art 280)**
Not offered 1989–90.]

**[Buddhist Art in Asia (History of Art 381)**
Not offered 1989–90.]

**[The Arts of Early China (History of Art 383)**
Not offered 1989–90.]

**[Studies in Indian and Southeast Asian Art (History of Art 386)**
Not offered 1989–90.]

**[Architecture and Gardens of Japan (History of Art 388)**
Not offered 1989–90.]

**[Ceramic Art of Asia (History of Art 482)**
Not offered 1989–90.]

**[Problems in Asian Art (History of Art 580)**
Not offered 1989–90.]

### Related Courses in Other Colleges

The courses listed below will count as College of Arts and Sciences credit only for Asian studies majors.

**Economics of Agricultural Development (Agricultural Economics 464)**

**Food, Population, and Employment (Agricultural Economics 660)**

**Macroeconomic Issues in Agricultural Development (Agricultural Economics 663)**

**Food and Nutrition Policy (Agricultural Economics 685 and Nutritional Science 685)**

**Macro Policy in Developing Countries (Agricultural Economics 763)**

**[Architecture in Its Cultural Context (Architecture 667–668)**
Not offered 1989–90.]

**[Communication in the Developing Nations (Communication 624)**
Not offered 1989–90.]

**[Social and Demographic Changes in Asia (Rural Sociology 439)**
Not offered 1989–90.]

**[Applications of Sociology to Development Programs (Rural Sociology 751)**
Not offered 1989–90.]

## China—Area Courses

**Economic Anthropology (Anthropology 326)**

**Religion, Family, and Community in China (Anthropology 343)**

**[Religion and Ritual in Chinese Society (Anthropology 443)**
Not offered 1989–90.]

**Selected Topics in Socialist Economies: China (Economics 369 and 569)**

**Chinese Government and Politics (Government 347)**

**[Comparative Revolutions (Government 350)**
Not offered 1989–90.]

**Socialism and the Market in China (Government 443/643)**

**[Readings on the Great Cultural Revolution (Government 447)**
Not offered 1989–90.]

**Political Economy of Contemporary China (Government 448)**
Not offered 1989–90.]

**[Capitalism and Communism: Chinese and Japanese Patterns of Development (Government 462)**
Not offered 1989–90.]

**[Politics of China (Government 645)**
Not offered 1989–90.]

**China and the West before Imperialism (History 243)**

**History of China up to Modern Times (History 293)**

**History of China in Modern Times (History 294)**

**Early Warfare, East and West (History 360)**

**Undergraduate Seminar in Medieval Chinese History (History 492)**

**[Self and Society in Late Imperial and Twentieth-Century China (History 493)**
Not offered 1989–90.]

**[Art and Society in Modern China (History 499)**
Not offered 1989–90.]

**Chinese Historiography and Source Materials (History 691)**

**Problems in Modern Chinese History (History 693–694)**

**[Seminar in Medieval Chinese History (History 791–792)**
Not offered 1989–90.]

**[Seminar in Modern Chinese History (History 793–794)**
Not offered 1989–90.]

**[Introduction to the Arts of China (History of Art 380)**
Not offered 1989–90.]

**[The Arts of Early China (History of Art 383)**
Not offered 1989–90.]

**[Chinese Painting (History of Art 385)**
Not offered 1989–90.]

**The Arts of Southeast Asia (History of Art 396)**

**The Arts in Modern China (History of Art 481)**

**Ceramic Art of China and Southeast Asia (History of Art 482)**

**[Chinese Art of the T'ang Dynasty (History of Art 483)**
Not offered 1989–90.]

**[Studies in Chinese Painting (History of Art 486)**
Not offered 1989–90.]

**Human Ecological Series (Rural Sociology 690)**

**Contemporary Chinese Society (Sociology 369)**

Other courses dealing extensively with China are Architecture 667–668; Government 348, 350, 387, 446, and 645; History 190 and 191; History of Art 280, 381, 482, 580, and 596.

## China—Language Courses

**Elementary Course (Chinese 101–102)**

**Cantonese Elementary Course (Chinese 111–112)**

**Cantonese Elementary Speaking (Chinese 113–114)**

**FALCON (full-time course, Chinese 161–162)**

**Intermediate Chinese (Chinese 201–202)**

**Intermediate Cantonese (Chinese 211–212)**

**Advanced Chinese (Chinese 301–302)**

**Advanced Chinese Conversation (Chinese 303–304)**

**Advanced Cantonese (Chinese 311–312)**

**[History of the Chinese Language (Chinese 401)**
Not offered 1989–90.]

**Linguistic Structure of Chinese I (Chinese 403)**

**Linguistic Structure of Chinese II (Chinese 404)**

**[Chinese Dialects (Chinese 405)**
Not offered 1989–90.]

**Readings in Modern Chinese (Chinese 411–412)**

**Chinese Reading Tutorials (Chinese 413–414)**

**[Chinese Dialect Seminar (Chinese 607)**
Not offered 1989–90.]

## Japan—Area Courses

**Japanese Society (Anthropology 345)**

**Japanese Ethnology (Anthropology 645)**

**Business and Labor in Politics (Government 334)**

**Politics in Contemporary Japan (Government 346)**

**[Politics of Productivity: Industrial Adjustment in Japan and West Germany (Government 430)**
Not offered 1989–90.]

**[Capitalism and Communism: Chinese and Japanese Patterns of Development (Government 462)**
Not offered 1989–90.]

**Comparative Politics Field Seminar (Government 605)**

**Introduction to Asian Civilization in the Modern Period (History 191)**

**[Japan and the West (History 192)**
Not offered 1989–90.]

**State, Society, and Culture in Japan to 1750 (History 297)**

**State, Society, and Culture in Modern Japan (History 298)**

**[War as Myth and History in Postwar Japan (History 399)**
Not offered 1989–90.]

**The Ideology of the Meiji Restoration (History 489)**

**Seminar in Japanese Thought (History [797]–798)**
[797 not offered 1989–90.]

**The Arts of Japan (History of Art 384)**

**[Architecture and Gardens of Japan (History of Art 388)**
Not offered 1989–90.]

**[Japanese Painting (History of Art 389)**
Not offered 1989–90.]

**Studies in Japanese Art and Architecture (History of Art 484)**
Not offered 1989–90.]

**[Ceramic Arts of Japan (History of Art 485)**
Not offered 1989–90.]

**Industrial Policy: Lessons for the United States from Japan and Europe (Management NBA 580)**

**Business in Japan (Management NBA 589)**

**Development in the Pacific Rim (Rural Sociology 492)**

Other courses dealing extensively with Japan are Anthropology 313; Architecture 667–668; Education 678; Government 348 and 387; History 190 and 191; History of Art 280, 381, 388, 482, 491, 580, and 596.

## Japan—Language Courses

**Elementary Course (Japanese 101–102)**

**Accelerated Introductory Japanese (Japanese 123)**

**[Introductory Japanese for Business Purposes (Japanese 141–142)**
Not offered 1989–90.]

**FALCON (full-time intensive course, Japanese 161–162)**

**Intermediate Japanese Reading I (Japanese 201–202)**

**Intermediate Japanese Conversation (Japanese 203–204)**

**[Intermediate Japanese Reading I and Conversation (Japanese 205–206)**
Not offered 1989–90.]

**[Transition to Intermediate Japanese Conversation (Japanese 223)**
Not offered 1989–90.]

**Intermediate Japanese for Business Purposes (Japanese 241–242)**

**Intermediate Japanese Reading II (Japanese 301–302)**

**Communicative Competence (Japanese 303–304)**

**Advanced Japanese for Business Purposes (Japanese 341–342)**

**Advanced Japanese Reading (Japanese 401–402)**

**Linguistic Structure of Japanese (Japanese 404)**

**Oral Narration and Public Speaking (Japanese 407–408)**

**History of Japanese Language (Japanese 410)**

**Directed Readings (Japanese 421–422)**

**[Introductory Japanese for Business Purposes (Japanese 541–542)**
Not offered 1989–90.]

**Intermediate Japanese for Business Purposes (Japanese 543–544)**

**Advanced Japanese for Business Purposes (Japanese 545–546)**

## South Asia—Area Courses

**Food, Population, and Employment (Agricultural Economics 660)**

**South Asian Seminar: (Anthropology 339)**

**[Cultures and Societies of India, Nepal, and Sri Lanka (Anthropology 342)**
Not offered 1989–90.]

**Anthropological Approaches to the Study of Buddhism in Asia (Anthropology 619)**

**[Himalayan Issues, Problems, and Prospects (Anthropology 623)**
Not offered 1989–90.]

**South Asia: Readings in Specific Problems (Anthropology 640–641)**

**Architecture in Its Cultural Context (Architecture 667–668)**

**Introduction to South Asian Civilizations (Asian Studies 215)**

**Introduction to Asian Religions (Asian Studies 250)**

**The Religious Traditions of India (Asian Studies 351)**

**South Asia Seminar: (Asian Studies 621)**

**South Asia Seminar: State Policy and State Practice: Views of the Subcontinent (Asian Studies 622)**

**The Global City (City and Regional Planning 101)**

**Transnational Corporations and Developing Regions (City and Regional Planning 775)**

**Theories of Development and Underdevelopment (City and Regional Planning 777)**

**[Communication in the Developing Nations (Communication Arts 624)**
Not offered 1989–90.]

**Fictions of India (English 353)**

**[India: Social and Economic Change in a Democratic Polity (Government 351)**
Not offered 1989–90.]

**The Political Economy of Change (Government 648)**

**[Agrarian Change in South Asia—Politics, Society, and Culture (Government 651)**
Not offered 1989–90.]

**[Buddhist Art in Asia (History of Art 381)**
Not offered 1989–90.]

**[Studies in Indian and Southeast Asian Art (History of Art 386)**
Not offered 1989–90.]

**[Dravidian Structures (Linguistics 440)**
Not offered 1989–90.]

**[Indo-Aryan Structures (Linguistics 442)**
Not offered 1989–90.]

**[Rigveda (Linguistics 619)**
Not offered 1989–90.]

**[Introduction to Pali (Linguistics 639–640)**
Not offered 1989–90.]

**Elementary Sanskrit (Linguistics 641–642)**

**Directed Research (Linguistics 701–702)**

**Rural Sociology and International Development (Rural Sociology 205)**

**[Gender Relations and Social Change (Rural Sociology 425)**
Not offered 1989–90.]

**Rural Social Stratification (Rural Sociology 445)**

**Developments in the Pacific Rim (Rural Sociology 492)**

**The Political Economy of Policy and Planning in Third World States (Rural Sociology 492)**

**[Applications of Sociology to Development Programs (Rural Sociology 751)**
Not offered 1989–90.]

**Sociotechnical Aspects of Irrigation (Rural Sociology 754, Government 644, Agricultural Engineering 754, and Agricultural Economics 754)**

Other courses dealing extensively with South Asia are Anthropology 321 and 611; Agricultural Economics 464; Communication Arts 626; Government 387 and 687; History 190 and 191; History of Art 280, 482, 580, and 596.

## South Asia—Language Courses

**Elementary Bengali (Bengali 121–122)**

**Intermediate Bengali (Bengali 203–204)**

**Elementary Course (Hindi 101–102)**

**Intermediate Hindi Reading (Hindi 201–202)**

**Intermediate Composition and Conversation (Hindi 203–204)**

**Advanced Readings in Hindi Literature (Hindi 301–302)**

**Advanced Composition and Conversation (Hindi 303–304)**

**Elementary Course (Nepali 101–102)**

**Intermediate Nepali Conversation (Nepali 201–202)**

**Intermediate Nepali Composition (Nepali 203–204)**

**Elementary Course (Sinhalese 101–102)**

**Intermediate Sinhala Reading (Sinhalese 201–202)**

**Intermediate Composition and Conversation (Sinhalese 203–204)**

**Elementary Course (Tamil 101–102)**

## Southeast Asia—Area Courses

**Microeconomic Issues in Agricultural Development (Agricultural Economics 664)**

**Sociotechnical Aspects of Irrigation (Agricultural Economics 754, Agricultural Engineering 754, Rural Sociology 754, and Government 644)**

**[Meaning across Cultures (Anthropology 220)**
Not offered 1989–90.]

**Ethnographic Description (Anthropology 306)**

**[Histories of Ideas of Exotica (Anthropology 325)**
Not offered 1989–90.]

**[Ethnology of Island Southeast Asia (Anthropology 334)**
Not offered 1989–90.]

**[Peoples and Cultures of Mainland Southeast Asia (Anthropology 335)**
Not offered 1989–90.]

**[Balinese Culture: Description and Comparison (Anthropology 410)**
Not offered 1989–90.]

**Myth, Ritual, and Sign (Anthropology 424)**

**[Myth and Mythology (Anthropology 610)**
Not offered 1989–90.]

**[Hierarchies, Ritual, and History (Anthropology 611)**
Not offered 1989–90.]

**Anthropological Approaches to the Study of Buddhism in Asia (Anthropology 619)**

**[Political Anthropology: Indonesia (Anthropology 628 and Government 647)**
Not offered 1989–90.]

**Southeast Asia: Readings in Special Problems (Anthropology 634–635)**

**[Southeast Asian Literature in Translation (Asian Studies 379)**
Not offered 1989–90.]

**Southeast Asia Seminar: Vietnam (Asian Studies 601)**

**Southeast Asia Seminar: Upland Peoples of Mainland South East Asia (Asian Studies 602)**

**[Southeast Asia Seminar (Asian Studies 604)**
Not offered 1989–90.]

**Southeast Asia Research Training Seminar (Asian Studies 676)**

**Directed Research (Asian Studies 703–704)**

**[Government and Politics of Southeast Asia (Government 344)**
Not offered 1989–90.]

**The United States and Asia (Government 387)**
Not offered 1989–90.]

**[Political Anthropology: Indonesia (Government 647 and Anthropology 628)**
Not offered 1989–90.]

**[Political Problems of Southeast Asia (Government 652)**
Not offered 1989–90.]

**[International Relations of Asia (Government 687)**
Not offered 1989–90.]

**Introduction to Asian Civilization: Modern Period (History 191)**

**Southeast Asia to the Eighteenth Century (History 395)**

**Southeast Asian History from the Eighteenth Century (History 396)**

**Early Southeast Asia: Graduate Proseminar (History 695)**

**Modern Southeast Asia: Graduate Proseminar (History 696)**

**Seminar in Southeast Asian History (History 795–[796])**
[796 not offered 1989–90.]

**[Introduction to Art History: Asian Traditions (History of Art 280)**
Not offered 1989–90.]

**[Buddhist Art in Asia (History of Art 381)**
Not offered 1989–90.]

**[Studies in Indian and Southeast Asian Art (History of Art 386)**
Not offered 1989–90.]

**[Traditional Arts in Thailand (History of Art 388)**
Not offered 1989–90.]

**[Ceramic Art of China and Southeast Asia (History of Art 482)**
Not offered 1989–90.]

**[Studies in Asian Art (History of Art 580)**
Not offered 1989–90.]

**[Problems Methodology Seminar (History of Art 595)**
Not offered 1989–90.]

**[Farming Systems Research (International Agriculture 606)**
Not offered 1989–90.]

**Sociolinguistics (Linguistics 405–406)**

**Field Methods (Linguistics 600)**

**Old Javanese (Linguistics 651–652)**

**Seminar in Southeast Asian Linguistics (Linguistics 653–654)**

**Austronesian Linguistics (Linguistics 655–656)**

**Seminar in Austro-Asiatic Linguistics (Linguistics 657–658)**

**Directed Research (Linguistics 701–702)**

**[Tibeto-Burman Linguistics (Linguistics 753)**
Not offered 1989–90.]

**[Introduction to Musics of the World (Music 103)**
Not offered 1989–90.]

**History, Theory, and Practice of Gamelan (Music 245–246)**

**Cornell Gamelan Ensemble (Music 445–446)**

**[Introduction to Enthnomusicology (Music 680)**
Not offered 1989–90.]

**Rural Sociology and International Development (Rural Sociology 205)**

**Sociotechnical Aspects of Irrigation (Rural Sociology 754, Agricultural Economics 754, Agricultural Engineering 754, and Government 644)**

**Special Seminar (Rural Sociology 771)**

**[Social and Demographic Change in Southeast Asia (Sociology 439)**
Not offered 1989–90.]

Other courses dealing with Southeast Asia are Agricultural Engineering 754 and 771; Agronomy 314 and 471; Anthropology 102 and 420; Architecture 667–668; Asian Studies 250, 351, 352, and 650; Education 685, 782, and 783; Government 692; History 190; International Agriculture 603, 606, and 703; Nutritional Sciences 680 and 695.

### Southeast Asia—Language Courses

**Elementary Course (Burmese 101–102)**

**Intermediate Burmese Reading (Burmese 201–202)**

**Intermediate Composition and Conversation (Burmese 203–204)**

**Advanced Burmese Reading (Burmese 301–302)**

**Burmese Directed Individual Study (Burmese 401–402)**

**Elementary Course (Cebuano [Bisayan] 101–102)**

**Elementary Course (Indonesian 101–102)**

**FALCON (full-time intensive course, Indonesian 161–162)**

**Intermediate Indonesian Reading (Indonesian 201–202)**

**Intermediate Composition and Conversation (Indonesian 203–204)**

**Linguistic Structure of Indonesian (Indonesian 300)**

**Advanced Readings in Indonesian and Malay (Indonesian 301–302)**

**Advanced Indonesian Conversation and Composition (Indonesian 303–304)**

**Directed Individual Study (Indonesian 305–306)**

**Advanced Readings in Indonesian and Malay Literature (Indonesian 401–402)**

**Elementary Course (Javanese 131–132)**

**Continuing Course (Javanese 133–134)**

**Directed Individual Study (Javanese 203–204)**

**Elementary Course (Khmer 101–102)**

**Intermediate Khmer Reading (Khmer 201–202)**

**Intermediate Composition and Conversation (Khmer 203–204)**

**Advanced Khmer (Khmer 301–302)**

**Directed Individual Study (Khmer 401–402)**

**[Structure of Khmer (Khmer 404)**
Not offered 1989–90.]

**Elementary Course (Tagalog 101–102)**

**Intermediate Tagalog Reading (Tagalog 201–202)**

**Linguistic Structure of Tagalog (Tagalog 300)**

**Elementary Course (Thai 101–102)**

**Intermediate Thai Reading (Thai 201-202)**

**Intermediate Composition and Conversation (Thai 203–204)**

**Advanced Thai (Thai 301–302)**

**Thai Literature (Thai 303–304)**

**Directed Individual Study (Thai 401–402)**

**Elementary Course (Vietnamese 101–102)**

**Intermediate Vietnamese Reading (Vietnamese 201–202)**

**Intermediate Composition and Conversation (Vietnamese 203–204)**

**Advanced Vietnamese (Vietnamese 301–302)**

**Directed Individual Study (Vietnamese 401–402)**

**Vietnamese Literature (Vietnamese 403–404)**

## ASTRONOMY

Y. Terzian, chair (512 Space Sciences Building, 255-4935); J. F. Veverka, director of undergraduate studies (312 Space Sciences Building 255-3507); S. V. W. Beckwith, J. A. Burns, D. B. Campbell, D. F. Chernoff, J. M. Cordes, M. M. Davis, P. J. Gierasch, R. Giovanelli, T. Hagfors, M. P. Haynes, T. L. Herter, J. R. Houck, P. D. Nicholson, C. E. Sagan, E. E. Salpeter, S. L. Shapiro, S. W. Squyres, S. A. Teukolsky, I. M. Wasserman. Emeritus T. Gold, M. O. Harwit

Cornell's astronomy faculty, research staff, and graduate students are active in diverse areas of modern astronomy ranging from theoretical astrophysics and general relativity to radio and radar astronomy, infrared and optical astronomy, and the exploration of the solar system. Cornell operates two local optical observatories, the world's largest radio telescope at Arecibo, Puerto Rico, and with two other institutions, the 200-inch optical telescope at Mt. Palomar in California.

The department offers a number of courses to satisfy a general interest in astronomy. These courses have few or no prerequisites and are not intended for the training of professional astronomers. The 100-level courses are designed primarily for nonscience majors. The alternative introductory sequence Astronomy 211–212 is geared toward sophomore physical science and engineering majors and requires coregistration in beginning calculus. Astronomy 332 is designed for nonmajors as an introduction to astrophysics and requires at

least one year of calculus and college physics as prerequisites. The other courses numbered below 400 have no college prerequisites at all.

Courses numbered above 400 are intended for students who have had two to three years of college physics and at least two years of college mathematics. Astronomy 440, Independent Study, permits students to engage in individual research projects under the guidance of a faculty member.

Interested students are encouraged to become members of the undergraduate Cornell Astronomy Club. The club has access to the Fuertes Observatory on campus and conducts regular observing and astrophotography sessions. All students are invited to visit the Space Sciences Building, see the exhibits on display there, and consult a faculty member about career plans or choice of courses.

## The Major

The purpose of the major in astronomy is to provide in-depth knowledge and education about the nature of the universe. Similar to other disciplines in the sciences, astronomy relies heavily on preparation in physics and mathematics. Consequently, many courses in these fields are included as prerequisites. In preparation for the major, a student would normally elect the introductory physics sequence Physics 112–213–214 or 116–217–218 plus Physics 315 and 318 and the complementary pathway in mathematics, Mathematics 111–122–221–222 or 191–192–293–294 (or equivalent). The sophomore seminar Astronomy 233 "Topics in Astronomy and Astrophysics" will provide an introduction to current research in astronomy and astrophysics for prospective majors, but is not required of students who elect to major in astronomy after the sophomore year. Students are also urged to acquire computer literacy. Acceptance to the major will first be considered after completion of three semesters of introductory physics and mathematics and in general will require a GPA of 3.20 in physics and mathematics courses.

The major requirements stress the importance of building a strong preparation in physical science. The following upper level courses are normally required:

Physics 324, 326, 341, and 443
Mathematics 421 and 422 (or equivalent)
Astronomy 410, 431, and 432.

Students are encouraged to supplement the above courses with any astronomy, physics, or other appropriate courses at or above the 400 level. Advanced seniors can enroll in astronomy graduate courses with the consent of the instructor. Students are also encouraged to work with faculty members on independent study projects (Astronomy 440).

**Honors.** A student may be granted honors in astronomy upon the recommendation of the Astronomy Advisers Committee of the astronomy faculty.

**Double majors.** A double major in astronomy and another subject is possible in many circumstances. However, the set of courses used to fulfill the requirements for each major must be completely independent.

**Concentration.** Students majoring in other fields but interested in astronomy are encouraged to supplement their major with a concentration in astronomy, an option that is somewhat less intensive than a major. Normally Astronomy 431 and 432 are required for a concentration.

## Distribution Requirement

The distribution requirement in physical sciences is met by A101 or A211, plus A102 or A212; or A102 or A212, plus A332. A103 and A104, identical to A101–102 except for the omission of the laboratories, cannot be used to satisfy the distribution requirement for students in the College of Arts and Sciences.

## Courses

**101 The Nature of the Universe**
Fall. 4 credits. No prerequisites. Labs and discussions limited to 20 students each.
Lecs, M W F 11:15; labs, *every other* week: M T or W 2:30–5 or M T W or R 7:30–10 p.m.; disc, one hour *every* week: M or W 1:25, 2:30, 3:35, or 7:30 p.m., or T or R 2:30, 3:35, or 7:30 p.m. Y. Terzian; labs, T. L. Herter.
The physical nature of existence. An examination of the universe and our place in it and the possible existence of life and intelligence elsewhere in the cosmos. The nature of stars, galaxies, and quasi-stellar sources. The birth, evolution, and death of stars and the formation of the chemical elements, including discussions of supernovae, pulsars, neutron stars, and black holes. The physical state and composition of the interstellar material and its influence on the evolution of our galaxy. An introduction to the special and general theories of relativity. The nature of time. Modern theories of cosmology and the structure and evolution of the universe.

**102 Our Solar System**
Spring. 4 credits. No prerequisites. Limited to 330 students (combined total with Astronomy 104: 430 students). Labs and discussions limited to 20 students each.
Lecs, M W F 11:15; labs *every other* week: M T or W 2:30–5 or M T W or R 7:30–10 p.m.; disc, one hour *every* week: M or W 1:25, 2:30, 3:35, or 7:30 p.m. or T or R 2:30, 3:35, or 7:30 p.m. J. R. Houck; labs, T. L. Herter.
The evolution of our understanding of the formation and structure of the solar system will be discussed. Modern theories of the solar system will be compared with the results of the space program. The chemical basis of life and current ideas about the spontaneous appearance of life will be considered along with searches for life beyond the earth, both inside and outside the solar system.

**103 The Nature of the Universe**
Fall. 3 credits.
Identical to Astronomy 101 except for omission of the laboratory (see description above). This course does not satisfy the distribution requirement in physical sciences for students in the College of Arts and Sciences.

**104 Our Solar System**
Spring. 3 credits. Limited to 100 students (combined total with Astronomy 102: 430 students).
Identical to Astronomy 102 except for omission of the laboratory (see description above). This course does not satisfy the distribution requirement in physical sciences for students in the College of Arts and Sciences.

**105 An Introduction to the Universe**
Summer. 3 credits.
M–F 11:30–12:45; evening labs to be arranged. Staff.
How do we measure the size of our galaxy and the size of the universe? Is the universe round or flat? How are the stars born, why do they shine, and how do they die? What are the chemical elements, and how were they formed in stars? What are quasars, pulsars, and black holes? How was the solar system formed? What are the environments of other planets like? What is the basic structure of Earth and the other planets? Will man catastrophically alter the earth? Does life exist elsewhere in the universe? How can we find out? Each student has an opportunity to make observations with small telescopes.

**106 Essential Ideas in Relativity and Cosmology**
Summer. 3 credits. Prerequisites: high school algebra and trigonometry.
M–F 10–11:15. Staff.
Einstein's theories of special and general relativity, which brought about a fundamental change in our conceptual understanding of space and time, will be studied. Correspondence to, and conflicts with, common sense will be pointed out. Applications to various areas will be studied: in special relativity—space travel, equivalence of mass and energy, nuclear fission and fusion, and thermonuclear processes in the sun; in general relativity—motion of light and particles in curved space-time, cosmological models, and the question of whether the universe is open or closed.

**201 Our Home in the Universe**
Spring. 3 credits.
T R 2:30–3:45. S. Beckwith.
A general discussion of man's relation to the physical universe; the nature of space and time as understood in modern physics; the universe of galaxies and stars; and the particular system of planets and satellites encircling one such average star, our sun. The origin and evolution of the solar system as revealed by modern planetary exploration. The great uncertainties that remain.

**211 Astronomy: Stars, Galaxies, and Cosmology**
Spring. 4 credits. Intended for engineering and physical sciences freshmen. Prerequisite: introductory calculus or coregistration in Mathematics 111 or 191.
Lecs, M W F 10:10; rec, one hour each week to be arranged; plus some evening observing periods. I. Wasserman.
The formation and evolution of stars. Supernovae, pulsars, quasars, and black holes. The interstellar medium. The structure and evolution of galaxies. Cosmology.

**212 The Solar System: Planets, Satellites, and Rings**
Fall. 4 credits. Intended for engineering and physical sciences freshmen. Prerequisite: introductory calculus or coregistration in Mathematics 111 or 191.
Lecs, M W F 11:15; rec, one hour each week to be arranged; possible evening observing labs to be arranged.
S. Squyres.
The origin of the solar system; celestial mechanics; tidal evolution; the physics and chemistry of planetary surfaces, atmospheres, and satellites; interiors; planetary rings; asteroids, comets, and meteorites; the search for other planetary systems.

**[215 Information and Knowledge in Science and Engineering (also Arts and Sciences 200)**
Fall. 4 credits. Not offered 1989–90.]

**233 Topics in Astronomy and Astrophysics**
Fall. 2 credits. Prerequisites: Physics 112 and 213, Mathematics 112 and 221, or permission of instructor.
T R 1:25–2:25. S. Beckwith, S. Squyres.
A seminar course on advanced topics in astronomy and astrophysics designed for prospective astronomy majors. Content will vary from year to year, but will include topics from the fields of planetary, galactic, and extragalactic research.

**[321 Life in the Universe**
Spring. 4 credits. Not offered 1989–90.]

**332 Elements of Astrophysics**
Spring. 4 credits. Prerequisites: calculus and Physics 213. Physics 214 strongly recommended.
Lec M W F 11:15. P. Nicholson.
An introduction to astronomy, with emphasis on the application of physics to the study of the universe. Physical laws of radiation. Distance, size, mass, and age of stars, galaxies, and the universe; stellar evolution and nucleosynthesis. Supernovae, pulsars, and black holes. Galaxies and quasars. Introduction to cosmology. Intended for students interested in astronomy, physics, and engineering.

**410 Experimental Astronomy**
Fall. 4 credits. Prerequisites: Physics 214 (or 310 or 360), Physics 325 (or co-registration) or permission of instructor. Limited to 10 students.
Hours to be arranged. S. Beckwith, J. Cordes, T. Herter, J. Houck.
Topics in experimental concepts in astrophysics. Major experiments will involve techniques in telescope operation, astronomical photography, CCD (charge-coupled-device) imaging, optical photometry, optical spectroscopy, and radio astronomy. Most of the experiments involve use of the 24-inch Hartung-Boothroyd Observatory. The radio astronomy experiments employ a radio telescope mounted on top of the Space Sciences Building. The laboratory covers the fundamentals of using astronomical instrumentation and performing data analysis applied to celestial phenomena, such as normal stars, neutron stars, and planetary nebulae.

**431 Introduction to Astrophysics and Space Sciences I**
Fall. 4 credits. Prerequisites: mathematics above the 200 level and physics above the 300 level; concurrent registration in Physics 341 and 443 is helpful.
T R 10:10–11:25. P. Gierasch.
A systematic development of modern astrophysical concepts for physical science majors. Atomic and electromagnetic processes in space. Introduction to star formation, stellar structure, stellar atmospheres, and the interstellar medium. At the level of *Astrophysical Concepts*, by Harwit.

**432 Introduction to Astrophysics and Space Sciences II**
Spring. 4 credits. Prerequisite: Astronomy 431 or permission of instructor.
M W F 10:10. D. Chernoff.
Astrophysics is discussed in the context of cosmology. Cosmological subjects covered include the expansion of the universe, metrics, Friedmann equations, dark matter, cosmological tests, the early universe, formation of galaxies, and cosmological production of the elements. Astrophysical subjects drawn on include special relativity, radiative transfer, electromagnetism, quantum mechanics, gravitational physics, and nuclear physics. At the level of *Astrophysical Concepts*, by Harwit.

**[433 The Sun**
Fall. 4 credits. Not offered 1989–90.]

**434 The Evolution of Planets**
Fall. 4 credits.
J. F. Veverka.
An introduction to the physical and chemical processes that have been active in altering the environment of planets and satellites from their original to their present state. Theories of the formation of the solar system are revealed with special emphasis on chemical differentiation of the primeval solar nebula. A critical assessment is made of how well the various theories account for the clues left in the meteorite record and how well they explain the current environments of the planets and satellites. The main ideas about the formation and evolution of terrestrial planets, satellite systems, and asteroids are considered in detail. Some specific topics included are the history of the earth-moon system, the probable evolution of Jupiter's Galilean satellites, and the comparative histories of Venus, Earth, and Mars.

**440 Independent Study in Astronomy**
Fall or spring. 2–4 credits. Prerequisite: permission of instructor. Recommended: familiarity with the topics covered in Astronomy 332, 431, or 434.
Hours to be arranged. Staff.
Individuals work on selected topics. A program of study is devised by the student and instructor. Students need to fill out an independent study form, have it signed by the instructor, and *register* in the department office, 510 Space Sciences Building.

**[490 Senior Seminar—Critical Thinking**
Spring. 3 credits. Not offered 1989–90.]

**[509 General Relativity (also Physics 553)**
Fall. 4 credits. Not offered 1989–90.]

**[510 Applications of General Relativity (also Physics 544)**
Spring. 4 credits. Not offered 1989–90.]

**511 Physics of Black Holes, White Dwarfs, and Neutron Stars (also Physics 525)**
Fall. 4 credits.
T R 1:25–2:40. S. L. Shapiro.
The formation of compact objects; neutrino and gravitational radiation from supernova collapse and neutron stars. Equilibrium configurations, equations of state, stability criteria, and mass limits: the influence of rotation and magnetic fields. Pulsar phenomena. Mass flow in binary systems; spherical and disk accretion; high-temperature radiation processes. Compact X-ray sources and X-ray bursts. Emphasis will be on the application of fundamental physical principles to compact objects. No astronomy or general relativity prerequisites. Text: *Physics of Black Holes, White Dwarfs, and Neutron Stars*, by Shapiro and Teukolsky.

**[516 Galactic Structure and Stellar Dynamics**
Fall. 4 credits. Not offered 1989–90.]

**520 Radio Astronomy**
Fall. 4 credits.
M W 1:25–2:40. D. Campbell, J. Cordes.
Radio astronomy telescopes and electronics; antenna theory; observing procedures and data analysis; concepts of interferometry and aperture synthesis.

**521 Radio Astrophysics**
Spring. 4 credits.
M W 1:25–2:40. D. Campbell, J. Cordes.
Thermal and nonthermal radiation processes. Emission from the interstellar medium, giant molecular clouds, planetary nebulae, novae, supernovae, pulsars, radio galaxies, quasars. Cosmic blackbody radiation. Galactic structure and kinematics from 21-cm line emission. Models from pulsar magnetospheres, double radio galaxies, and quasi-stellar objects. Observational cosmology.

**[523 Signal Processing and Data Analysis in Astronomy**
Fall. 4 credits. Not offered 1989–90.]

**[525 Optical and Infrared Astronomy**
Fall. 4 credits. Not offered 1989–90.]

**[526 Infrared and Optical Astrophysics**
Spring. 4 credits. Not offered 1989–90.]

**[555 Theory of the Interstellar Medium (also Physics 665)**
Spring. 4 credits. Not offered 1989–90.]

**560 Theory of Stellar Structure and Evolution (also Physics 667)**
Fall. 4 credits.
T R 2–3:30. D. Chernoff.
Summary of observational facts on stars; dimensional analysis; nuclear reactions and energy transport in stellar interiors; models for static and evolving stars. At the level of *Principles of Stellar Evolution and Nucleosynthesis*, by Clayton.

**570 Physics of the Planets**
Spring. 4 credits.
Hours to be arranged. P. Nicholson.
An introductory survey of planetary science with an emphasis on the application of physical principles. Recent observational results, including those of ground-based optical, infrared, radio, and radar astronomy, as well as those made by spacecraft, will also be discussed. Planetary dynamics, including satellite orbits, tidal interactions, and ring dynamics. An introduction to the theory of planetary interiors, gravitational and magnetic fields, heat sources, and chemical composition. Physics and chemistry of planetary atmospheres, radiative transfer, convection, thermal structure, and dynamics. Planetary magnetospheres. Intended for students in astronomy, physics, and engineering.

**[571 Mechanics of the Solar System (also Theoretical and Applied Mechanics 673)**
Fall. 3 credits. Not offered 1989–90.]

**575 Atmospheric and Ionospheric Physics (also Electrical Engineering 585)**
Fall. 3 credits.
Hours to be arranged. P. Gierasch, D. Farley.
Energy balance and thermal structure of neutral atmospheres. Elements of circulation theory. Waves and instabilities. Coupling of lower atmospheres to upper atmospheres. Observations of the terrestrial atmosphere and of the other planets. Physical processes in the earth's ionosphere and magnetosphere. Production, loss, and transport of charged particles. Electric fields. Coupling of neutral atmosphere dynamics with electric fields and charged-particle transport. Diagnostic techniques, including radar and in situ observations. The equatorial electrojet. Observations of ionospheres on the other planets.

**576 Solar Terrestrial Physics (also Electrical Engineering 586)**
Spring. 3 credits.
Hours to be arranged. P. Gierasch, D. Farley.
High-latitude ionosphere; electric fields in the polar cap and auroral zone; particle precipitation and the aurora; magnetic and ionospheric storms; plasma instabilities in the ionosphere and magnetosphere; structure and physical processes in the sun, solar corona, and solar wind; interactions between the solar wind and the earth's magnetosphere; trapping, acceleration, and drift of energetic particles in the magnetosphere.

**[579 Celestial Mechanics (also Theoretical and Applied Mechanics 673)**
Spring. 3 credits. Not offered 1989–90.]

**[590 Galaxies and the Universe**
Spring. 4 credits. Not offered 1989–90.]

**599 Cosmology**
Fall. 4 credits. Prerequisites: statistical physics, quantum mechanics, and electromagnetic theory.
Hours to be arranged. I. Wasserman.
This course is intended to provide a detailed theoretical development of current ideas in cosmology. Topics will include observational overview; growth of irregularities, galaxy formation, and clustering; big bang cosmology, recombination, nucleosynthesis; very early universe, symmetry breaking, inflationary scenarios. At the level of Peebles, *Physical Cosmology* and *The Large Scale Structure of the Universe*.

**[620 Seminar: Advanced Radio Astronomy**
Fall. 2 credits. Not offered 1989–90.]

**[621 Seminar: Planetary Radar Astronomy**
Spring. 3 credits. Not offered 1989–90.]

**640 Advanced Study and Research**
Fall or spring. Credit to be arranged.
Hours to be arranged. Staff.
Guided reading and seminars on topics not currently covered in regular courses. Students need to *register* in the department office, 510 Space Sciences Building.

**660 Cosmic Electrodynamics (also Applied and Engineering Physics 608)**
Spring. 2 credits.
Hours to be arranged. R. Lovelace.
Selected topics discussed in detail; the solar corona and wind; extragalactic radio sources; magnetized accretion discs and modes and instabilities of self-gravitating systems.

**671 A Seminar: The Neptune System**
Spring. 3 credits.
Hours to be arranged. J. Veverka.
The course will review our current understanding of the planet and its satellites. Emphasis will be placed on new results obtained during the August 1989 flyby of the Neptune system by Voyager 2.

**671 B Seminar: Planetary Exploration and the Origin of Life**
Spring. 3 credits.
Hours to be arranged. C. Sagan.
An interdisciplinary seminar that will concentrate on the physical environment of the primitive Earth; prebiological organic chemistry; organic matter in the outer solar system—including asteroids, the Jovian planets and their moons, the Pluto system, comets and the interstellar medium; the search for life on Mars; and some discussion of the radio search for extraterrestrial intelligence.

**[673 Seminar: Planetary Atmospheres**
Fall. 2 credits. Not offered 1989–90.]

**[680 Seminar: Cosmic Rays and High-Energy Electromagnetic Radiation**
Spring. 2 credits. Not offered 1989–90.]

**690 Seminar: Computational Astrophysics (also Physics 681)**
Spring. 3 credits. Prerequisites: working knowledge of FORTRAN. Only those students who have completed the fundamental graduate physics courses should consider attending.
T R 10:10 –11:30. S. A. Teukolsky.
A course designed to familiarize graduate students with numerical techniques for solving diverse problems in astrophysics. Topics in hydrodynamics will be included as examples of nonlinear phenomena. Numerical methods discussed in the course will include solving ordinary and partial differential equations, linear algebra, and value problems. Monte Carlo techniques, fast Fourier transforms, etc. Students will be allotted computer time to solve, both individually and in small teams, assigned numerical exercises.

**699 Seminar: Problems in Theoretical Astrophysics (also Physics 680)**
Fall. 2 credits.
Hours to be arranged. E. Salpeter.
Topics covered this year are related to "Theories of Star Formation," including the collapse of interstellar clouds, the initial mass function, and star formation in external galaxies.

## BIOLOGICAL SCIENCES

P. J. Bruns, director (200 Stimson Hall, 255-5042); H. T. Stinson, associate director and director of undergraduate studies (118 Stimson Hall, 255-5233); R. M. Sparrow, Biology Center coordinator (Biology Center, G20 Stimson Hall, 255-3358); M. L. Cox, executive staff assistant (118 Stimson Hall, 255-6859)

Biology is a popular subject at many universities for a variety of reasons: It is a science that is in an exciting phase of development; it prepares students for careers in challenging and appealing fields such as human and veterinary medicine and environmental sciences; and it deals with the inherently interesting questions that arise when we try to understand ourselves and the living world around us. Many of the decisions we face today deal with the opportunities and problems that biology has put before us.

The program of study in biology at Cornell is offered by the Division of Biological Sciences to students enrolled in either the College of Agriculture and Life Sciences or the College of Arts and Sciences. Student services in the division's office for academic affairs and the Behrman Biology Center are available to students from either college.

The biology major is designed to enable students to acquire necessary scientific foundations, to concentrate in a specific area of biology, and to obtain breadth by studying different aspects of modern biology. Areas of concentration include animal physiology and anatomy; biochemistry; botany; cell biology; ecology, systematics, and evolution; general biology; genetics and development; and neurobiology and behavior. Special concentration programs are available for qualified students with particular interest in areas such as biophysics, microbiology, or nutrition. As an alternative to selecting one of the concentration areas, students may choose to complete the Program in General Biology. Students interested in the marine sciences may consult the Cornell Marine Programs Office (G14 Stimson Hall, 255-3717) for academic advice and career counseling. For more details about the biology curriculum see the section in this catalog on the Division of Biological Sciences.

## BURMESE AND CEBUANO (BISAYAN).

See Modern Languages and Linguistics.

# CHEMISTRY

J. C. Clardy, chair and director of undergraduate studies (124 Baker Laboratory, 255-4174); H. D. Abruña, A. C. Albrecht, B. A. Baird, T. P. Begley, J. M. Burlitch, B. K. Carpenter, D. B. Collum, F. J. DiSalvo, G. S. Ezra, R. C. Fay, M. E. Fisher, J. M. J. Fréchet, J. H. Freed, B. Ganem, R. Hoffmann, P. L. Houston, A. Kuki, R. Loring, F. W. McLafferty, J. E. McMurry, J. Meinwald, G. H. Morrison, L. A. Philips, R. F. Porter, H. A. Scheraga, K. H. Theopold, D. A. Usher, B. Widom, J. R. Wiesenfeld, C. F. Wilcox, P. T. Wolczanski

The chemistry department offers a full range of courses in physical, organic, inorganic, analytical, theoretical, bioorganic, and biophysical chemistry. In addition to their teaching interests, chemistry faculty members have active research programs. The link between teaching and research is a vital one in a continuously evolving scientific subject; it ensures that students will be provided with the most advanced information and perspectives.

## The Major

The chemistry major at Cornell is not an easy option; it requires conceptual skills in mathematics and logical thinking, practical and laboratory skills, and creativity in the design of experiments. In recent years chemistry majors have gone on to graduate study in chemistry, medicine, law, and business management, as well as directly into positions with chemical, pharmaceutical, and other industrial companies. A major in chemistry can provide the basis for significant work in related areas such as molecular biology, chemical physics, geochemistry, chemical engineering, and solid state physics. A major in chemistry permits considerable flexibility in the detailed planning of a course program. The required courses can be completed in three years, leaving the senior year open for advanced and independent work under the supervision of a professor.

The courses are arranged as a progression, with some courses (including mathematics and physics) prerequisite to those that are more advanced. During the first year, the student should normally register for general chemistry (preferably but not necessarily Chemistry 215), mathematics, a freshman writing seminar course, a foreign language if necessary, or, in some instances, physics. Although Chemistry 215–216 is preferred, students may begin their programs with Chemistry 207–208. Chemistry 215–216 is limited to those students with good preparation and a strong interest in chemistry. Students who do not know if their preparation is adequate should consult the instructor. In the second year the student should complete calculus and take physics and organic chemistry (Chemistry 359–360 is preferred to Chemistry 357–358). The second-year laboratory courses include 300, Quantitative Chemistry, if needed, and 301, Experimental Chemistry I. Chemistry 389–390, Physical Chemistry I and II, and Chemistry 302–303, Experimental Chemistry II and III, should be completed in the third year. Chemistry 410 should be completed in the third or fourth year. Advanced work in chemistry and related subjects can be pursued in the fourth year and, to some extent, in the earlier years as well. The opportunity for independent research is also available. All students with questions about details of a major program are encouraged to consult the chair of the Department of Chemistry or the chair's representative. Entering students who are exceptionally well prepared in chemistry may receive advanced placement credit for Chemistry 207–208 and proceed to a more advanced program.

Prerequisites for admission to a major in chemistry are (1) Chemistry 215–216 or 207–208 plus 300, (2) Physics 207, and (3) Mathematics 111 or 191. Students are not encouraged to undertake a major in chemistry unless they have passed those prerequisite courses at a good level of proficiency. Knowledge of simple computer programming is essential. This may be achieved either by self-study (a syllabus is available) or by taking courses such as Computer Science 100. The minimum additional courses that must be completed for a major in chemistry are listed below.

1) Chemistry 301, 302, 303, 359, 360 (or, if necessary, 357–358 may be substituted), 389, 390, and 410

2) Mathematics 112 plus 213; or 122 plus 221, 222; or 192 plus 293, 294

3) Physics 208

Potential majors electing to take Mathematics 213 are strongly urged to do so in their sophomore year to avoid scheduling conflicts with Chemistry 389 in their junior year.

This sequence is a core program in chemistry. It is anticipated that students will, through elective courses, extend it substantially in whatever direction suits their own needs and interests. It is particularly important that those going on to do graduate work in chemistry recognize that these requirements are minimal, and such students are strongly urged to supplement their programs, where possible, with Chemistry 405, 605, 606, 668, and 681 and German or Russian. Even students not planning graduate work in chemistry should consider advanced work in physics and mathematics, courses in the biological sciences, and advanced work in chemistry as possible extensions of the basic program.

**Honors.** The honors program in chemistry offers superior students an opportunity to study independently in seminars and to gain additional experience by engaging in research during the senior year. It is particularly recommended to those who plan graduate work in chemistry. Prospective candidates should complete the introductory organic chemistry and physical chemistry sequences by the end of the junior year. However, failure to have completed those courses in the junior year does not in itself disqualify a student from the honors program. Completion of the program at a high level of performance leads to the degree of Bachelor of Arts with honors in chemistry. Students will be admitted to the program by invitation of the department. Selection will be based on a superior cumulative average, including chemistry grades, and good performance in a prior research program. Prospective candidates should discuss their plans with advisers by March 1 of their junior year. Participants are notified by early January of their senior year. To be awarded honors, candidates must show outstanding performance in at least 8 credits of undergraduate research such as is offered in Chemistry 421, 433, 461, or 477. In addition, superior performance, including the writing of a thesis, in the honors seminar (Chemistry 498) is expected.

## Program for Science Teachers

Chemistry majors who wish to become teachers will be interested to know that Cornell University offers a certification program for teachers of secondary (grades 7–12) science. Interested students apply to the program during their sophomore or junior years. If accepted, students integrate some course work in Education with the rest of their undergraduate studies. All chemistry majors who enter this program will remain in the College of Arts and Sciences to complete the major.

After earning the bachelor's degree, certification students enter the Graduate Field of Education to complete a fifth year of study at Cornell. Following this fifth year, students are eligible for a master's degree from Cornell and a teaching certificate from New York State. Financial support is available for qualified applicants. Additional information is available from Susan Blish, 308 Roberts Hall, 255-9255 or Prof. Deborah Trumbull, 301 Roberts Hall, 255-3108.

## Laboratory Course Regulations

Students registered for laboratory courses who do not appear at the first meeting of the laboratory will forfeit their registration in that course.

Students and members of the teaching staff are required to wear safety goggles and lab aprons in all chemistry laboratories. Students are reminded to take their goggles and lab aprons to the first laboratory session. Those who fail to cooperate with the safety program will be asked to leave the laboratories.

Students are required to pay for glassware and any other items broken or missing from their laboratory desks at the close of each semester. Students who fail to inventory their desks at the appointed time in the presence of their instructor are charged a $10 fee in addition to charges for any breakage.

## Courses

Preliminary examinations for all courses may be given in the evening.

**103–104 Introduction to Chemistry**
103, fall or summer; 104, spring or summer. 3 credits each term. Enrollment limited. Prerequisite for Chemistry 104: Chemistry 103. Recommended for students who have not had high school chemistry and for those needing a less mathematical course than Chemistry 207–208. Not recommended for students who plan to do further work in chemistry subsequent to Chemistry 104.

Lecs, M W 11:15; lab, T or R 8–11, or F 10:10–1:10, or M W or F 1:25–4:25. Prelims: 7:30–9 p.m., Oct. 5, Nov. 14, March 1, April 12. Fall: R. C. Fay; spring: A. Hamner.

An introduction to chemistry, with emphasis on the important principles and facts of inorganic and organic chemistry.

**203 The World of Chemistry**
Fall. 3 credits. This course does not satisfy the College of Arts and Sciences physical science distribution requirement.

Lecs and discs: M W 2:30–4.
R. Hoffmann.

From its origins in metallurgy, fermentation, and alchemy to its present essential position in the world economy, the art and science of chemistry has been a part of world culture and has shaped that culture. We will enter modern chemistry via a case study of two contemporary chemical papers. The basic concepts of chemistry will be introduced in the course of the discussion of these papers. Connections will be made to history and philosophy, the language and sociology of science, and questions of social responsibility and economics. No special background is necessary for this course, not even high-school chemistry.

**207–208 General Chemistry**
207, fall or summer: 208, spring or summer. 4 credits each term. Enrollment limited. Recommended for those students who will take further courses in chemistry. Prerequisite for Chemistry 207: high school chemistry. Prerequisite for Chemistry 208: Chemistry 207 or 103–104.

Lecs: fall, T R 10:10 or 12:20; spring, T R 9:05 or 10:10. Lab: fall, T R 8–12 or M T W R or F 12:20–4:25; spring, M T W R or F 12:20–4:25. Prelims: 7:30–9 p.m., Sept. 26, Oct. 19, Nov. 21, Feb. 27, April 5. Fall: J. E. McMurry; spring: R. Hoffmann.

The important chemical principles and facts are covered, with considerable attention given to the quantitative aspects and to the techniques important for further work in chemistry. Second-term laboratory includes a systematic study of qualitative analysis.

*Note:* Entering students exceptionally well prepared in chemistry may receive advanced placement credit for General Chemistry by demonstrating competence in the advanced placement examination of the College Entrance Examination Board or in the departmental examination given at Cornell before classes start in the *fall.*

**211 Chemistry for the Applied Sciences**
Fall or spring. 4 credits. Recommended for those students who intend to take only one term of chemistry. Enrollment limited. Prerequisite: high school chemistry or permission of instructor. Corequisite: a calculus course at the level of Mathematics 111 or 191.

Lecs: fall, M W F 12:20; spring, M W F 10:10. Lab: fall, M T W R F 1:25–4:25; spring, M T W R F 1:25–4:25. Prelims: 7:30–9 p.m., Oct. 3, Nov. 7, Feb. 27, April 5. Fall: F. J. DiSalvo; spring: H. D. Abruña.

The important chemical principles and facts are covered with the objective of understanding the role of chemistry in other fields. Emphasis is on topics such as solid-state materials, periodic trends, and specific classes of compounds, such as polymers.

*Note:* Entering students exceptionally well prepared in chemistry may receive advanced placement credit for General Chemistry by demonstrating competence in the advanced placement examination of the College Entrance Examination Board or in the departmental examination given at Cornell before classes start in the *fall.*

**215–216 General and Inorganic Chemistry**
215, fall; 216, spring. Fall, 4 credits; spring, 5 credits. Recommended for students who intend to specialize in chemistry or in closely related fields. Enrollment limited. Prerequisites: good performance in high school chemistry and physics and in mathematics SAT. Corequisite: a calculus course at the level of Mathematics 111 or 191 for students who have not taken high school calculus. Prerequisite for Chemistry 216: Chemistry 215.

Fall: lecs, M W F 12:20; lab, M T W R or F 1:25–4:25. Spring: lecs, M W F 12:20; two labs, M W 1:25–4:25, T R 10:10–1:10 or T R 1:25–4:25. Prelims: 7:30–9 p.m., Oct. 3, Oct. 26, Nov. 21, Feb. 15, March 15, April 19. Fall: A. Kuki; spring: R. C. Fay.

An intensive systematic study of the laws and concepts of chemistry, with considerable emphasis on quantitative aspects. Second term includes systematics of inorganic chemistry. Laboratory work covers both qualitative and quantitative analysis.

**222 Molecular Messengers In Nature**
Spring. 3 credits. Prerequisite: one year of high school chemistry, Chemistry 103 or 207, or permission of instructor.

Lecs, M W 11:15: disc, F 11:15.
J. Meinwald.

Organisms communicate with one another in nature chiefly by means of chemical signals. We will examine this intriguing mode of communication as it applies to a wide variety of species ranging from bacteria to insects and mammals, including humans. Essential concepts of organic chemistry and biology will be introduced and illustrated. Each student will be expected to prepare a term paper, and there will be an opportunity for oral presentation of some of these papers for class discussion.

**251 Introduction to Experimental Organic Chemistry**
Fall or summer. 2 credits. Recommended for non-chemistry majors. Enrollment limited. Prerequisites: Chemistry 208 and coregistration in Chemistry 253 or 357; or Chemistry 104 and 253 with a grade of C or better. Students who have taken Chemistry 104 must complete Chemistry 253 before taking Chemistry 251.

Lec, M or F 12:20 (all students attend first lecture); lab, M T W R or F 1:25–4:25, or T or R 8–11. Prelims: 7:30–9 p.m., Oct. 12, Nov. 16. A. Attygalle.

Introduction to the synthesis, separation, and handling of materials, including applications of many types of chromatography, simple and fractional distillation, crystallization, extraction, and others.

**252 Elementary Experimental Organic Chemistry**
Spring or summer. 2 credits. Recommended for non-chemistry majors. Prerequisite: Chemistry 251.

Lec, M 12:20; lab, M T W or R 1:25–4:25. Prelims: 8 a.m., March 5, April 9. A. Attygalle.

A continuation of Chemistry 251.

**253 Elementary Organic Chemistry**
Fall or summer. 4 credits. Primarily for students in the premedical and biological curricula. Limited to 480 students. Prerequisite: Chemistry 104 with grade of C or better or Chemistry 208 or 216.

Lecs, M W F S 10:10. Prelims: 7:30–9 p.m., Sept. 28, Oct. 26, Nov. 14. D. A. Usher.

The occurrence and properties of organic molecules and the mechanisms of organic reactions, including a brief introduction to the organic chemistry of biological systems, are studied.

*Note:* Because of duplication of material, students are not permitted to earn both 4 credits for Chemistry 253 and 3 credits for Chemistry 357. In special situations (consult instructor for details), students should take Chemistry 255 for 2 credits after having earned 3 credits for Chemistry 357. Premedical students should determine the entrance requirements of the particular medical school they wish to enter. Students may earn 6 credits by taking Chemistry 251–253 or 8 credits by taking Chemistry 253–301 or 253, 251, and 252.

**255 Elementary Organic Chemistry**
Fall or summer. 2 credits.
Same course as Chemistry 253, but to be taken for reduced credit by students already having 3 credits for Chemistry 357.

**287–288 Introductory Physical Chemistry**
287, fall; 288, spring. 3 credits each term. Prerequisites: Chemistry 208 or 216 and Mathematics 111–112, or permission of instructor. Prerequisite for Chemistry 288: Chemistry 287.

Lecs, M W F 9:05; rec, M or W 1:25, T 9:05. Prelims: 7:30–9 p.m., Oct. 3, Nov. 7, Dec. 5. 288.1, Feb. 15, March 15, April 19; 288.2, Feb. 15, March 29, April 26. Fall: R. Loring; spring: J. B. Baird, J. H. Freed.

A systematic treatment of the fundamental principles of physical chemistry. In the spring there will be two lectures; lecture 02 will be oriented to the application of physical chemistry to biological systems.

**289–290 Introductory Physical Chemistry Laboratory**
289, fall; 290, spring. 2 credits each term. Prerequisite for Chemistry 290: Chemistry 289. Corequisite: registration in Chemistry 287–288.

Lec R 8 a.m.; lab, M T W R 1:25–4:25. Prelims: 8 a.m., fall: H. A. Scheraga; spring: TBA.

Quantitative and qualitative methods basic to the experimental study of physical chemistry.

**300 Quantitative Chemistry**
Fall. 2 credits. Prerequisite: Chemistry 208 or advanced placement in chemistry.

Lec, F 12:20; lab, M T W R 12:20–4:25 or R 8–12. Lab includes one-hour rec. Prelims: 12:20, Oct. 13, Dec. 1. G. H. Morrison.

Gravimetric, volumetric, spectrophotometric, and potentiometric methods are emphasized. Lectures and problem sets stress the relationship between theory and applications.

**301 Experimental Chemistry I**
Spring. 4 credits. Prerequisites: Chemistry 216 or 300, and 253 or 357 or 359. Concurrent registration in Chemistry 253 is not recommended.
Lecs, M W F 8; 2 labs, M W 1:25–4:25 or T R 8–11 or 1:25–4:25. Prelims: 8 a.m., Feb. 28, April 4. T. P. Begley.
An introduction to the techniques of synthetic chemistry. A representative selection of the most important classes of organic reactions will be explored in the laboratory. The theoretical basis for these reactions and for the separation techniques used will be discussed in the lectures.

**302 Experimental Chemistry II**
Fall. 4 credits. Enrollment limited; preference given to chemistry majors. Prerequisite: Chemistry 301.
Lecs, M W F 9:05; 2 labs, M W 1:25–4:25, or T R 1:25–4:25. Prelims: 7:30–9 p.m. Oct. 12, Nov. 28. L. A. Philips.
Instrumental methods, including basic electronics, optical spectroscopy, atomic absorption, NMR, mass spectrometry, gas chromatography, GC/MS, and electrochemical methods, are surveyed. Experiments are performed that examine basic concepts in thermodynamics.

**303 Experimental Chemistry III**
Spring. 4 credits. Each lab limited to 24 students. Prerequisites: Chemistry 302, 389, 390; coregistration in the latter is permissible.
Lecs, M W F 9:05; 2 labs, M W 1:25–4:25 or T R 1:25–4:25. A. Kuki.
An introduction to measurement strategies in physical chemistry as applied to kinetics, spectroscopy, the dynamics of photo-excited states, and the dielectric properties of matter. The principles and assembly of electronic, optic, computer, and vacuum line equipment will be studied. A familiarity with computer programming is assumed.

**357–358 Introductory Organic Chemistry**
357, fall; 358, spring. 3 credits each term. Prerequisite for Chemistry 357: Chemistry 208 or 216 or advanced placement; recommended: concurrent registration in Chemistry 251 or 300. Prerequisite for Chemistry 358: Chemistry 357; recommended: concurrent registration in Chemistry 252 or 301.
Lecs, M W F 9:05; optional rec may be offered. Prelims: 7:30–9 p.m., Sept. 28, Oct. 26, Nov. 14, Feb. 15, March 15, April 19. Fall: D. Collum; spring: B. Ganem.
A systematic study of the more important classes of carbon compounds—reactions of their functional groups, methods of synthesis, relations, and uses.

*Note:* Because of duplication of material, students are not permitted to earn both 4 credits for Chemistry 253 and 3 credits for Chemistry 357. In special situations (consult instructor for details), students should take Chemistry 255 for 2 credits after having earned 3 credits for Chemistry 357. Students will not be permitted to take Chemistry 358 after completing Chemistry 253.

**359–360 Organic Chemistry I and II**
359, fall; 360, spring. 4 credits each term. Recommended for students who intend to specialize in chemistry or closely related fields. Enrollment limited. Prerequisites: Chemistry 216 with a grade of B or better, Chemistry 208 with a grade of A or better, or permission of instructor. Prerequisite for Chemistry 360: Chemistry 359. Recommended: coregistration in Chemistry 300–301–302.
Lecs, M W F 9:05; makeup lec, W 7:30 p.m. Prelims: 9:05 a.m., Sept. 29, Oct. 27, Nov. 27, Feb. 23, April 6.
Fall: J. C. Clardy; spring: J. M. J. Fréchet.
A rigorous and systematic study of organic and organometallic compounds, their structures, the mechanisms of their reactions, and the ways they are synthesized in nature and in the laboratory.

**389–390 Physical Chemistry I and II**
389, fall; 390, spring. 4 credits each term. Prerequisites: Mathematics 213 or, ideally, 221–222; Physics 208; Chemistry 208 or 216 or permission of instructor. Prerequisite for Chemistry 390: Chemistry 389.
Lecs, M W F 10:10; makeup lec, W 7:30 p.m. Prelims: 7:30–9 p.m., Oct. 5, Nov. 9, Dec. 5, Feb. 20, March 29, April 26. Fall: A. C. Albrecht; spring: L. A. Philips.
The principles of physical chemistry are studied from the standpoint of the laws of thermodynamics, kinetic theory, statistical mechanics, and quantum chemistry.

**405 Techniques of Modern Synthetic Chemistry**
Spring. 6 credits. Enrollment limited. Prerequisites: Chemistry 302 and permission of instructor. Selection of students will be based on grades in Chemistry 301 and 302. With permission of the instructor, graduate students may perform a minimum of three two-week experiments on a prearranged schedule.
Lab time required: 16 hours each week, including at least two 4-hour sessions in one section (M W 1:25). First meeting will be at 1:30 on first class day of semester. Lec, first week only, at times to be arranged. J. M. Burlitch.
The syntheses of complex organic, organometallic, and inorganic molecules are carried out with emphasis on the following techniques: vacuum line, high pressure, high-temperature solid state, inert atmosphere, nonaqueous solvents, radioactive labeling, photochemical and electrochemical methods, solid phase peptide synthesis, and polymer synthesis. Elementary glassblowing.

**410 Inorganic Chemistry**
Spring. 4 credits. Prerequisites: Chemistry 358 or 360, and 389.
Lecs, M W F 11:15. K. H. Theopold.
A systematic study of the synthesis, structure, and reactivity of inorganic and organometallic compounds.

**421 Introduction to Inorganic Research**
Fall or spring. 2–4 credits. Prerequisites: Chemistry 303 and 389–390, or Chemistry 287–288, and Chemistry 289–290 with an average of B– or better, or permission of instructor. Selected faculty.
Research in inorganic chemistry involving both laboratory and library work, planned in consultation with a faculty member.

**433 Introduction to Analytical Research**
Fall or spring. 2–4 credits. Prerequisites: Chemistry 303 and 390 with an average of B– or better or permission of instructor. Selected faculty.
Research in analytical chemistry involving both laboratory and library work, planned in consultation with a faculty member.

**461 Introduction to Organic Research**
Fall or spring. 2–4 credits. Prerequisites: Chemistry 302 and 358 or 360 with a grade of B– or better or permission of instructor. Selected faculty.
Research in organic chemistry involving both laboratory and library work, planned in consultation with a faculty member.

**477 Introduction to Physical Chemistry Research**
Fall or spring. 2–4 credits. Prerequisite: Chemistry 390 with an average of B– or better or permission of instructor. Selected faculty.
Research in physical chemistry involving both laboratory and library work, planned in consultation with a faculty member.

**498 Honors Seminar**
Spring. No credit. Admission by departmental invitation. Additional prerequisites or corequisites: outstanding performance in either (1) two coherent 4-credit units of research in a course such as Chemistry 421, 433, 461, or 477; or (2) one 4-credit unit in a course such as Chemistry 421, 433, 461, or 477 and summer research equivalent to at least 4 credits in the same subject.
W 2:30–4. J. E. McMurry.
Informal presentations and discussions of selected topics in which all students participate. Individual research is on advanced problems in chemistry or a related subject under the guidance of a faculty member, culminating in a written report.

**600–601 General Chemistry Colloquium**
600, fall; 601, spring. No credit. Required of all graduate students except those majoring in organic or bioorganic chemistry. Juniors and seniors are encouraged to attend.
R 4. K. H. Theopold.
A series of talks representative of all fields of current research interest in chemistry other than organic chemistry, given by distinguished visitors and faculty members.

**605 Advanced Inorganic Chemistry I: Symmetry, Structure, and Reactivity**
Fall. 4 credits. Prerequisite: Chemistry 389–390 or equivalent or permission of instructor.
Lecs, M W F 11:15. J. M. Burlitch.
Group theory applications: hybrid orbitals, molecular orbitals, molecular vibrations, and ligand field theory; at the level of Cotton's *Chemical Applications of Group Theory.* Selected topics in structure, bonding, and reactivity of inorganic compounds at the level of *Chemistry of the Elements,* by Greenwood and Earnshaw.

**606 Advanced Inorganic Chemistry II: Synthesis, Structure, and Reactivity of Inorganic and Organotransition Metal Compounds**
Fall. 4 credits.
Lecs, M W F 10:10. P. T. Wolczanski.
Synthesis, structure, and reactivity of coordination compounds and organometallic complexes. Emphasis on bonding models, structure, and reactivity, including the elucidation of mechanisms. Readings at the level of Purcell and Kotz's *Inorganic Chemistry*, and Collman, Hegedus, Finke, and Norton's *Principles and Applications of Organotransition Metal Chemistry.*

**607 Advanced Inorganic Chemistry III: Solid-State Chemistry**
Spring. 4 credits. Prerequisite: Chemistry 605 or permission of instructor.
Lecs, M W F 11:15. F. J. DiSalvo.
The third of a three-term sequence. Interdisciplinary approach to solids. Topics include solid-state structure and X-ray diffraction, synthesis methods, phase diagrams, electronic structure, and chemical and physical properties of solids. Text: *Solid State Chemistry and Its Applications*, by West. Readings from inorganic chemistry and solid-state physics texts.

**622 Chemical Communication (also Biological Sciences 623)**
Fall. 3 credits. Limited to 30 students. Prerequisites: Chemistry 358 or 360 and Biological Sciences 102. Intended primarily for research-oriented students. Offered alternate years.
Lecs, M W F 1:25. J. Meinwald, T. Eisner.
The production, transmission, and reception of chemical signals in communicative interactions of animals, plants, and microorganisms. Communication involving insects is emphasized. Specific topics are treated, with varying emphasis on chemical, biochemical, neurobiological, ecological, and evolutionary principles.

**625 Advanced Analytical Chemistry I**
Fall. 4 credits. Prerequisite: Chemistry 288 or 390 or equivalent.
Lecs, M W F 8; exams, T 7:30 p.m.
C. F. Wilcox, F. W. McLafferty.
The application of molecular spectroscopy to chemical problems. Topics in infrared, NMR, mass, and Raman spectroscopy are discussed.

**[627 Advanced Analytical Chemistry II**
Spring. 3 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390 or equivalent. Not offered 1989–90.
Lecs, T R 10:10; problem sessions and exams, T 7:30 p.m. F. W. McLafferty.
Modern analytical methods for molecular characterizations, including electron, Mossbauer, and Fourier spectroscopy; mass spectrometry; methods applicable to macromolecules; information theory.]

**628 Advanced Analytical Chemistry III**
Spring. 3 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390 or equivalent.
Lecs, T R 10:10. G. H. Morrison.
Modern trace, micro, and surface methods of analysis, including atomic spectrometry, solid mass spectrometry, activation analysis, microscopes, microprobes, and electron spectroscopy.

**629 Electrochemistry**
Fall. 3 credits. Primarily for graduate students and upperclass undergraduates. Prerequisite: Chemistry 390 or equivalent (Mathematics 213 helpful).
Lecs, T R 8:40–9:55. H. D. Abruña.
Fundamentals and applications of electrochemistry. Topics will include the fundamentals of electrode kinetics, electron transfer theory, the electrical double layer, and diffusion. A wide range of techniques and their application as well as instrumental aspects will be covered.

**650–651 Organic and Organometallic Chemistry Seminar**
650, fall; 651, spring. No credit. Required of all graduate students majoring in organic or bioorganic chemistry. Juniors and seniors are encouraged to attend.
M 4. B. Ganem.
A series of talks representative of all fields of current research interest in organic and organometallic chemistry, given by research associates, faculty members, and distinguished visitors.

**665 Advanced Organic Chemistry**
Fall. 4 credits. Primarily for graduate students and upperclass undergraduates. Prerequisites: Chemistry 253 or 358 or 360, and 390 or equivalents or permission of instructor.
Lecs, M W F 12:20. B. K. Carpenter.
A survey of reaction mechanisms and reactive intermediates in organic chemistry. Applications of qualitative molecular orbital theory are emphasized.

**666 Synthetic Organic Chemistry**
Spring. 4 credits. Primarily for graduate students and upperclass undergraduates. Prerequisite: Chemistry 665 or permission of instructor.
Lecs, T R 8–9:30. D. Collum
Modern techniques of synthesis; applications of organic reaction mechanisms to the problems encountered in rational multistep synthesis, with particular emphasis on modern developments in synthesis design.

**668 Chemical Aspects of Biological Processes**
Fall. 4 credits. Prerequisite: Chemistry 358 or 360 or equivalent.
Lecs, T R 8:30–10. T. P. Begley.
A representative selection of the most important classes of enzyme-catalyzed reactions will be examined from a mechanistic perspective. Topics discussed will include the chemical basis of enzymatic catalysis, techniques for the elucidation of enzyme mechanism, cofactor chemistry, the biosynthesis of penicillin, chlorophyll, methane, terpenes, amino acids, and the biodegradation of lignin and a variety of pollutants. The application of chemical principles to understanding biological processes will be emphasized.

**671 Synthetic Polymer Chemistry (also Materials Science and Engineering 671 and Chemical Engineering 675)**
Fall. 3 credits. Prerequisite: Chemistry 359–360 or equivalent or permission of instructor; recommended: Materials Science and Engineering 620.
Lecs, T R 8:30–10. J. M. J. Fréchet.
Modern concepts in synthetic polymer chemistry. The application of organic synthesis to the development of new polymers and copolymers and the control of their architecture. Chain and step-growth polymerizations, reactions of polymers, block and graft copolymers. A broad spectrum of applications from recent literature will also be discussed.

**672 Kinetics and Regulation of Enzyme Systems**
Fall. 4 credits. Primarily for graduate students in Chemistry and Biochemistry. Prerequisite: Chemistry 390, Biological Sciences 331, or equivalents or permission of instructor.
Lecs, M W F 9:05, and occasionally W 7 p.m. B. A. Baird.
Protein structure and dynamics; thermodynamics and kinetics of ligand binding; steady state and transient enzyme kinetics; enzyme catalysis and regulation; role of plasma membrane receptors in regulating cellular activities.

**677 Chemistry of Nucleic Acids**
Spring. 4 credits. Primarily for graduate students. Prerequisites: Chemistry 358 or 360, and 390 or equivalents. S-U grades only.
Lecs, M W 10–11:10. D. A. Usher.
Properties, synthesis, reactions, and biochemical reactions of nucleic acids.

**678 Thermodynamics**
Spring. 4 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390 or equivalents.
Lecs, T R 8:30–9:55. P. L. Houston.
Principles of equilibrium thermodynamics. Thermodynamic functions; First and Second Laws; gases and condensed phases; solutions; phase equilibrium; chemical equilibrium; surface thermodynamics; electrolytes; statistical thermodynamics and the Third Law.

**681 Physical Chemistry III**
Fall. 4 credits. Prerequisites: Chemistry 288 or 390; Mathematics 213 and Physics 208; or equivalents.
Lecs, M W F 10:10. P. L. Houston.
An introduction to the principles of quantum theory and statistical mechanics, atomic and molecular spectra, and elementary valence theory. At the level of *Quantum Chemistry*, by Levine.

**[686 Physical Chemistry of Proteins**
Spring. 4 credits. Primarily for graduate students. Prerequisite: Chemistry 288 or 390 or equivalents. S-U grades. Letter grades for undergraduates. Offered alternate years. Not offered 1989–90.
Lecs, M W F 8, and occasionally W 7:30 p.m. H. A. Scheraga.
Chemical constitution, molecular weight, and structural basis of proteins; thermodynamic, hydrodynamic, optical, spectroscopic, and electrical properties; protein and enzyme reactions; statistical mechanics of helix-coil transition in biopolymers; conformation of biopolymers; protein folding.]

**700 Baker Lectures**
Spring, on dates to be announced. No credit. Distinguished scientists who have made significant contributions to chemistry present lectures for periods varying from a few weeks to a full term. This year's lecturer: J. S. Waugh, M.I.T.

**701–702 Introductory Graduate Seminar in Analytical, Inorganic, and Physical Chemistry**
701, fall; 702, spring. No credit. Required of all first-year graduate students majoring in analytical, inorganic, physical, theoretical, and biophysical chemistry.
Hours to be arranged. R. Porter.

**[716 Selected Topics in Advanced Inorganic Chemistry: Transition Metal Oxides (also Materials Science and Engineering 716)**
Fall. 3 credits. Prerequisite: some elementary knowledge of chemistry and bonding. Not offered 1989–90.
Lecs, M W F 9:05. P. A. Cox.
This course will cover a range of properties of transition metal oxides. It will include a survey of their structure and synthesis and their defect and surface chemistry. Bonding and physical and materials properties, especially those relating to electronic structure, will be emphasized, i.e., optical and magnetic properties, metal-insulator transitions, and superconductivity. The course will have a strong interdisciplinary flavor and should be of interest to solid-state and surface chemists, physicists, and materials scientists at the graduate-student and postdoctoral level.]

**[745 Physical Polymer Science I (also Chemical Engineering 745)**
Fall. 3 credits. Prerequisite: a graduate-level thermodynamics statistical course. Not offered 1989–90.
Lecs, TR 10–11:15.
Thermodynamic properties of dilute, semidilute, and concentrated solutions from both classical and scaling approaches. Characterization techniques of dilute solutions: osmometry, light scattering, viscometry, and sedimentation. Rubber elasticity; mechanical and thermodynamic properties of gels. Polymer melts: equations of state and glass transition phenomenon.]

**746 Physical Polymer Science II (also Chemical Engineering 746)**
Fall. 3 credits. Prerequisite: a graduate level thermodynamics statistical course.
Lecs, T R 10–11:15. C. Cohen
Rheology and processing. Applications and limitations of various rheometers. Linear viscoelasticity; non-linear continuum models; kinetic theory of polymeric liquids. Pressurization, pumping, and the modelling of processing machines. Injection and compression molding; mold filling, simulations, structure, and orientation.

**[762 Special Topics in Organic Chemistry**
Spring. 3 credits. Not offered 1989–90.
Lecs, M W F 9:05.
Topics vary.]

**765 Physical Organic Chemistry I**
Spring. 4 credits. Primarily for graduate students. Prerequisite: Chemistry 665 or permission of instructor.
Lecs, M W F 10:10. C. F. Wilcox.
Continues and extends the approach of Chemistry 665 to more complicated organic reactions. Emphasis is on applications of reaction kinetics and isotope effects to gain an understanding of reaction mechanisms.

**[766 Physical Organic Chemistry II**
Spring. 3 credits. Primarily for graduate students. Prerequisite: Chemistry 765 or permission of instructor. Not offered 1989–90.
Quantitative aspects of organic chemistry.]

**[774 Chemistry of Natural Products**
Fall. 3 credits. Primarily for graduate students. Prerequisites: Chemistry 665–666. Not offered 1989–90.
Lecs, T R 12:20.
Particular attention is devoted to methods of structure determination and synthesis as applied to selected terpenes, steroids, alkaloids, and antibiotics.]

**780 Principles of Chemical Kinetics**
Fall. 4 credits. Prerequisite: Chemistry 681 or permission of instructor.
Lecs, M W F 9:05. B. Widom.
Principles and theories of chemical kinetics; special topics such as fast reactions in liquids, enzymatic reactions, energy transfer, and molecular beams.

**[782 Special Topics in Biophysical and Bioorganic Chemistry**
Spring. 3 credits. Not offered 1989–90.
Lecs, T R 11:15.
Topics vary from year to year.]

**789 X-ray Crystallography**
Spring; offered only when sufficient registration warrants. 4 credits. Prerequisite: Chemistry 288 or 390 or permission of instructor.
M W F 10:10. G. VanDuyne.
A beginning course in the application of X-ray crystallography to structural chemistry. Topics include symmetry properties of crystals, diffraction of X-rays by crystals, interpretation of diffraction data, and refinement of structures. The chemical information available from a diffraction experiment is stressed, and theoretical aspects are illustrated by conducting an actual structure determination as a classroom exercise. At the level of Ladd and Palmer's *Structure Determination by X-ray Crystallography.*

**791 Spectroscopy**
Fall. 4 credits. Prerequisite: Chemistry 793 or Physics 443 or equivalent.
Lecs, M W F 10:10. J. H. Freed.
Principles of one- and two-dimensional magnetic resonance spectroscopies. Topics will include time-domain versus frequency-domain spectroscopy, multiple pulse and double resonance techniques, two-dimensional coherence spectroscopy, multiple-quantum spectroscopy, and spin-relaxation.

**[792 Molecular Collision Theory**
Spring. 3 credits. Hours to be arranged. Not offered 1989–90.
G. S. Ezra.
The concepts and methods of scattering theory are described with particular emphasis on applications to problems of chemical interest. At the level of Child's *Molecular Collision Theory* and Taylor's *Scattering Theory.*]

**793 Quantum Mechanics I**
Fall. 4 credits. Prerequisites: Chemistry 681, coregistration in Mathematics 421, and Physics 431 or equivalents or permission of instructor.
Lecs, M W F 11:15. G. S. Ezra.
Schrodinger's equation, wave packets, uncertainty principle, WKB theory, matrix mechanics, orbital and spin angular momentum, exclusion principle, perturbation theory, variational principle, Born-Oppenheimer approximation. At the level of Cohen-Tannoudji's *Quantum Mechanics.*

**794 Quantum Mechanics II**
Spring. 4 credits. Prerequisites: Chemistry 793 or equivalent and coregistration in Physics 432 and Mathematics 422, or permission of instructor.
Lecs, M W F 9:05. A. C. Albrecht.
Electronic structure of atoms and molecules. Quantum chemical calculations. Group theory. Time-dependent phenomona in quantum mechanics and light/matter interaction. Spectroscopies. At the level of Weissbluth's *Atoms and Molecules* and Sakurai's *Modern Quantum Mechanics.*

**796 Statistical Mechanics**
Spring. 4 credits. Primarily for graduate students. Prerequisite: Chemistry 793 or equivalent.
Lecs, T R 8:30–9:55. R. Loring.
Microstates, ensembles, partition functions, and fluctuations. Quantum statistics. Thermodynamic properties of ideal gases and crystals. Chemical equilibrium. Dense gases. Structure of classical liquids. Phase transitions and critical phenomena. Introduction to nonequilibrium statistical mechanics: density matrix and response theory, transport processes, Brownian motion. At the level of *Statistical Mechanics*, by McQuarrie.

**[798 Selected Topics in Physical Chemistry**
Spring. 3 credits. Prerequisite: Chemistry 793 or equivalent; Chemistry 794 recommended but not essential. Not offered 1989–90.
Lecs, T R 10:10–11:25. R. Hoffmann.
Topics vary.]

## CHINESE

See Modern Languages and Linguistics.

FALCON Program: 255–6457; C. Shih, 213 Morrill Hall, 255-4230; J. Wheatley, 416 Morrill Hall, 255-9301.

## CLASSICS

A. Nussbaum, chair; L. S. Abel, F. M. Ahl, K. Clinton (graduate faculty representative), J. E. Coleman, G. Davis, J. R. Ginsburg, I. Hohendahl, G. M. Kirkwood (emeritus), H. Kolias, P. I. Kuniholm (on leave 1989–90), D. Mankin (director of undergraduate studies), G. M. Messing (emeritus), C. Minkowski, P. T. Mitsis (on leave 1989–90), H. Pelliccia, P. Pucci (on leave fall 1989), J. Romm, J. S. Rusten, D. Shanzer, W. Wetherbee

Patricia E. Easterling, Townsend Lecturer; Jane Whitehead, Mellon Postdoctoral Fellow

Cornell University has long recognized the importance of studying the civilizations of ancient Greece and Rome. Particularly in an age of increasing specialization, study of the Classics is widely viewed as an excellent

means of acquiring a liberal education; at Cornell, we are deeply interested in the continuing humanistic values contained in the literature of the ancient world and in gaining a fuller understanding of these important cultures and their imprint upon subsequent ages.

The Department of Classics at Cornell is one of the oldest and largest in the country. With sixteen faculty members, together with professors of related interests in the departments of History, Philosophy, Comparative Literature, History of Art, Architecture, Modern Languages and Linguistics, and Near Eastern Studies and in the Archaeology and Medieval Studies programs, the range of instruction available is very large, including not only the traditional study of language, literature, and ancient history, but also newer developments in the field, such as comparative study of Mediterranean civilizations and modern literary theory.

Although Classics, like other areas of humanistic study, does not aim at providing specific preprofessional training, over the years Classics majors from Cornell have gone on to a wide variety of careers: in law, teaching, medicine, diplomacy, management, educational administration, government, and many others.

The department offers courses in Bronze Age and Classical archaeology and is active in field archaeology in Classical lands. It recently sponsored an archaeological excavation at Alambra, in Cyprus, which served as a field training school for Cornell undergraduate and graduate students, and plans are under way for further excavation projects. On campus there are also collections of ancient artifacts, reproductions of ancient sculpture, and one of the few laboratories in the world to concentrate on the tree-ring dating of ancient monuments from Greece, Cyprus, and Turkey. The archaeology courses may be used to satisfy some of the requirements for the Intercollegiate Program in Archaeology or for the major in Classical civilization. They require no knowledge of either Greek or Latin. Similarly, the department offers a variety of courses and seminars in English on such subjects as Greek mythology, Greek and Roman mystery religions, early Christianity, and Roman law, as well as ancient epic, tragedy, history, and philosophy. For those whose interest in things Greek and Roman extends no further than a desire to understand the English language a little better, the department offers one course in the Greek and Latin elements that make up a huge proportion of the vocabulary of Modern English, and another that deals more specifically with the Greek and Latin ingredients of bioscientific vocabulary. Programs in Greek and Latin at the elementary level are also offered, of course; and for the more ambitious there are courses involving reading, in the original, of Greek and Latin authors from Homer to St. Augustine and Bede and, periodically, the Latin works of Dante, Petrarch, and Milton. The department makes every attempt to adapt its program to the needs of each student. If there is a Classical writer you would like to study, the department will do its best to help you do so whether you are a major in the department or not.

## Majors

The Department of Classics offers majors in Classics, Greek, Latin, and Classical civilization.

### Classics

Those who major in Classics must complete 24 credits in advanced Greek or Latin (numbered 201 or above) and 15 credits in related subjects selected in consultation with the adviser.

### Classical Civilization

Those who major in Classical civilization must complete (a) qualification in Latin and Greek or proficiency in either; (b) 24 credits selected from the courses listed under Classical civilization, Classical archaeology, Latin, and Greek; and (c) 15 credits in related subjects (courses in the humanities selected in consultation with the adviser).

### Greek

Those who major in Greek must complete 24 credits of advanced courses in Greek and 15 credits in related subjects (including Latin).

### Latin

Requirements for the major in Latin parallel those of the major in Greek.

**Honors.** Candidates for the degree of Bachelor of Arts with honors in Classics, Greek, Latin, or Classical civilization must fulfill the requirements of the appropriate major study as given above and must also successfully complete the special honors courses 370, 471, and 472. Credit for honors courses may be included in the credits required for the major study. Students who wish to become candidates for honors, who have a cumulative average of B+ or better, and who have demonstrated superior performance in Classical courses (Greek, Latin, and Classical civilization), submit an outline of their proposed honors work to the honors committee during the first month of their fifth semester. The chair will appoint a committee of three faculty members for each candidate, and the committee will be responsible for evaluating the candidate's proposal and subsequently supervising his or her work. At the completion of the honors thesis, which must demonstrate knowledge of the main bibliographical sources, give promise of scholarly talent, and show creativity, the committee will determine the level of honors to be awarded.

## Study Abroad

Cornell participates in the Intercollegiate Center for Classical Studies in Rome, which offers courses in Latin, Greek, ancient history, art, archaeology, and Italian. Cornell is a member institution of the American School of Classical Studies at Athens, whose Summer Program is open to graduate students and qualified undergraduates. The American Academy in Rome, of which Cornell is also a member institution, offers regular and summer programs for qualified graduate students. For graduate students the Department of Classics offers a few travel grants each year from the Townsend Memorial Fund. Detailed information on these programs is available in the Department of Classics Office, 120 Goldwin Smith Hall.

## Summer Support for Language Study

The Beatrice R. Kanders Memorial Scholarship and a certain amount of aid made possible by gifts from the Constantinos C. Polychronis Foundation are normally available to students who want to enroll in Intensive Latin or Greek in the Cornell summer session. These six-week courses are designed to enable students to enter second-year Latin or Greek the following fall. Applications are due to the chair of the Department of Classics by April 13.

## Placement in Latin

Placement of first-year students in Latin courses is determined by an examination given by the Department of Classics during orientation week or, if necessary, in the second half of the fall term.

## Freshman Writing Seminars

These courses are offered as freshman writing seminars and as freshman electives but may not be used to satisfy the humanities distribution requirement. Consult John S. Knight Writing Seminar Program brochures and the summer session catalog for times, instructors, and descriptions.

**109 The Art of Argument: An Introduction to Rhetoric (also English 109)**
Summer. 3 credits.

**113 Word Power: Greek and Latin Elements in the English Language**
Summer. 3 credits.

**114 Word Power for the Biological Sciences**
Summer. 3 credits.

**120 Latin Literature**
Fall or spring. 3 credits.

**121 Classical Archaeology**
Fall or spring. 3 credits.

**123 Comedy**
Spring. 3 credits.

**125 Tragedy**
Fall. 3 credits.

**150 Greek and Roman Myths**
Fall or spring. 3 credits.

## Classical Civilization

**100 Word Power: Greek and Latin Elements in the English Language**
Fall. 3 credits.
M W F 10:10. I. Hohendahl.
This course gives the student with no knowledge of Classical languages an understanding of how the Greek and Latin elements, which make up over half our English vocabulary, operate in both literary and scientific English usage. Attention is paid to how words acquire their meaning and to enlarging each student's working knowledge of vocabulary and grammar.

**[102 Word Power for the Biological Sciences**
Spring. 3 credits. Not offered 1989–90.
This course teaches the Greek and Latin word elements that combine to form most of the specialized terms in the biological sciences. The student who learns the meanings of these elements and the rules of word formation will usually recognize the basic meaning of any unfamiliar word in this field. Attention will also be paid to misformations, common errors, and words still in use that reflect scientific theories since rejected.]

**[200 Classical Civilization**
Summer. 3 credits. Not offered 1990.
F. Ahl.
Readings in translation from the *Iliad*, the *Odyssey*, the *Aeneid*, and Greek and Roman drama, oratory, and history. An encounter with the texts that have shaped our humanistic tradition.]

**211 The Greek Experience**
Fall. 3 credits.
T R 10:10–11:25. F. Ahl.
An introduction to the literature and thought of ancient Greece. Topics will include epic and lyric poetry, tragedy and comedy, and historical, political, philosophical, and scientific writings. Some attention will also be given to the daily life of ordinary citizens, supplemented by slides of ancient art and architecture.

**212 The Roman Experience**
Spring. 3 credits.
M W F 1:25. J. Ginsburg.
An introduction to the civilization of the Romans as expressed in their literature, art, and social and political institutions. This course will examine not only the intellectual life of the Romans but what it meant for men and women of all social classes to live in the Roman world. Selected readings in translation of works of literature, history, and philosophy, supplemented by slides and other visual materials.

**217–218 Initiation to Greek and Roman Cultures**
Limited to 18 students. These courses are intended especially for freshmen (a few exceptionally motivated sophomores or upperclass students may be accepted) and may be taken independently of one another. Apply in writing to the chair, Department of Classics, 120 Goldwin Smith Hall.

Knowledge of Greek or Latin is not necessary, since all texts are in translation. What is necessary is the willingness to participate in three one-hour seminars each week and also a supplementary one-hour (occasionally two-hour) session, during which the class will participate in workshops with specially invited guests.

**217 Initiation to Greek Culture. Warfare and the Tragic Hero in Ancient Greece**
Fall. 4 credits.
M W F 10:10, plus 1 hr. to be arranged.
J. Coleman, J. Romm.
One of the most troubling legacies of the Ancient Greeks is their almost unquestioning acceptance of war as a legitimate human activity and as a measure of human, and specifically male, heroism. Our critical examination will show how literature exemplifies this predominant Greek attitude, beginning with the first and greatest war poem, the *Iliad*, and concluding with Thucydides' account of the Peloponnesian war, tragedies such as Aeschylus' *Persians*, and anti-war comedies such as Aristophanes' *Lysistrata*. In addition, sculptures and paintings of warriors will illustrate the effects of war on daily life and family. Themes to be considered will include the literary and visual image of the hero, the role of women as mediators and victims, and the role of warfare in maintaining—or destroying—the social hierarchy.

**218 Initiation to Roman Culture. Populi Romani: The Peoples of Rome, Italy, and the Empire**
Spring. 4 credits.
M W F 10:10, plus 1 hr. to be arranged.
D. Mankin, J. Whitehead.
This course explores the diversity of Roman society through its art and literature. Study begins with the early peoples of Italy, their myths of arrival and formation, and the archaeological evidence for their history. The Late Republic reveals the tensions of plurality in check: the artistic patronage of the Senatorial class, the role of women, the status of the soldier, the economic and increasing political power of clients (both Roman and foreign), freedmen, and even slaves. With the Empire, peoples far removed from Rome, yet Roman citizens, develop ways of life and means of artistic expression both attuned to and yet strikingly distinct from the traditions embodied in the Imperial court. We will read in translation accounts by Virgil, Livy, and various Greek writers concerning the founding of Rome. For the Late Republic, our sources will include Catullus and Cicero, and for the Empire, Petronius, Tacitus, and Juvenal. Art and architecture will be studied through slides, reproductions, and a museum trip. There will also be several guest speakers, experts on various aspects of Roman art, history, and literature.

**[224 Greek Philosophy**
Fall. 3 credits. Not offered 1989–90.
An introduction to the pre-Socratic philosophers and Plato.]

**[225 Hellenistic and Roman Philosophy**
Spring. 4 credits. Not offered 1989–90.
P. Mitsis.
An introduction to late Greek and Roman philosophy, including Epicureans, Stoics, and Skeptics. Topics include philosophy of language and epistemology, materialism, personal identity, free will and necessity, and ethical naturalism.]

**235 Modern Greek Poetry and Politics (also Comparative Literature 235 and Government 335)**
Fall. 3 credits.
T R 1:25–2:40. G. Holst-Warhaft.
The history of modern Greece has been marked by a series of political crises that have resulted in deep divisions in society. Greek poetry has reflected these crises and divisions, and in this course the poetry of nineteenth- and twentieth-century Greece will be interpreted in its historical and political context. The course will concentrate on four periods in which there has been a particularly strong interaction. The continuity of ancient Greek myths in modern Greek poetry will also be explored. Students taking this course as Government 335 for 4 credits must write an additional paper on a political topic.

**236 Greek Mythology (also Comparative Literature 236)**
Fall. 3 credits.
T R 11:40–12:55. D. Mankin.
A survey of the Greek myths, with emphasis on the reconstruction of the content and significance of the myths in preliterate Mediterranean society, including the place of myth in Greek life and consciousness; the factors and influences involved in the creation of myths; and the use of myths for our understanding of Greek daily life, religion, and moral and political concepts.

**[237 Greek Religion and Mystery Cults**
Spring. 3 credits. Not offered 1989–90.
T R 11:40–12:55. K. Clinton.
Greek religion constitutes one of the essential features of ancient Greek civilization and distinguishes it from later Western civilization. Since religion permeates Greek culture, including the major art forms (epic poetry, tragedy, comedy, architecture, painting, and sculpture), the course will investigate the interaction of religion with these forms—an investigation that is fruitful both for the understanding of Greek religion and the forms themselves, some of which, like tragedy, originated in cult. A representative variety of cults and their history will be studied with special emphasis on mystery cults, such as the Eleusinian mysteries of Demeter and Persephone, the Kabiroi, the Great Gods of Samothrace, and Bacchic rites.]

**238 The Ancient Epic**
Spring. 3 credits.
M W F 10:10. H. Pelliccia.
A close reading of the Homeric epics and Vergil's *Aeneid* in translation. The *Iliad* and the *Odyssey* will be considered as oral poetry and in terms of their place in a traditional society but with reference to modern interpretations. The *Aeneid* will be read as a major rewriting of Homer designed for a new audience.

**[239 Greek and Roman Mystery Cults and Early Christianity**
3 credits. Prerequisite: Classics 237 or permission of instructor. Not offered 1989–90.
K. Clinton.
A study of the controversial question of religious continuity between paganism and early Christianity. After a brief survey of Classical mystery cults and Hellenistic religion, the course will focus on such Hellenistic cults as the mystery cults of Isis, Bacchus, and Attis and the Great Mother and on the distinctive features that contributed to their success. Discussion of Christian liturgy and beliefs both in the East and the West to determine what Christianity owed to its pagan predecessors and to isolate the factors that contributed to its triumph over the "rival" pagan cults of late antiquity.]

**[245 Greek and Roman Historians**
Spring. 3 credits. Not offered 1989–90.
T R 2:30–3:45. J. Ginsburg.
Study of historical writing in antiquity through selected readings in translation from the Greek and Roman historians. Among topics to be examined are the historian's task as understood by the ancients; the method, narrative technique, and accuracy of the Greek and Roman historians; and their attitudes toward the events that they relate.]

**[300 Greek and Roman Drama (also Comparative Literature 300)**
Spring. 4 credits. Not offered 1989–90.
The tragedies of Aeschylus, Sophocles, and Euripides, read in translation. The main emphasis will be on the form of the dramas and on their meaning in the fifth century B. C. and today.]

**[333 Latin Foundations of Western Literature (also Comparative Literature 333)**
Spring. 4 credits. Not offered 1989–90.]

**[336 Foundations of Western Thought (also Comparative Literature 336)**
Fall. 4 credits. Not offered 1989–90.
P. Mitsis.]

**[337 Ancient Philosophy of Science**
Spring. 4 credits. Not offered 1989–90.
The development of scientific method by the ancient Greeks: the pre-Socratic philosophers, Aristotle, the ancient atomists, and the medical writers (Hippocrates, Galen, and the empiricists).]

**[339 Ancient Wit: An Introduction to the Theory and Form of Comic and Satiric Writing in Greece and Rome (also Comparative Literature 339)**
Fall. 4 credits. Not offered 1989–90.
F. Ahl.
The aim is not only to provide an introduction to the comedy, satire, and other humorous writing in Greek and Roman literature, but to discuss the ancient works in light of modern theories of comedy and laughter. Discussion of the nature of laughter itself in light of both ancient and modern scholarship on the subject, from Plato's *Philebus* to Freud's *Wit and Its Relations to the Unconscious* and Koestler's *The Act of Creation*. Examination of select works and passages of Homer, Euripides, Aristophanes, Hierocles, Lucian, Plautus, Nonnus, Horace, Martial, Juvenal, and Petronius.]

**340 Ancient Greek Constitutions (also Government 360)**
Spring. 4 credits. Prerequisite: one of the following: survey of Greek history, a course in Greek civilization, a course in political theory or comparative politics, or permission of instructor.
T R 8:40–9:55. L. Abel.
The Greek work *politeia* means "constitution," but not a single written document. It means the form of political life within a state. This course will survey briefly the variety of forms of political life in ancient Greece from the time of Homer to the Classical fourth-century Athenian democracy. The majority of time will be devoted to the history, functioning, and assessment of the Athenian democracy and Athenian law. The second major topic will be the constitution of Sparta and its role as the alternative to democracy. As each constitution is studied, the role of women and ideas of justice within the state will be considered. Required readings will be in translation.

**346 The Classical Influence of Renaissance Literature (also Comparative Literature 346)**
Spring. 3 credits.
T R 10:10–11:25. J. Romm.
All the most important writings of the sixteenth century are steeped in the Greek and Latin classics, although not always the classics we might expect; essayists and moral philosophers—Plato, Lucian, Cicero, Seneca, and Plutarch—played a surprisingly large role in shaping humanist thought. This course will examine these and other classical authors most important to the Renaissance humanists and compare them with some of the notable imitations they inspired: More's *Utopia*, Erasmus' *Colloquies* and *Praise of Folly*, Montaigne's *Essays*. Other readings will try to show why the humanists selected certain classical models above others and how they sought to apply those models to their own lives and problems. Some prior familiarity with ancient literature is desirable but not required.

**363 Representations of Women in Ancient Greece and Rome (also Women's Studies 363)**
Fall. 4 credits.
M W 2:30–3:45. L. S. Abel, J. Ginsburg.
Classical authors created and left behind powerful images of women and of what women ought and ought not to be. These writers also provide fleeting insights into the real lives of women in antiquity. In this course, we will examine the ancient evidence in order to trace the origin of some Western attitudes about women and to analyze the assumptions that underlie the representations of women in ancient Greece and Rome. How are these images constructed and how do they work? How can we use the ancient evidence to assess the real lives and social roles of women in antiquity?

**[380 Roman Society and Politics under the Julio-Claudians**
Spring. 4 credits. Prerequisite: Classics 212, History 268, or permission of instructor. Not offered 1989–90.
W 2:30–4:30. J. Ginsburg.
An undergraduate seminar examining several of the important social and political changes in Roman society under Augustus and his successors, the Julio-Claudians. Topics to be investigated include Augustus's consolidation of power through political and social revolution, the Augustan attempt to regulate family life and social relations by legislation, the relation of the emperor Tiberius with the members of the old ruling class, the growth of the imperial bureaucracy and the new opportunities for social mobility, the political opposition to Claudius and Nero, Nero's cultural and provincial policy, and the manipulation of the imperial cult. All readings will be in English.]

**[382 Greeks, Romans, and Victorians (also Society for the Humanities 382)**
4 credits. Not offered 1989–90.
F. Ahl.
Modern popular and scholarly views of Greek and Latin literature were shaped in the Victorian years of the nineteenth century, between the years of Republican and Marxist revolution. This course explores some of the ways in which nineteenth-century social and intellectual upheavals, and changes in scholarly techniques and approaches, may have affected how English and Irish writers presented Greco-Roman antiquity and, especially, how they began to discard an idealized past based on a Roman model for one based on a Greek model. The focus will be on poets and dramatists (and a few artists and novelists) rather than on philosophers and scientists. The varied influences of Vergil and Homer, Seneca and Sophocles, Plautus and Aristophanes, Horace, and Greek lyric poetry will be discussed in selected works of writers such as Thomas More, Shelley, Byron, Swinburne, Arnold, Tennyson, W. S. Gilbert, Oscar Wilde, Samuel Butler, and others, including important artists such as Aubrey Beardsley.]

**390 Comparative Sanskrit Myth and Epic (also Asian Studies 390)**
Spring. 4 credits.
T R 1:25–2:40. C. Minkowski.
Readings in translation from the two Sanskrit epics, the *Mahabharata* and the *Ramayana*, and from the main cycles of the *Puranas*, the Sanskrit mythological literature. Special attention will be given to parallels and comparisons with Greek myth and epic, especially Homer and Hesiod. Classics 236 or 238 would be useful as background, but not presupposed.

**465–466 Independent Study in Classical Civilization, Undergraduate Level**
465, fall; 466, spring. Up to 4 credits.
Hours to be arranged. Staff.

**[610 Language of Myth (also Anthropology 610)**
Spring. 4 credits. Not offered 1989–90.
P. Pucci
An analysis of the theories on language leading to Levi-Strauss and Derrida.]

**668 Medieval Education and the Classical Tradition**
Fall. 4 credits.
Hours to be arranged. W. Wetherbee.
An introduction to the institutions by which literary culture was shaped and transmitted in the medieval period. Starting from a review of the legacy of the schools of late antiquity, we will look at the evolving curricula of the medieval schools; ways in which classical and religious texts were read and glossed; the development of new literary forms in the schools; and the role of the classical traditions in shaping social ideology and defining a program for vernacular literature. Some knowledge of Latin will be very useful.

**[681 Patristic Seminar: Graduate**
Fall or spring. 4 credits. Not offered 1989–90.]

**711–712 Independent Study for Graduate Students in Classical Civilization**
711, fall; 712, spring. Up to 4 credits.
Hours to be arranged. Staff.

## Greek

**101 Greek for Beginners**
Fall. 4 credits.
M T W F 9:05. A. Nussbaum.
Introduction to Attic Greek. Designed to enable the student to read the ancient authors as soon as possible.

**103 Attic Greek**
Spring. 4 credits. Prerequisite: 101 or equivalent.
M T W F 12:20. H. Pelliccia.
A continuation of Classics 101.

**104 Intensive Greek**
Summer. 6 credits.
An intensive introduction to the fundamentals of ancient Greek grammar. Prepares students in one term for 200-level Greek.

**111–112 Modern Greek**
111, fall; 112, spring. 3 credits each term.
Fall: M W F 11:15; spring: M W F 1:25.
H. Kolias.

**201 Attic Authors**
Fall. 3 credits. Prerequisite: Classics 103 or 104 or equivalent.
M W F 1:25. D. Shanzer.
Selected readings from Greek prose writers.

**[203 Homer**
Spring. 3 credits. Prerequisite: Classics 103 or 104 or equivalent. Not offered 1989–90.
M W F 2:30 J. Rusten.
Readings in the Homeric epics with emphasis on formulaic style.]

**206 Herodotus**
Spring. 3 credits. Prerequisite: Classics 103 or 104 or equivalent.
M W F 2:30. J. Ginsburg.
Selected readings from Herodotus' *Histories.*

**209 Greek Composition**
Fall. 3 credits. Prerequisite: Classics 203 or 204 or equivalent.
T R 8:40–9:55. J. Rusten.

**210 Greek Composition**
Spring. 3 credits. Prerequisite: Classics 209 or equivalent.
M W F 9:05. P. Pucci.

**213 Intermediate Modern Greek**
Fall. 3 credits. Prerequisite: Classics 112 or placement by departmental examination.
M W F 12:20. H. Kolias.
This course, designed for students who have completed introductory modern Greek or have a reading knowledge of the language, will review modern Greek grammar and give attention to developing facility in conversational and written expression, usually in connection with assigned readings in modern Greek prose and poetry. Audio- and videocassettes will be used from time to time to introduce contemporary Greek life and culture.

**[301 Greek Historians**
Fall. 4 credits. Prerequisite: Classics 203 or 204 or equivalent. Not offered 1989–90.]

**[302 Greek Tragedy**
Fall. 4 credits. Prerequisite: Classics 203 or equivalent. Not offered 1989–90.]

**[303 Readings in Greek Rhetoric**
Fall. 4 credits. Not offered 1989–90.
P. Mitsis.
An examination of the development of Greek rhetorical theory and practice from Antiphon to Dinarchus. Consideration will be given not only to the methods and techniques of Attic oratory, but also to its legal and political context. These texts will also be studied as important sources for the Greeks' views on such ethical questions as the nature of responsibility, moral obligations between citizens, and the morality of war.]

**[305 Attic Comedy**
Fall. 4 credits. Prerequisite: Classics 203 or 204 or equivalent. Not offered 1989–90.]

**306 Greek Lyric Poetry (also Classics 417)**
Fall. 4 credits. Prerequisite: Classics 203 or 204 or equivalent.
T R 10:10–11:25. H. Pelliccia.
A survey of selected "lyric" poems from Archaic to Hellenistic times.

**[307 Plato**
Fall. 4 credits. Prerequisite: Classics 203 or 204 or equivalent. Not offered 1989–90.
M W F 2:30. P. Mitsis.
Plato on egoism, love, and friendship: *Lysis* and *Symposium.*]

**[308 New Testament Greek**
Fall. 4 credits. Prerequisite: at least three terms of college-level Greek or permission of instructor. Not offered 1989–90.
Selected readings from the Gospels and other New Testament writings will aim at giving students the ability to translate Koine Greek with relative ease.]

**310 Greek Undergraduate Seminar: The *Odyssey***
Spring. 4 credits. Prerequisite: two 200-level courses in Greek or permission of instructor.
M W F 12:20. P. Pucci.

**311 Greek Philosophical Texts (also Philosophy 411)**
Fall or spring. Up to 4 credits. Prerequisites: knowledge of Greek and permission of instructor.
Hours to be arranged. T. H. Irwin.
Reading of Greek philosophical texts in the original.

**401–402 Independent Study in Greek, Undergraduate Level**
401, fall; 402, spring. Up to 4 credits.
Hours to be arranged. Staff.

**417 Advanced Readings in Greek Literature (also Classics 306)**
Fall. 4 credits. For advanced undergraduates and graduate students. Prerequisite: two terms of 300-level Greek or permission of instructor.
T R 10:10–11:25. H. Pelliccia.
For description, see Classics 306.

**418 Advanced Readings in Greek: Attic Inscriptions and Dialect**
Spring. 4 credits. For advanced undergraduates and graduate students. Prerequisite: two terms of 300-level Greek or permission of instructor.
M 1:25–3:55. K Clinton, A. Nussbaum.

**[419 Advanced Greek Composition**
Fall. 3 credits. Prerequisite: Classics 209–210 or equivalent. Not offered 1989–90.]

**[442 Greek Philosophy**
Fall or spring. 4 credits. Not offered 1989–90.]

**605–606 Graduate Survey of Greek Literature**
605, fall; 606, spring. 4 credits each term. Prerequisite: linguistic proficiency to be determined by instructor.
Fall: M W F 11:15, K. Clinton; spring: M W F 11:15, J. Rusten.
A survey of Greek literature in two semesters. Classics 605: Greek literature from Homer to the mid-fifth century. Classics 606: Greek literature from the late fifth century to the Empire.

**671 Graduate Seminar in Greek: Hesiod**
Fall. 4 credits.
W 1:25–4:25. D. Mankin.

**672 Graduate Seminar in Greek: Tragedy**
Spring. 4 credits.
R 1:25–4:25. P. Easterling.

**701–702 Independent Study for Graduate Students in Greek**
701, fall; 702, spring. Up to 4 credits.
Hours to be arranged. Staff.

## Latin

**105 Latin for Beginners**
Fall. 4 credits.
M T W F 8, I. Hohendahl; M T W F 11:15, J. Romm; M T W F 12:20, K. Clinton; M T W F 1:25, D. Simpson; M T W F 2:30, M. Ierulli.
An introductory course in the essentials of Latin, designed for rapid progress toward reading the principal Latin writers.

**106 Elementary Latin**
Spring. 4 credits.
M T W F 8, I. Hohendahl; M T W F 11:15, D. Mankin; M T W F 1:25, D. Simpson.
A continuation of Classics 105, using readings from various authors.

**107 Intensive Latin**
Spring or summer. 6 credits.
Spring: M W F 9:05 and T R 8:40–9:55. K. Clinton, A. Nussbaum.
Prepares students in one term for 200-level Latin.

**205 Intermediate Latin**
Fall or summer. Prerequisite: Classics 106, 107, or 108 or placement by departmental examination.
Fall: M W F 11:15, D. Shanzer; M W F 1:25, H. Pelliccia.
Readings in Latin prose.

**207 Catullus**
Spring. 3 credits. Prerequisite: Classics 106, 107, or 108 or one term of 200-level Latin.
M W F 11:15. G. Davis.

**[208 Roman Drama**
Spring. 3 credits. Prerequisite: Classics 106, 107, or 108 or one term of 200-level Latin. Not offered 1989–90.]

**216 Vergil**
Spring. 3 credits. Prerequisite: Classics 106, 107, or 108 or one term of 200-level Latin.
M W F 1:25. W. Wetherbee.

**[241 Latin Composition**
Fall. 3 credits. Prerequisite: Classics 106, 107, or 108 or equivalent. Not offered 1989–90.]

**[242 Latin Composition**
Spring. 3 credits. Prerequisite: Classics 241 or equivalent. Not offered 1989–90.]

**312 Latin Undergraduate Seminar (also Classics 412)**
Spring. 4 credits. Prerequisite: two terms of 200-level Latin or permission of instructor.
T R 11:40–12:55. D. Shanzer.
Selections from all six books of Lucretius' *De rerum natura.* The emphasis will be broad, including textual, philological, philosophical, scientific, and literary questions.

**314 The Augustan Age (also Classics 411)**
Fall. 4 credits. Prerequisite: two terms of 200-level Latin or permission of instructor.
M W F 10:10. G. Davis.
Selected readings from the poetry of Horace.

**[315 Roman Satire**
Spring. 4 credits. Prerequisite: two terms of 200-level Latin or permission of instructor. Not offered 1989–90.]

**[316 Roman Philosophical Writers**
Spring. 4 credits. Prerequisite: two terms of 200-level Latin. Not offered 1989–90.
Hours to be arranged. P. Mitsis.
An examination of some central Roman philosophical texts.]

**[317 Roman Historiography**
Fall. 4 credits. Prerequisite: one term of 300-level Latin or permission of instructor. Not offered 1989–90.
J. Ginsburg.
Reading of three "conspiracy narratives" from the works of Sallust, Livy, and Tacitus. Class discussion will focus both on historical questions (such as the causes of discontent that gave rise to these episodes in Roman history and why the Romans defined these events as conspiracies) and on the narrative techniques used by Roman historians to impose an interpretation on their material.]

**[318 Roman Elegy: Tibullus, Propertius, Ovid**
Spring. 4 credits. Prerequisite: two terms of 200-level Latin. Not offered 1989–90.]

**[366 Late Latin: Epic after Vergil**
Fall. 4 credits. Not offered 1989–90.
T R 10:10–11:25. F. Ahl.
Selections from Ovid, Lucan, Statius, Silius, and Prudentius to illustrate the development and refinement of Latin epic during the Roman Empire.]

**[368 Medieval Latin Literature**
Fall. 4 credits. Prerequisite: Classics 216 or permission of instructor. Not offered 1989–90.
M W F 2:30. W. Wetherbee.
Close study of selected Medieval Latin texts and their historical and cultural contexts.]

**411 Advanced Readings in Latin Literature (also Classics 314)**
Fall. 4 credits. For advanced undergraduates and graduate students. Prerequisite: two terms of 300-level Latin or permission of instructor.
M W F 10:10. G. Davis.
For description, see Classics 314.

**412 Advanced Readings in Latin Literature (also Classics 312)**
Spring. 4 credits. For advanced undergraduates and graduate students. Prerequisite: two terms of 300-level Latin or permission of instructor.
T R 11:40–12:55. D. Shanzer.
For description, see Classics 312.

**441 Advanced Latin Composition**
Spring. 3 credits. For undergraduates who have completed Latin 241–242 and for graduate students.
T R 8:40–9:55. D. Shanzer.

**451–452 Independent Study in Latin, Undergraduate Level**
451, fall; 452, spring. Up to 4 credits.
Hours to be arranged. Staff.

**[625–626 Graduate Survey of Latin Literature**
625, fall; 626, spring. 4 credits each term. Prerequisite: linguistic proficiency to be determined by instructor. Not offered 1989–90; next offered 1990–91.
M W F 11:15. D. Mankin.
A survey of Latin literature in two semesters. Classics 625: Latin literature from its beginnings to the end of the Republic. Classics 626: Latin literature of the Imperial period.]

**679 Graduate Seminar in Latin: Livy**
Fall. 4 credits.
R 1:25–4:25. J. Ginsburg.

**680 Graduate Seminar in Latin: Vergil's *Aeneid***
Spring. 4 credits.
W 1:25–4:25. F. Ahl.

**751–752 Independent Study for Graduate Students in Latin**
751, fall; 752, spring. Up to 4 credits.
Hours to be arranged. Staff.

## Classical Art and Archaeology

**219 Mediterranean Archaeology (also Near Eastern Studies 267)**
Fall. 3 credits.
M W F 12:20. J. Coleman.
An examination of the archaeological bases of ancient Mediterranean civilization with special focus on contacts and interrelationships in the Bronze Age (ca. 3500-1100 B.C.). Topics include the Neolithic of Anatolia, Greece, and the Near East; the rise of civilization in Egypt; the Bronze Age states of Syro-Palestine (Ebla, Ugarit, Byblos, etc.); Cyprus, copper, and the Alasia question; the Hittites and Bronze Age Anatolia; the early Bronze Age in Greece; Minoans, Mycenaeans, and their eastern and western contacts; the Bronze Age in the western Mediterranean; and ancient ships and trade in the late Bronze Age.

**220 Introduction to Classical Archaeology (also History of Art 220)**
Spring. 3 credits.
M W F 10:10. J. Coleman.
The archaeology of the ancient Greeks and Romans as seen from a critical perspective. Major developments in Classical archaeology will be traced from treasure hunting to modern scientific research. Examples illustrating various approaches will be chosen: the sculpture, vase painting, and architecture of the ancient Greeks from the Geometric period through the Hellenistic, and the art of the Romans from the early republic to the late empire.

**[221 Minoan-Mycenaean Art and Archaeology (also Archaeology 221 and History of Art 221)**
Fall. 3 credits. Students may not obtain credit for both this course and Classics 319. Not offered 1989–90.
T R 10:10–11:25. Staff.
The birth of civilization in Greece and the Aegean islands during the Bronze Age. The main focus is on the rise and fall of Minoan Crete and Mycenaean Greece, with consideration given to the nature and significance of Aegean interactions with Egypt, the Near East, and Anatolia.]

**[233 Archaeology in Action II (also Archaeology 233)**
Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
M 2:30; two labs to be arranged.
P. I. Kuniholm.
Objects from the Classical, Hellenistic, and Roman periods are "dug" out of Cornell basements, identified, cleaned, restored, catalogued, and photographed and are considered in their appropriate historic, artistic, and cultural contexts.]

**[250 Etruscan Art and Archaeology (also Archaeology 250 and History of Art 223)**
Fall. 3 credits. Not offered 1989–90.
M W F 12:20. J. Whitehead.
An examination of Etruscan culture for both its uniqueness and its diversity. The first part of the course will trace the history and the art of the Etruscans, beginning with questions of their origins and ending with their assimilation into the Roman state. Developments in artistic style run parallel to those in Greek art and illuminate the unique Etruscan character. The second half will focus on the individual cities and how strongly they differed from one another in their art, customs, practices, and relationship to Rome.]

**[309 Dendrochronology of the Aegean (also Archaeology 308)**
Fall or spring. 4 credits. Limited to 10 students. Prerequisite: permission of instructor. Not offered 1989–90.
M 12:20; two labs to be arranged.
P. I. Kuniholm.
Participation in a research project of dating modern and ancient tree-ring samples from the Aegean and Mediterranean. Supervised reading and laboratory work. A possibility exists for summer fieldwork in Greece or Turkey.]

**[319 Minoan-Mycenaean Archaeology**
Spring. 4 credits. Prerequisite: participants are expected already to have completed some course work in Mediterranean or Classical archaeology (e.g., Classics 219/Near Eastern Studies 267, Classics/History of Art 220). Students may not obtain credit for both this course and Archaeology/Classics/History of Art 221. Not offered 1989–90.
T R 10:10–11:25. J. Coleman.
The art and archaeology of Greece and the Aegean in the Bronze Age (ca. 3500–1100 B.C.). Detailed treatment is given to the Minoan and Mycenaean civilizations of the middle and late Bronze Age. Other topics include the Neolithic "background" of Aegean civilization, the early Bronze Age in Greece, Crete, and the Cycladic islands; the volcanic eruption of Thera; and Aegean interconnections with Cyprus and the Near East and, in particular, the evidence for Mycenaean shipping, trade, and immigration from 1400–1100 B.C. Two papers will be presented in class, and these will subsequently be handed in and graded.]

**[320 Arts and Monuments of Athens (also History of Art 320)**
Spring. 4 credits. Prerequisite: Classics 220 or permission of instructor. Not offered 1989–90.
M W F 1:25. J. Coleman.
Recent developments in the archaeology of Athens from the Geometric period to late antiquity. Topics will include consideration of the nature of Athenian society and an assessment of the influence of Athens on the rest of the Greek world and beyond.]

**[321 Archaeology of Cyprus (also History of Art 321)**
Spring. 4 credits. Prerequisite: Classics 220 or permission of instructor. Not offered 1989–90.
Study of Cyprus from its first settlement in the Neolithic period until the end of the ancient world. Special emphasis on the Bronze Age, the acme of Cypriot culture, and the neighboring civilizations. Lectures and oral reports by students.]

**[322 Greeks and Their Neighbors (also History of Art 328)**
Fall. 4 credits. Prerequisite: Classics 220 or 221, or permission of instructor. Not offered 1989–90.
T R 1:25–2:40. J. Coleman.
A study of the archaeological and other evidence for the interaction between Greek civilization and the eastern and western Mediterranean from the thirteenth to the fourth centuries B.C.E. The course will focus on Greek relationships with Phoenicia and the rest of the Levant, Cyprus, Anatolia, and the Etruscans in the post-Bronze Age period.]

**[323 Painting in the Greek and Roman World (also History of Art 323)**
Spring. 4 credits. Not offered 1989–90.
M W F 2:30. A. Ramage.
Vase painting, wall painting, and mosaics from the ancient Mediterranean world will be studied in conjunction with the testimony of Greek and Roman sources. An attempt will be made to grasp the concerns and achievements of the Classical painters.]

**325 Greek Vase Painting (also History of Art 325)**
Spring. 4 credits. Prerequisite: previous enrollment in a History of Art or Classics course or permission of instructor.
M W F 10:10. A. Ramage.
A stylistic and iconographical approach to an art in which the Greeks excelled. The course will be arranged chronologically, from the early (eleventh century B.C.), anonymous beginnings to the "personal" hands of identifiable masters of the fifth and fourth centuries B.C. Styles other than Attic will be stressed.

**[326 Art and Archaeology of Archaic Greece (also History of Art 326)**
Fall. 4 credits. Not offered 1989–90.
A study of the formative period of Classical Greek civilization, based primarily on the evidence of art and archaeology. Attention is concentrated on the beginnings and early developments of architecture, sculpture, and painting.]

**327 Greek and Roman Coins (also History of Art 327)**
Fall. 4 credits. Prerequisite: History of Art 220 or Classics 220 or permission of instructor.
M W F 11:15. A. Ramage.
The varied issues of Greek cities and the Roman state are examined. Coins are considered as art objects as well as economic and historical documents. The changes in design, value, and metals from the origins of coinage to the late Roman period are studied. Lectures, student presentations, and work with actual examples.

**[328 Greek Architecture (also History of Art 324)**
Fall. 4 credits. Prerequisite: Classics 220 or permission of instructor. Not offered 1989–90.]

**[329 Greek Sculpture (also History of Art 329)**
Spring. 4 credits. Not offered 1989–90.
This course will examine ancient Greek sculpture, both three-dimensional and two-dimensional, from the Archaic period to the Hellenistic. We will study various aspects of the works: technological advances in handling materials, the changing ideology of the sculptors, regionality of styles, and taste of individual patrons. Sculptures of marble and bronze will be considered, and comparisons with other ancient civilizations that influenced the Greek will be undertaken.]

**[330 Art in Pompeii: Origins and Echoes (also History of Art 330)**
Spring. 4 credits. Not offered 1989–90.]

**[350 Arts of the Roman Empire (also History of Art 322)**
Fall. 4 credits.
M W F 9:05. A. Ramage. Not offered 1989–90.
The visual arts in the service of the first world state. The course starts with the Etruscan and Republican period but concentrates on monuments of the Imperial era in Italy and the provinces until the time of Constantine.]

**356 Practical Archaeology (also Archaeology 356)**
Spring. 4 credits. Prerequisite: one course in archaeology.
M W F 11:15, plus workroom sessions to be arranged. J. Coleman.
The fundamentals of archaeological fieldwork, including techniques of excavation and recording. Hands-on experience with cataloging of ancient objects in the Herbert F. Johnson Museum of Art and the collection of the Department of Classics. No previous fieldwork required. Especially recommended for those planning to participate in summer field programs such as the Cornell project at Halai and East Lokris in Greece.

**360 Field Archaeology in Greece (also Archaeology 360)**
Summer. 6 credits.
J. Coleman.
A six-week archaeological field training program in conjunction with the Cornell Halai and East Lokris Project. For information and application forms, contact Professor John E. Coleman, Department of Classics, 120 Goldwin Smith Hall.

**361 Summer Program in Etruscan Archaeology at La Piana near Siena, Italy (also Archaeology 361)**
Summer. Non-credit or 3 credits.
J. Whitehead.
A five-week program that offers a field school in excavation techniques, handling of artifacts, and archaeological recording. For information and application forms, contact Professor Jane Whitehead, Department of Classics, 120 Goldwin Smith Hall.

**[423 Ceramics (also Archaeology 423 and History of Art 423)**
Fall. 4 credits. Prerequisite: Classics 220 or History of Art 220 or permission of instructor. Not offered 1989–90.
T 2:30–4:30. A. Ramage.
Greek and Roman pottery specimens from several Near Eastern and Mediterranean sites will be studied to provide direct experience in one of the basic prerequisites of archaeological excavation— the identification and dating of pottery types. A report, delivered in class, will concern ancient ceramic materials or particular types and periods. Practical experience in making and decorating pottery will be encouraged.]

**[431 Greek Sculpture (also History of Art 431)**
Fall. 4 credits. Not offered 1989–90.]

**432 Sardis and the Cities of Asia Minor (also Archaeology 432 and History of Art 432)**
Fall. 4 credits. Prerequisite: permission of instructor.
T 2:30–4:30. A. Ramage.
The growth and interaction of the Greek and Roman cities and their art will be studied using the finds and conclusions from the Cornell-Harvard excavations at Sardis as a focal point. The magnificent works of art and architecture will be set beside domestic remains and objects of daily life. We shall examine local themes in the context of the history, the topography, and the larger political and economic scene in Asia Minor. We shall concentrate on the Golden age of Lydia and Ionian Greece.

**[434 The Rise of Classical Greece (also Archaeology 434 and History of Art 434)**
Spring. 4 credits. Prerequisite: Classics 220 or 221, History of Art 220 or 221, or permission of instructor. Not offered 1989–90.
T R 2:55–4:25. P. I. Kuniholm.
The art and archaeology of the Greek dark ages. Topics include site reports, pottery, metalworking, the introduction of the alphabet, the beginnings of coinage, and links with Anatolia and the Near East.]

**435 Seminar on Roman Art: Social Stratification in Roman Art (also History of Art 427)**
Fall. 4 credits. Prerequisite: permission of instructor.
M 2:30–4:30. J. Whitehead.
The course begins with a chronological overview of Roman art and with concepts of *romanitas:* underlying all this diversity is there an essence that can be considered purely Roman? The rest of the course will explore the dichotomies, the contrasting ideals and ideologies as expressed in the art of the different segments of society: artisan and aristocrat, freedmen and emperor, provincial and urbanite, foreign and domestic, rich and nouveau riche. It seeks to define the degree to which artistic taste is bound to social class.

**475–476 Independent Study in Classical Archaeology, Undergraduate Level**
475, fall; 476, spring. Up to 4 credits.
Hours to be arranged. Staff.

**[629 Graduate Seminar in Bronze Age Archaeology**
Fall. 4 credits. Not offered 1989–90.
T 1:25–4:25. J. Coleman.
Cyprus and its interconnections with the Aegean and the Near East in the middle and late Bronze Ages. Special focus on the problems of trade between Cyprus and the Aegean in the late Bronze Age.]

**[630 Graduate Seminar in Classical Greek Archaeology**
Fall. 4 credits. Not offered 1988–89.
M 1:25–4:25. J. Coleman.
The rise of Greek civilization in the seventh and sixth centuries B. C. is exemplified in art, architecture, and daily life. Focus on the evidence for the formation of the Greek polis, such as religious and military architecture, density of settlement, and interrelations between towns, cities, and regions.]

**721–722 Independent Study for Graduate Students in Classical Archaeology**
721, fall; 722, spring. Up to 4 credits.
Hours to be arranged. Staff.

## Greek and Latin Linguistics

**[421 Greek Comparative Grammar (also Linguistics 609)**
Fall. 4 credits. Prerequisite: thorough familiarity with the morphology of classical Greek. Not offered 1989–90.
A. Nussbaum.
The prehistory and evolution of the sounds and forms of ancient Greek as reconstructed by comparison with the other Indo-European languages.]

**[422 Latin Comparative Grammar (also Linguistics 610)**
Fall or spring. 4 credits. Prerequisite: thorough familiarity with the morphology of classical Latin. Not offered 1989–90.
A. Nussbaum.
The prehistory and evolution of the sounds and forms of Classical Latin as reconstructed by comparison with the other Indo-European languages.]

**424 Italic Dialects (also Linguistics 612)**
Fall. 4 credits.
T R 11:40–12:55. A. Nussbaum.
The phonology and morphology of Faliscan, Oscan, and Umbrian studied through the reading of epigraphical texts. Attention to the relationships of these languages to Latin and the question of Proto-Italic.]

**[425 Greek Dialects (also Linguistics 611)**
Fall or spring. 4 credits. Not offered 1989–90.
A. Nussbaum.
A survey of the dialects of ancient Greek through the reading and analysis of representative epigraphical and literary texts.]

**[426 Archaic Latin (also Linguistics 614)**
Spring. 4 credits. Prerequisite: reading knowledge of Latin. Not offered 1989–90.
Hours to be arranged. A. Nussbaum.
Reading of epigraphic and literary preclassical texts with special attention to archaic and dialectal features. The position of Latin among the Indo-European languages of ancient Italy, the rudiments of Latin historical grammar, and aspects of the development of the literary language.]

**[427 Homeric Philology (also Linguistics 613)**
Fall or spring. 4 credits. Prerequisite: ability to read Homeric Greek. Not offered 1989–90.
A. Nussbaum.
The language of the Homeric epics: dialect background, archaisms, epicisms, modernizations. The notion of a *Kunstsprache*: its constitution, use, and internal consistency. The phonological and morphological aspects of epic compositional technique.]

**[429 Mycenaean Greek (also Linguistics 615)**
Fall or spring. 4 credits. Prerequisite: thorough familiarity with the morphology of Classical Greek. Not offered 1989–90.
A. Nussbaum.
An introduction to the epigraphy, language, and content of the Linear B tablets with special attention to their implications for Greek historical grammar and dialectology.]

### Sanskrit

**131–132 Elementary Sanskrit (also Sanskrit 131–132)**
131, fall; 132, spring. 3 credits each term.
M W F 2:30. C. Minkowski.
Also see Classics 390 (Classical Civilization listings).

## Honors Courses

**370 Honors Course**
Spring. 4 credits. To be taken in the junior year.
A program of reading and conferences centered on an author or topic chosen in accordance with the special interests of the student and instructor.

**471 Honors Course**
Fall. 4 credits. To be taken in the senior year. A continuation of Classics 370, with change of author or topic.

**472 Honors Course: Senior Essay**
Spring. 4 credits. For students who have successfully completed Classics 471. Topics must be approved by the student's honors committee at the end of the first term of the senior year.

## Related Courses in Other Departments

See listings under:

Archaeology

Comparative Literature

English

History

History of Art

Medieval Studies

Modern Languages and Linguistics

Near Eastern Studies

Philosophy

Society for the Humanities

Women's Studies

# COMPARATIVE LITERATURE

A. Caputi, chair (139 Goldwin Smith Hall, 255-4155); W. Cohen, graduate faculty representative (343 Goldwin Smith Hall, 255-6279); W. Kennedy, director of undergraduate studies (163 Goldwin Smith Hall, 255-3398); C. Arroyo, C. Carmichael, J. Culler, G. Davis, H. Gates, Jr., G. Gibian, S. Goodhart (visiting professor), D. Grossvogel, P. Hohendahl, W. Holdheim, J. Monroe, E. Rosenberg, L. Waugh

Also cooperating: D. Bathrick, J. Bishop, K. Brazell, P. Carden, G. Friedman, S. Gilman, R. Kaske, D. Mankin, T. Murray, J. Romm, G. Waite

The Department of Comparative Literature provides a broad range of courses in European as well as non-European literatures. Courses variously stress significant authors, themes, problems, styles, genres, historical periods, and theoretical perspectives. The departmental offerings reflect current interdisciplinary approaches to literary study, hermeneutics, rhetorical analysis, semiotics, deconstruction, Marxism, reception aesthetics, feminism, formalism, and psychoanalysis.

## The Major

The major enables students to develop an integrated knowledge of Western literature, to strengthen their reading and writing abilities, and to prepare for careers demanding analytical, interpretive, and evaluative skills. Prospective majors should consult with the director of undergraduate studies. After declaring a major, a student chooses an adviser from the department's faculty. The requirements for the major are designed to allow each student to follow a course of study that combines intellectual rigor with the pursuit of personal interests. The specific contours of such a program are worked out in consultation with the student's adviser.

### Requirements for the Major

1) Five courses in Comparative Literature at the 200 level and above, including the core course listed below. A student may include up to two literature courses from other departments.

2) One core course in Comparative Literature (for 1989–90 the core courses are Comparative Literature 372 [fall] and Comparative Literature 373 [spring]), to be taken by all majors either in the spring term of their junior year or the fall term of their senior year. Students may enroll in both core courses.

3) Five courses in literature or other areas of the humanities at the 200 or higher level, to be taken in one or more foreign literature departments. Texts must be read in the original language. A student may offer one language course (conversation, composition, etc.).

4) A senior essay (Comparative Literature 493) of roughly fifty pages, to be written during the senior year under the direction of the student's adviser.

The department also encourages:

1) a program that includes broad historical coverage (e.g., Comparative Literature 201–202: Great Books, Comparative Literature 210: Ancients and Moderns); intensive study of a single genre, (e.g., Comparative Literature 320: Introduction to Caribbean Poetry, Comparative Literature 353: European Drama, 1600-1900, Comparative Literature 363–364: The European Novel); analysis of problems in literary theory (e.g., Comparative Literature 302: Literature and Theory, Comparative Literature 381: Marxist Cultural Theory, and Comparative Literature 402: Theories of Rhetoric)

2) a second foreign language, especially for students interested in graduate work in literature.

## Honors

A student who completes the requirements for the major is eligible for the degree of Bachelor of Arts with honors in comparative literature. The department bases its decision on the student's achieving grades of at least B+ in the senior essay and in course work for the major, and on overall academic performance at Cornell.

## Freshman Writing Seminars

Most 100-level courses may be used toward satisfying the freshman writing seminar requirements. A full description of the freshman writing seminar program may be found on p. 22.

## Courses

**[150 Introduction to Cultural Studies (also Society for the Humanities 150)**
Spring. 4 credits. Does not satisfy the freshman writing seminar requirement, but will satisfy the distribution requirement. Not offered 1989–90.
W. Cohen.
Not an introduction to culture but to the study of it, this course outlines an emerging field of inquiry concerned with the ultimately political character of meanings, values, subjectivity, and symbolization. Topics include the definition and theory of culture, culture and society (institutions and ideologies), interdisciplinary approaches to culture (relations among various art forms), high (elite) and low (mass, or popular) culture, the dominant culture vs. subcultures (of age, class, ethnicity, gender, race, region, or religion), historical research on culture, and comparative analyses of culture (cultural imperialism, first world–second world–third world). Methodologies are introduced for the development of a model of cultural circulation that encompasses production, structure, reception, and transformation. The focus is not only on public cultural apparatuses and artifacts (literature, music, art, architecture, film, radio, television, print journalism, sports, tourism, advertising, education), but also on the more private culture of everyday life. Examples are drawn primarily from the 1960s—the Beatles, James Bond, Bob Dylan, Gabriel García Márquez, Martin Luther King, Jr., Andy Warhol, Christa Wolf, etc.—and are considered partly from the perspective of the theory of postmodernism.]

**201–202 Great Books**
201, fall; 202, spring; summer, TBA. 4 credits. Comparative Literature 201 and 202 may be taken independently of each other.
Fall: M W 11:15; sec, F 9:05, 10:10, 11:15, or 12:20, W. J. Kennedy. Spring: M W 11:15; sec, F 9:05, 10:10, 11:15, 12:20. J. Monroe.
A reading each semester of seminal texts that represent and have shaped Western culture and hence form an essential part of the student's intellectual equipment. By analyzing, interpreting, and evaluating, students will develop critical reading abilities. 201: selections from the Bible, Homer, Aristophanes, Dante, Rabelais, Shakespeare, and others. 202: selections from Moliere, Blake, Wordsworth, Balzac, Baudelaire, Kafka, Brecht, Eliot, Kundera, and others.

**210 Ancients and Moderns**
Spring. 4 credits.
M W F 12:20. W. J. Kennedy.
Key texts from the Bible, Greek civilization, and Roman antiquity have had an astonishing impact on Western culture in modern times. This course compares and contrasts a selection of important themes from those texts. They will be drawn from the Bible and Nietzsche, Aeschylus and Dostoevsky, and Homer and Joyce.

**235 Modern Greek Poetry and Politics (also Classics 235, 3 credits, and Government 335, 4 credits)**
Fall. 3 credits.
T R 1:25–2:40. G. Holst-Warhaft.
The history of modern Greece has been marked by a series of political crises that have resulted in deep divisions in society. Greek poetry has reflected these crises and divisions; the poetry of nineteenth- and twentieth-century Greece will thus be interpreted in its historical and political context. It will concentrate on four periods in which the interaction has been particularly strong. The continuity of ancient Greek myths in modern Greek poetry will also be explored. Students taking this course as Government 335 for 4 credits must write an additional paper on a political topic.

**236 Greek Mythology (also Classics 236)**
Fall. 3 credits.
T R 11:40–12:55. D. Mankin.
A survey of the Greek myths, with emphasis on the reconstruction of the content and significance of the myths in preliterate Mediterranean society, including the place of myth in Greek life and consciousness; the factors and influences involved in the creation of myths; and the use of myths for our understanding of Greek literature, religion, and moral and political concepts.

**302 Literature and Theory (also English 302/702)**
Fall. 4 credits.
M W F 10:10. J. Culler.
A study of issues in contemporary theoretical debates, with particular attention to structuralism, deconstruction, psychoanalysis, and feminism. Readings by Barthes, Derrida, Foucault, B. Johnson, J. Rose, and others. No previous knowledge of literary theory is assumed.

**320 Introduction to Caribbean Poetry**
Spring. 4 credits.
M W F 10:10–11. G. Davis.
The primary aim of this course is to introduce major authors and themes in Caribbean poetry against the background of the historical and cultural interactions between Europeans and people of African descent in the New World. Select masterworks of four contemporary poets will be the main focus of our detailed readings: Derek Walcott, Edward Brathwaite, Aimé Césaire, and Nicholas Guillen. Topics to be explored in conjunction with the literary texts will include the relation of "creole" to metropolitan languages, the problem of cultural identity, colonizer/colonized relations, the amalgamation of European and African cultural traditions, and the quest for an "authentic" Caribbean voice. Wherever relevant to the understanding of the literary texts, examples of oral, popular culture (e.g., calypso and reggae lyrics) will receive appropriate consideration. In addition to the poetry, the class will study a small selection of West Indian novels and films that provide a concrete sense of place and social context (e.g., Jamaica Kincaid's *Annie John*; Jean Rhys' *Wide Sargasso Sea*; Eugene Palcy's film *Sugar-Cane Alley*).

**[324 Selected Problems of Law and Religion**
Spring. 4 credits. Limited to 20 juniors and seniors. A Common Learning course. Not offered 1989–90.
C. M. Carmichael and others.
The experience of past generations in wrestling with issues of perennial concern and how their efforts might enhance our contemporary understanding of them. Perspectives from biblical, Jewish, Greek, and Roman antiquity and from American legal and religious history will be brought to bear on such topics as abortion, bribery, civil disobedience, contraception, death, divorce, drunkenness, individual and communal responsibility, informal marriage, limitations on self-sacrifice, rebirth, resisting or appeasing an oppressor, suicide, and unwanted salvation.]

**[326 Christianity and Judaism**
Spring. 4 credits. Not open to freshmen. Not offered 1989–90.
C. M. Carmichael.
A study of the New Testament as a product of first-century Palestinian and Hellenistic Judaism. Other text (also in translation): *Passover Haggadah*.]

**[328 Literature of the Old Testament**
Fall. 4 credits. Not open to freshmen. Not offered 1989–90.
C. M. Carmichael.
Analysis of selected material in translation.]

**343 Medieval Literature**
Fall. 4 credits.
M W F 12:20–1:10. R. E. Kaske.
Reading and interpretation of three medieval epics (*Beowulf*, *Nibelungenleid*, *Njálssaga*) and three medieval romances (Chrétien's *Yvain*, Wolfram's *Parzival*, and *Sir Gawain and the Green Knight*). Two written exams, mid-term, and final; a term paper of about 2,500 words; and some demonstration of reading beyond the assigned texts.

**346 The Classical Influence on Renaissance Literature (also Classics 346)**
Spring. 3 credits.
T R 10:10–11:25. J. Romm.
For description, see Classics 346.

**347 Reading Freud: Race, Gender, and Psychoanalysis (also English 347, German Studies 347, HPST 347, and Psychology 389)**
Fall. 3 credits. Lecture and discussion. In English.
F 1:25–3:20. S. L. Gilman.
For desciption, see German Studies 347.

**[352 Classic and Renaissance Drama (also Theatre Arts 325)**
Spring. 4 credits. Not offered 1989–90.
A. Caputi.
A study of the major traditions in Western drama from the beginnings among the Greeks to the Renaissance in England and Spain. The work will consist of both lectures and discussions focusing primarily on a close reading of the plays. But we shall also give attention to the physical conditions of production and to social and political contexts. Among the authors to be read will be Aeschylus, Sophocles, Euripides, Aristophanes, Marlowe, Shakespeare, and Lope de Vega.]

**353 European Drama, 1630–1900 (also Theatre Arts 326)**
Spring. 4 credits.
M W F 9:05–9:55. A. Caputi.
A survey of European Drama from 1630 to 1900 emphasizing major movements and major figures. Texts will be drawn from the work of Corneille, Moliere, Wycherley, Sheridan, Schiller, Gogol, and Ibsen, among others.

**[354 Modern Drama (also German Studies 354 and Theatre Arts 327)**
Fall. 4 credits. Not offered 1989–90.
D. Bathrick.
A study of the major currents of modern drama against the background of modern culture. Readings in European drama from Ibsen to the present.]

**363–364 The European Novel**
363, fall; 364, spring. 4 credits. Comparative Literature 363 and 364 may be taken independently of each other.
Fall: T R 10:10–11:25, W. W. Holdheim; spring: T R 11:40–12:55. E. Rosenberg.
Close reading of English and Continental novels from 1600 to 1950. 363: Cervantes to Dostoevsky. 364: Tolstoy to Gide. The novelists to be studied include Voltaire, Scott, Stendhal, Balzac, Goethe, Flaubert, Hardy, Mann, and Nabokov. Analysis of novelistic subgenres: picaresque fiction, historical novel, moral fable, *récit*, detective story, and *Bildungsroman*.

**367 The Russian Novel (in English translation) (also Russian 367)**
Fall. 4 credits. Also open to graduate students. Special disc for students who read Russian.
T R 9:05–9:55, plus 1 hr. to be arranged. G. Gibian.
Realism and modernism. The prosaics of Russian writers of the nineteenth and twentieth centuries. Novels and short stories by Gogol, Turgenev, Tolstoy, Dostoevsky, Chekhov, Solzhenitsyn, and others.

**372 Selections from Contemporary World Literature**
Spring. 4 credits. Limited to 15 students. Core course for majors.
T R 11:40–12:55. J. Monroe.
Readings of celebrated texts by contemporary authors with attention to the local and global contexts of their literary production and reception. The course will include works in various genres by such authors as Christa Wolf, Marguerite Duras, Gunter Grass, Gabriel García Márquez, Salman Rushdie, Raul Zurita, Milan Kundera, Wole Soyinka, and Toni Morrison.

**373 Tragedy**
Spring. 4 credits. Limited to 15 students. Core course for majors.
T R 1:25–2:40. S. Goodhart.
Close reading of the celebrated texts of this genre from the classical, Renaissance, and modern periods. Our focus will be both upon the works themselves (in their own historical and cultural context) and upon the familiar philosophic and literary perspectives within which they have commonly been interpreted. Readings will include plays by Aeschylus, Sophocles, Euripides, Shakespeare, Beckett, and Miller, and selections from theoretical statements by Plato, Aristotle, Hegel, Kierkegaard, Nietzsche, and Heidegger.

**379 The Russian Connection (also Russian 379)**
Fall. 4 credits.
T R 2:55–4:10. P. Carden.
For description, see Russian Literature 379.

**389 Modern Literature in Poland, Czechoslovakia, and Yugoslavia (also Russian Literature 389)**
Spring. 4 credits.
T R 9:05 plus 1 hr. TBA. G. Gibian.
The course will focus on novels and short stories, but some consideration will also be given to drama and poetry. No knowledge of Eastern European languages is required; the reading will be done in English translation. Primary emphasis will be on the texts as literary works of art, but attention will also be given to historical and political backgrounds.

**400 The Japanese Noh Theater and Modern Dramatists (also Asian Studies 400)**
Fall. 4 credits.
M W 2:30–4:30. K. Brazell.
For description, see Asian Studies 400.

**402 Theories of Rhetoric (also Compartive Literature 602)**
Spring. 4 credits.
M 2:30–4:30. W. J. Kennedy.
Reading and discussion of theories about rhetoric and its relation to literature and other forms of discourse. Texts by Plato, Longinus, Nietzsche, Derrida, and others.

**410 Semiotics and Language (also French Language 400 and Linguistics 400)**
Spring. 4 credits. Prerequisite: some background in an area relevant to semiotics: e.g., linguistics, philosophy, psychology, anthropology, or literature; or permission of instructor.
TBA. L. Waugh.
An introduction to the study of semiotics in general and to particular semiotic theories (e.g., those of Saussure, Peirce, Jakobson) and to language as a semiotic system. The particular topics to be discussed will depend on the interest of the students.

**416 Romanticism and Revolution (also Society for the Humanities 416)**
Fall. 3 credits. Knowledge of French required, knowledge of German desirable. Limited to 17 students.
M 12:20–2:15. G. Friedman.
For description, see Society for the Humanities 416.

**419–420 Independent Study**
419, fall; 420, spring. Variable credit. Comparative Literature 419 and 420 may be taken independently of each other.
Hours to be arranged. Staff.

**[421 Old Testament Seminar**
Fall. 4 credits. Not offered 1989–90.
C. M. Carmichael.
Identification and discussion of problems in selected material from the Pentateuch.]

**[426 New Testament Seminar**
Spring. 4 credits. Limited to 20 students. Not offered 1989–90.
C. M. Carmichael.
Identification and discussion of problems in the New Testament.]

**429 Readings in the New Testament (Near Eastern Studies 429)**
Spring. 4 credits. Limited to 25 students.
M W F 1:25. J. P. Bishop.
Close readings of representative texts from the New Testament in modern scholarly editions, with the help of appropriate commentary, introductory and specialized. The focus for 1990 will be on Acts and Paul. All readings will be in English, but repeated reference to the Greek original will be made. Graduate students and undergraduates from other colleges who are interested in the material should not feel inhibited from enrolling. The approach will be primarily exegetical; that is, we will try to find out what the texts say and what they mean by what they say. Thus we can hope to stay open to scholarly and religious issues alike.

**452 Renaissance Humanism (also Comparative Literature 652)**
Fall. 4 credits.
M 2:30–4:30. W. J. Kennedy.
A reading and discussion of key texts by Renaissance humanists in Italian, French, English, and other European literatures from the fourteenth to the seventeenth centuries. Topic for 1989: Canon Formation of the Classics.

**493 Senior Essay**
Fall and spring. 8 credits.
TBA. Staff.
Hours to be arranged individually in consultation with the Director of Undergraduate Studies. Approximately fifty pages to be written over the course of two semesters in the student's senior year under the direction of the student's adviser. Credit for the first semester will be awarded upon completion of the second semester.

**497 The Hermeneutic Tradition (also German Studies 497)**
Spring. 4 credits.
W 2:30–4:30. W. W. Holdheim.
Hermeneutics is not so much a particular philosophy as an abiding yet developing tradition of reflexivity. The course will place this approach into a historical perspective, tracing it back to antiquity (St. Augustine), then following its development from eighteenth-century rationalism via romantic hermeneutics (Schleiermacher, E. A. Poe) and the contribution of the historical school (Droysen) to *Geisteswissenschaften* (Dilthey). Finally, there will be a discussion of various twentieth-century trends (Bultmann, Ricoeur, Gadamer) reflecting the influence of Heideggerian phenomenology.

**499 Fiction and Film in France (also French 499)**
Spring. 4 credits.
T R 2:55–4:10. D. Grossvogel.
The nature of selected dramatic structures and fictional forms (especially in realism and surrealism) and their influence on the motion pictures derived from them.

**602 Theories of Rhetoric (also Comparative Literature 402)**
Spring. 4 credits.
M 2:30–4:30. W. J. Kennedy.
For description, see Comparative Literature 402.

**610 Stendhal, Balzac, Flaubert (also French Literature 685)**
Fall. 4 credits.
R 10:10–12. J. Culler.
Study of *Le Rouge et le Noir*, *La Chartreuse de Parme*, *La Cousine Bette*, *Splendeurs et miseres des courtisanes*, *Madame Bovary*, and *L'Education sentimentale*, with particular attention to questions of narrative structure and technique and issues of power, gender, and knowledge.

**619–620 Independent Study**
619, fall; 620, spring. Variable credit. Comparative Literature 619 and 620 may be taken independently of each other.
Hours to be arranged. Staff.

**628 Aimé Césaire and the Poetics of Negritude**
Fall. 4 credits.
R 2:30–4:25. G. Davis.
Aimé Césaire is a major contemporary poet of the francophone Caribbean. This course will engage in a comprehensive analysis of Césaire's lyric *oeuvre* to date, including his poetic drama. The class will examine the texts in the historical, social, and inter-cultural context of French colonialism. Césaire's complex concept of *negritude* (a word he invented and made famous) will be interpreted both as a liberating response to cultural "assimilation" and in terms of an evolving aesthetic project. Literary, artistic, and social movements that are historically germane to that project, e.g., Surrealism, Magic Realism, Marxism—will provide theoretical frameworks for seminar discussions. In studying individual poems and plays, due attention will be paid to "intertextual" considerations both in relation to poetry in the French tradition (e.g., Mallarmé, Rimbaud, and Lautréamont) and to Caribbean oral traditions (e.g., Martinican creole paradigms).

**633 Hölderlin (also German Studies 633)**
Spring. 4 credits. Conducted primarily in English, most texts in German; good reading knowledge of French is useful, not required.
R 3:55–5:30. G. Waite.
For description, see German Studies 633.

**642 Revolutions in Poetic Language**
Spring. 4 credits. Spanish, French, or German recommended.
W 1:30–3:20. J. Monroe.
What exactly counts as a "revolution" in poetic language? Can revolution be contained "in" poetic language or elsewhere? What correlations is it possible to establish between what one might call a revolution in poetic language and revolutionary transformation in the broader social and historical sense? How should we conceive of poetry's revolutionary potential in relation to both aesthetic and extra-aesthetic modes of discourse? What strategies have poets used to engage the historical moments of their poetic production? Why choose poetry at all as a tool for revolutionary transformation? In considering works by Aimé Césaire (Martinique), Hans Magnus Enzensberger (West Germany), Wole Soyinka (Nigeria), Raul Zurita (Chile), Adrienne Rich, and representative figures from the "Language Poetry" movement that has come to prominence in the United States in the 1980s, we shall explore recent efforts to articulate a poetry that would help to realize the dream of a revolutionary community extending "beyond the work." Critical readings will include such authors as Kristeva, Benveniste, Bakhtin, Easthope, Jameson, and Nancy. All primary and most secondary foreign language materials will be available in English translation as well as in the original.

**652 Renaissance Humanism (also Comparative Literature 452)**
Fall. 4 credits.
M 2:30–4:30. W. J. Kennedy.
For description, see Comparative Literature 452.

**688 Theodor W. Adorno: Mass Culture and the Avant-Garde (also German Studies 688 and Theatre Arts 688)**
Fall. 4 credits.
T 1:25–3:20. P. Hohendahl.
In this country Adorno is primarily known for his philosophical writings and his music criticism. His literary criticism and his contributions to aesthetic theory, on the other hand, remain to be discovered. The seminar will explore Adorno's importance for contemporary criticism; it will focus on Adorno's theory of art as well as his literary and music criticism, especially those parts concerned with the Avant-garde and its role in the age of modern mass culture. The readings will be taken from Adorno's essays as well as *Minima Moralia, Dialectic of Enlightenment, Philosophy of Modern Music, Prisms,* and *Aesthetic Theory.*

**691 Native Revenge (also Spanish 691)**
Fall. 4 credits.
W 2:30–4:25. José Piedra.
For description, see Spanish 691.

**695 Brecht and Artaud (also German Studies 695 and Theatre Arts 695)**
Fall. 4 credits.
W 12:20–2:15. D. Bathrick.
For description, see German Studies 695.

**697 The Hermeneutic Tradition (also German Studies 697)**
Spring. 4 credits.
W 2:30–4:30. W. W. Holdheim.
For description, see Comparative Literature 497.

**699 German Film Theory (also German Studies 699 and Theatre Arts 699)**
Spring. 4 credits.
R 1:25–3:20. D. Bathrick.
For description, see German Studies 695.

**721 Mourning, Melancholy, and Hysteria in Seventeenth-Century Writing (also English 721)**
Fall. 4 credits.
W 1:25–3:20. T. Murray.
For description, see English 721

# COMPUTER SCIENCE

G. Bilardi, K. Birman, T. Coleman, R. L. Constable, B. Donald, D. Gries, J. Hartmanis, J. E. Hopcroft, D. Howe, D. Kozen, D. Huttenlocher, K. Marzullo, P. Panangaden, K. Pingali, G. Salton, F. B. Schneider, A. Segrè, D. Subramanian, R. Teitelbaum, S. Toueg, C. Van Loan, S. Vavasis, V. Vazirani

The Department of Computer Science is in both the College of Arts and Sciences and the College of Engineering. A student in either college can major in computer science. The following describes the College of Arts and Sciences major.

## The Major

The major has three components: a core (a minimum of 42 credits), a group of electives in computer science and related fields (a minimum of 10 credits), and a concentration outside computer science (a minimum of 14 credits). The core focuses on the central topics within computer science: the logical design of programs, data structures, and algorithms. The remaining components of the major—the related electives and the outside concentration—provide a flexible extension to the core program. Students are expected to choose in consultation with their advisers the electives and the outside concentration that best suit their graduate and career plans.

Students interested in pursuing an advanced degree in theoretical computer science should concentrate in mathematics. Students preparing for advanced work in scientific computation should take Computer Science 621 (instead of Computer Science 222) and Computer Science 622 (as a related elective) and concentrate in some branch of applied mathematics. Qualified students are encouraged to concurrently major in mathematics.

### Admission

The prerequisites for admission to the major are:

1) Completion of Computer Science 100–211–(or 212)–280 (or equivalent)
2) Completion of Mathematics 111–122–221 or Mathematics 191–192–293
3) A 2.75 grade-point average in all computer science and mathematics courses
4) Acceptance by the department's admissions committee

After admission, students are expected to maintain at least a 2.75 grade-point average in their major courses. Any grade below C– in a core course or related elective is not acceptable.

### Core

The core consists of the following courses:

1) Calculus and linear algebra: Mathematics 111–122–221–222 or 191–192–293–294
2) Programming and systems: Computer Science 100, 211 (or 212), 314 and 410
3) Theory of computation: Computer Science 280, 381 (or 481), and 482. (One of the following may be substituted for Computer Science 280: Mathematics 332, 432, 434, or 481.)
4) Numerical analysis: Computer Science 222 or 421

### Related Electives

The related electives requirement consists of three courses. One must be a computer science course or course/laboratory combination numbered above 400 that includes a substantial programming project, for example, Computer Science 412, 414/415, 417/418, or 432/433; the other two are to be selected from the following:

Electrical engineering courses numbered 230 or higher

Operations research courses numbered 260 or higher

Mathematics courses numbered 411 or higher

Computer Science courses numbered 400 or above (except Computer Science 415, 418, 433, 600, 601, and seminar courses)

Students are expected to select related electives that complement their concentration.

### Concentration

This component encourages the student to study some discipline outside of computer science in reasonable depth. The concentration consists of an approved sequence of four courses (at least 14 credits) numbered 200 or higher in some field related to the theoretical or practical aspects of computing. A list of approved concentrations is available in the Computer Science Undergraduate Office, 303 Upson Hall. Students may also design their own concentrations, subject to the approval of their adviser.

### Other Requirements

Computer science majors must also satisfy the College of Arts and Sciences and university requirements. In particular, the spirit of the 15-credit electives requirement will be strictly followed. This requirement helps ensure breadth of education, and consequently no computer- or mathematics-related course can be used toward its fulfillment. In general, no courses may be used to fulfill more than one requirement. There are two exceptions: first, appropriate core courses may be used to satisfy the group IV distribution requirement, and second, in the case of a double major, the same course may be applied to both majors.

**Probability and statistics courses.** Computer science majors are encouraged to include at least one course in the field of probability and statistics in their program of study. Although there is no formal department of statistics at Cornell, the Department of Mathematics and the School of Operations Research and Industrial Engineering offer a wide range of probability and statistics courses suitable for computer science majors, including the following introductory two-course sequences:

Math 471, Basic Probability

Math 472, Statistics

OR&IE 260, Introductory Engineering Probability

OR&IE 370, Introduction to Statistical Theory with Engineering Applications

A less rigorous but satisfactory one-semester introduction to probability and statistics is given in either of:

Math 370, Elementary Statistics

OR&IE 270, Basic Engineering Statistics

**Honors.** A student may be granted honors in computer science on the recommendation of the Computer Science Academic Affairs Committee. The committee guidelines will generally be the following:

1) An overall grade-point average of not less than 3.25
2) A grade-point average for all computer science courses of not less than 3.5
3) Satisfactory completion of at least two computer science courses numbered above 600 or satisfactory completion of a significant special investigation (Computer Science 490).

## Courses

For complete course descriptions, see the computer science listing in the College of Engineering section.

**100 Introduction to Computer Programming (also Engineering 100)**
Fall, spring, or summer. 4 credits. Students who plan to take both Computer Science 101 or 102 and 100 must take 101 or 102 first.
2 lecs, 1 rec (optional). 3 evening exams.

**101 The Computer Age**
Fall or summer. 3 credits. Credit is granted for both Computer Science 100 and 101 only if 101 is taken first.
2 lecs, 1 rec. 1 evening exam.

**102 Introduction to Microcomputer Applications (also Agricultural Engineering 102)**
Fall. 3 credits. Each lab section limited to 16 students. May be taken only for out-of-college credit by students in the College of Arts and Sciences. Not open to students in the College of Engineering or to students who have taken any prior computer courses at Cornell. Students in statutory colleges must enroll in Agricultural Engineering 102.
2 lecs, 1 lab. 2 evening exams.

**211 Computers and Programming (also Engineering 211)**
Fall, spring, or summer. 3 credits. Prerequisite: Computer Science 100 or equivalent programming experience. Credit will not be granted for both Computer Science 211 and Computer Science 212.
2 lecs, 1 rec. 2 evening exams.

**212 Modes of Algorithmic Expression**
Fall. 4 credits. Prerequisite: Computer Science 100 or equivalent programming experience. Credit will not be granted for both Computer Science 211 and Computer Science 212.
2 lecs, 2 recs. 2 evening exams.

**222 Introduction to Scientific Computation (also, Engineering 222)**
Spring. 3 credits. Prerequisites: Computer Science 100 and Mathematics 112, 122, or 192.
2 lecs, 1 rec. 2 evening exams.

**280 Discrete Structures**
Fall or spring. 4 credits. Prerequisite: Computer Science 211 or 212 or permission of instructor.
3 lecs.

**[305 Social Issues in Computing**
Fall. 3 credits. Prerequisite: Computer Science 100 or 101 or permission of instructor. Not offered 1989–90.
2 lecs.]

**314 Introduction to Computer Systems and Organization**
Fall, spring, or summer. 4 credits. Prerequisite: Computer Science 211 or 212 or equivalent.
2 lecs, 1 sec. 2 evening exams.

**381 Introduction to Theory of Computing**
Fall. 4 credits. Prerequisite: Computer Science 280 or permission of instructor.
3 lecs.

**400 The Science of Programming**
Spring. 4 credits. Prerequisite: Computer Science 280 or equivalent.
3 lecs.

**410 Data Structures**
Fall or spring or summer. 4 credits. Prerequisite: Computer Science 280 or permission of instructor.
2 lecs. 2 evening exams.

**411 Programming Languages and Logics**
Spring. 4 credits. Enrollment limited. Prerequisites: Computer Science 410 or permission of instructor. Not offered every year.
2 lecs.

**412 Introduction to Compilers and Translators**
Spring. 4 credits. Prerequisites: Computer Science 314, 381, and 481. Not offered every year.
3 lecs.

**414 Systems Programming and Operating Systems**
Fall. 3 credits. Prerequisite: Computer Science 314 or permission of instructor.
2 lecs. 2 evening exams.

**415 Practicum in Operating Systems**
Fall. 2 credits. Prerequisite: Computer Science 410. Corequisite: Computer Science 414.
1 lec.

**417 Computer Graphics (also Architecture 374)**
Spring. 3 credits. Prerequisite: Computer Science 211 or 212.
2 lecs. 1 lab.

**418 Practicum in Computer Graphics (also Architecture 375)**
Spring. 2 credits. Prerequisite: Computer Science 211 or 212. Recommended: Computer Science 314. Corequisite: Computer Science 417.
1 lab.

**421 Numerical Solution of Algebraic Equations**
Fall. 4 credits. Prerequisites: Mathematics 294 or 222, one additional mathematics course numbered 300 or higher, and knowledge of FORTRAN at the Computer Science 222 level.
3 lecs.

**432 Introduction to Database Systems**
Spring. 3 credits. Prerequisites: Computer Science 211 or 212 and Computer Science 410, or permission of instructor. Recommended: Computer Science 314.
2 lecs. 1 rec.

**433 Practicum in Database Systems**
Spring. 2 credits. Corequisite: Computer Science 432.
1 lab.

**472 Introduction to Artificial Intelligence**
Fall. 4 credits. Prerequisite: Computer Science 410. Open to juniors, seniors, and graduate students.
2 lecs, 1 sec.

**481 Introduction to Theory of Computing**
Spring. 4 credits. Prerequisite: Computer Science 280 or permission of instructor. Credit will not be granted for both Computer Science 381 and Computer Science 481.
3 lecs.
A faster-moving and deeper version of Computer Science 381. Corrective transfers between Computer Science 481 and 381 (in either direction) are encouraged during the first few weeks of instruction.

**482 Introduction to Analysis of Algorithms**
Spring. 4 credits. Prerequisites: Computer Science 410 and Computer Science 381 or 481, or permission of instructor.
3 lecs.

**486 Applied Logic (also Mathematics 486)**
Spring. 4 credits. Prerequisites: Mathematics 222 or 294, Computer Science 100, and an additional course in mathematics or theoretical computer science.
2 lecs, 1 lab to be arranged.

**490 Independent Reading and Research**
Fall or spring. 1–4 credits.

**600 Computer Science and Programming**
Fall. 1 credit. Prerequisite: graduate standing in computer science or permission of instructor.
1 lec.

**601 Introduction to Programming Logics**
Spring. 1 credit. Prerequisite: graduate standing in computer science or permission of instructor.
1 lec.

**611 Advanced Programming Languages**
Fall. 4 credits. Prerequisites: Computer Science 410, and 381 or 481, or permission of instructor.
3 lecs.

**612 Compiler Design for High-Performance Architectures**
Spring. 4 credits. Prerequisites: Computer Science 314, 410, and 412, or permission of instructor.
3 lecs.

**613 Concurrent Programming**
Spring. 4 credits. Prerequisites: Computer Science 414 and 600 or permission of instructor.
3 lecs.

**614 Advanced Systems**
Spring. 4 credits. Prerequisite: Computer Science 414 or permission of instructor.
2 lecs.

**[615 Machine Organization**
Spring. 4 credits. Prerequisite: Computer Science 314 or permission of instructor. Not offered every year.]

**616 VLSI Algorithms**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.
2 lecs.

**621 Matrix Computations**
Fall. 4 credits. Prerequisites: Mathematics 411 and 431 or permission of instructor.
3 lecs.

**622 Numerical Optimization and Nonlinear Algebraic Equations**
Spring. 4 credits. Prerequisite: Computer Science 621.
3 lecs.

**632 Database Systems**
Fall. 4 credits. Prerequisites: Computer Science 410 and Computer Science 432 or permission of instructor.
2 lecs.

**635 Automatic Text Processing and Information Retrieval**
Spring. 4 credits. Prerequisite: Computer Science 410 or equivalent or permission of instructor.
2 lecs.

**643 Design and Analysis of Computer Networks**
Fall. 4 credits. Prerequisite: Computer Science 414 or permission of instructor. Not offered every year.
2 lecs.

**655 Mathematical Foundations for Computer Modeling and Simulation (also Mathematics 655)**
Fall. 4 credits. Prerequisites: Mathematics 431 and 432, or the equivalent in both content and level of mathematical sophistication or permission of instructor. Not offered every year.
3 lecs.

**661 Robotics**
Fall. 4 credits. Prerequisites: Computer Science 482 and permission of instructor. Not offered every year.
3 lecs.

**662 Robotics Laboratory**
Fall. 1 credit. Prerequisite: graduate standing or permission of instructor. Not offered every year.
1 lab.

**671 Introduction to Automated Reasoning**
Fall. 4 credits. Prerequisites: Computer Science 611 and 681 and Mathematics 581. Not offered every year.
3 lecs.

**672 Artificial Intelligence Programming**
Spring. 4 credits. Prerequisite: Computer Science 472 or permission of instructor.
3 lecs.

**681 Analysis of Algorithms**
Fall. 4 credits. Prerequisite: Computer Science 381 or 481, or permission of instructor.
3 lecs.

**682 Theory of Computing**
Spring. 4 credits. Prerequisite: Computer Science 381 or 481, or permission of instructor.
3 lecs.

**709 Computer Science Graduate Seminar**
Fall or spring. 1 credit. S-U grades only. For staff, visitors, and graduate students interested in computer science.

**711 Topics in Programming Languages and Systems**
Spring. 4 credits. Prerequisites: Computer Science 381 or 481 and Computer Science 611, or permission of instructor. Not offered every year.
2 lecs.

**712 Topics in Programming Languages and Systems**
Spring. 4 credits. Prerequisite: Computer Science 612. Not offered every year.
2 lecs.

**713 Seminar in Systems and Methodology**
Fall or spring. 4 credits. Prerequisites: Computer Science 414 and an advanced systems course such as CS613, 614, 632, or 643, or permission of instructor. Not offered every year.

**714 Distributed Computing**
Spring. 4 credits. Prerequisites: Computer Science 414 and an advanced systems course (e.g., Computer Science 613, 614, 632, or 643). Not offered every year.
2 lecs.

**715 Seminar in Programming Refinement Logics**
Fall or spring. 4 credits. Prerequisite: permission of instructor.

**719 Seminar in Programming Languages**
Fall or spring. 4 credits. Prerequisite: Computer Science 611 or permission of instructor. S-U grades only.

**721 Topics in Numerical Analysis**
Fall. 4 credits. Prerequisite: Computer Science 621 or 622, or permission of instructor. Not offered every year.
2 lecs.

**722 Topics in Numerical Analysis**
Spring. 4 credits. Prerequisite: Computer Science 621 or 622 or permission of instructor. Not offered every year.
2 lecs.

**729 Seminar in Numerical Analysis**
Fall or spring. 1–4 credits (to be arranged). Prerequisite: permission of instructor. S-U grades only.

**[733 Selected Topics in Information Processing**
Not offered every year.
2 lecs.]

**734 Seminar in File Processing**
Fall. Credit to be arranged. Prerequisite: Computer Science 733 or permission of instructor. Not offered every year.

**739 Seminar in Text Processing and Information Retrieval**
Fall or spring. Credit to be arranged. Prerequisite: Computer Science 635 or permission of instructor. S-U grades only.

**[743 Topics in Fault-Tolerant Distributed Computing**
Prerequisite: Computer Science 614, 643, or 714. Not offered every year.
1 lec.]

**747 Seminar in Program Logic and Semantics**
4 credits. Prerequisite: permission of instructor. S-U grades only. Not offered every year.

**749 Seminar in Systems Modeling and Analysis**
Fall or spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.

**771 Topics in Artificial Intelligence**
4 credits. Prerequisite: permission of instructor. Not offered every year.

**772 Robotics Seminar**
4 credits. Prerequisite: permission of instructor. Not offered every year.

**774 Proseminar in Cognitive Studies II (also Cognitive Studies 774 and Linguistics 774)**
Spring. 4 credits. Prerequisite: permission of instructor.

**779 Seminar in Artificial Intelligence**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor. S-U grades only.

**781 Topics in Analysis of Algorithms and Theory of Computing**
Fall. 4 credits. Prerequisites: Computer Science 681 and 682 or permission of instructor. S-U grades only. Not offered every year.
2 lecs.

**782 Topics in Analysis of Algorithms and Theory of Computing**
Spring. 4 credits. Prerequisites: Computer Science 681 and 682 or permission of instructor. S-U grades only. Not offered every year.
2 lecs.

**789 Seminar in Theory of Algorithms and Computing**
Fall or spring. 2–4 credits. Prerequisite: permission of instructor. S-U grades only.

**790 Special Investigations in Computer Science**
Fall or spring. Prerequisite: permission of a computer science adviser. Letter grades only.

**890 Special Investigations in Computer Science**
Fall or spring. Prerequisite: permission of a computer science adviser. S-U grades only.

**990 Special Investigations in Computer Science**
Fall or spring. Prerequisite: permission of a computer science adviser. S-U grades only.

# DUTCH

See Modern Languages and Linguistics.

# ECONOMICS

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The study of economics provides an understanding of the way economies operate and an insight into public issues. The department offers a broad range of undergraduate courses in such fields as money and banking international and comparative economics; econometrics; theory; history; growth and development; and the organization, performance, and control of industry.

## Social Science Distribution Requirement

The microeconomics distribution requirement can be fulfilled with any of the following:

Economics 101, Economics 201, or Economics 203.

The macroeconomics distribution requirement can be satisfied with any of the following:

Economics 102, Economics 202, or Economics 204.

## The Major

Students who wish to major in economics must have completed Economics 101 or Economics 203 *and* Economics 102 or Economics 204 or equivalent courses, *and* Mathematics 111, or its equivalent. A grade below a C will not be accepted for any of the above. Economics 203 satisfies both the introductory micro (Economics 101) and the intermediate micro (Economics 313) requirement. Similarly Economics 204 satisfies both the introductory macro (Economics 102) and intermediate macro (Economics 314) requirement.

Prospective majors should apply at the department office.

The requirements for the major beyond the introductory courses and Math 111 are: (1) Economics 313 or Economics 203, (2) Economics 314 or Economics 204, (3) Economics 319 or Economics 321, and (4) 20 credits of other economics courses listed by the Department of Economics, except that Economics 399 will not count toward the 20-credit requirement. With the permission of the major adviser, one or (in exceptional cases) two economics courses offered outside the College of Arts and Sciences may be applied to fulfill this requirement. Only courses in which a student receives a grade of C– or better will be counted towards satisfying the major requirements.

An honors program is currently being offered. Students should consult the director of undergraduate studies before May of their junior year for more information.

Students planning graduate work in economics or business are strongly encouraged to prepare themselves well in mathematics and econometrics. These students are strongly encouraged to enroll in Economics 319–320 rather than Economics 321.

## Courses

**101 Introductory Microeconomics**
Fall, spring, or summer. 3 credits. Economics 101 is not a prerequisite for 102.
Lecs and disc.
Explanation and evaluation of how the price system operates in determining what goods are produced, how goods are produced, and who receives income, and how the price system is modified and influenced by private organizations and government policy.

**102 Introductory Macroeconomics**
Fall, spring, or summer. 3 credits. Economics 101 is not a prerequisite for 102.
Lecs and disc.
Analysis of aggregate economic activity in relation to the level, stability, and growth of national income. Topics discussed may include the determination and effects of unemployment, inflation, balance of payments, deficits, and economic development, and how these may be influenced by monetary, fiscal, and other policies.

**105 Principles of Accounting**
Summer only. 3 credits.
The principles of accounting essential to an understanding of cost control. Cost accounting: analysis and interpretation of financial statements.

**201 Introduction to the American Economy**
Fall. 3 credits. Prerequisites: not open to freshmen or to students who have taken any prior economics courses at Cornell.
This course is intended for students who do not plan to take advanced courses in economics. The sequence Economics 201–202 covers the same topics as are taught in Economics 101–102. The course is designed to teach the basic knowledge of economics needed to understand how economic systems function, but it will emphasize analysis of current issues. The meetings of the class are arranged by topic and will be taught by senior faculty members who specialize in the particular topics.

**202 Introduction to the World Economy**
Spring. 3 credits. Prerequisites: not open to freshmen or to students who have taken any prior economics courses at Cornell.
This course is intended for students who do not plan to take advanced courses in economics. A continuation of Economics 201 with a focus on international issues.

**203 Microeconomics**
Fall or spring. 4 credits. Prerequisite: calculus.
Intended for students with strong analytical skills who have not taken Economics 101, 102, 201, or 202. Can be used to replace both Economics 101 and 313. This course covers the topics taught in Economics 101 and 313. An introduction to the theory of consumer and producer behavior and to the functioning of the price system.

**204 Macroeconomics**
Fall or spring. 4 credits. Prerequisite: calculus.
Intended for students with strong analytical skills who have not taken Economics 101, 102, 201, or 202. Can be used to replace both Economics 102 and 314. This course covers the topics taught in Economics 102 and 314. An introduction to the theory of national income determination, unemployment, growth, and inflation.

**205 Managerial Accounting for Planning and Control**
Summer only. 3 credits. Prerequisite: a course in accounting or equivalent experience or permission of instructor.
An extension of Economics 105. Considers the accounting process primarily from a managerial rather than a financial point of view. The basics of accounting systems and financial statements are reviewed and extended to provide a basis for comparing financial and managerial perspectives. Manufacturing cost systems, operational budgeting, standard costing, and short-term managerial decision making.

**301 Economics of Market Failure**
Fall. 4 credits. Prerequisites: Economics 101–102.
The course will review briefly the welfare properties of the perfectly competitive market model and will then consider a range of situations in which these properties are modified and where there may be a case for some form of government intervention. The cases to be considered will include (a) the presence of externalities, pollution, and the economics of the environment; (b) the provision of public goods, the free-rider problem; (c) uncertainty and imperfect information, an analysis in the context of labor and insurance markets, and the market for medical care; (d) the regulation of natural monopoly and public utility pricing; (e) the failure of the market to achieve desired redistributional objectives; (f) direct and indirect taxation as instruments of redistribution.

**302 The Impact and Control of Technological Change (also Government 302 and City and Regional Planning 440)**
Spring. 4 credits.
Examines social, environmental, and economic implications of technological change in the United States in the context of possible policies and strategies of control. Several specific cases will be considered in detail, followed by a broader investigation of the problems of a modern technological society. Alternative political-economic solutions will be explored.

**303 Positive and Normative Theories of Income Distribution**
Spring. 4 credits. Enrollment limited. Prerequisite: permission of instructor. Cannot be applied to the major.
After examining the distinction between the terms *positive* and *normative* as used in economics, this course will explore three main questions: (1) Why is income distributed the way it is? (2) How should income be distributed? (3) What is the relationship between 1 and 2? Particular emphasis will be given to those theories of income distribution, both positive and normative, that tend to dominate discussion of these topics in America.

**304 Economics and the Law**
Fall. 4 credits. Prerequisite: Economics 101 is required; Economics 311 or 313 or their equivalent is recommended.
An examination, through the lens of economic analysis, of legal principles drawn from a variety of legal fields, including contracts, property, torts, and procedure. No legal training is required.

**306 Economics of Defense Spending**
Spring. 4 credits. Prerequisites: Economics 101–102.
The economic aspects of defense spending are analyzed. Emphasis is on the procurement of weapons systems. Topics covered include an overview of the defense budget, special characteristics of the defense market, the structure of the defense industry, and the economic behavior of defense firms.

**307 Introduction to Peace Science**
Fall. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
Introduction to theories and research on conflict resolution. Topics include conflict, its role and impact on society; theories of aggression and altruism; causes of war; game theory; conflict management procedure and other analytical tools and methods of peace science; alternatives to war.

**308 Economic Analysis of Government (also Civil and Environmental Engineering 322)**
Spring. 4 credits. Prerequisites: calculus plus Economics 313 or equivalent or Civil and Environmental Engineering 321.
Analysis of economic bases for government intervention in a market economy. Topics include public goods, cost-benefit analysis, public finance, environment regulation and risk management, and macroeconomic topics.

**309 Capitalism and Socialism (also Industrial and Labor Relations 347)**
Fall. 4 credits. Prerequisite: permission of instructor.

**311 Intermediate Microeconomic Theory**
Fall, spring, or summer. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
The pricing processes in a private enterprise economy are analyzed under varying competitive conditions, and their role in the allocation of resources and the functional distribution of national income is considered.

**312 Intermediate Macroeconomic Theory**
Fall, spring, or summer. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
The theory of national income determination and economic growth in alternative models of the national economy is introduced. The interaction and relation of aspects of these models of empirical aggregate economic analysis is examined.

**313 Intermediate Microeconomic Theory**
Fall, spring, or summer. 4 credits. Prerequisites: Economics 101–102 and calculus.
For description see Economics 311.

**314 Intermediate Macroeconomic Theory**
Fall, spring, or summer. 4 credits. Prerequisites: Economics 101–102 and calculus.
For description see Economics 312.

**315 History of Economic Analysis**
Fall. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
Early writings in economics and their relationship to current economic analysis and policy issues, for example, ancient and medieval philosophers on justice in exchange; mercantilist arguments for trade protection; early theories about the effect of monetary expansion (D. Hume); the role of the entrepreneur (Cantillon); and general competitive equilibrium (the Physiocrats). The most recent reading assignment in this course is Adam Smith's *Wealth of Nations* but the emphasis is on the relationship between the precursors of Adam Smith and his *Wealth of Nations* to modern economics analysis and current efforts to answer some of the questions raised in the early writing on economics.

**317 Intermediate Mathematical Economics I**
Fall. 4 credits.
Introduction of calculus and matrix algebra; problems of maximization of a function of several variables. Economic examples are used to illustrate and teach the mathematical concepts.

**318 Intermediate Mathematical Economics II**
Spring. 4 credits.
Advanced techniques of optimization and application to economic theory.

**319 Introduction to Statistics and Probability**
Fall, spring, or summer. 4 credits. Prerequisites: Economics 101–102 and calculus (Mathematics 111 or equivalent).
This course provides an introduction to statistical inference and to principles of probability. It includes descriptive statistics, principles of probability, discrete and continuous distributions, and hypothesis testing (of sample means, proportions, variance). Regression analysis and correlation are introduced.

**320 Introduction to Econometrics**
Fall, spring, or summer. 4 credits. Prerequisites: Economics 101–102, 319, or equivalent.
Introduction to the theory and application of econometric techniques. How econometric models are formulated, estimated, used to test hypotheses, and used to forecast; understanding economists' results in studies using regression model, multiple regression model, and introduction to simultaneous equation models.

**321 Applied Econometrics**
Fall. 4 credits. Prerequisites: Economics 101–102 and calculus.
This course provides an introduction to statistical methods and principles of probability. Topics to be covered include analysis of data, probability concepts and distributions, estimation and hypothesis testing, regression, correlation and time series analysis. Applications from economics are used to illustrate the methods covered in the course.

**323 American Economic History**
Fall. 4 credits.
Problems in American economic history from the first settlements to early industrialization are surveyed.

**324 American Economic History**
Spring. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
A survey of problems in American economic history from the Civil War to World War I.

**325 Economic History of Latin America**
4 credits. Open to upperclass students with some background in economics or history, or with permission of instructor.

**326 History of American Enterprise**
4 credits. Prerequisites: Economics 101–102 or equivalents.
History of the changing structure of American business from 1800 to the present, with major emphasis upon developments after the Civil War. The focus of the course will be the changing structure of challenges (for example, the rise of unions, development of a national capital market, changing role of government) and the various responses of business organizations and entrepreneurs to those challenges.

**329 Eastern Europe Today: Economics, Government, Culture (also Government 326 and Russian 329)**
Spring. 4 credits.
Economics majors cannot use this course to fulfill major requirements. Introductory interdisciplinary survey of Poland, Hungary, Czechoslovakia, and Yugoslavia since World War II, with emphasis on contemporary development. The goals of the course are to examine differences (the variety of backgrounds) among East European countries, the common elements (for example, political relations with the USSR), domestic situations, the economy, and culture.

**330 The Soviet Union: Politics, Economics, and Culture (also Government 330 and Russian 330)**
4 credits.
Economics majors cannot use this course to fulfill major requirements. Interdisciplinary survey of the USSR since the Revolution, with emphasis on contemporary developments.

**331 Money and Credit**
Spring or summer. 4 credits. Prerequisites: Economics 101–102.
A systematic treatment of the determinants of the money supply and the volume of credit. Economic analysis of credit markets and financial institutions in the United States.

**333 Theory and Practice of Asset Markets**
Fall or summer. 4 credits. Prerequisites: Economics 311 or 313, and 312 or 314, or their equivalents.
The theory and decision making in the presence of uncertainty and the practical aspects of particular asset markets are examined.

**335 Public Finance: The Microeconomics of Government**
Fall. 4 credits. Prerequisites: Economics 101–102 and 313, or their equivalent, and one semester of calculus, or permission of instructor.
The role of government in a free market economy is analyzed. Topics covered include public goods, market failures, allocation mechanisms, optimal taxation, effects of taxation, and benefit-cost analysis. Current topics of an applied nature will vary from term to term.

**336 Public Finance: Resource Allocation and Fiscal Policy**
Spring. 4 credits. Prerequisites: Economics 101–102, 313 or their equivalent and one semester of calculus, or permission of instructor.
A continuation of Economics 335 covering macroeconomics and special topics. Subjects covered include the federal debt, the budget, and government regulation and transfers, as well as problems like local public goods, the hierarchy of governmental structure, plus a variety of applied problems.

**338 Macroeconomic Policy**
Fall. 4 credits. Prerequisite: Economics 312 or 314 or equivalent.
The use of fiscal and monetary policies for achieving full employment, price-level stability, and appropriate economic growth are studied.

**341 Labor Economics**
Fall. 4 credits. Prerequisites: Economics 101–102.

**342 Economic Analysis of the University**
Spring. 4 credits. Prerequisite: ILR 240 or Economics 311 or 313 or their equivalent.
This course seeks to illustrate the complexity of decision making in a nonprofit organization and to show how microeconomic analysis in general, and labor market analysis in particular, can be usefully applied to analyze resource allocation decisions at universities. Among the topics covered are financial aid, tuition, and admissions policies, endowment policies, faculty salary determination, the tenure system, mandatory retirement policies, merit pay, affirmative action, comparable worth, collective bargaining, resource allocation across and within departments, undergraduate versus graduate education, research costs, libraries, athletics, and "socially responsible" policies.

**347 Economics of Evaluation**
4 credits.
An introduction to the methodologies used by economists to evaluate the impacts of social-action programs and legislation. General evaluation methodology, cost-benefit analysis, and econometrics are discussed. Case studies are considered to illustrate the uses of these techniques, to acquaint the student with major current government programs and legislation, and to estimate these programs' economic impacts. Throughout, the primary analytic framework used by the instructor is microeconomics.

**351 Industrial Organization**
Fall. 4 credits. Prerequisite: Economics 101 is required; 311 or 313 or their equivalent is recommended.
A study of markets that differ from the ideal of perfect competition (e.g., monopoly and oligopoly) and the efforts of our legal system through the antitrust laws to deal with the kinds of problems that arise in such markets. Specific topics covered include mergers, price fixing, price discrimination, predatory pricing, and vertical restraints such as resale price maintenance.

**352 Advanced Topics in Industrial Organization**
Spring. 4 credits. Prerequisites: Economics 101 and 351 and some knowledge of calculus. Recommended strongly: Economics 311, or equivalent.
This course is an extension of 351 and will emphasize (a) more-advanced topics in the theory of industrial organization with special attention to recent developments in the literature; and (b) empirical analysis of numerous issues relating to the structure of markets and their performance.

**354 Economics of Regulation**
Spring. 4 credits. Prerequisite: Economics 313 or equivalent or Civil and Environmental Engineering 321.
Explores technological bases for government intervention in the private market economy, which include decreasing cost industries (natural monopolies) and technical externalities (pollution and risk). The economic implications of regulating electric, gas, and communications and transportation utilities, including pricing, service quality, efficiency incentives, and long-range planning issues, are examined in detail. Topics on environmental protection and societal risk management are also explored.

**355 Departures from Rational Choice**
Fall. 4 credits. Prerequisites: Economics 311 or 313 and 312 or 314, or their equivalents.
This course examines behaviors that appear inconsistent with the traditional theory of rational choice. These behaviors fall under two broad categories: (1) irrational behavior with regret, and (2) irrational behavior without regret. The first category includes, but is not limited to, behaviors that result from cognitive errors. Once people are made aware of these errors, they typically express a desire to modify their behavior in the directions called for by rational choice theory. The second category represents a deeper challenge to the traditional model. It consists of behaviors that people generally express no desire to modify despite their inconsistency with rational choice theory.

**357 Economics of Imperfect Information**
Spring. 4 credits. Prerequisites: Economics 101–102 and calculus.
This course covers a variety of topics in the economics of uncertainty, including basic decision theory, search theory, risk insurance, and equilibrium price dispersion.

**358 Current Economic Issues**
Fall. 3 or 4 credits. (A research paper will be required if the 4-credit option is chosen.) Prerequisites: Economics 101–102.
The emphasis will be on the application of simple microeconomics and industrial organization concepts to the formulation of public policy in the present and recent past. Among the topics likely to be covered will be policies relating to energy, communications, and transportation; the financing and delivery of medical care, public utility, and other kinds of regulation; and the economics of inflation.

**361 International Trade Theory and Policy**
Fall. Prerequisites: Economics 101–102 and calculus, or permission of instructor.
This course surveys the sources of comparative advantage. It studies commerical policy and analyzes the welfare economics of trade between countries. Some attention is paid to the institutional aspects of the world trading system.

**362 International Monetary Theory and Policy**
Spring. Prerequisites: Economics 101–102 and calculus, or permission of instructor.
This course surveys the determination of exchange rates and theories of balance of payments adjustments. It also explores open economy macroeconomics, and it analyzes some of the institutional details of foreign exchange markets, balance of payments accounting, and the international monetary system.

**365 Japanese Economy**
Summer only. 4 credits. Prerequisites: Economics 101–102 or a course in Far Eastern history or Far Eastern politics.
The history and the present structure of the Japanese economy, concentrating on its two periods of "miraculous" growth and development and on contemporary Japanese-American economic relations.

**366 The Economy of the Soviet Union**
Fall. 4 credits. Prerequisites: Economics 101–102.
A survey of the Soviet economic system and Soviet economic development since 1917. Both institutional and theoretical aspects will be considered. Emphasis will be on current developments, including East-West economic and military competition, economic relations with the Eastern Bloc and with Western Europe, and foreign trade.

**367 Comparative Economic Systems: Soviet Union and Europe**
Fall. 4 credits. Prerequisites: Economics 313–314, or equivalents, or permission of instructor.
Discussion of approaches to comparison of economic systems. Consideration of abstract models (market economy, central planning, decentralized socialist market) as well as national economies (France and Sweden, Yugoslavia, and Soviet Union). Possibility of convergence of economic systems is explored.

**368 Comparative Economics: United States, Europe, and the Soviet Union**
Spring or summer. 4 credits. Prerequisites: Economics 101–102.
Intended for students who are not majoring in economics. European and Soviet economies after the Second World War are surveyed. The European countries studied include France and Sweden in the West, and Yugoslavia plus another country in the East. A descriptive and institutional approach is used.

**369 The Economy of China**
Spring. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
Examines the development of the Chinese economy and the evolution of China's economic system since 1949.

**370 Issues in Poverty and Development**
Spring. 4 credits.
The course will introduce current issues and controversies in the field of development economics. Questions to be discussed will include: What are the obstacles to development according to the different schools of thought? Which countries have made significant progress in the last three decades and why? What are the policies that have been pursued, and how successful have they been? The required readings will be supplemented with outside speakers and film presentations.

**371 Economic Development**
Fall. 4 credits. Prerequisites: Economics 311 or equivalent and 320.
Study of the problem of sustaining accelerated economic growth in less-developed countries. Trade-offs between growth, welfare, and equity; the legacy of colonialism; relevance of history and economic theory; problems of capital formation, economic planning and international specialization; and the interaction of industrialization, agricultural development, and population change are emphasized.

**372 Applied Economic Development**
Spring. 4 credits. Prerequisite: Economics 311, 313, or equivalent.

**373 International Specialization and Economic Development**
Spring. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
The assessment of the gains and risks and the appropriate role for specialization and trade in economic development; management of the external disequilibrium attending serious efforts to accelerate economic development; and the processes, institution, and opportunities for innovation in transferring income from the relatively developed countries to those less developed.

**374 National and International Food Economics (also Nutritional Sciences 457)**
Spring. 3 credits. Prerequisites: a college course in economics and junior standing or permission of instructor.
Examination of individual components essential for an understanding of the U.S. and world food economies. Analysis of the world food economy. Review and analysis of (a) the major economic factors determining the demand for food, the composition of food consumption, and nutritional intake; and (b) the major economic factors affecting food production and supply. Examination and evaluation of the effectiveness of various food policies and programs in altering food consumption patterns. Principles of nutritional planning in developing countries within the context of the process of economic and social development.

**378 Economics, Population, and Development**
Fall. 4 credits.
The economic aspects of population and the interaction between population change and economic change are introduced. Particular attention is paid to economic views of fertility, mortality, and migration, and to the impact of population growth on economic growth, development, modernization, resources, and the environment.

**381 Economics of Participation and Workers' Management**
Fall. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
The theory of labor-management economies is developed systematically, and literature on that and related subjects surveyed. Theories of the participatory firm, industry, and general equilibrium are covered together with a microeconomic theory and analysis of special dimensions of the system. Efficient decision-making processes within the firm are also studied. Illustrative references to Yugoslavia and other real instances of labor participation are made throughout.

**382 The Practice and Implementation of Self-Management**
Spring. 4 credits.
A broad introduction to the subject of workers' self-management intended for both economists and non-economists. It contains no technical tools nor does it require prior professional knowledge: thus there are no prerequisites. The course objective is to answer 5 broad questions: (1) What is self-management? (2) Where and in what form does it occur? (3) What is its history? (4) How does it work? and (5) How is a cooperative enterprise/economy started/operated?

**383 Marxist Political Economy**
Summer only. 4 credits. Prerequisites: Economics 101–102 or permission of instructor.
An intensive introduction to Marxist political economy. Close reading of selected original writings of Marx and Engels. An investigation and analysis of the historical development and current theory and method of Marxist political economy. Applications of that analysis, and current debates over issues such as crisis theory and Marxist-feminist analysis.

**399 Readings in Economics**
Fall or spring. Variable credit.
Independent study.

**416 Intertemporal Economics**
Fall. 4 credits. Prerequisites: Economics 311, 313, or equivalent and calculus.
This course is intended for advanced economics majors who are especially interested in economic theory. Topics to be covered: (a) review of the one good Ramsey model of optimal savings and accumulation; conditions for intertemporal efficiency in production; comparative dynamics and sensitivity analysis; (b) some earlier models of capital accumulation; the roles of present value and internal rate of return in guiding investment decisions; (c) growth, exhaustible resources; pollution and conservation: discussion of the trade-offs facing a society.

**419 Economic Decisions under Uncertainty**
Fall. 4 credits. Prerequisites: Economics 319 and calculus.
This course provides an introduction to the theory of decision making under uncertainty with emphasis on economic applications of the theory.

**445 Topics in Microeconomic Analysis—Markets and Planning**
Fall. 4 credits. Prerequisites: Economics 311, 313, or equivalent and one term of calculus.
This is a course of economic theory designed for upperclass undergraduates. Course contents may vary from year to year. Issues that may be examined include (1) How can economic activities be efficiently organized through the market mechanism? Why is the presence of many traders essential to efficiency? (2) What can be done if the indivisibility in production processes becomes an important hindrance to competitive pricing? (3) How can economic planning be decentralized efficiently? This course serves two purposes: (1) to introduce concepts that are novel to undergraduates and relevant to public policy but require only a modicum of analytic tooling up, and (2) to illustrate the deductive approach of modern economic analysis—how to define concepts unambiguously, how to form propositions in clear-cut fashion, and how to follow up logical implications sequentially to the conclusion.

**446 Topics in Macroeconomic Analysis—Is Keynesianism Dead?**
Spring. 4 credits. Prerequisites: Economics 312, 314, or equivalent and one term of calculus.
The coverage of this course may vary from term to term. Presently the content of the course deals with the range of criticisms against Keynesian theory by the New Classical Economics, alias the Equilibrium School, alias the Rational Expectations School. Despite the fact that almost all intermediate macroeconomic textbooks are Keynesian in perspective, clearly Keynesian economics is currently at bay. We shall review critically, critiques to Keynesian theory.

**448 Deficits, Debt and the Monetary System**
Fall. 4 credits. Prerequisites: Economics 313 and 314 or their equivalent.
History has witnessed many instances of fast growth of public debt—mostly the result of wars and depressions in the past, but also of peace-time deficits in recent times. Economic analysis has devoted a growing body of theoretical literature to examining the effects and the eventual outcomes of processes of debt accumulation: the variety of the results matches that of historical experiences.

The purpose of the course is to survey the relevant strands of theory, old and new, trying however to keep in touch with reality and history. The sustainability of debt growth is an elusive notion that will be critically examined with reference to alternative models and "regimes." Debt growth establishes an important intertemporal link between deficits and inflation that will be considered by studying the notion and the role of seigniorage. The policy problems posed by debt growth will be examined from three perspectives: means and ends of debt management; stabilization plans; the coexistence of high and low debt countries under an exchange rate agreement such as the European Monetary System.

**473 Economics of Export-led Development**
Spring. 4 credits. Prerequisites: Economics 313, 314, or their equivalent.
This course will examine the phenomenon of export-led development from both the theoretical and empirical points of view. Concentration will be on experiences within the West Pacific Rim.

**481 Economic Effects of Participation and Labor-Managed Systems**
Spring. 4 credits. Prerequisites: Economics 381 and 382.
This course applies microeconomic theory to analyzing the performance of firms in which employees either participate in the decision-making process or make all the important decisions. If a specialist in the area is lacking, Prof. Vanek may give the course as a seminar where primarily grad students will discuss topics in the literature selected through consensus of the participants.

**482 Practical Aspects of Business Management of Worker Enterprises**
Spring. 4 credits. Prerequisite: should be taken concurrently with or following Economics 382/582, or by permission of instructor.
This course is designed to further and deepen undergraduate and graduate students' knowledge of workers' self-management democratic enterprises. It will be based primarily on dialogue and participants' own presentations of their research in relevant areas such as cooperative business law, finance, accounting, or internal work organization. The instructor will act primarily as a coordinator and resource person. Whenever possible an attempt is made to form and incorporate a self-managing cooperative enterprise. Students who have taken all three courses, Economics 381/681, 382/682, and 482, both graduate and undergraduate, are welcome to participate as teacher-student interns. They may receive additional independent study credit for this work.

**483 The Technological and Product Base of Worker Enterprises, with Special Emphasis on Ecology and Solar Energy Applications**
Spring. 4 credits. Prerequisite: may be taken concurrently with or following Economics 382/582, or with permission of instructor.
This course is designed to deepen undergraduate and graduate students' knowledge of workers' self-management and cooperation, through learning about and construction of simple energy-related technologies, to be produced in workers' enterprises. Size of the class is limited by technical, space, and instruction resources. Some of the technologies may serve as a basis for projects to be undertaken in Economics 482.

**499 Honors Program**
Fall and spring. 8 credits.
Consult the Director of Undergraduate Studies for details. Interested students should apply to the program in the spring semester of their junior year.

## Graduate Courses and Seminars

**503 Nonparametric Methods for Peace Scientists and Regional Scientists**
Fall. 4 credits.
Topics to be covered include advantages and disadvantages of parametric and nonparametric methods; problems involved in measurement; nonparametric methods based on one sample and many samples; nonparametric methods requiring only nominal measurement, and those requiring only ordinal measurement; nonparametric measures of association; procedures for nonnormal distributions.

**504 Economics and the Law**
Fall. 4 credits.
For description see Economics 304.

**505 Interdependent Decision Making**
Fall. 4 credits.
The basic elements in interdependent decision-making situations are examined. Situations where decision makers have different sets of objectives that they wish to achieve and employ different criteria for evaluating performance are focused on. The use of maximizing incremental procedures, game theory, and diverse methods of establishing priorities and cooperative action as well as recursive, interactive approaches to resolve conflict are considered. Coalition theory and related topics are covered.

**509 Microeconomic Theory I**
Fall. 4 credits.
Topics in consumer and producer theory.

**510 Microeconomic Theory II**
Spring. 4 credits.
Topics in consumer and producer theory, equilibrium models and their application, externalities and public goods, intertemporal choice, simple dynamic models and resource depletion, choice under uncertainty.

**513 Macroeconomic Theory: Static Income Determination**
Fall. 4 credits.

**514 Macroeconomic Theory: Dynamic Models, Growth, and Inflation**
Spring. 4 credits.

**516 Applied Price Theory**
Fall. 4 credits.
The course emphasizes the applications of the principles of price theory to a variety of problems taken from concrete, practical settings.

**517 Intermediate Mathematical Economics I**
Fall. 4 credits.

**518 Intermediate Mathematical Economics II**
Spring. 4 credits.

**519 Econometrics I**
Fall. 4 credits. Prerequisites: Economics 319–320 or permission of instructor.
This course gives the probabilistic and statistical background for meaningful application of econometric techniques. Topics to be covered are (1) probability theory: probability spaces, random variables, distributions, moments, transformations, conditional distributions, distribution theory and the multivariate normal distribution, convergence concepts, laws of large numbers, central limit theorems, Monte Carlo simulation; (2) statistics: sample statistics, sufficiency, exponential families of distributions. Further topics in statistics will be considered in Economics 520.

**520 Econometrics II**
Spring. 4 credits. Prerequisite: Economics 519.
This course is a continuation of Economics 519 (Econometrics I) covering (1) statistics: estimation theory, least squares methods, method of maximum likelihood, generalized method of moments, theory of hypothesis testing, asymptotic test theory, and nonnested hypothesis testing and (2) econometrics: the general linear model, generalized least squares, specification tests, instrumental variables, dynamic regression models, linear simultaneous equation models, nonlinear models, and applications.

**523 American Economic History**
Fall. 4 credits.
For description see Economics 323.

**524 American Economic History**
Spring. 4 credits.
For description see Economics 324.

**525 Economic History of Latin America**
Fall. 4 credits.
For description see Economics 325.

**535 Public Finance: Resource Allocation and Fiscal Policy**
Fall. 4 credits.
For description see Economics 335.

**536 Public Finance: Resource Allocation and Fiscal Policy**
Spring. 4 credits.
For description see Economics 336.

**548 Deficits, Debt and the Monetary System**
Fall. 4 credits.
For description see Economics 448.

**551 Industrial Organization**
Fall. 4 credits.
For description see Economics 351.

**552 Public Regulation of Business**
Spring. 4 credits.
For description see Economics 352.

**554 Economics of Regulation**
4 credits.
For description see Economics 354.

**555 Politics and Markets**
Fall. 4 credits.
For description see Economics 355.

**557 Economics of Imperfect Information**
Fall. 4 credits. Prerequisites: Economics 509 and statistics.
The purpose of the course is to consider some major topics in the economics of uncertain information. Although the precise topics considered will vary from year to year, subjects such as markets with asymmetric information, signalling theory, sequential choice theory, and search theory will be discussed.

**561 International Trade Theory and Policy**
Fall. 4 credits.
For description see Economics 361.

**562 International Monetary Theory and Policy**
Spring. 4 credits.
For description see Economics 362.

**565 Economic Problems of Latin America**
Spring. 4 credits.

**567 Comparative Economic Systems: Soviet Union and Europe**
Fall. 4 credits.
For description see Economics 367.

**569 The Economy of China**
Spring. 4 credits.
For description see Economics 369.

**571 Economic Development**
Spring. 4 credits.
For description see Economics 371.

**572 Applied Economic Development**
Spring. 4 credits.
For description see Economics 372.

**573 International Specialization and Economic Development**
Spring. 4 credits.
For description see Economics 373.

**578 Economics, Population, and Development**
Fall. 4 credits.
For description see Economics 378.

**581 Economics of Participation and Worker Management**
Fall. 4 credits.
For description see Economics 381.

**582 The Practice and Implementation of Self-Management**
Fall. 4 credits.
For description see Economics 382

**599 Readings in Economics**
Fall or spring. Variable credit.
Independent study.

**603 Seminar in Peace Science**
Fall. 4 credits.
Among topics to be covered at an advanced level are game theory, coalition theory, bargaining and negotiation processes, cooperative procedures, microbehavior models, macrosocial processes, and general systems analysis.

**605 Advanced Social Theory for Peace Scientists**
Spring. 4 credits. Prerequisites: Economics 505 and knowledge of microeconomic theory.
Study of diverse social science hypotheses and theories as they relate to, and can be synthesized within, multiregional, multinational, and generally multigroup conflict and cooperative frameworks. Particular attention will be given to developments stemming from microeconomics and general systems theory. Dynamic analyses will be emphasized.

**610 Stochastic Economics: Concepts and Techniques**
Spring. 4 credits. Prerequisites: Economics 509, 510, 513, 514, 519, and 520.
This course will review a number of techniques that have been useful in developing stochastic models of economic behavior. Among these are (a) discrete-time Markov processes, (b) dynamic programming under uncertainty, and (c) continuous-time diffusion processes. Examples of economic models will be drawn from recent literature on optimal capital accumulation and optimal savings and portfolio selection problems; permanent income hypothesis; dynamic models of price adjustment, etc. Advanced graduate students contemplating work in economic theory and econometric theory will be able to get some exposure to current research.

**611 Advanced Microeconomic Theory**
Fall. 4 credits.

**612 Advanced Macroeconomic Theory**
Fall. 4 credits.

**617 Mathematical Economics**
Fall. 4 credits.

**618 Mathematical Economics**
Spring. 4 credits.

**619 Advanced Topics in Econometrics I**
Fall. 4 credits. Prerequisites: Economics 519–520 or permission of instructor.
Advanced topics in econometrics, such as asymptotic estimation and test theory, robust estimation, Bayesian inference, advanced topics in time-series analysis, errors in variable and latent variable models, qualitative and limited dependent variables, aggregation, panel data, and duration models.

**620 Advanced Topics in Econometrics II**
Spring. 4 credits. Prerequisites: Economics 519–520 or permission of instructor.
For description see Economics 619.

**623 American Economic History**
Fall. 4 credits.

**624 American Economic History**
Spring. 4 credits.

**626 Methods in Economic History**
Spring. 4 credits.

**631 Monetary Theory and Policy**
Fall. 4 credits.

**632 Monetary Theory and Policy**
Spring. 4 credits.

**635 Public Finance: Resource Allocation and Fiscal Policy**
Fall. 4 credits.

**636 Public Finance: Resource Allocation and Fiscal Policy**
Spring. 4 credits.

**637 Location Theory and Regional Analysis**
Fall. 4 credits. Prerequisites: Economics 509 and 517 and Econometrics.
Economic principles influencing the location of economic activity, its spatial equilibrium structure, and dynamic forces. Topics include spatial pricing policies, price competition, and relocation by firms; residential location patterns; patterns of regional growth and decline; and patterns of urbanization.

**638 Public Finance: Local Government and Urban Structure**
Fall. 4 credits.
An integration of urban economics and location theory with local public goods and state and local public finance topics. Both equilibrium models and dynamic analyses are explored.

**641 Seminar in Labor Economics**
Fall. 4 credits.

**642 Seminar in Labor Economics**
Spring. 4 credits.

**644 The Labor Market and Public Policy: A Comparative View**
Spring. 4 credits.

**647 Economics of Evaluation (also Industrial and Labor Relations 647)**
Spring. 4 credits.
For description see Industrial and Labor Relations 647.

**648 Issues in Latin America**
Spring. 4 credits.

**651 Industrial Organization and Regulation**
Fall. 4 credits.

**652 Industrial Organization and Regulation**
Spring. 4 credits.

**653 Public Policy Issues for Industrial Organizations**
Spring. 4 credits. Prerequisites: Economics 509, 510, and 651.
The course takes an in-depth view of the interaction between the government and business. Methods of business control, including antitrust, price regulation, entry regulation, and safety regulation. Emphasis will be not only on the economic effects on business, but on the economics of selecting and evolving the method of control.

**661 International Economics: Pure Theory and Policy**
Fall. 4 credits.

**662 Seminar in International Economics**
Spring. 4 credits. Prerequisites: Economics 661, acquaintance with conventional trade analysis, or permission of instructor.
The course will cover advanced topics in international economics normally covered in International Economics 661.

**664 International Economics: Balance of Payments and International Finance**
Spring. 4 credits.

**670 Economic Demography and Development**
Fall. 4 credits.

**671 Economics of Development**
Spring. 4 credits.

**672 Economics of Development**
Fall. 4 credits. Prerequisites: first-year graduate economic theory and econometrics. Analytical approaches to the economic problems of developing nations. Topics to be covered include: some old and new directions in development economics thinking, the welfare economics of poverty and inequality, empirical evidence on who benefits from economic development, labor market models, project analysis with application to the economics of education, and development policy.

**673 Economic Development**
Spring. 4 credits. Prerequisites: Economics 509 and 520.
The course is concerned with theoretical and applied works that seek to explain economic development, or lack thereof, in countries at low-income levels. Specific topics vary each semester.

**674 Economic Systems**
Spring. 4 credits.

**678 Economic Growth in Southeast Asia**
Spring. 4 credits.

**679 Theory of Quantitative Economic Policy**
Spring. 4 credits.

**681 Economics of Participation and Self-Management**
Fall. 4 credits. Prerequisites: Economics 101–102, or permission of instructor.
For description see Economics 381. Economics 681 is given on a more advanced graduate level.

**682 Seminar on Economics of Participation and Labor-managed Systems**
Fall. 4 credits.

**684 Seminars in Advanced Economics**
Fall and spring. 4 credits.

# ENGLISH

D. Mermin, chair; T. Murray, director of undergraduate studies (255-3492); C. Chase, graduate faculty representative (255-6800); P. Marcus, director of honors program; M. Abrams, B. B. Adams, A. R. Ammons, J. P. Bishop, J. F. Blackall, A. Boehm, F. V. Bogel, L. Bogel, L. Brown, A. Caputi, J. Culler, S. Davis, D. D. Eddy, L. Fakundiny, R. T. Farrell, E. G. Fogel, D. Fried, H. L. Gates, R. Gilbert, K. Gottschalk, L. Herrin, T. D. Hill, M. Hite, M. Jacobus, P. Janowitz, B. Jeyifo, N. Kaplan, C. V. Kaske, R. E. Kaske, M. Koch, C. S. Levy, A. Lurie, D. E. McCall, K. A. McClane, J. R. McConkey, M. McCoy, H. S. McMillin, S. P. Mohanty, R. Morgan, H. Mullen, R. Parker, S. Parrish, J. Porte, M. A. Radzinowicz, E. Rosenberg, N. Saccamano, S. Samuels, P. Sawyer, D. R. Schwarz, M. Seltzer, H. E. Shaw, S. Siegel, W. J. Slatoff, H. Spillers, S. C. Strout, G. Teskey, S. Vaughn, W. Wetherbee

Visiting professors and lecturers: C. Burke, L. Moore, J. Welch

The Department of English offers a wide range of courses in English, American, and Anglophone literature as well as in creative writing, expository writing, and film. Literature courses focus variously on the close reading of texts, the study of particular authors and genres, questions of critical theory and method, and the relationship of literary works to their historical periods and to other disciplines. The department seeks not only to foster analytical reading and lucid writing but also, through the study of literary texts, to teach students to think about the nature and value of human experience.

Students who major in English develop their own programs of study in consultation with their advisers. Some focus on a particular historical period or literary genre. Others pursue special interests in such areas as women's literature, Afro-American literature, or creative writing.

## The Major

Any student considering a major in English should meet with the department's director of undergraduate studies to discuss the major and be assigned a major adviser. Copies of a brochure containing suggestions for English majors and prospective English majors are available in the department office, 250 Goldwin Smith Hall.

The Department of English recommends that its students ready themselves for the major by taking at least one preparatory course. Freshmen interested in majoring in English are encouraged to take one of the following freshman seminars: The Reading of Fiction (English 270), The Reading of Poetry (English 271), or Introduction to Drama (English 272). First-term freshmen with a score of 700 or above on the CEEB College Placement Tests in English composition or literature or 4 or 5 on the CEEB Advanced Placement Examination in English may enroll in English 270, 271, 272 as space permits (all students who have taken one freshman seminar are permitted to enroll in these courses as space permits).

English 201 and 202, a survey of major British writers, though not required for the major, are strongly recommended for majors and prospective majors, since they afford an overview of the history of English literature, providing an introduction to periods, authors, and genres that allows students to make a more informed choice of advanced courses.

In addition, The American Literary Tradition (English 275) and Creative Writing (English 280 or 281) are especially suitable in preparation for the major.

### Requirements

Each English major must complete with passing letter grades at least 36 credits in courses approved for the major. In addition to English 201 and 202, students may count up to two courses for the major from the category entitled "200-level Courses Approved for the Major." All English courses numbered 300 or above count toward the major. Of the 36 credits required for the major, 12 (three courses) must be taken in English and American literature before 1800. (Courses taken for the English major may also be used to satisfy the arts college humanities distribution requirement or, in the case of creative writing courses, the expressive arts distribution requirement.)

English majors also are required to complete six credits of foreign language study (preferably in literature) in courses for which qualification is a prerequisite. Advanced placement credit does not fulfill this requirement, nor does the study of foreign literature in translation. Majors are urged to complete this requirement by the end of their sophomore year, and those who enter Cornell without sufficient preparation should begin their language study at once.

Students may count toward the English major a maximum of 12 credits in literature and creative writing courses at the 300 level or above given by such departments and programs as Comparative Literature, Theatre Arts, foreign languages, the Africana Studies and Research Center, and the Society for the Humanities. Double majors may count toward these 12 credits any courses, 300 level or above, taken in their other major if such courses are approved by their English department adviser as relevant to the study of literature.

**Honors.** Prospective candidates for the degree of Bachelor of Arts with honors in English should read the handout "English Department Honors Program." These students should consult the chair of the Honors Committee during the spring term of their sophomore year or early in their junior year. Honors candidates will take one or two honors seminars (English 491 or 492) during their junior year, as well as a 400-level course in the field in which they plan to work during their senior year. The work of the senior year is a year-long tutorial (English 493 and 494) on a special topic of the candidate's choosing, culminating in the writing of a scholarly honors thesis of approximately fifty pages, or a substantial work of high quality in creative writing completed for English 480–481. More information about the program may be found in the department's brochure for honors candidates.

## Courses for Nonmajors

For students not majoring in English, the department makes available a variety of courses at all levels. Some courses at the 200 level are open to qualified freshmen, and all of them are open to sophomores. Courses at the 300 level are open to juniors and seniors and to underclass students with permission of the instructor. The suitability of courses at the 400 level for nonmajors will vary from topic to topic, and permission of the instructor is required.

## Freshmen Seminars

As part of the Freshman Writing Seminar Program, the Department of English offers many one-semester courses concerned with various forms of writing (narrative, biographical, expository), with the study of specific areas in English and American literature, and with the relation of literature to culture. Students may elect any two of these courses during their first year to satisfy the Freshman Seminar requirement. Descriptions of Freshman Writing Seminar offerings may be found in the Freshman Seminar Program listings, available from college registrars in August for the fall term and in November for the spring term.

Especially well-qualifed students who are considering a major in English are encouraged to enroll in English 270, 271, or 272.

Students *who have scored 4 or 5 on the Princeton exam or 700 or better on the English Composition or CEEB test* are eligible to enroll in the fall semester (space permitting) in any one of these courses. English 270, 271, and 272 will be open to all freshmen in the spring semester who have satisfactorily completed one freshman seminar. Registration is handled by the Freshman Writing Seminar Program during freshman registration.

**270 The Reading of Fiction**
Fall, spring, summer. 3 credits. Each section limited to 17 students. Freshman Seminar. Recommended for prospective majors in English.
Forms of modern fiction, with emphasis on the short story and novella. Critical study of works by English, American, and Continental writers from 1880 to the present.

**271 The Reading of Poetry**
Fall, spring. 3 credits. Each section limited to 17 students. Freshman Seminar. Recommended for prospective majors in English. Designed to sharpen the student's ability to understand and respond to poetry, readings in the major periods, modes, and genres of poetry written in English.

**272 Introduction to Drama**
Fall, spring. 3 credits. Each section limited to 17 students. Freshman Seminar. Recommended for prospective majors in English. Selected masterworks by such playwrights as Sophocles, Ibsen, and Shaw introduce the chief idioms and styles of drama. The course work will consist of discussions and papers and may include a special project related to the plays being produced by the Department of Theatre Arts.

## Courses for Sophomores

Although courses numbered in the 200s are primarily for sophomores, some of them are open to qualified freshmen and to upperclass students. Courses approved for the major are English 201 and 202 and all courses numbered 300 or above. In addition to English 201–202, students may count up to two 200-level courses toward the major from "Courses Approved for the Major," listed below.

## Courses Recommended for Prospective Majors

**275 The American Literary Tradition**
Fall, spring. 3 credits. Recommended for prospective majors in American studies. This is *not* a Freshman Seminar.
Fall, M W F 12:20–1:10, J. Bishop; spring, T R 10:10–11:25, M. Seltzer.
The problem of an American national literature is explored through the reading, discussion, and close analysis of texts representing the four principal periods in American literary history. Not a survey, this course focuses on the relations of the texts to each other, the role of Americanness in those relationships, and the assumptions about history, language, and the self that underlie them. Edwards, Irving, Hawthorne, Whitman, Twain, James, Cather, Fitzgerald, Lowell, Ginsberg, and Morrison.

**280–281 Creative Writing**
Fall, spring, summer, and winter session. 3 credits. Limited to 18 students each section. Recommended for prospective English majors. English 280 is *not* a prerequisite for English 281.
An introductory course in the theory and practice of writing narrative prose, poetry, and allied forms.

## Courses Primarily for Nonmajors

**205–206 Readings in English and American Literature**
206, fall; 205, spring. 3 credits each term. Open to all undergraduates. English 205 is not a prerequisite for 206.
206: Fall, M W F 10:10. S. Parrish
206. Covers literature since the mid-nineteenth century. Novels by such authors as Emily Bronte, Conrad, Hardy, Hemingway, Faulkner, Vonnegut, and others; poems by Browning, Housman, and Frost; plays by Shaw and one or two contemporary writers such as Arthur Miller. Two lectures and one discussion section each week. Two short papers, two prelims, no final examination.
205: Spring, M W F 11:15–12:05. R. Farrell.
205. An introduction to some of the major texts from the beginning of the literature through the eighteenth century. The first weeks will be devoted to *Beowulf* and two selections from Chaucer's *Canterbury Tales* as samples of early yet readily understood literature. Readings from other authors include Shakespeare, Jonson, Marlowe, Donne, Pope, Swift, and Johnson.

**[208 Forms of Poetry**
Spring. 3 credits. Not offered 1989–90.]

**210 Medieval Romance: The Voyage to the Otherworld**
Spring. 3 credits.
M W F 11:15–12:05. T. Hill.
The course will survey some medieval narratives concerned with representative voyages to the otherworld or with the impinging of the otherworld upon ordinary experience. The syllabus will normally include some representative Old Irish otherworld literature; selections from *The Mabinogion*; selections from the *Lais* of Marie de France; Chretien de Troyes's *Erec*, *Yvain*, and *Lancelot*; and the Middle English *Sir Gawain and the Green Knight*. We will finish by looking at a few later otherworld romances such as selections from J. R. R. Tolkein. All readings will be in modern English. Requirements: three brief (two to three typed pages) papers and a final exam designed to test the students' reading.

**227 Shakespeare**
Fall, spring, or summer. 3 credits. Each section limited to 25 students.
Fall: T R 1:25–2:40, D. Eddy; M W F 12:20–1:10, G. Machecek; spring: M W F 10:10–11. C. Levy.
A critical study of representative plays from the principal periods of Shakespeare's career.

**263 Forms of Hollywood Comedy: The 1930s and 1940s**
Fall. 3 credits. Enrollment limited to 20 students.
T R 11:40–12:55. L. Bogel.
This seminar will focus on American film comedies in their relation to the historical moments that produced them and to the Hollywood production system. We will discuss comedy's social functions, its structures, its visual styles. The 1930s brought the end of silent slapstick or vaudeville comedies that relied heavily on physical humor, though artists like Charlie Chaplin (in *Modern Times*) continued these older traditions, while the Marx brothers transformed them into sound films like *A Day at the Races* and *Duck Soup*. With screwball comedy, a strong verbal and domestic tradition emerged in the 1930s. We will consider such films as *It Happened One Night*, *My Man Godfrey*, *Bringing Up Baby*, *His Girl Friday*, and *The Philadelphia Story*, for the ways they negotiated issues of class and gender, as well as for the ways they participated in Hollywood's star system. We will concentrate as well on satiric comedies by Preston Sturges (*The Miracle of Morgan's Creek*) and Ernest Lubitsch (*The Shop Around the Corner*). There will be regularly scheduled, required screenings and video viewings of about ten films, outside class meeting hours. Student enrolling for the course will have to be free to attend these screenings, on alternate Mondays at 4:00 p.m. and Thursdays at 6:30 p.m. Students can anticipate writing viewing exercises for most films and three essays. Lab fee.

**283 Writing for Readers—Reading for Writers (also Writing 203)**
Spring. 3 credits. Limited to 17 students. Prerequisite: permission of the instructor.
T R 10:10–11:25. J. Martin.
This course will develop students' writing abilities by teaching them to become skilled readers of their own work as well as that of others. By studying our own preconceptions about writing and through readings on language and rhetoric, we will work to develop a critical vocabulary for evaluating writing, focusing on such issues as the role of audience, patterns of organization, the varieties of language, and the recognition and manipulation of styles. The class will focus on how writers can respond to the work of others through informed evaluations and criticisms and on how writers can learn from the evaluations of their readers. In considering how a reader can help direct and influence subsequent drafts of an essay, the writer learns to strengthen writing skills by rewriting in response to the reader's critical evaluation. In classes, in editing groups, and in written responses, students will evaluate their own work and that of others to develop effective writing and revising strategies. Students will write and revise at least eight essays during the semester. Qualified students may have the opportunity to continue the practice of reading and responding by becoming tutors in the Writing Workshop's Walk-In Service.

**286 Writing in the Humanities (also Writing 201)**
Fall or spring. 3 credits. Limited to 17 students. Registrants must have completed freshman writing requirements. S-U grades with permission of instructor.
Fall: M W F 11:15–12:05. S. Davis.
Spring: T R 11:40–12:55. S. Davis.
English 286 helps students strengthen reading and writing skills valuable in all disciplines and particularly appropriate to the humanities. It also encourages them to reflect on what they do when they interpret and write about works of literature, philosophy, and visual art. Just what happens when we "read" such works—and what do we mean when we claim to understand them? What is interpretation, and how is it best presented in writing to an informed audience? How are conflicts of interpretation resolved? How do historical knowledge and theory affect our interpretations? What kinds of knowledge and self-awareness does study in the humanities yield?

Works studied in the course challenge our understanding by their strangeness or their uncanny familiarity. They show Western reason in conflict with its real or supposed opposites—alien humanity, artistic inspiration, illusion, madness, the divine, and the will to power. Readings and viewings may include paintings by da Vinci and Velasquez; novels by Nabokov, Coetzee, and Achebe; Plato's *Gorgias* or *Protagoras*; Nietzsche's *Birth of Tragedy*; Euripides' *The Bacchae*; and Peter Weiss's *Marat/Sade*, the play and the film.

Students in the course write (and often rewrite) 30 pages of papers and confer frequently with the instructor.

**288–289 Expository Writing**
288, fall; 289, spring. 3 credits each term. Each section limited to 18 students.
Hours to be arranged.
This course is intended to meet the needs of undergraduates from a range of disciplines who wish to gain skill in expository writing. Under the instructor's direction, students will write on topics related to their own interests. A substantial amount of new writing or a revision of an earlier essay will be expected each week. Since the class is the primary audience for the essay, attendance and participation in discussion by all students are essential. In addition to regularly scheduled class meetings, instructors will hold frequent conferences with students.

## 200-Level Courses Approved for the Major

In addition to English 201–202, students may take up to two of the following 200-level courses for credit toward the English major.

**201–202 The English Literary Tradition**
Fall and spring. 4 credits. Open to all undergraduates. English 201 is not a prerequisite to 202. May be counted toward the English major.
Fall, M W F 11:15–12:05. W. Wetherbee.
201: Interpretation of major works ranging from Beowulf through Milton. Surveys Old English poetry, Chaucer, medieval romances, Spenser, Shakespeare, Renaissance lyric poetry, and Milton.
Spring, M W F 11:15–12:05. P. Sawyer.
202: Includes Dryden, Swift, Pope, Johnson, Blake, the major Romantic and Victorian poets, and Yeats. The course will be conducted by a combination of lectures and seminars.

**[219 The Destiny of the Hero: An Introduction to Medieval Heroic Lay and Epic**
4 credits. Spring. Not offered 1989–90.]

**[247 Major Nineteenth-Century Women Novelists (also Women's Studies 248)**
Fall. 4 credits. Not offered 1989–90.]

**251 Twentieth-Century Women Novelists (also Women's Studies 251)**
Spring. 4 credits.
T R 10:10–11:25. S. Samuels.
This course will examine questions raised by literature by and about women in twentieth-century narrative fiction, particularly questions about women's experience, perspective, and language. We will read works by Virginia Woolf, Gertrude Stein, Toni Morrison, Alice Walker, Zora Neale Hurston, and others.

**253 The Modern Novel**
Fall. 4 credits.
M W F 9:05–9:55. S. P. Mohanty.
A survey of the modern novel, with some attention to its social and cultural context. We shall read novels and shorter fiction by such writers as Flaubert, Conrad, Joyce, Woolf, and Thomas Mann, as well as more contemporary works by Gabriel Garcia Marquez, Toni Morrison, and Salman Rushdie.

**255 African Literature**
Fall. 4 credits.
T R 11:40–12:55. B. Jeyifo.
An introduction to major African writers and literary traditions. Authors studied may include Achebe, Soyinka, Clark, Armah, Ngugi, and Amecheta.

**264 Ethnic Literature: Bridges and Boundaries**
Spring. 4 credits.
T R 1:25–2:40. H. Mullen.
The American language that, William Carlos Williams noted, came "from the mouths of Polish mothers" has also been shaped by the oral and written traditions of Native Americans, Afro-Americans, Chicanos, and Asian Americans whose literary production will be examined in this course. Works by writers in these traditions will be studied as sites marking the emergence of a contemporary American language and literature capable of representing the diverse and particular realities of a multicultural nation. This course will focus especially on how each ethnic tradition uses the contested territories of geography, language, and gender in texts that both refer to and imaginatively construct communities and traditions based on collective experience. Discussion will focus on how each text makes connections and distinctions between individuals as well as within and among communities bound together by shared linguistic, geographical, and cultural traditions.

**[265 The Afro-American Folk Tradition in American Literature (also Africana Studies and Research Center 265)**
Fall. 3 credits. Not offered 1989–90.]

**[290 Literature and Value**
Spring. 4 credits. Not offered 1989–90.]

## Courses for Sophomores, Juniors, and Seniors

Courses at the 300 level are open to juniors and seniors and to others with the permission of the instructor. There are no specific prerequisites except as noted for English 382–383 and 384–385.

**302 Literature and Theory (also English 702 and Comparative Literature 702)**
Fall. 4 credits.
W F 10:10 and discussion section on Monday. Time: TBA. J. Culler.
Study of issues in contemporary theoretical debates, with particular attention to structuralism, deconstruction, psychoanalysis, and feminism. Readings by Barthes, Derrida, Foucault, B. Johnson, J. Rose, and others. No previous knowledge of literary theory is assumed.

**[308 The Icelandic Family Saga**
Fall. 4 credits. Limited to 30 students.
M W F 10:10. T. Hill.
Not offered 1989–90.]

**310 Old English Literature in Translation**
Fall. 4 credits.
M W F 10:10–11:00. T. Hill.
Cultural backgrounds, reading, and critical analysis of Anglo-Saxon poetry in translation, pagan and Christian epic, elegy, heroic legend, and other forms. Attention will be given to the relations of this literature to that of later periods.

**319 Chaucer**
Spring. 4 credits.
M W F 11:15. R. T. Farrell.
The course will center on a close reading of the major stories from *The Canterbury Tales*, *Troilus and Criseyde*, and some of the minor works. Students will be given ample opportunity to learn Chaucer's language, so that all dimensions of the poems will be available to them. Prior knowledge of Middle English is neither expected nor required; course participants will be encouraged to follow up their own interests in class reports and papers.

**320 The Sixteenth Century—Tudor Culture**
Fall. 4 credits.
M W F 1:25–2:15. C. Levy.
The development of English as an imaginative and persuasive medium, from Wyatt and Ascham through Sidney, Spenser, Marlowe, Shakespeare (the nondramatic verse), and Hooker. Consideration in particular of lyric verse, pastoral, epic, and epyllion; prose stylistics, and rhetorical doctrine; and such early prose fiction as that of Green, Lodge, and Nashe. Some attention to Elizabethan drama other than Shakespearean and a brief excursion into late Elizabethan counterculture.

**321 Spenser and Malory**
Spring. 4 credits.
M W F 10:10. C. Kaske.
Paired selections covering about half of Malory's *Mort D'Arthur* and half of Spenser's *Faerie Queene*. Chretien's romances and some of Spenser's minor poems will be mentioned occasionally as background. Comparisons will assess possible literary influence, the distinctive genius of each author as a writer of romance, and the development of Arthurian romance from the Middle Ages to the Renaissance. Informal lecture and discussion. Two papers, no exams.

**322 The Seventeenth Century**
Spring. 4 credits.
M. A. Radzinowicz. Time: TBA
The main traditions in poetry with emphasis on John Donne, Ben Jonson, Andrew Marvell, and on the genres they used. Also, consideration of the major work in prose of Bacon, Burton, Browne, Walton, and Bunyan.

**327 Shakespeare**
Spring. 4 credits.
M W F 9:05–9:55. B. Adams.
An introduction to the works of Shakespeare based on a selection of major plays and sonnets designed to illustrate the stages of his development and the range of his artistic achievement. Plays to be examined in detail include *Hamlet, King Lear, As You Like It, The Taming of the Shrew, Richard III,* and *The Tempest*. Regularly scheduled showings of videotape productions of plays treated in lectures.

**329 Milton**
Fall. 4 credits.
T R 10:10–11:25. G. Teskey.
An introduction to the poetry of John Milton.

**330 Restoration and Eighteenth-Century Literature**
Spring. 4 credits.
L. Brown. Time: TBA.
This course will explore the canonical writers of the age through an examination of the first major era of English imperialism, juxtaposing texts by Dryden, Behn, Defoe, Swift, and others with contemporary documents and comments on trade, exploration, and colonialism in Africa and the New World. The main theme of the course will include a definition of the structure and function of imperialist ideology; its connection with matters of literary form including the decline of drama, the development of the novel, and the rise of the novel of sentiment; its relevance of issues of racism and abolitionism; and its relation to the representation of women.

**333 The Eighteenth-Century English Novel**
Fall.
TR 10:10–11:25. N. Saccamano.
The rise of the English novel. We will place the emergence of the novel as a dominant literary genre in the context of other intellectual and cultural developments in eighteenth-century England and will discuss what the novel's changing form can tell us about the nature of fiction and the problems of representation. Novels by Defoe, Richardson, Fielding, Smollett, Sterne, MacKenzie, and Burney.

**340 The English Romantic Period**
Fall. 4 credits.
M W F 11:15. S. Parrish.
Readings in the major poets—Blake, Wordsworth, Coleridge, Byron, Shelley, and Keats—along with a few related letters and critical essays. By the end of the readings we will try to arrive at an understanding of what we call the "romantic revolution."

**345 The Victorian Period**
Fall. 4 credits.
M W F 1:25–2:15. P. Sawyer.
The Victorian age was a period of turbulence and uncertainty much like our own. The extremes of wealth and poverty created by the factory system, the challenges to religious belief, and the advances of science stimulated people to rethink basic questions and to seek answers in a flourishing literary culture. Readings will include the poetry of Tennyson, Browning, and Arnold; two novels, *Great Expectations* and *Middlemarch*; one play, *The Importance of Being Ernest*; and selections from Carlyle, Ruskin, Darwin, and others.

**347 Reading Freud: Race, Gender, and Psychoanalysis (also German Lit. 347, Comp. Lit. 347, HPST 347, and Psychology 389)**
Fall. 4 credits.
F 1:25–3:20. S. Gilman.
The course will read a series of texts from the formative works of Sigmund Freud (beginning with the *Studies in Hysteria)* and concluding with Freud's reading of the Schreber autobiography). These readings will be placed within the tension existing at the turn of the century between the concept of the biology of race and biology of gender. Close attention will be paid to the cultural, scientific, as well as polemical literature on the ideas of race and gender from the biological writings of the late nineteenth century. The course will also provide an introduction to the basic concepts of Freudian psychoanalytic theory.

**348 The Female Literary Tradition: Wollstonecraft to Woolf (also Women's Studies 348)**
Spring. 4 credits.
T R 11:40–12:55. M. Jacobus.
A survey of the (mainly British) female literary tradition from the French Revolution to early twentieth-century modernism. The course will trace the dual legacies of romanticism and revolution through their monstrous and gothic forms, exploring their repressed presence in Victorian women's fiction until they surface again in the writing of the 1848 revolution and after. As well as the social protest literature of the mid-nineteenth century, we will look at the literature of the (female) uncanny, through which Victorian women writers confront their inner worlds, before turning to the emergence of the "new Woman" and utopian women's fiction at the end of the nineteenth century and to the beginnnings of the twentieth-century modernist experiment by women. Texts will include works by Wollstonecraft, Austen, Mary Shelley, Emily and Charlotte Bronte, Eliot, Barrett Browning, Gaskell, Gilman, Schreiner, and Woolf.

**350 The Early Twentieth Century (to 1930)**
Fall. 4 credits.
T R 10:10–11:25. D. Schwarz.
Critical study of major works by Hardy, Conrad, Lawrence, Joyce, Woolf, Eliot, Yeats, Hopkins, Wilde, and others. While the emphasis will be on close reading of individual works, some attempt will be made to place the authors and works within the context of literary and intellectual history. The course will seek to define the development of literary modernism in England by reference to these authors' innovations in themes and techniques.

**351 Modern Literature since 1914**
Spring. 4 credits.
T R 10:10–11:25. M. Hite.
By the second decade of the twentieth century, modernism was a full-blown and highly self-conscious cultural and—to some extent—political movement, involving painting, architecture, and music as well as literature, and generating its own distinctive theories about the relation of art to consciousness, the physical universe, and society. This class will examine poetry, fiction, and drama by such paradigmatic modernists as Eliot, Ford, H.D., Joyce, Lawrence, Rhys, Shaw, and Woolf, and will explore the relation of these works to important critical writings of the period. The classroom emphasis will be on discussion and on critical writing: regular in-class assignments, probably 7–8 short (4–6 page) papers over the semester, plus a take-home final examination.

**353 Post-Colonial Literatures**
Spring. 4 credits.
T R 2:55–4:10. S. P. Mohanty.
Topic for 1989: Fictions of India. In what different ways has the Indian subcontinent been represented in literary and cultural texts in this century? What can the study of a range of such texts—from E.M. Forster's *A Passage to India* to Salman Rushdie's *Midnight's Children*, from Kipling's popular fiction to V. S. Naipaul's critical essays, or even from David Lean's film adaptation of Forster to such popular television serials as "The Jewel in the Crown"—tell us not only about "India" but more generally about the political significance of cultural representation? Focusing on such examples and questions, this course examines the historical construction of race, gender, and cultural "others" in the *fictions* of modern India.

**361 Early American Literature**
Fall. 4 credits.
T R 1:25–2:40. S. Samuels.
American writing from the 1630s to the 1830s, including prose and poetry of the Puritans, Edwards, Franklin, Crevecoeur, Brockden Brown, Irving, Bryant, and Cooper and the early work of Poe, Hawthorne, and Emerson.

**362 The American Renaissance**
Spring. 4 credits.
M W F 1:25. R. Gilbert.
The major literary achievements of Emerson, Thoreau, Hawthorne, Melville, Whitman, and Dickinson—read in themselves and in relation to one another.

**363 The Age of Realism and Naturalism**
Fall.
T R 11:40–12:55. M. Seltzer.
The literary expression of American culture between the Civil War and the First World War. We will read a sequence of representative instances, chiefly fictional or historical, selected from the work of such authors as Whitman, Twain, Howells, Cable, H. James, W. James, Crane, Wharton, H. Adams, S. O. Jewett, Dreiser, and Cather.

**364 American Literature between the Wars**
Spring. 4 credits.
T R 1:25–2:40. J. Porte.
This course will alternate with English 365, which surveys American literature since 1945. It will be concerned with a sequence of works exemplifying various aspects of American literary culture between the First and Second World Wars. Topics will include: small town life in America; the new urban scene; expatriation; trends in modernist and popular poetry; the Harlem Renaissance; immigrant responses to America; feminism; the literature of socio-political consciousness and awareness. Authors to be studied may include, among others: Sherwood Anderson, Willa Cather, Sinclair Lewis, Hemingway, Fitzgerald, Jean Toomer, Faulkner, Zora Neale Hurston, Wallace Stevens, W. C. Williams, Marianne Moore, Edna Millay, Dos Passos, Henry Roth, James Agee, Edmund Wilson, and Richard Wright.

**[365 American Literature since 1945**
Spring. 4 credits. Not offered 1989–90.]

**366 The Nineteenth-Century American Novel**
Fall. 4 credits.
M W F 1:25–2:15. D. McCall.
Former title—The Earlier American Novel. Hawthorne, Melville, James, and Mark Twain.

**367 The Modern American Novel (through World War II)**
Spring.
M W F 10:10 D. McCall.
A reading of some modern American writers of the first half of the twentieth century. Works by Wharton, Dreiser, Hemingway, Fitzgerald, Faulkner, Wright, Cather, and others. Lectures with some opportunity for discussion. Emphasis will be on the individual works in their historical contexts.

**368 The Contemporary American Novel**
Spring. 4 credits. Prerequisite: One 300- or 400-level literature course or permission of instructor.
M W F 1:25–2:15. L. Herrin.
We will read, talk about—and you will write about—eight to ten novels from the post-war period in American literature. Authors to be read will almost certainly include Eudora Welty, Vladimir Nabokov, Norman Mailer, Saul Bellow, Toni Morrison, and John Hawkes.

**370 The Nineteenth-Century English Novel**
Spring. 4 credits.
M W F 1:25–2:15. P. Sawyer.
A study of representative works by major English novelists from Austen to Hardy. The course will view these works from a number of different perspectives, focusing on the individual texts as well as on the question of what is involved in reading them (or any other novels). By the end of the course the student should have learned something about nineteenth-century fiction but also about ways of interpreting fiction in general. The reading list will include Austen, *Pride and Prejudice*; Thackeray, *Vanity Fair*; Bronte, *Wuthering Heights*; Dickens, *Bleak House*; Eliot, *Middlemarch*; and Hardy, *Jude the Obscure*.

**371 American Poetry from Emerson to Stevens**
Fall. 4 credits.
T R 2:55–4:10. J. Porte.
A critical examination of the American poetic tradition as it evolves from Emerson. Particular attention will be paid to the development of new modalities of verse out of the English tradition and to theories of poetry. Other writers to be considered will include Walt Whitman, Emily Dickinson, Robert Frost, Ezra Pound, William Carlos Williams, Marianne Moore, T.S. Eliot, and Hart Crane.

**[372 English Drama**
Fall. 4 credits. Not offered 1989–90.]

## Creative and Expository Writing

**[381 Reading as Writing**
Spring. 4 credits. Not offered 1989–90.]

**382–383 Narrative Writing**
382, fall; 383, spring. 4 credits each term. Each section limited to 15 students. Students are encouraged to take English 280–281 previously. Prerequisite: permission of instructor, normally on the basis of a manuscript.
Fall: M W 2:30–3:20, A. Caputi;
M W 1:25–2:15, M. McCoy;
M W 11:15–12:05, D. McCall; plus conferences to be arranged. Spring: hours to be arranged. J. Welch, L. Herrin, M. McCoy.
The writing of fiction; study of models; analysis of students' work.

**384–385 Verse Writing**
384, fall or summer; 385, spring. 4 credits each term. Each section limited to 15 students. Prerequisites: English 280 and 281 and permission of instructor.
Fall: M 2:30–4:25, K. McClane;
W 2:30–4:25, P. Janowitz. Spring: hours to be arranged. A. Ammons, R. Morgan.
The writing of poetry; study of models; analysis of students' poems; personal conferences.

**[387 Autobiography: Theory and Practice**
Fall. 4 credits. Not offered 1989–90.]

**388–389 The Art of the Essay**
389, fall; 388, spring or summer. 4 credits each term. Limited to 15 students. Prerequisite: permission of instructor. Interested students should submit a writing sample to the appropriate professor before the beginning of the term.
Fall: T R 2:55–4:10 (and conferences to be arranged), L. Fakundiny. Spring: M W 1:25–2:15 (and conferences to be arranged), C. Levy.
For both English majors and nonmajors who have done well in freshman writing seminars, or in such courses as English 288–289 or 286, and who desire intensive practice in writing essays. Particular, but not exclusive, emphasis on expository techniques of analysis and persuasion with special attention to relations between voice and purpose.

## Courses for Advanced Undergraduates

Enrollment in courses at the 400 level is limited by prerequisite or permission of the instructor.

**405 The Politics of Contemporary Criticism**
Fall. 4 credits. Limited to 15 students. Open only to undergraduates. Prerequisite: permission of instructor. Background in literary studies will be expected, but no training in critical theory will be presumed.
M W F 1:25–2:15. S. P. Mohanty.
An introduction to some of the major issues in contemporary criticism through an examination of the relationship between two influential movements in critical theory—hermeneutics and deconstruction. Adherents of both movements seem to agree about the fundamental opposition between their respective approaches and conclusions. We shall try to understand the issues at stake in this opposition, exploring such questions as: what is a (literary) text? what is interpretation and what are its limits? what political issues underlie particular critical strategies and methodological choices? We shall negotiate between the competing claims of each position and focus on the implications of answers to such questions in actual critical analysis. Primary readings from some of the chief exponents of the two movements, particularly Paul Ricoeur, Hans-Georg Gadamer, and Jacques Derrida. Additional readings from a variety of critical and philosophical traditions of such writers as Barthes, Eagleton, Felman, Foucault, and Jameson.

**406 Archaeology of Early Christian England and Ireland (also English 606 and Archaeology 406)**
Spring. 4 credits.
M W F 1:25–2:15 (plus an extra hour by arrangement). R. Farrell.
This course is intended as a study in depth of the recent advances of our understanding of a fascinating period, England and Ireland ca. 400–1100. Architecture, both secular and sacred, will play a large part in the course, as well a close examination of the span of material evidence from excavation. Attention will also be paid to the far-flying external trade/exchange relations England and Ireland enjoyed in this period. Frequent oral reports, a take home mid-term and final, and/or a significant term paper will be expected. While there is no absolutely firm prerequisite, knowledge of Latin and/or Anglo-Saxon will be helpful, as would a grounding in such disciplines as history, archaeology, or art history.

**[409 Freud as Imaginative Reader and Writer**
Spring. 4 credits. Not offered 1989–90.]

**411 Introduction to Old English (also English 611)**
Fall. 4 credits.
M W F 12:20–1:10. T. Hill.
The aim of the course is to teach students to read Old English as accurately and fluently as possible. While the primary emphasis is on acquiring a reading knowledge of the language, we will also be concerned with the linguistic and literary problems presented by the texts we cover.

**412 Beowulf (also English 612)**
Spring. 4 credits.
M W F 12:20–1:10. T. Hill.
A close reading of *Beowulf*. Attention will be given to relevant linguistic and literary problems.

**[413 Sutton Hoo: Past, Present, and Future (also Archaeology 413 and English 603)**
Spring. 4 credits. Not offered 1989–90.]

**[422 The Faerie Queene**
Fall. 4 credits. Not offered 1989–90.]

**[423 The Map of Seventeenth-Century Poetry: School, Genre, and Ideology in the Verse of the Period**
Spring. 4 credits. Not offered 1989–90.]

**[424 Lyric Sequences**
Spring. 4 credits. Not offered 1989–90.]

**427 Studies in Shakespeare**
4 credits.
T R 2:55–4:10. E. Fogel.
*Fall: Shakespeare and Chekhov*. We will examine what Shakespeare and Chekhov have in common, and how they differ, as to their modes of dramatic construction, their theatrical effects, and their treatment of human experience. The texts to be examined are *Hamlet*, *The Seagull*, *Twelfth Night*, *King Lear*, *The Cherry Orchard*, and *The Tempest*. Students will write one short paper (ten pages). The class will be run as a seminar with brief oral reports and ensuing discussions.
4 credits.
T R 2:55–4:10. T. Murray.
*Spring: Shakespeare on Film*. Study of the transformation of Shakespeare's plays into films. Attention will be focused on two aspects of film and analysis. First, we will consider the film's interpretation of the text—how does the visual image influence the viewer's reception of the text? Second, we will discuss the critical and technical strategies of the filmmakers—how do films of Shakespeare differ from one another formally and ideologically? Attention will also be given to the reception of the films in the current social and political climate. The syllabus will most likely include adaptations of *Othello* (by Burge and Olivier), *King Lear* (Kozintsev, Brooks, Godard), *Hamlet* (Oliver, Kozintsev), *MacBeth* (Kurosawa, Polanski), and *The Tempest* (Jarman).

**428 Elizabethan and Jacobean Drama**
Fall. 4 credits. Limited to 15 students.
T R 1:25–2:40. B. Adams.
A critical study of major plays by Marlowe, Jonson, Webster, Beaumont and Fletcher, Ford, and others, tracing the development of dramatic forms and main intellectual, political, and social currents in the chief dramatic works by contemporaries of Shakespeare and Donne.

**430 Writers of the Revolution (also Society for the Humanities 428)**
Spring. 3 credits. Limited to 17 students.
F 12:20–2:15. R. Parker.
Readings in polemical and poetical works by various English writers of the 1790s and after, such as Burke, Blake, Wollstonecraft, Paine, Godwin, Wordsworth, Coleridge, Shelley, and Carlyle, read in the context of the ongoing politics, national and international, of the French Revolution. Though the chief emphasis will be on the close interpretation of major poetic, dramatic, and prose texts, the course will also explore, through related contemporary representations and interpretations of the Revolution and through recent critical and historiographical studies (including revisionist challenges to Marxian models), the practical and theoretical problems encountered when reading literary works in a historical context. A major interest will be to test the notion of the romantic poet as one whose power depends on the transcendence, through disillusionment, of intense political concerns. Students should have either some general (undergraduate) knowledge of the English Romantic period and the French Revolution or be ready to do collateral work.

**433 Discontinuity, Revolution, and Satire (also Society for the Humanities 409)**
Fall. 4 credits. Limited to 15 students.
T 12:20–2:15. F. Bogel.
This seminar will focus on three related topics: the theory and practice of satire in the later seventeenth and eighteenth centuries; representations of revolution; and models of discontinuity (spatial, historical, symbolic). Readings will be drawn from a variety of fields—literature, political theory, philosophy, aesthetics, and perhaps cosmology and mathematics as well—and will bear on such topics as: models of historical development and change; theories of causality, consciousness, and personal identity; theories of the sublime, the beautiful, and the grotesque; and the rhetoric of satire and related literary modes. Authors will most likely include: Milton, Dryden, Hobbes, Locke, Clarendon, Hume, Swift, Pope, Bolingbroke, Burke, Newton, and Leibniz. There will also be some reading in modern theories of satire and of social ritual.

**436 Mechanism, Replication, Revolution, and Satire, 1940–1970 (also Society for the Humanities 412)**
Spring. 3 credits. Limited to 17 students.
T 12:20–2:15. F. Bogel.
The late seventeenth and early eighteenth centuries in England were marked by a profound exploration of the phenomena of mechanism and replication, in philosophy, natural science, social theory, aesthetics, and literary theory and practice. What forms does the imagination of revolutionary possibility—in politics, in literature, in philosophy, and elsewhere—take in such a context? What happens when anxiety about revolutionary innovation confronts anxiety about replicability? We will ask such questions while investigating the fields of political theory; printing technology; acting and mimicry; literary imitation; forgery and counterfeiting; literary satire, parody, and mock-forms; and aesthetic theories of original and unmechanizable production. Authors will include Descartes, Hobbes, Dryden, Newton, Swift, Pope, Diderot, Young, La Mettrie, Boswell, and Burke.

**[438 Inventing Human Nature: Passion and Experience in the Seventeenth and Eighteenth Centuries**
Spring. 4 credits. Not offered 1989–90.]

**447 Nineteenth-Century Women Novelists**
Fall. 4 credits.
T R 11:40–12:55. C. Chase.
A close focus on works of two great nineteenth-century novelists, Charlotte Brontë and George Eliot, including *Jane Eyre*, *Villette*, and *Daniel Deronda*. The course will explore how literary forms and imaginative structures are inhabited by women; how do they find or create a subject matter? What are the relations between author and characters? We will consider in what ways these novels transform and interpret women's experience—including the question of how gender, class, money, and familial roles affect the way characters are perceived and their opportunities for development. Discussion format, with many 1–2 page papers (to start discussion) and one 10–15 page essay.

**448 Theatre of Revolution (also Society for the Humanities 421)**
Fall. 4 credits.
F 12:20–2:15. R. Parker.
We will consider various writings on acting, theatre, painting, public eloquence, and political spectacles by or about such late enlightenment and romantic thinkers and artists as Rousseau, Diderot, Garrick, Burke, Hume, Reynolds, Schiller, and Blake. We will read these selections in conjunction with a number of plays composed, adapted, or produced in the revolutionary climates of England and France, including Schiller's *The Robbers*, Beaumarchais' *The Marriage of Figaro*, Voltaire's *Brutus*, Shakespeare's *Macbeth*, Wordsworth's *The Borderers*, and Büchner's *Danton's Death*, and with paintings and *fêtes révolutionnaires* of David. The interest throughout will be on discussing the public, political role of theatrical art, elo-

quence, and spectacle in a period when the very notion of the "public" was ripe with the ferment of the republican revolution. A photocopy portfolio of secondary readings in works by Jean Starobinski, Michel Foucault, Mikhail Bakhtin, Mona Ozouf, Annie Ubersfeld, Michael Fried, Ronald Paulson, Marie-Helène Huet, and others will be available. French and German texts will be read in English translation.

**449 The Self and the Colonial Encounter: Kipling and Conrad**
Spring. 4 credits.
T R 2:55–4:10. S. P. Mohanty.
Drawing on two writers whose work is deeply informed by their colonial encounters, this course will explore how an understanding of the self is dependent on the way we understand our social and political world—specifically how notions of the self are articulated in literary works and forms and how they reflect and refract tensions and movements of an imperialist culture. Basic readings on notions of the self, drawn from psychoanalysis and feminism (Freud, Chodorow, Irigaray), anthropology (Mauss, Geertz), discourse theory (Foucault, Greenblatt) and film studies (Mulvey, Heath). Literary texts include *The Portable Kipling* and *Kim* and Conrad's *Heart of Darkness* and *Lord Jim*. Relevant historical writings by James Mills, Cecil Rhodes, Lord Macaulay, and Charles Grant.

**450 The History of the Book**
Spring. 4 credits. Limited to 20 students.
Prerequisite: permission of instructor.
T 7–9 p.m. D. Eddy.
A study of the physical aspect of books printed during the last six centuries. Included are papermaking, typography and printing, bookbinding, and the history of book illustrations; the transmission of texts and bibliographical descriptions of hand-printed and modern trade books. Above all, this is the study of the book as a work of art.

**[451 The Long Poem in America**
Fall. 4 credits Not offered 1989–90.]

**[453 Public Aesthetics: Art, Video, and Spectacle in the Age of Technology**
Spring. 4 credits. Not offered 1989–90.]

**[454 Slave Narratives and the Production of Black Literature**
Spring. 4 credits. Not offered 1989–90.]

**456 Race and Theatre in America (also Theatre Arts 456)**
Spring. 4 credits.
T 3:30–5:30. B. Jeyifo.
The course will explore the representation(s) of race in selected periods and movements of dramatic writing and theatrical performance in America. Drawing both on conventional dramatic theories of "types" and "masks" and poststructuralist theories of "otherness" and "difference," the course will study important dramatic texts and performance forms which have made race such a historically crucial dimension of the American theatre. One major area of our exploration will be the changing patterns of the politics of representation of race in the American theatre. Class discussion will draw on supplementary materials like films, video, and slides.

**458 Mayhem, Myth, and Modernism**
Fall. 4 credits. Limited to 15 students.
T R 2:55–4:10. P. Marcus.
Vision and form in major texts from the period between the world wars. An exploration of the search for values in a troubled era and of concomitant formal experiments. The syllabus will include Lawrence, *Women in Love*; Joyce, *Ulysses* (selections); Pound, *Hugh Selwyn Mauberley* and *The Cantos*; Eliot, *The Wasteland* and *Four Quartets*; Woolf, *Mrs. Dalloway* and *To the Lighthouse*; Hemingway, *The Sun Also Rises*; and Yeats *The Tower* and *Last Poems*. Some attention will be given to parallel developments in the visual arts.

**460 Contemporary American Indian Literature**
Spring. 4 credits.
T 1:25–3:20. J. Welch.
This course will focus on the novels, stories, and poems of American Indian writers. We will read this literature with these burning questions in mind: Is it distinctive? What are the thematic concerns of these writers? Is the writing comparable in quality with mainstream literature? Two papers, short oral reports. Texts to be used include: McNickle, *The Surrounded*; Momaday, *House Made of Dawn*; Silko, *Ceremony*; Welch, *Fools Crow*; Erdrich, *Love Medicine* and *Tracks*; Campbell, *Halfbreed*; Bruchac, ed., *Songs from This Earth on Turtle's Back*.

**[461 Literature of the Early American Republic**
Spring. 4 credits. Not offered 1989–90.]

**463 Memory, Nostalgia, and Repetition in Modern Poetry and Poetics**
Spring. 4 credits.
T R 1:25–2:40. S. Siegel.
What desires drive the poetry and poetics of Yeats, Eliot, and Stevens? How do they regard the past? Why does chance play a prominent part in their writings? Are the political positions they voice in their poetry and in their prose conservative? What do they wish to conserve? This seminar will address these questions through readings in Nietzsche, Bergson, and Freud of whose work we will ask similar questions.

**464 Black Women Writers: Theory in the Flesh**
Fall. 4 credits.
T R 1:25–2:40. H. Mullen.
Black women, while challenging feminism to acknowledge and explore differences among women, have also created a literature in which differences among black women, particularly differences of color and class, are meticulously observed and critically articulated. As collaborators in the creation of Afro-American culture, black women have also written perceptively about the precise inflections of gender that make differences in the experience of black women and black men. This course will focus on textual representations of color, class, and cultural differences within Afro-American communities, especially as these differences influence constructions of female identity in the texts of black women writers, including Nella Larsen, Gwendolyn Brooks, Toni Morrison, Alice Walker, Toni Cade Bambera, Paule Marshall, Adrienne Kennedy, Gayl Jones, Terry McMillan, and Andrea Lee.

**465 Proseminar in American Studies (also American Studies 465)**
Spring. 4 credits.
W 1:25–3:35. J. Porte and members of the American Studies Program.
Selected topics in American history, literature, the arts, and politics. Recommended for American Studies majors.

**469 William Faulkner**
Spring. 4 credits.
T R 1:25–2:40. H. Spillers.
This course will examine selected writings of William Faulkner, beginning with some of the early novels (*The Sound and the Fury*, *Light in August*, *Absalom, Absalom!*) and concluding with *A Fable*. We will consider Faulkner's impact as a maker of myth and as one of the leading figures of a literary discourse that creates a modernist sensibility in American letters. As a southern writer, Faulkner is traditionally confined to the character study of exotic types, but his systemic fictional exploration of "violence and the sacred" provides a powerful clue to the larger issue of a national identity. Faulkner in his own terms, dared to imagine "culture" as a problem for fiction. This course will attempt to consider the outcome.

**[470 Studies in the Novel: Dickens, Flaubert, and Mann (also Comparative Literature 470)**
Fall. 4 credits. Not offered 1989–90.]

**[473 Tradition, Modernity, and Revolution in African Literature**
4 credits. Not offered 1989–90.]

**475 Feminist Literary Criticism**
Spring. 4 credits.
T R 11:40–12:55. M. Jacobus.
An introduction to the varieties of feminist literary criticism currently practiced in America. We will explore and question the practice and theoretical assumptions of feminist criticism in the past decade—psychoanalytic, marxist, linguistic, reader-response, black and lesbian, and Anglo-American. In addition, we will read excerpts from some of the recently translated French feminist critics whose work has been especially influential for Anglo-American feminist criticism and theory. We will be particularly concerned with questions such as: What are the assumptions which underpin the concept of a specifically feminine literary practice or writing (*écriture feminine*)? How do questions of gender enter into reading and interpretation? How do questions of racial difference and sexual preference figure in feminist criticism itself? Is there a politics of women's writing? What does it mean to invoke a (M)Other Tongue, and what is the basis for the pervasive maternal or matrilinear metaphors in feminist accounts of literature, literary tradition, and language? Though the main texts will be essays in feminist literary criticism and theory, we will also read relevant short works by women authors which have been especially central to the new feminist criticism, asking: why these?

**476 Irish Culture**
Spring. 4 credits. Limited to 20 students.
T R 2:55–4:10. P. Marcus.
An interdisciplinary survey of Irish culture from earliest times to the present. Topics include medieval literature and mythology, early Irish social life, land and agriculture, the Irish language, the visual arts, the decline of the Gaelic order, and the corresponding rise of the Anglo-Irish ascendancy. The modern literary revival will receive particular attention, and major works by Yeats, Synge, Joyce, O'Casey, and others will be studied in relation to historical and political developments from the Young Ireland movement of the 1840s to the revolution and civil war of 1916–23. The course will conclude with a consideration of post-revolutionary literature and the continuing Ulster crisis. Extensive video materials supplement the readings. No prerequisites.

**477 Children's Literature**
Fall. 4 credits.
M W F 2:30–3:20. A. Lurie.
A survey of classic English and American works for children from 1850 to the present. Folklore and fiction. Readings may include Jacobs, *English Fairy Tales*; MacDonald, *The Princess and the Goblin*; Carroll, *Alice in Wonderland*; Alcott, *Little Women*; Twain, *Tom Sawyer*; Stevenson, *Treasure Island*; Kipling, *The Jungle Books*; Baum, *The Wizard of Oz*; Barrie, *Peter Pan*; Nesbitt, *The Five Children* or *The Amulet*; Grahame; Milne, *Winnie-the-Pooh*; Tolkien, The Hobbitt; White, *Charolotte's Web*; L'Engle, *A Wrinkle in Time*.

**480–481 Seminar in Writing**
Fall and spring. 4 credits. Each section limited to 15 students. Students are encouraged to take English 280–281 and either 382–383 or 384–385 previously. Prerequisite: permission of instructor, normally on the basis of a manuscript.
Fall: L. Herrin, A. Lurie; spring: M. McCoy, L. Moore.
Intended for those writers who have already gained a basic mastery of technique. Students normally enroll for both terms and should be capable of a major project—a collection of stories or poems, a group of personal essays, or perhaps a novel—to be completed by the end of the second semester. Seminars are used for discussions of the students' manuscripts and published works that individual members have found of exceptional value.

**491 Honors Seminar I**
Fall: Section 1: Four Post-War American Poets: Elizabeth Bishop, Robert Lowell, John Ashbery, and Adrienne Rich.
4 credits.
M W F 10:10–11:00. R. Gilbert.
A close consideration of four significant poets of the last four decades. We will consider individual poems as well as the published collections in which they appear, trace each poet's career book by book, while simultaneously aiming for a more general understanding of the shifting relations between self, world, history, and language as reflected in their poems. Other topics to be explored: the various ways in which these poets both extend and modify the projects of modernist poetics; different senses of poetic forms in their work; the notion of period style. Intensive reading in the poetry, with some prose as well. In addition, some supplementary reading in other contemporary poets will be assigned to help provide a literary context. Four 5–8 page papers; one or two oral reports. Limited enrollment.

Section 2: Historical and Political Facts in the Novel
4 credits.
T R 11:40–12:55. E. Rosenberg.
Some six major novels—three English novels for starters to be followed by three modern Continental fictions—will be examined both as autonomous texts and as "representative" of their period and country. We shall explore the historical and social attitudes which inform these books and trace the stylistic patterns by which these attitudes are articulated. As the course is designed to tell us something about the evolution of fiction, we begin with a brief Renaissance text, then move to the nineteenth and twentieth centuries. Readings include Nashe's *Unfortunate Traveller*, Scott's *Bride of Lammermoore* Dickens *Bleak House*, Flaubert's *Madame Bovary*, Mann's *Magic Mountain*, and Camus's *The Plague*. (I may wish to examine some shorter texts—things like Flaubert's "Herodias" and Mann's "Mario".) Three short papers. Occasional oral reports by way of implementing class discussion and covering topics not covered by the instructor. Limited enrollment.

**492 Honors Seminar II**
Spring. 4 credits. Prerequisite: permission of director of the honors program.
Section 1. Early Shakespeare.
T R 2:55–4:10. S. McMillin.
A reading of most of Shakespeare's writing in the 1590s in order 1) to identify topics for advanced papers in that material, and 2) to lay a groundwork for topics in the later and better-known works. Readings will include the three parts of *Henry VI*, *Richard III*, *Romeo and Juliet*, *Titus Andronicus*, such earlier comedies as *Merchant of Venice* and *Midsummer Night's Dream* and *The Rape of Lucrece*.
Section 2. Reading Joyce's *Ulysses*.
D. Schwarz. T R 1:25–2:40.
A thorough, episode-by-episode study of the art and meaning of Joyce's *Ulysses*. We will explore the relationship between *Ulysses* and the other experiments in modernism and show how *Ulysses* redefines the concepts of epic and hero. We will also view *Ulysses* to address major issues in literary study and to test various critical and scholarly approaches. Such a self-conscious inquiry into theories and methods should prepare students to confront other complex texts, as well as help them define their own critical positions as they plan their senior honors theses.

**493 Honors Essay Tutorial I**
Fall or spring. 4 credits. Prerequisites: senior standing and permission of director of the honors program.
Staff.

**494 Honors Essay Tutorial II**
Fall or spring. 4 credits. Prerequisites: English 493 and permission of director of the honors program.
Staff.

**495 Independent Study**
Fall or spring. 2–4 credits.

## Courses Primarily for Graduate Students

Permission of the instructor is a prerequisite for admission to courses numbered in the 600s. These are primarily intended for graduate students, although qualified undergraduates are sometimes admitted. Undergraduates seeking admission to a 600-level course should consult the instructor. The list of courses given below is illustrative only; a definitive list, together with course descriptions and class meeting times, is published in a separate department brochure before course enrollment each term.

**Fall**

**600 Colloquium for Entering Students**

**611 Old English (also English 411)**
T. Hill.

**621 Authority and Experiment in the Renaissance Epic**
G. Teskey

**639 Gothic and Gender**
M. Jacobus.

**645 Victorian Poetry**
P. Sawyer.

**662 Gender in Nineteenth-Century America**
S. Samuels.

**672 Critical and Theoretical Perspectives on the Modernist Tradition**
D. Schwarz.

**694 Marxism and Post-Colonial Discourse**
B. Jeyifo.

**702 Literature and Theory (also English 302 and Comparative Literature 302)**
J. Culler.

**721 Mourning, Melancholy, and Hysteria in Seventeenth-Century Writing (also Comparative Literature 721)**
T. Murray.

**740 Studies in Wordsworth**
S. Parrish.

**741 The Theatre of Revolution: The Politics and Poetics of Spectacle (also English 448, Society for the Humanities 421)**
R. Parker.

**751 Topics in Modernism**
S. Siegel.

**762 The American Transcendental Movement**
J. Porte.

**780.1 M.F.A. Seminar: Poetry**
K. McClane.

**780.2 M.F.A. Seminar: Fiction**
L. Herrin.

**793 Master's Essay**
Fall or spring. No credit.
Staff.

**794 Directed Study**
Fall or spring. 5 credits, variable.
Staff.

**795 Group Study**
Fall or spring. 5 credits, variable.
Staff.

**796 Teaching and Research**
Fall or spring. 5 credits, variable.
Staff.

**Spring**

**406/606 The Archaeology of Early Christian England and Ireland (also English 406 and Archaeology 406)**
R. Farrell.

**612 Beowulf (also English 412)**
T. Hill.

**619 Chaucer**

**622 English and American Seventeenth-Century Prose**
M. A. Radzinowicz.

**627 Shakespeare**
B. Adams.

**643 Writers of the Revolution (also Society for the Humanities 428)**
R. Parker.

**663 Bodies and Machines**
M. Seltzer.

**668 Post-Modern Fiction**
M. Hite.

**674 Feminist Theory and Psychoanalysis**
M. Jacobus.

**682 Black Women Writers**
H. Spillers.

**684 Afro-American Literature in Ante-Bellum America**
H. L. Gates.

**686 Harlem Renaissance**
H. L. Gates.

**719 Chaucer and the Courtly Tradition**
W. Wetherbee.

**753 Literary Anti-Feminism**
L. Brown.

**778 G. Eliot**
D. Mermin.

**779 Avant-Garde Theory of Drama**
B. Jeyifo.

**781.1 MFA Seminar—Poetry**
R. Morgan.

**781.2 MFA Seminar—Fiction**
D. McCall.

**783 Title Unknown**
Lorrie Moore.

## FRENCH LANGUAGE AND LINGUISTICS

See Department of Modern Languages and Linguistics.

## FRENCH LITERATURE

See Department of Romance Studies.

## FRESHMAN WRITING SEMINARS

For information about the requirements for freshman writing seminars, see p. 22. For descriptions of seminar offerings, see p. 319 and consult the John S. Knight Writing Program brochure, available from college registrars in August for the fall term and in November for the spring term.

## GEOLOGICAL SCIENCES

D. L. Turcotte, chair; A. L. Bloom, director of undergraduate studies; R. Allmendinger, M. Barazangi, W. A. Bassett, J. M. Bird, L. D. Brown, L. M. Cathles, J. L. Cisne, B. L. Isacks, T. E. Jordan, D. E. Karig, S. Kaufman, R. W. Kay, J. E. Oliver, F. H. T. Rhodes, W. B. Travers, W. M. White

As an intercollege unit, the Department of Geological Sciences has degree programs in both the College of Arts and Sciences and the College of Engineering.

Within the past few years, studies of the earth have become increasingly important. The need for increased understanding of plate tectonics, limited energy and mineral reserves, awareness of natural hazards such as earthquakes and volcanic eruptions, and an increasing concern for our environment encourage studies of the earth by geologists. Consequently, interest in geology courses and the employment of geologists have greatly increased.

There are eighteen faculty members, including Cornell's president, in the department, and twenty-five undergraduate majors. A variety of courses provides our students with a broad and solid foundation. The department is particularly strong in geophysics, petrology and geochemistry, structural geology, and tectonics.

Students study the deeper parts of the earth's crust using many techniques but concentrating on seismic methods. High-pressure, high-temperature mineralogy research uses the diamond anvil and Cornell's synchrotron as research tools. Undergraduates have served as field assistants for faculty and graduate students who work in Greenland, British Columbia, the Aleutian Islands, Scotland, Barbados, the South Pacific, South America, and various parts of the continental United States. Undergraduates are encouraged to participate in research activities, sometimes as paid assistants.

Students who major in geological sciences are encouraged to take courses appropriate to their interests in the other sciences and mathematics. To develop skills in observing the natural earth, geology majors attend a summer field camp, usually during the summer following their junior year.

### The Major

The prerequisites for admission to a major in geological sciences in the College of Arts and Sciences are two two-semester sequences, Mathematics 191–192 and Physics 112–113, or their equivalents, and an additional semester course in chemistry or biological sciences, such as Chemistry 207. Geological Sciences 101,103, 111, or 201 followed by 102, 104, or 202 are recommended, but a student with a strong foundation in mathematics and science may be accepted as a major without completion of an introductory sequence.

Majors take the five core courses in geological sciences, a summer field geology course, 6 credits of additional course work from geological sciences courses numbered 300 or 400, plus an additional course in mathematics, physics, chemistry, or biology at an intermediate or advanced level.

*Core Courses*

**326 Structural Geology**

**355 Mineralogy**

**356 Petrology and Geochemistry**

**375 Sedimentology and Stratigraphy**

**388 Geophysics and Geotectonics**

Prospective majors should consult one of the following departmental major advisers—A. L. Bloom, L. M. Cathles, J. L. Cisne, B. L. Isacks, or W. B. Travers—as early as possible for advice in planning a program. Students majoring in geological sciences may attend the departmental seminars and take advantage of cruises, field trips, and conferences offered through the Department of Geological Sciences.

Courses offered at the 100 and 200 level are open to all students. Certain 300-level courses in geology may be of particular interest to students of chemistry, biology, ecology, and physics. Students are encouraged to inquire about courses that interest them at the department office in Snee Hall.

**Honors.** An honors program is offered by the Department of Geological Sciences for superior students. Candidates for honors must maintain an overall 3.0 grade-point average and a cumulative average of 3.5 in the major and complete an honors thesis (Geological Sciences 490). Students interested in applying should contact the director of undergraduate studies during the second semester of the junior year.

### Courses

For course descriptions, see the Geological Sciences listing in the College of Engineering.

**101 Introductory Geological Sciences**
Fall, spring, or summer. 3 credits.
2 lecs, 1 lab, field trips, evening exams.
Fall: J. M. Bird, D. L. Turcotte; spring: W. B. Travers.
To better harmonize human endeavor with the natural earth, we need to know what is natural *on* earth. This course teaches observation and understanding of landscape, including coasts, rivers, valleys, and glaciated regions; the genesis of earthquakes, volcanoes, and mountains; evidence for the drifting of continents and its consequences; and the origin, discovery, and development of mineral and water resources. The lab teaches use of topographic and geologic maps and recognition of minerals and rocks and includes field trips to Cascadilla Gorge, Fall Creek, and Enfield Glen.

**102 Introduction to Historical Geology**

**103 Geology in the Field**

**104 Introduction to Oceanography**

**107 Frontiers of Geology I**

**108 Frontiers of Geology II**

**111 To Know the Earth**

**201 Introduction to the Physics and Chemistry of the Earth**

**202 Environmental Geology**

**210 Introduction to Field Methods in Geological Sciences**

**212 Special Field Trip**

**214 Western Adirondack Field Course**

**326 Structural Geology**

**355 Mineralogy**

**356 Petrology and Geochemistry**

**375 Sedimentology and Stratigraphy**

**388 Geophysics and Geotectonics**

**401 Field Geology**

**412 Experiments and Techniques in Earth Sciences**

**424 Petroleum Geology**

**431 The Earth's Crust: Structure, Composition, and Evolution**

**432 Digital Processing and Analysis of Geophysical Data**

**433 Exploration Seismology I: Data Acquisition and Processing**

**434 Exploration Seismology II: Analysis and Interpretation**

**441 Geomorphology**

**442 Glacial and Quaternary Geology**

**445 Geohydrology**

**452 X-Ray Diffraction Techniques**

**453 Modern Petrology**

**454 Advanced Mineralogy**

**455 Isotope Geochemistry**

**456 Geochemistry**

**474 Modern Depositional Systems**

**476 Sedimentary Basins: Tectonics and Mechanics**

**479 Paleobiology**

**487 Geophysical Prospecting**

**489 Earthquakes and Tectonics**

**490 Senior Thesis**

**491–492 Undergraduate Research**

**500 Design Project in Geohydrology**

**501 Geohydrology Design Project Seminar**

**502 Case Histories in Ground Water Analysis**

**600–699 Seminars and Special Work**

**621 Tectonic and Stratigraphic Evolution of Sedimentary Basins**

**622 Advanced Topics in Structural Geology**

**625 Rock and Sediment Deformation**

**631 Plate Tectonics and Geology**

**641 Advanced Geomorphology Topics**

**651 Petrology and Geochemistry**

**653 Mineralogy and Crystallography, X-Ray Diffraction, Microscopy, High-Pressure/Temperature Experiments**

**655 Advanced Topics in Petrology and Tectonics**

**657 Current Research in Petrology**

**662 Advanced Topics in Petroleum Exploration**

**671 Advanced Topics in Sedimentology and Stratigraphy**

**673 Paleobiology**

**680 Seismic Record Reading**

**681 Geophysics, Exploration Seismology**

**683 Advanced Topics in Seismology and Tectonics**

**685 Exploration Seismology, Gravity, Magnetics**

**687 Geophysics, Seismology, and Geotectonics**

**689 Research on Seismic-Reflection Profiling of the Continental Crust**

**693 Andes Seminar**

**695 Computer Methods in Geological Sciences**

**696 Geochemistry of the Solid Earth**

**697 Fluid-Rock Interactions**

**721 Marine Tectonics**

**722 Advanced Structural Geology I**

**724 Advanced Structural Geology II**

**728 Geology of Orogenic Belts**

**735 Advanced Geophysics I**

**737 Advanced Geophysics II**

**781 Geotectonics**

**787 Seismology**

# GERMAN STUDIES

A. Groos, chair; H. Deinert, director of undergraduate studies; D. Bathrick, B. Buettner, I. Ezergailis, S. L. Gilman, P. U. Hohendahl, C. A. Martin, P. M. Mitchell, L. M. Olschner, G. Waite

The Department of German Studies offers courses in German, Medieval German, Yiddish, and Old Icelandic area studies. Major areas of specialization cover the period from the early Middle Ages to the twentieth century. While the emphasis remains on literature, the department teaches film, theater, the political culture of the two Germanys, women's studies, music, intellectual history, and Jewish studies. Courses are designed with the general student population in mind; courses taught in German demand knowledge of the German language. The department often cosponsors courses with the departments of Comparative Literature, History, History of Art, Government, Music, Near Eastern Studies, and Theatre Arts, as well as with the Medieval Studies and Women's Studies programs and in the history of science. For further information about majors and courses, see Modern Languages and Linguistics.

## The Major

Students majoring in German are encouraged to design their programs in a manner that will allow for diversity in their courses of study. It should enable them to become acquainted with an adequate selection of major works, authors, and movements of German literature and to develop their skill in literary analysis. Students majoring in German will normally proceed through German 201, 202, 203, 204. Students who, because of previous training, are qualified to enroll in 300– or 400–level courses will be permitted to do so. For details, students may consult the major advisers, H. Deinert, in the Department of German Studies, or H. L. Kufner or W. Harbert, in the Department of Modern Languages and Linguistics. Students majoring in German are expected to complete successfully a minimum of six 300- and 400-level courses in addition to German 303–304. These courses should be a representative selection of subjects in German literature, Germanic linguistics, or both. The attention of students majoring in German is called to the courses offered by departments and programs such as Comparative Literature, History, History of Art, Government, Music, Society for the Humanities, Theatre Arts, and Women's Studies, many of which complement the course offerings in German.

Students majoring in German are expected to become competent in the German language. This competence is normally demonstrated by the successful completion of German 304. Placement of German majors who have done no work in German at Cornell will be determined by the level of preparation they have obtained elsewhere. For information, students should consult the major advisers, H. Deinert, H. L. Kufner, or W. Harbert.

## Study Abroad

Cornell has a formal agreement with the University of Hamburg enabling its undergraduates to take courses in any field offered by the German university. The program offers a challenging course of study and the experience of total immersion in German life and culture. Participants in this program attend a required 3-credit orientation course in September, which is designed to help them adjust to the academic and social life of Germany. Special field trips are organized as part of the orientation session. Beginning in mid-October, students enroll as fully matriculated students at the University of Hamburg.

Cornell maintains a center in Hamburg with appropriate support staff. The resident director is a faculty member from Cornell, who teaches a special seminar each semester, provides academic advice, and helps ensure the quality of the courses. The center, which includes a classroom, a small library, and word-processing facilities, is used by students for the orientation session, special seminars, tutorials, lectures, and informal gatherings.

Applicants are expected to have attained at least proficiency in German prior to departure. Students are strongly encouraged to study abroad for the entire year rather than for one semester. For further information, students should contact the director of undergraduate studies and the director of Cornell Abroad.

## German Area Studies Major

The German area studies major is intended for students who are interested in subject matter related to German-speaking countries but not necessarily or not exclusively in German literature or linguistics. Students will select appropriate courses offered in history, government, economics, music, theater arts, or other suitable subjects. These students will select a committee of two or more faculty members to help them design a program and supervise their progress. One committee member must be from the German faculty of either the Department of Modern Languages and Linguistics or the Department of German Studies. The other member(s) should represent the student's main area of interest.

The student majoring in German area studies is expected to become competent in the German language. Such competence is normally demonstrated by successful completion of German 304. A minimum of six area courses above the 200-level is required for the major.

Students coming to Cornell with advanced standing in German and/or another subject often find it possible to complete two majors. Recent double majors have combined history, psychology, chemistry, biology, or physics with German literature or German area studies. Students in Agriculture and Engineering have entered dual degree programs.

**Honors**. The honors program in German is open to superior students who want to work independently in an area of their own choice. Students are free to select any faculty member of the Field of Germanic Studies (in the case of area studies majors, the appropriate member of their committee) to assist them in designing their honors program, to supervise their work, and to help them select a suitable topic for an honors essay. The independent study courses, German 451 and 452, may form part of the program.

## Freshman Writing Seminar Requirement

The following courses will satisfy the freshman writing seminar requirement: German 107, 109, 151, 175, 211, and 312. For details students should consult the instructors.

**Fees**. Depending on the course, a small fee may be charged for photocopied texts for course work.

## Literature

**107 Images of the Individual and Society**
Fall or spring. 3 credits.
T R 11:40–12:55. A. Terhune.
This course will examine several texts, mainly of the nineteenth century, exploring their various treatments of the individual and society and discussing issues such as sanity and madness and private ethics and public mores. We will be reading short fiction, drama, and other prose works by authors such as Hoffman, Büchner, and Nietzsche. Much emphasis will be placed on writing, and we will closely examine the role style plays in each of the texts read.

### Freshman Writing Seminars

**109 Fairy Tales and the Literary Imagination**
Fall or spring. 3 credits.
M W F 9:05, 10:10, 11:15, or 12:20 or
T R 8:40–9:55 or 11:40–12:55.
I. Ezergailis and staff.
Starting with the fairy-tale collection of the Brothers Grimm, we will trace the reverberation of fairy-tale elements in German literature, primarily from the nineteenth century. Preoccupation with the writing process—especially in the German romantic tradition—will be fruitful for the development of writing skills.

**151 Kafka, Hesse, Brecht, and Mann**
Fall or spring. 3 credits.
Lec, M 10:10; secs, W F 10:10 or
T R 11:15. H. Deinert and staff.
This course will be based on complete works (in English translation) by four representative German authors of the first half of the century. Although dealing with works of great popular appeal (*Demian, Siddhartha, Death in Venice, The Metamorphosis, Mother Courage, Galileo,* and others), the emphasis of the course will be on improving writing skills. We will meet once a week for a combined lecture. In addition, there will be regular conferences between students and their instructors to discuss the papers.

**175 German Cinema**
Fall or spring. 3 credits.
T R 10:10–11:25 or 11:40–12:55.
G. Waite and staff. Screening to be arranged.
How do you *look* at movies? How do you look at *German* movies? How do you *talk and write* about what you see? This freshman writing seminar has three primary and interrelated aims: (1) to provide students with the tools necessary to view all movies analytically and critically; (2) to sharpen students' abilities to articulate their ideas, in this case their ideas about what they see; and (3) to introduce students to the history (from the earliest silent flicks, through the Nazi period, up to the present scene) of one of the most exciting and influential cultural practices: German cinema. *No* knowledge of German is required: all films will have subtitles or be dubbed, or translated scripts will be provided. You will write many short papers that will be returned with great attention to analytic and writing skills. Lectures, classroom discussions, and screenings.

### Courses Offered in German

**201 Introduction to German Literature I: Prose**
Fall or spring. 3 credits. Prerequisite: qualification in German or permission of instructor. Taught in German. Fulfills both the language proficiency requirement and, followed by German 202 or another German literature course at the 200 level or above, the humanities distribution requirement.
Fall: M W F 12:20 or T R 10:10–11:25; spring: M W F 12:20. L. M. Olschner and staff.
An intermediate course designed to improve reading, writing, speaking, and listening skills in German. Emphasis is placed on developing reading competency, tools of literary analysis, and expansion of vocabulary. Grammar review included. The complexities of inner and outer reality as expressed in selected prose works of Bachmann, Brecht, Kafka, Mann, Dürrenmatt, Aichinger and others.

**202 Introduction to German Literature II: Drama**
Fall or spring. 3 credits. Prerequisite: German 201 or permission of instructor. Taught in German. Fulfills both the language proficiency requirement and, together with German 201 or another German literature course at the 200 level or above, the humanities distribution requirement.
Fall: M W F 12:20–1:10; spring: M W F 12:20–1:10 or T R 10:10–11:25.
L. M. Olschner and staff.
An intermediate course designed to improve reading, writing, speaking, and listening skills in German. Emphasis is placed on developing reading competency, tools of literary analysis, and expansion of vocabulary. Self-confrontation and social conflict in the plays of major Austrian, Swiss, and German dramatists, including Dürrenmatt, Brecht, Frisch, Hofmannsthal, Goethe, and Schiller.

**211 Intensive Workshop in Germanic Studies for Freshmen I**
Fall. 6 credits. Intended for entering freshmen with extensive training in the German language (CPT achievement score of 650 or comparable evidence; please consult instructor). Taught in German. Satisfies the language and distribution requirements *or* the freshman writing seminar requirement.
T R 1:25–3:20. H. Deinert.
Not intended as a survey but rather as a rigorous seminar designed to familiarize students with literary forms and the tools of critical analysis. The course will provide an intensive introduction to the study of German literature through the discussion of exemplary prose works, dramas, and poems from the eighteenth and nineteenth centuries.

**307 Modern Germany**
Spring. 4 credits. Prerequisite: German 202 or equivalent. Taught in German.
T R 1:25–2:40. L. M. Olschner.
Introduction to the history of postwar Germany, the development of the two Germanys, and their societies. The emphasis is on cultural and social institutions such as mass media, educational systems, and political parties. Students will have the opportunity to practice their spoken and written German.

**312 Intensive Workshop in Germanic Studies for Freshmen II**
Spring. 4 credits. May be used to satisfy the Freshman Seminar requirement. Taught in German.
T R 1:25–3. I. Ezergailis.
Designed primarily as a sequel to German 211. Emphasis is on German literature since 1900 (T. Mann, Hesse, Kafka, Brecht, Dürrenmatt, Peter Weiss, Plenzdorf, Rilke, Benn, Celan). Supplementary reading from contemporary philosophy, psychology, sociology, and political theory.

**[337 The German *Novelle***
Fall. 4 credits. Prerequisite: German 201–202 or permission of instructor. Taught in German. Not offered 1989–90.
M W F 9:05. B. Buettner.
An investigation of the development of the German *Novelle* as a major literary genre during the nineteenth and twentieth centuries. We will discuss the *Novelle* as a genre in relation to the changing literary and cultural context. Readings will include works by Goethe, Kleist, Tieck, Gotthelf, Hofmannsthal, Mann, and Grass.]

**[353 Kleist**
Spring. 4 credits. Prerequisite: German 201–202 or permission of instructor. Taught in German. Not offered 1989–90.
W 1:25–3:20. H. Deinert.
Reading and analysis of selected dramas, novellas, and essays.]

**[354 Schiller**
Spring. 4 credits. Prerequisite: German 201–202 or permission of instructor. Taught in German. Not offered 1989–90.
W 1:25–3:20. H. Deinert.
A discussion of Schiller's dramas, selected poetry, and philosophical and aesthetic writing against the political and intellectual background of eighteenth-century Europe.]

**[355 The Age of Goethe**
Not offered 1989–90.]

**356 Goethe's *Faust***
Spring. 4 credits. Prerequisite: German 201–202 or permission of instructor. In addition to the regularly scheduled class time, there will be take home assignments and individual conferences.
W 1:25–3:20. G. Waite.
A close reading of Goethe's *Faust*, Parts I and II, with an introduction to representative criticism and literary theory, both during the Age of Classicism and subsequently.

**[357 Major Works of Goethe**
Spring. 4 credits. Prerequisite: German 201–202 or permission of instructor. Taught in German. Not offered 1989–90.
W 1:25–3:20. H. Deinert.
*Goetz, Tasso, Iphigenie, Werther, Faust, Wahlverwandtschaften, Novelle*, selections from critical writings, and poetry.]

**[358 Romanticism**
Fall. 4 credits. Prerequisite: German 201–202 or permission of instructor. Taught in German. Not offered 1989–90.
M W F 10:10. G. Waite.
A systematic survey of texts of early German romanticism. We will focus primarily on a close reading of exemplary works but do so always with attention to the larger ideological, historical, and social contexts from which European literature of the late eighteenth and early nineteenth centuries emerged.]

**[359 Heine and Büchner**
Spring. 4 credits. Prerequisite: German 201–202 or permission of instructor. Taught in German. Not offered 1989–90.
T R 10:10–11:25. G. Waite.
This course will introduce major themes and problems of early to mid-nineteenth century. German literature by way of a close, in-depth analysis of these two exemplary writers. Our special concern will be to discuss different modes of response by literature to the most pressing political and social issues of its day.]

**[360 Naturalism and Feminism**
Not offered 1989–90.]

**[362 Modern German Literature II: Twentieth-Century Prose**
Not offered 1989–90.]

**[363 Contemporary Literature**
Not offered 1989–90.]

**[364 German Lyric Poetry of the Nineteenth Century**
Fall. 4 credits. Prerequisite: German 201–202 or permission of instructor. Taught in German. Not offered 1989–90.
T R 1:25–2:40. L. M. Olschner.
This course will cover the period from the mid-1790s to the mid-1890s and interpret major texts from the mature Goethe to the young Hofmannsthal. Readings and discussions will illuminate the development of individual poets in their time, the transformation of poetic speech, and the history of forms. Questions of poetics, forms, reception, canon, and influence; the problem of epoch designation; and the role of poetry and the poet in society will complement the analyses. In the context of the romantic identification of music and poetry we will hear musical settings of representative poetic texts (*Lieder* by Müller/Schubert, Heine/Schumann, Mörike/Wolf, and Rückert/Mahler).]

**365 German Poetry of the Twentieth Century**
Fall. 4 credits. Prerequisite: German 201–202 or permission of instructor.
M W F 10:10. L. M. Olschner.
The course will focus on exemplary lyric texts by Rilke, Trakl, Benn, Brecht, and Celan, and include others by poets such as Lasker-Schüler, Sachs, and Bachmann, whose work helps define or question contexts of tradition, discontinuity, modernism, poetic canon, and hermeticism. In examining German Symbolism and Expressionism and their continuing traces, political and willfully non-political poetry, exile and Holocaust writing, and the late reception of Hölderlin, we shall attempt to understand the progression, digression, and regression of poetic language, the reactions of poets to historical pressures, and the problems of influence and originality, of formulating poetics, and of determining period or movement.

**[376 Contemporary Soviet Latvian Literature**
Fall. 4 credits. Prerequisite: permission of instructor. Taught in Latvian. Not offered 1989–90.
M W F 12:20. I. Ezergailis.
Analysis of the verse and prose of such world-caliber Soviet authors as Vacietis, Belsevica, Ziedonis, Peters, and Ezera. We will also examine the social and political climate surrounding their work by reading current newspapers as well as literary and theoretical periodicals.]

### Courses in English Translation

**283 Contemporary European Society and Politics (also History 283 and Government 343)**
Fall. 4 credits.
T R 2:55–4:10. N. Karwan, J. Pontusson, G. Waite.
An introduction to European societies, their development, and current dynamics. The course is designed for students with an interest in, or experience of various European countries, who wish to increase their knowledge of Western Europe. There are no formal prerequisites.

**[285 Contemporary European Society and Politics (also History 285 and Government 285)**
Fall. 4 credits. Not offered 1989–90.
T R 2:30–3:45. S. L. Gilman, J. Pontusson.
This course is designed for students with an interest in, or experience of, various European countries, who wish to increase their knowledge of Western Europe. There are no formal prerequisites. This course provides a general introduction to modern European society and politics. Focusing on Britain and the countries of northern Europe, we will explore the meaning of current events and issues from a historical perspective. Topics will include the legacy of colonialism, class culture and the role of organized labor, immigrant workers and ethnic minorities, problems of national identities; new social movements (e.g., the "Greens" in West Germany), and European perceptions of the United States. The course will pursue these themes and others through films, newspaper articles, and literature as well as critical writings.]

**[314 Nietzsche, the Man and the Artist**
Spring. 4 credits. Not offered 1989–90.
T R 2:30–3:45. S. L. Gilman.
An intensive reading of selections from Nietzsche's poetry, letters, and philosophical writings: *The Birth of Tragedy, The Gay Science, Thus Spake Zarathustra, Beyond Good and Evil, Ecce Homo.* His work will be read in the intellectual context of his time and will be interpreted both as a reflection of his intellectual development and as a manifestation of his literary genius. In discussing the literary aspect of his work, close attention will be paid to Nietzsche's poetics.]

**[320 Postwar German Novel**
Spring. 4 credits. Not offered 1989–90.
T R 10:10–11:25. I. Ezergailis.
A reading, in English translation, of such post-1945 German novelists as Grass, Böll, Johnson, and Christa Wolf. This course is recommended for the concentration in modern European studies.]

**322 Medicine and Civilization (also Biology and Society 322 and HPST 322)**
Spring. 4 credits.
T R 1:25–2:40. S. L. Gilman.
What is sickness? What is health? Who is the physician? Is a physical illness different from mental illness? Where is medicine practiced? Is being a patient or a doctor different from culture to culture and from age to age? This course will introduce the undergraduate student to the historical and cultural context of medicine. Our sources will range from the texts of ancient Greek medicine to contemporary films and novels dealing with medicine. We will examine the historical and social context of mental illness as well as physical illness from the standpoint of patient, physician, and "society." All of the primary readings are available in English.

**[327 Health and Disease (also Biology and Society 327 and Psychology 387)**
Fall. 4 credits. Not offered 1989–90.
M 1:25–3:25. S. L. Gilman and others.
Everyone knows what health and disease are or do they? This Common Learning course on health and disease will explore some of the cultural, psychological, philosophical, anthropological, medical, economic, and political dimensions of these concepts to show how various models of disease function in contexts from business to engineering, from the military to the medical profession. The course will be divided into two segments: the first will examine the general implications of concepts of health and illness; the second will study these general principles as reflected in the definition, treatment, and mythmaking surrounding one specific disease: schizophrenia. The course will draw on specialists from throughout the university.]

**338 19th-Century Drama**
Fall. 4 credits. Prerequisite: German 201–202 or permission of instructor.
M W F 12:20–1:10. I. Ezergailis.
We will read, in German and with close attention, a selection of plays spanning the century. The list of authors includes Franz Grillparzer, Friedrich Hebbel, Georg Büchner, and ends with Gerhart Hauptmann.

**347 Reading Freud: Race, Gender, and Psychoanalysis (also Comparative Literature 347, English 347, HPST 347, and Psychology 389)**
Fall. 3 credits. Lecture and discussion. In English.
F 1:25–3:20. S. L. Gilman.
This course will read a series of texts from the formative works of Sigmund Freud (beginning with the *Studies in Hysteria* and concluding with Freud's reading of the Schreber autobiography). These readings will be placed within the tension existing at the turn of the century between the concepts of the biology of race and the biology of gender. Close attention will be paid to the cultural, scientific, as well as polemical literature on the ideas of race and gender from the biological writings of the late nineteenth century. The course will also provide an introduction to the basic concepts of Freudian psychoanalytic theory.

**[348 Women in Medieval Literature (also Comparative Literature 349 and Women's Studies 349)**
Spring. 4 credits. Not offered 1989–90.
M W F 9:05. B. Buettner.
A study of women and their roles in the social order as portrayed in the literature of the Middle Ages. Readings will illustrate the range of attitudes toward women from asceticism and antifeminism to their idealization in courtly love lyric and romance. We will examine woman's putative influence in literature, both positive and negative, and on man and society, and the debates over woman's "proper" attitude and role. Works in English translation will include a play by Hroswitha of Gandersheim, the *Nibelungenlied*, *Willehalm*, selected Mariological and mystical poems, courtly love lyric, *Parzival*, and *Tristan and Isolde*.]

**349 Anti-Semitism in Germany and the Jewish Response (also Near Eastern Studies 349)**
Fall. 3 credits. Reading knowledge of German helpful, though the basic texts will be read in English.
M 1:25–3:20. S. L. Gilman.
An overview of the history of German anti-Semitism from Luther to Hitler. Readings from political, theological, and literary texts ranging from the Church Fathers (as background to a reading of Luther) to the anti-Semitic literary novels of the nineteenth century to *Mein Kampf*. Parallel texts will be examined to judge the Jewish intellectual and literary response to evolving forms of German anti-Semitism.

**[350 Yiddish Literature in English Translation**
Not offered 1989–90.]

**[354 Modern Drama (also Theatre Arts 327 and Comparative Literature 354)**
Fall. 4 credits. Not offered 1989–90.
T R 12:10–1:25. D. Bathrick.
Readings in European drama from Ibsen to the present.]

**[366 Broch and Musil**
Fall. 4 credits. There will be an additional discussion section for students who can read the original German. Not offered 1989–90.
M W F 12:20. I. Ezergailis.
We will read, in English translation, selected prose of two important and challenging authors whose works span the disintegration of the Austro-Hungarian empire and the forming of new configurations in politics, culture, and art. Along with their penetrating cultural critiques, they are also known for radical experimentation with form and genre.]

**374/674 Opera (also Music 274/674 and Italian 374)**
Fall. 4 credits. Prerequisite: Music 252 or proficiency in German or Italian.
M W 11:15–12:05. D. Rosen.
A study of major works of the German and Italian repertory between 1780 and 1920. Among the issues to be considered will be source-libretto and words-music relationships, reception, and criticism. Works to be studied will include operas by Mozart, Verdi, Wagner, Puccini, and Strauss.

**[377 Topics in Yiddish Literature**
Not offered 1989–90.]

**[381 Marxist Cultural Theory (also Comparative Literature 381)**
Fall. 4 credits. Not offered 1989–90.
T R 12:20–1:35. W. Cohen, P. U. Hohendahl.
A historical survey of leading European Marxist thinkers, offering a critical perspective on culture, particularly in relation to ideology. Mainly a close reading of selected texts, but with consideration of historical contexts as well. Some emphasis on aesthetics and especially literary theory. Readings from Marx, Engels, Lukács, Gramsci, Brecht, Benjamin, Horkheimer, Adorno, Marcuse, Sartre, Althusser, and Williams.]

**[396 German Film (also Comparative Literature 396 and Theatre Arts 396)**
Fall. 4 credits. Requirements: participation in class discussion, one paper, midterm, and final. Not offered 1989–90.
T R 11:40–12:55; screening, T 4:30.
D. Bathrick.
The goal of the course is to explore the form and context of German film in relation to the cultural and sociopolitical context of which it is a part. Accordingly, the material discussed will be divided into three major periods: Weimar film, 1918–1933; Nazi film 1933–1945; Postwar film, 1945–present. Readings and lectures will be devoted to formal and cultural developments in the history of German film as well as intrepretive analysis of selected individual films. In both lectures and discussions, particular emphasis will be placed on helping students develop an appropriate method for viewing and analyzing films.]

**[399 Forms of Opposition: German Women Writers on the Nazi Period (also Comparative Literature 399 and Women's Studies 399)**
Not offered 1989–90.]

**[409 The Double Identity Crisis: German-Jewish Women from Rahel Varnhagen to Hannah Arendt (also Near Eastern Studies 409, Women's Studies 409, and Society for the Humanities 409)**
Fall. 4 credits. Not offered 1989–90.
M 12:20–2:15. A. Colin.
Through an analysis of texts by Rahel Varnhagen, Rosa Luxemburg, Else Lasker-Schüler, Nelly Sachs, Rose Ausländer, Hannah Arendt, and other German-Jewish women, this seminar will explore their diverse attempts to cope with a double identity crisis, internalized prejudices, religious beliefs, and cultural patterns, as well as changing social rules. It will discuss the impact of their fatal double bind on the development of feminist movements in German-speaking countries as well as on German-Jewish intellectual history, psychoanalysis, philosophy, and literature.]

**[419 Thomas and Heinrich Mann**
Fall. 4 credits. Not offered 1989–90.
M W F 12:20. I. Ezergailis.
We will read, in translation, a group of texts by Thomas and Heinrich Mann (including *Buddenbrooks*, *Doctor Faustus*, *Henri VI*) and consider them as autonomous works and as witnesses to the dynamic of a brothers' strife that illuminates not only a model of psychological tensions but highly significant cultural and political configurations of a decisive time in German history. This is indeed "a brotherhood in which German history was mirrored . . . in all its agony." Essayistic and publicistic texts of both brothers will also be analyzed along with some of their correspondence. We will also read some background material to provide the needed social, political, and intellectual context. This course is recommended for the concentration in modern European studies.]

**[438/648 East and West German Drama: Post-1945 (also Theatre Arts 438/648)**
Fall. 4 credits. Not offered 1989–90.
W 1:25–3:20. D. Bathrick.
This course will cover the major historical and textual developments in German theater from the end of World War II to the present. Leading dramatists from West and East Germany, Switzerland, and Austria (Brecht, Frisch, Dürrenmatt, Weiss, Hochhuth, Müller, Braun, Kroetz, Handke, and others) will be treated in light of the political events and aesthetic-dramaturgical traditions from which they emerge and with which they are taking issue.]

**[444/644 The Holocaust Survivor as Author (also Near Eastern Studies 444)**
Spring. 4 credits. Reading knowledge of German helpful; however two of the major novels are available in English. Not offered 1989–90.
M 1:25–3:20. S. L. Gilman, E. Hilsenrath.
The topic will be the novels of the German-American writer Edgar Hilsenrath. Hilsenrath has written three major novels, including the best-selling, *The Nazi and the Barber*, on the topic of the Holocaust. His work is unique in that it uses black humor and satire to represent the world of the Holocaust. The seminar will cover the general literature on the writing of the Holocaust and look at the problems of Hilsenrath's work in the light of contemporary criticism (Langer, Des Pres, Steiner). Hilsenrath will take part in the seminar for the month of April, during which additional, informal meetings with him will be arranged.]

### Graduate and Advanced Undergraduate Courses

**[405 Introduction to Medieval German Literature I**
Fall. 4 credits. Prerequisite: reading knowledge of German. Not offered 1989–90.
M W F 10:10. A. Groos.
The course will emphasize learning Middle High German in a literary context, using the *Nibelungenlied* and a romance of Hartmann von Aue.]

**[406 Introduction to Medieval German Literature II**
Spring. 4 credits. Prerequisite: German 405 or equivalent. Not offered 1989–90.
M W F 10:10. A. Groos.
The course will survey the Classical period, emphasizing Wolfram von Eschenbach's *Parzival*, Gottfried von Strassburg's *Tristan und Isolde*, and major poets of the *Minnesang*, especially Walther von der Vogelweide.]

**[431 Goethe's Poetry**
Not offered 1989–90.]

**[433 E. T. A. Hoffmann**
Not offered 1989–90.]

**451–452 Independent Study**
451, fall; 452, spring. 1–4 credits each term.
Prerequisite: permission of instructor.
Hours to be arranged. Staff.

**[495 The Aesthetic Theory of the Frankfurt School (also Comparative Literature 495)**
Spring. 4 credits. Not offered 1989–90.
R 1:25–3:20. P. U. Hohendahl.
This course is designed as an introduction to the history of the Frankfurt School and the essential concepts of critical theory. The emphasis will be placed on the theory of culture and its application to the understanding of literature and aesthetics. The reading material will be taken from the works of Max Horkheimer, Theodor W. Adorno, Walter Benjamin, and Jürgen Habermas.]

**497/697 The Hermeneutic Tradition (also Comparative Literature 497/697)**
Fall. 4 credits.
W 2:30–4:30. W. W. Holdheim.
Hermeneutics is not so much a particular philosophy as an abiding yet developing tradition of reflexivity. The course will place this approach into a historical perspective, tracing it back to antiquity (St. Augustine), then following its development from eighteenth-century rationalism via romantic hermeneutics (Schleiermacher, E. A. Poe) and the contribution of the Historical School (Droysen) to *Geisteswissenschaften* (Dilthey). Finally, there will be a discussion of various twentieth-century trends (Bultmann, Ricoeur, Gadamer) reflecting the influence of Heideggerian phenomenology.

### Seminars

*Note:* For complete descriptions of courses numbered 600 or above consult the appropriate instructor.

**[605 Introduction to Modern German Literary Theory with an Emphasis on Contemporary Criticism (also Comparative Literature 605)**
Fall. 4 credits. Not offered 1989–90.
R 2:30–4:25. P. U. Hohendahl.
The seminar will offer a survey of German criticism from 1900 to the present. Emphasis will be placed on the period from 1945 to the present. The aim of the course is to familiarize incoming graduate students with the main currents of German criticism. Readings will be taken from Heidegger, Staiger, Käte Hamburger, Szondi, Adorno, Jauss, and others.]

**[611 Seminar in Old Icelandic Literature I (also English 602)**
Not offered 1989–90.]

**[612 Seminar in Old Icelandic Literature II (also English 612)**
Not offered 1989–90.]

**[623 Seminar in Medieval German Literature I (also Medieval Studies 601)**
Fall. 4 credits. Not offered 1989–90.
W 1:25–3:25. A. Groos.
Topic: *Minnesang*.]

**[624 Seminar in Medieval German Literature II**
Spring. 4 credits. Not offered 1989–90.
T 1:25–3:20. A. Groos.
Topic: *Parzival*.]

**[625 The Northern Renaissance and Reformation**
Spring. 4 credits. Not offered 1989–90.
M 1:25–3:25. S. L. Gilman.
Topic: disease and society in fifteenth- and sixteenth-century Germany. The course will center on the function of metaphors of disease in writers such as Erasmus, Luther, and Hutten and the relationship between these metaphors and the social perception of illness, especially the syphilis epidemics of the late fifteenth and early sixteenth centuries. Readings in German and Latin of major texts in intellectual and medical history.]

**[627 Baroque**
Fall. 4 credits. Not offered 1989–90.
R 1:25–3:20. P. U. Hohendahl.
The seminar will focus on the development of German literature from 1620 to 1700 with an emphasis on its critical and historical assessment. The readings will stress the special nature of the Baroque period, i.e., its political and social structure, as well as its major religious and aesthetic tendencies, as a transition from feudalism to the early absolutism. The discussion will highlight the role of the poet, the function of literature, and the composition of the audience. All major genres (poetry, drama, novel) will be examined. Among the authors to be read will be Fleming, Grimmelshausen, Gryphius, Hofmannswaldau, Opitz, and Zigler.]

**629 The Enlightenment**
Fall. 4 credits.
R 1:25–3:20. P. U. Hohendahl.
The seminar will focus on eighteenth-century German literature and philosophy from 1730 to 1790. Emphasis will be placed on the concept of *Aufklärung* and its meaning for the development of German thought. The discussions will stress major areas of critical inquiry, such as religion, philosophy, and literature. Readings will be taken from authors like Forster, Gellert, Gottsched, Kant, Lessing, and Wieland. The critical literature will include the writings of Adorno, Foucault, Habermas, Horkheimer, and Koselleck.

**[632 *Faust***
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
M 1:25–3:25. G. Waite.
An intensive analysis of parts I and II.

Our task will be to combine techniques of close reading and attention to textual nuance with a concern for the history of the reception and appropriation of the text, including contemporary theory (e.g., hermeneutics, deconstruction, semiotics, feminism, and historical materialism).]

**633 Hölderlin (also Comparative Literature 633)**
Spring. 4 credits. Conducted primarily in English, most texts in German; good reading knowledge of French useful, not required.
R 3:35–5:35. G. Waite.
We will read Holderlin's major writings and some representative secondary scholarship.

**[635 Backgrounds of German Realism**
Not offered 1989–90.]

**[636 Nineteenth-Century Poetry**
Not offered 1989–90.]

**[637 Seminar in Realism: *Die Novelle***
Not offered 1989–90.]

**[638 Contemporary German Women Writers**
Not offered 1989–90.]

**[639 German Poetry of the Twentieth Century**
Spring. 4 credits. Not offered 1989–90.
R 3:35. L. M. Olschner.
The seminar will focus on close readings of exemplary poetic and theoretical texts. George, Hofmannsthal, and especially Rilke will provide the foundation on which aspects of tradition, modernism, avant-gardism, and hermeticism can be defined and differentiated. Expressionism, Dada, Surrealism, traditional and recent nature poetry, political poetry from the right and left, Holocaust poetry, poetry of *Innerlichkeit*, and concrete poetry are the areas of primary interest.]

**[640 Paul Celan in Tradition and Context**
Spring. 4 credits. Open to qualified undergraduates with permission of instructor. Not offered 1989–90.
W 3:35. L. M. Olschner.
Paul Celan, now widely recognized as one of the most important European poets in this century, has complex origins: belonging to the Ashkenazim in Rumania, who spoke German at home, Celan never lived in a German-speaking environment after moving to Paris in 1948. Having lost his parents in a concentration camp, he lived the fractured existence of writing in the language of the murderers. The seminar examines Celan's cultural background in Czernovitz and his indebtedness to romanticism, symbolism, and Surrealism; the context of the Cabala and the Holocaust; intertextual connections with Hölderlin, Rilke, and Mandelstam, as well as dialogues with Heidegger, Benn, and N. Sachs; his translations from seven languages; and poetics and the reception of his poetry, especially in the conservative climate of the Federal Republic of Germany.]

**[641 The Modern German Novel**
Not offered 1989–90.]

**[642 West German Literature, 1945–1970**
Spring. 4 credits. Open to advanced undergraduates with permission of instructor. Taught in German. Not offered 1989–90.
W 1:25–3:25. L. M. Olschner.
The seminar will emphasize source texts of all genres and analyze the cultural and political background leading to the production of texts that may be read as mimetic echos or critical reactions to the emergence of postwar West Germany. The twenty-year history of the *Gruppe 47* will provide the central frame of reference. The dubiousness or validity of terms such as *Nullpunkt*, *Kahlschlag*, and *Trümmerliteratur*; the function, significance, and history of literary magazines in the late forties and fifties, attitudes and presuppositions of literary critics; the problem of *Vergangenheits-bewältigung*; and the role of literature in the public sphere are background areas that will add to an understanding of primary texts. Within this context the positions of Benn and E. Jünger will be examined, and paradigmatic texts by Böll, Grass, Johnson, Weiss, Enzensberger, and others will be interpreted in close readings.]

**[643 East German Novel of the Seventies and Eighties**
Fall. 4 credits. Not offered 1989–90.
T 3:35. D. Bathrick.
The course will explore the thematic and formal developments of the novel in the DDR since the publication of Christa Wolf's *Nachdenken über Christa T.* (1968) in the light of radically changing cultural and political norms (women, dissent, Jewish question, "subjectivity," socialist realism, etc.) in the society as a whole.]

**[644 The Holocaust Survivor as Author (also Near Eastern Studies 444)**
For description, see German Studies 444. Not offered 1989–90.]

**[648 East and West German Drama: Post–1945 (also Theatre Arts 438/648)**
For description, see German Studies 438. Not offered 1989–90.]

**650 Culture in the Weimar Period (also Theatre Arts 650)**
Spring. 4 credits.
T 3:35–5:35. D. Bathrick.
This survey course will treat major developments in the area of German culture (literature, cinema, painting) between 1900 and 1933. Individual representative texts will be studied and discussed in their relation to the cultural, political, and social contexts out of which they emerge. Lectures and discussions will focus *both* on detailed interpretation of individual works as well as on the general historical background and developments of the period.

**[660 Visual Ideology**
Spring. 4 credits. Not offered 1989–90.
T 3:35–5:35. G. Waite.
Some of the most interesting and influential approaches to visual objects have come from the peripheries of traditional art history and criticism. This seminar will analyze some of these approaches so as to understand the interactions between the disciplines of art history and criticism and such fields as philosophy, psychoanalysis, film and literary theory, and sociology. More specifically, we will attempt to advance a dialectical interpretation of the ideological and sociopolitical determinations on the reciprocal production and consumption of visual artifacts. Readings taken from Althusser, Barthes, John Berger, Benjamin, Bryson, T. J. Clark, Freud, Gadamer, Carlo Ginzburg, Hadjinicolaou, Hauser, Klingender, Kristeva, Lacan, Lenin, McCabe, Marin, Marx, Nietzsche, Ortega, Plekhanov, Max Raphael, Sontag, and Wolin. Examples of artifacts for analysis will be drawn primarily from the history of oil painting, but we will discuss other types as well, including photography and cinema.]

**[665 The Search for German Cultural Identity, 1850–1920**
Spring. 4 credits. Not offered 1989–90.
T 3:35. P. U. Hohendahl.
The seminar will concentrate on the period between the Revolution of 1848 and World War I, emphasizing the discourse on German national identity. The texts will be drawn from various areas, including history, music criticism, philosophy, and literature. Authors to be considered are Heine, Wagner, Nietzsche, and Thomas and Heinrich Mann.]

**674 Opera (also Music 274/674 and Italian 374)**
For description, see German Studies 374.

**[676 New German Cinema (also Theatre Arts 676)**
Spring. 4 credits. Not offered 1989–90.
T R 11:40–12:55; screening, T 4:30.
D. Bathrick.
The course will examine in depth major films and filmmakers who are considered a part of the German new wave cinema (Fassbinder, Schlöndorff, Von Trotta, Kluge, Sander, Herzog, Wenders, etc.). Of special interest will be the differing impact of these films in the contexts of West Germany, Europe, and the United States.]

**677 Mozart (also Music 677)**
Fall. 4 credits.
T 1:25–4. N. Zaslaw.

**[678 Theory and Practice of Modern Drama (also Theatre Arts 678)**
Spring. 4 credits. Not offered 1989–90.
W 3:35. D. Bathrick.
The course will explore different theories of modern drama (Szondi, Brecht, Artaud, etc.) and discuss these on the basis of a number of representative works of modern drama. The point will be to trace the interchange between theory formation and dramatic practice.]

**[679 Bertolt Brecht in Context (also Comparative Literature 679 and Theatre Arts 679)**
Spring. 4 credits. Requirements: seminar paper that will form the basis for an oral presentation for class discussion. Not offered 1989–90.
M 2:30–4:30. D. Bathrick.
Brecht's theory and dramatic praxis will be examined in the light of a two-fold context: (1 ) the relation of selected plays and writings to the historical contingencies of the Weimar and exile periods in which they emerged; (2) in later periods: an analysis of the reception and various readings of these same works by later writers and critical publics in West Germany, East Germany, and the United States as a way of understanding the changing nature of aesthetic values in the postwar period. Special attention will be given to the importance of Marxism for Brecht's art, as well as to the author's role as a representative of the cultural avant-garde.]

**681 Mann and Myth**
Fall. 4 credits. Prerequisite: permission of instructor.
M 1:25–3:20. I. Ezergailis.
An examination of Thomas Mann's use of mythical (including biblical) sources and traditions, centering on a reading of the Joseph-tetralogy and the correspondence between Mann and Karl Kerény.

**[682 Seminar on Richard Wagner (also Music 678)**
Not offered 1989–90.]

**[683 Freud and the *Fin de Siecle***
Fall. 4 credits. Reading knowledge of German necessary. Not offered 1989–90.
M 2:30–4:25. S. L. Gilman and C. A. Martin.
A survey of major late nineteenth- and early twentieth-century works reflecting the adoption of the biological model as a central metaphor in German thought. Central to the course will be Freud's early work (*Studies in Hysteria, Interpretation of Dreams, Three Essays*). Other writers to be read include Nietzsche, Haeckel, Andreas-Salomé, Wedekind, Hauptmann, Schnitzler, and Lombroso.]

**[684 Heidegger: A Reading of *Being and Time***
Not offered 1989–90.]

**[685 Gramsci and Cultural Politics (also Comparative Literature 685 and Government 675)**
Spring. 4 credits. Not offered 1989–90.
W 1:25–3:20. G. Waite.
The modern transnational-capitalist state rules not only by domination and coercion but by the "noncoercive coercion" of cultural hegemony. What is the proper role of intellectuals (and who and what is an intellectual?) in cultural politics? How do "leftist" cultural critics, theorists, and artists living under late capitalism relate as individuals and collectively to nascent socialist countries? What is the relationship of intellectuals to political parties? We will deal with the political and cultural writings of Antonio Gramsci—whether Gramsci is best understood as a "Western Marxist" or as an extension of Leninist "orthodoxy"—and with the response of critics, artists, and cultural practices to Gramsci's challenge: the neorealist film *La Terra trema*, Griffith's drama *Occupations*, the paintings of Cremonini, Fowles's novel *Daniel Martin*, Pasolini's poem cycle "Ashes for Gramsci," the mass-media analyses of Parenti (*Inventing Reality*) and Kukarkin (*The Passing Age*), the political philosophy of Laclau and Mouffe (*Hegemony and the Socialist Strategy*), the theory and practice of "low-intensity conflict" as developed by the CIA and the NSC, and the cultural theories of Williams (*Marxism and Literature*) and Said (*The World, the Text, and the Critic*).]

**688 Theodor W. Adorno: Mass Culture and the Avant-Garde (also Comparative Literature 688 and Theatre Arts 688)**
Fall. 4 credits.
T 1:25–3:20. P. U. Hohendahl.
In this country Adorno is primarily known for his philosophical writings and his music criticism. His literary criticism and his contributions to aesthetic theory, on the other hand, remain to be discovered. The seminar will explore Adorno's importance for contemporary criticism; it will focus on Adorno's theory of art as well as his literary and music criticism, especially those parts concerned with the avant-garde and its role in the age of modern mass culture. The readings will be taken from Adorno's essays as well as *Minima Moralia, Dialectic of Enlightenment, Philosophy of Modern Music, Prisms*, and *Aesthetic Theory*.

**[689 Art and Truth: The Aesthetic Theory of Theodor W. Adorno (also Comparative Literature 689)**
Spring. 4 credits. Not offered 1989–90.
T 1:25–3:20. P. U. Hohendahl.
The seminar will focus on the aesthetic writings of Adorno, beginning with relevant chapters from *Dialectic of Enlightenment*, as well as selected essays on European literature and music. The emphasis then will be placed on Adorno's major posthumous work, *Aesthetic Theory* (1970). The aim is a close reading of Adorno's theory in the context of the Kantian and Hegelian tradition.]

**690 German Feminist Criticism and Theory (also Women's Studies 690)**
Spring. 4 credits. Open to qualified undergraduates with permission of instructor. Reading knowledge of German required.
W 1:25–3:20. C. A. Martin.
This course is designed to explore developments in feminist literary theory with particular attention to the field of German literature. We will consider competing critical strategies and their political implications by working through different readings of specific literary texts and by raising questions about the implications for feminism of competing critical strategies in the general field of literary theory; the tension in feminist *Germanistik* between critical attention to the "male canon" and the construction of a female literary tradition; the impact of French and American feminist work in the field of German; the impact and treatment of the Nazi period; the effects of the East-West divide on development in both Germanys; the impact on feminist literature and criticism of Third World women in Germany; and approaches in West and East Germany to imperialism and racism.

**[694 Seminar in Literary Theory: Aesthetics of Reception and Reader Response Theory (also Comparative Literature 694)**
Fall. 4 credits. Not offered 1989–90.
T 1:25–3:20. P. U. Hohendahl.
The interest in the reception of literature and reader response has become a major focus for the development of literary theory since 1970. The seminar will concentrate on the emergence of the aesthetics of reception in both West and East Germany during the late seventies and early eighties. These approaches will be compared with the emerging reader response theory in the United States. The reading material will be taken from the writings of Jauss, Iser, Naumann, Weimann, Stanley Fish, and Norman Holland.]

**695 Brecht and Artaud (also Comparative Literature 695 and Theatre Arts 695)**
Fall. 4 credits.
W 12:20–2:15. D. Bathrick.
This course will explore in depth the writings and practices of two major 20th-century theatrical artists, Bertolt Brecht and Antonin Artaud, to (a) map out differences and similarities between the two as representatives of avant-garde theatre; (b) situate their respective work in the political and cultural contexts out of which they emerged; and (c) explore their impact upon succeeding movements and artists of modern drama and cinema. A central focus of the course will be to explore the differing and changing notions of "avant-garde theatre" as demonstrated in the work and reception of Brecht and Artaud. The face-off between the two will serve methodologically both to delineate and to interrogate critically what have become two discrete "models" of avant-garde theatre as well as to consider ways in which these two models have been and could be synthesized.

**697 The Hermeneutic Tradition (also Comparative Literature 497/697)**
For description, see German Studies 497.

**[698 Gadamer's Hermeneutics (also Comparative Literature 698)**
Fall. 4 credits. Open to qualified undergraduates with permission of instructor. Not offered 1989–90.
W 1:25–3:20. W. W. Holdheim.
An intensive and systematic study of H. G. Gadamer's work *Truth and Method* (in translation) will lead to an examination of such problems as the structure of humanistic and historical knowledge and its relation to theoretical knowledge, "objectivity" and "subjectivity" in interpretation, the role of language in human existence, and the nature of the aesthetic phenomenon. Various intellectual trends will be located and evaluated in terms of an overall theory of understanding.]

**699 German Film Theory (also Comparative Literature 699 and Theatre Arts 699)**
Spring. 4 credits.
R 1:25–3:20. D. Bathrick.
This course will examine critically the writings of major German film theorists from the Weimar period to the present. Works by Bela Balazs, Rudolf Arnhelm, Siegfried Kracauer, Walter Benjamin, Theodor Adorno, Max Horkheimer, Alexander Kluge, H. J. Syberberg, Gertrud Koch, Thomas Elsaesser, and others will be read and discussed in light of the following considerations: What are the aesthetic and philosophical premises underlying these theories? What are the cultural and political contexts out of which these ideas emerge and how are these theories addressing these contexts? How do these theories relate to the work coming out of other national traditions at the same time or to current debates in feminist, formalist, post-modern, or post-structuralist film theory? There will be film showings.

**753-754 Tutorial in German Literature**
Fall and spring. 1–4 credits per term.
Prerequisite: permission of instructor.
Hours to be arranged. Staff.

## Related Courses in Other Departments

**Comparative Literature 642: Revolutions in Poetic Language**
J. Monroe.

**Government 376: Marx**
S. Buck-Morss.

**History 357–358: Survey of German History**
I. V. Hull.

**History 661: German History 1900–1955**
I. V. Hull.

**Society for the Humanities 410: Reason, Rhetoric, and Revolution: Responses to the French Revolution in England and Germany**
I. Balfour.

# GOVERNMENT

V. Shue, chair; B. R. O'G. Anderson, M. G. Bernal, S. Buck-Morss, W. J. Dannhauser, A. T. Dotson, M. J. Esman, B. Ginsberg, M. Goldfield, S. I. Jackson, M. Katzenstein, P. Katzenstein, E. W. Kelley, E. G. Kenworthy, H. Khanh, I. Kramnick, R. N. Lebow, T. J. Lowi, W. Mebane, T. J. Pempel, J. Pontusson, J. Rabkin, T. Risse-Kappen, M. Rush, L. Scheinman, M. Shefter, S. G. Tarrow, N. T. Uphoff

*Government* is what Cornell calls a department that elsewhere might be termed *political science.* The focus of this discipline is power applied to public purposes. Some faculty concentrate on purposes, some on applications. Some engage in the close reading of great texts of political philosophy, while others analyze the behavior of power-wielders and publics in this and other societies. Government is divided into four subfields: U. S. politics, comparative politics (other nations), political theory (philosophy), and international relations (transactions between nations).

To accommodate new courses or course changes, a supplementary announcement is prepared by the department. Before enrolling in courses or registering each term, students are requested to consult the current supplement listing courses in government, available in 125 McGraw Hall.

## The Major

To be *admitted* to the major, a student must have passed or be currently taking two government courses, one an introductory course, the second any other course offered by the department, including freshman writing seminars.

To *complete* a major in government, the student must (1) pass three of the four introductory courses; (2) accumulate 24 credits in courses numbered 300 or higher, including one seminar; and (3) complete 12 credits in related fields, again at the 300 level or higher. All courses used to fulfill a government major must be passed with a letter grade. Majors are urged to complete the introductory course requirement early.

Seminars are those courses numbered 400, 490, and 500, plus whatever additional courses the director of undergraduate studies may designate. To be admitted to a seminar, students apply during the course scheduling period held the previous semester. Related fields normally include courses offered by these departments: Anthropology, Economics, History, Psychology, and Sociology. Majors should discuss their selection of related courses with their advisers. When approved by an adviser or by the director of undergraduate studies, courses from still other departments may be used to fulfill this requirement.

**Cornell-in-Washington Program.** Government majors may apply to the Cornell-in-Washington program to take courses and undertake a closely supervised externship during a fall or spring semester.

**European Studies Concentration.** Government majors may elect to group some of their required and optional courses in the area of European studies, drawing from a wide variety of courses in relevant departments. Students are invited to consult Professors P. Katzenstein, Scheinman, and Tarrow for advice on course selection and foreign study programs.

**International Relations Concentration.** See the description under "Special Programs and Interdisciplinary Studies."

**Honors.** Each fall a small number of seniors enter the honors program. To apply, junior majors submit applications in May. Along with a fuller description of the honors program, application forms are available in 125 McGraw Hall. The three courses comprising the honors sequence (honors courses) are described below.

## Introductory Courses

Students registering for introductory courses should register for the lecture only. Sections will be assigned during the first week of class. Introductory courses are also offered during summer session.

**111 The Government of the United States**
Spring and summer. 3 credits.
B. Ginsberg.
An introduction to government through the American experience. Concentration on analysis of the institutions of government and politics as mechanisms of social control.

**131 Introduction to Comparative Government and Politics**
Fall and summer. 3 credits.
M. J. Esman.
A survey of the institutions, processes, and major problems of politics and government in contemporary states. The structures and ideologies of different regimes, the relationships of individuals and groups to the state, the shaping and implementation of public policy, the regulation of political conflict, and the adaptation of political systems to changing conditions. Particular attention is paid to the government and politics in Great Britain, France, the Soviet Union, China, Nigeria, and Mexico.

**161 Introduction to Political Theory**
Spring and summer. 3 credits.
I. Kramnick.
A survey of the development of Western political theory from Plato to the present. Readings from the works of the major theorists. An examination of the relevance of their ideas to contemporary politics.

**181 Introduction to International Relations**
Fall and summer. 3 credits.
P. Katzenstein.
An introduction to the basic concepts and practice of international politics.

## Freshman Writing Seminars

**100 Freshman Seminars**
Fall, spring, or summer. 3 credits. Seminars will be offered in fall, spring, and summer terms. Consult the listings for the Freshman Seminar Program in the section "Special Programs and Interdisciplinary Studies," the supplement issued by the department, and the Freshman Seminar booklet for course descriptions and instructors.

## Major Seminars

**400 Major Seminars**
Fall or spring. 4 credits.
These seminars, emphasizing important controversies in the discipline, cap the majors' experience. Thus preference in admission is given majors over nonmajors and seniors over juniors. Topics and instructors change each semester. To apply, students should pick up a form in 125 McGraw Hall during the course selection period the semester before the seminar is given. The following courses are open to sophomores, juniors, and seniors without prerequisites unless otherwise indicated.

## American Government and Institutions

Government 111 is recommended.

**[306 Sex Discrimination: Law and Social Policy (also Women's Studies 372 and Sociology 372)**
Not offered 1989–90.]

**[309 Interpretations of American Politics**
Not offered 1989–90.]

**[310 Power and Poverty in America**
Not offered 1989–90.]

**311 Urban Politics**
Spring. 4 credits.
M. Shefter.
The interaction between urban problems and the politics of city government has resulted in important public policy issues in the United States. This course provides an introduction to the politics of metropolitan areas; analysis of the central institutions and processes of urban government such as mayors, city councils, elections, and the criminal justice system; and specific public policy problem areas such as race relations, education, housing, law enforcement, and civil disorder.

**312 Urban Affairs Laboratory**
Fall or spring. 4 credits. Open to both undergraduate and graduate students. Application required to assure balanced enrollment from different colleges and majors. Applications available in 125 or B29 McGraw Hall. Course fee, $20.
E. W. Kelley.
An interdisciplinary course in urban affairs that emphasizes learning through participation in a complex gaming simulation. Students assume roles of decision makers in a simulated city and test their solutions to environmental, economic, social, and political problems. Issue-related readings and lectures provide complementary theoretical focus.

**313 The Nature, Functions, and Limits of Law**
Spring. 4 credits.
K. Clermont.
A general education course for students at the sophomore and higher levels. Law is presented not as a body of rules but as a set of varied techniques for resolving conflicts and dealing with social problems. The roles of courts, legislatures, and administrative agencies in the legal process is analyzed, considering also the constitutional limits on their power and practical limits on their effectiveness. Readings consist mainly of judicial and administrative decisions, statutes and rules, and commentaries on the legal process.

**[316 The American Presidency**
4 credits. Not offered 1989–90.]

**[317 Political Parties and Elections**
4 credits. Not offered 1989–90.]

**318 The American Congress**
Fall. 4 credits.
M. Shefter.
The role of Congress in the American political system. Topics to be discussed: the political setting within which Congress operates, the structure of Congress, the salient features of the legislative process, and recent congressional behavior in a number of policy areas.

**320 Public Opinion and Public Choice**
Fall. 4 credits.
W. Mebane.
Popular control of government—government "by the people"—is without question a fundamental principle of democracy. Everyday intuition suggests that a government the people control will be a government that does what the people want. That, however, turns out not to be so. A government "by the people" will hardly ever be one "for the people" as well. This course develops this apparent paradox, by examining several of the most important mechanisms through which popular control of government is exercised in the United States. These mechanisms include opinion polls, elections, legislative activity, interest groups, and bureaucracy. These devices are examined in light of a number of alternative theories, including the psychological theory of political attitudes, the rational theory of collective choice, the process theory of agenda setting, and the bureaucratic theory of working relations. These theories offer a variety of approaches to the broad problem of popular control, some metaphorical, some mathematical, some anecdotal—and some all of the above. While each theory presents a mix of virtues and limitations, some, it will turn out, offer a much more limited understanding of politics than do others. Course requirements include three papers—two closely focused short (4–7 pages) ones, and one long (15–20 pages) final one based on extensive original research—and a final exam. Prior familiarity with the basic institutions and processes of American politics is assumed.

**323 The "Fourth" Branch**
Spring. 4 credits.
J. Rabkin.
The national administrative branch is examined. Particular attention is given to the contitutional and political problems that result from the rise of administrative power.

**327 Civil Liberties in the United States**
Spring and summer. 4 credits.
J. Rabkin.
An analysis of contemporary issues in civil liberties and civil rights, with emphasis on Supreme Court decisions. Cases are analyzed in terms of democratic theory and the social and political context in which they arose.

**[328 Constitutional Politics: The United States Supreme Court**
4 credits. Not offered 1989–90.]

**[329 Race, Gender, and Politics**
4 credits. Not offered 1989–90.]

**353 Feminism, the State, and Public Policy (also Women's Studies 353)**
Spring. 4 credits.
M. Katzenstein.
The course examines the aims and strategies of the feminist movement in the United States and the response of both society and the state to feminist claims. It is thus a course about political protest and the capacity of American political institutions to promote and shape as well as to counter social change. In examining the law and public policy on such issues as job discrimination, wife battery, rape, abortion, etc., the course explores the contradictions between, and the congruence of, the dual ideals of individual choice and group equality.

**[403 Cleavages and Conflicts in Contemporary American Politics**
4 credits. Not offered 1989–90.]

**[405 Political Economy**
4 credits. Not offered 1989–90.]

**[406 Politics of Education**
4 credits. Not offered 1989–90.]

**407 Law, Science, and Public Values**
Spring. 4 credits.
S. Jasanoff.
This course explores the varied interactions between science and the legal process that have developed in recent years as a result of attempts to bring greater public accountability to the use of science and technology. It examines the activities of both legislatures and courts in controlling science, and analyzes the values underlying these initiatives. Three major types of science-law interactions form the focus of the course: regulation of new technologies, judicial review of risk management decisions, and legal control of professional standards in science and technology. Specific topics include the regulation of toxic chemicals and nuclear power; controversies about biotechnology, reproductive technologies and biomedical research; and science fraud.

**408 Class, Race, and Interest Groups in U.S. Politics**
Fall. 4 credits.
M. Goldfield.
The American polity is often characterized as a democracy, sometimes as a representative democracy, sometimes as a pluralist democracy. While most people recognize the existence of a great deal of corruption, unequal benefits, special advantages to the wealthy, and even the political exclusion of the "poor" and "minorities," these phenomena are usually viewed as abberations or imperfections that do not fundamentally define either the distribution of power or the democratic functioning of the political process. In this course we will entertain the proposition that issues of class and race are central to the shaping of politics in this country. While the course will spend some time examining the dominant paradigms in U.S. politics, the bulk of our attention will be devoted to more critical readings.

**[411 Political and Economic Power in Cities**
4 credits. Not offered 1989–90.]

**[414 The Administrative State**
4 credits. Not offered 1989–90.]

**418/618 Labor in American Politics**
Spring. 4 credits.
M. Goldfield.
This seminar will examine a series of questions about the "exceptional" character of American politics. We will first examine various theories about why the United States, in contrast to other economically developed capitalist countries, has no strong working class political party. The emphasis will be on distinguishing a series of plausible hypotheses whose validity can be evaluated. We will then attempt to test these hypotheses by a study of the development of U.S. industrial unions. Our goal will be an adequate explanation of why U.S. labor and American politics are "different."

**420/620 American Political Development**
Fall. 4 credits.
M. Goldfield.
This course will examine a number of theories of how American politics has developed its distinctive aspects. The first half of the course will be devoted to examining five theories of American political development: 1) Pluralist views (e.g., Hartz) on the distinctive liberal values in U.S. society; 2) state-centered theories that stress the importance of the development of the administrative capacities of the federal government; 3) critical election theories that emphasize the importance of electoral realignments; 4) theories that point to the changes in structure or regimes of capital accumulation; 5) analyses that argue for the centrality of political exclusion and divisions by class, race, and gender. The second half of the course will attempt to evaluate the applicability of these theories to American politics by looking at distinctive features of the period from the New Deal to the present.

**[423 Labor and the New Deal**
4 credits. Not offered 1989–90.]

**[424 Political Change in the United States**
4 credits. Not offered 1989–90.]

**[426 Science, Technology, and Public Policy**
4 credits. Not offered 1989–90.]

**[428 Government and Public Policy: An Introduction to Analysis and Criticism**
4 credits. Not offered 1989–90.]

**[429 Government and Public Policy: An Introduction to Analysis and Criticism**
Spring. 4 credits. Not offered 1989–90.]

## Comparative Government

Government 131 is recommended.

**[326 Eastern Europe Today: Economics, Government, Culture (also Russian Literature 329 and Economics 329)**
4 credits. Not offered 1989–90.]

**330 The Soviet Union: Politics, Economics, and Culture (also Russian Literature 330 and Economics 330)**
4 credits. Spring.
M. Rush, G. Gibian, G. Staller.
Interdisciplinary survey of the USSR since the Revolution, with emphasis on contemporary developments.

**[331 Beyond the Year 2000**
4 credits. Not offered 1989–90.]

**333 Government and Politics of the Soviet Union**
Fall. 4 credits.
M. Rush.
The politics of the top leaders, the institutions through which they operate, and the impact of their policies on the Soviet people. Emphasis is also on phases in the development of the Soviet system and on the ways in which the Soviet Union served as the prototype for all subsequent Communist states.

**334 Business and Labor in Politics**
Fall. 4 credits.
T. J. Pempel.
Historically, business and labor have been critical elements in shaping the specific politics of most advanced industrial democracies. Land grants to U.S. railroad magnates, unionization and class consciousness in continental Europe, the development of social welfare programs, and colonization and imperialism are but a few of the foremost examples. Today such interactions are similarly crucial in such diverse areas as the rise of multinational corporations, immigrant labor, strikes by public-sector employees, racial and class exclusionism in unions, environmental pollution, consumer protection, and electoral financing. The historical and contemporary roles of business and labor in such areas are examined in different industrialized societies.

**335 Modern Greek Poetry and Politics (also Comparative Literature 235 and Classics 235)**
Fall. 4 credits.
G. Holst-Warhaft.
The history of modern Greece has been marked by a series of political crises that have resulted in deep divisions within society. Greek poetry has reflected these crises and divisions, and in this course the poetry of 19th- and 20th-century Greece will be interpreted in its historical and political context. The course will concentrate on four periods in which there has been a particularly strong interaction. The continuity of ancient Greek myths in modern Greek poetry will also be explored. Students taking this course as Government 335 for 4 credits must write an additional paper on a political topic.

**[336 The Ethnic Dimension in Politics**
4 credits. Not offered 1989–90.]

**337 Marxism, Communism, and Revolution**
Fall. 4 credits.
S. Tarrow.
From Marx to Gorbachev, from mid-19th century to the present, and from Western Europe to Asia, Marxism and communism spread rapidly across the globe. For some, Marxism was a beacon of hope and liberation; for others, communism was The Evil Empire. At one time, communist revolutionaries seemed poised to spread the doctrine of Marxism through violent revolution. This apparent threat created a bi-polar world and transformed American foreign policy. More recently, communism has fallen on hard times. Intellectuals, political leaders, and ordinary people in communist countries reject the doctrine of Marxism that once inspired them. In countries as different as Poland, the Soviet Union, and China, they have begun to challenge the communist elites who run their countries. What is the theory of Marxism and how did it give rise to such contradictions? How does it relate to the practice of communism today? This course will analyze the appearance of Marxism in Western Europe in the mid-19th century, the meteoric rise and diffusion of communist parties and regimes in the first half of our century, their role in revolution in Russia, China, and Cuba, and the fate of Marxism and communism today.

**338/638 European Political Development**
Fall. 4 credits.
J. Pontusson.
Focusing on Britain, France, Germany, and Russia, this course explores the interaction of politics and economics in the formation of contemporary European political systems. On the political side, it deals with the development of public authority, state administration, and representative institutions from the Middle Ages until the end of the First World War. On the economic side, the course deals with the transition from feudalism to capitalism, and the industrial revolution. Various theoretical approaches to the study of political development will be considered.

**340 Latin American Politics**
Spring. 4 credits. Limited to 50 students.
E. Kenworthy.
An introduction to the politics and society of key Latin American nations, combining a conventional overview (readings, examination) with simulations of current crises (research, role-playing).

**[341 Society and Politics in Central Europe**
4 credits. Not offered 1989–90.]

**[342 The Vietnam War: American and Vietnamese Perspectives**
4 credits. Not offered 1989–90.]

**343 Contemporary European Society and Politics (also History 283 and German Literature 283)**
Fall. 4 credits.
J. Pontusson, J. Weiss.
An interdisciplinary and comparative investigation of Western European society, politics, culture, and contemporary history. Topics include the differing experiences of the generations coming of age after World War II, the dynamics of class relations, economic policy, social movements, family and community life, cultural institutions, and modes of cultural criticism.

**[344 Government and Politics of Southeast Asia**
4 credits. Not offered 1989–90.]

**[345 Contemporary European Society and Politics (also German Literature 285 and History 285)**
4 credits. Not offered 1989–90.]

**346 Politics of Contemporary Japan**
Spring. 4 credits.
T. J. Pempel.
The focus will be on the political, social, and economic delimiters of policymaking in postwar Japan, with some particular attention given to ideological conflict, political parties and elections, the bureaucracy, the consumer movement, student protest, defense policy, and economic penetration of Southeast Asia.

**347 Government and Politics of China**
Fall. 4 credits. No prerequisites.
V. Shue.
An introduction to the main currents in China's domestic politics over the last fifty years. Topics include Maoist philosophy; the Communist party's revolutionary rise to power; peasants, communes, and village politics; ultraleft socialist idealism and mass mobilization; intrabureaucratic politics; the conditions for military and industrial modernization; and the recent turn toward "market socialism."

**348 Politics of Industrial Societies**
Spring. 4 credits.
J. Pontusson.
What are the major challenges currently confronting industrialized countries? Why have different countries opted for different strategies in the face of similar challenges? This lecture course surveys the policies and politics of advanced industrial states in three areas: 1) welfare provision and redistribution; 2) promotion of industrial development; and 3) relations between employers and unions. The United States, Japan, France, Britain, and Sweden will be discussed in some detail.

**[349 Political Role of the Military**
4 credits. Not offered 1989–90.]

**[350 Comparative Revolutions**
4 credits. Not offered 1989–90.]

**351 India: Social and Economic Change in a Democratic Polity**
Spring. 4 credits.
M. Katzenstein.
This course explores the social, economic, and political forces that have shaped India's development since independence. It considers why democratic political institutions in India have proved so resilient and what effect these institutions have on the economic and social policies that are pursued. The importance of international as well as domestic forces in shaping India's economic and political choices is also assessed.

**[352 Religion and State in the Contemporary Middle East (also Near Eastern Studies 397)**
4 credits. Not offered 1989–90.]

**354 America in the World Economy**
Fall. 4 credits.
P. Katzenstein.
Unemployed auto workers in Detroit and the wood stoves in New England signal an important change in America's relation to the world economy. This course characterizes these changes in a number of fields (trade, money, energy, technology), explains them as the result of the political choices of a declining imperial power that differs substantially from the choices of other states (Japan, Germany, Britain, France, the small European states, and Korea), and examines their consequences for America and international politics.

**[355 Contemporary Revolutions**
4 credits. Not offered 1989–90.]

**356 Elites and Society: The Political Economy of Power**
Spring. 4 credits.
N. T. Uphoff.
For students who have an interest in the nature and uses of power in politics. Consideration of how power has been treated by earlier political thinkers and by contemporary social scientists. Propositions will be formulated and critiqued about the distribution and consequences of power in America, in other industrialized societies, and in the Third World, and their implications for the making of public policy. A game simulation, Third World Power Play, is undertaken at the end of the course.

**[357 Political Development in Western Europe**
4 credits. Not offered 1989–90.]

**358 Modern History of the Middle East: Changing Politics, Society, and Ideas (also Near Eastern Studies 294)**
Fall. 4 credits.
Staff.
This introductory course is designed to acquaint students with the main political, social, and cultural trends that have shaped the modern and contemporary history of the Middle East. While discussing developments in the region during the nineteenth and twentieth centuries, the lectures will focus on such themes as modernization, nationalism, Islamic response, and Arab politics in the global and regional contexts. The course does not presuppose the knowledge of Middle Eastern languages.

**[365 Social Movements and Politics in Industrial Societies**
4 credits. Not offered 1989–90.]

**[430 The Politics of Productivity: Germany and Japan**
4 credits. Not offered 1989–90.]

**[432 Labor and Politics**
4 credits. Not offered 1989–90.]

**[434 State and Economy in Advanced Capitalism**
4 credits. Not offered 1989–90.]

**[435 Collective Action and Politics in Modern Europe (also History 435)**
4 credits. Not offered 1989–90.]

**439 Formation of European Nation-States**
Spring. 4 credits.
J. Pontusson.
Focusing on Britain, France, Germany, and Russia, this course explores the emergence and development of public authority and state administration from the Middle Ages through the industrial revolution. The course emphasizes the relationship of state-building to economic development and social classes, but wars and other geopolitical factors will also be considered.

**443/643 Socialism and the Market in China**
Spring. 4 credits.
V. Shue.
What are the problems and benefits of China's recent wide-ranging experiments with free market reform? Can the legacies of Maoist socialism be made compatible with a market-based economy and rapid "modernization"? Readings, research, and seminar discussion; open to students with at least some previous coursework on contemporary Chinese society, politics, or economy.

**[446 Comparative Communism**
4 credits. Not offered 1989–90.]

**453 The Fabrication of Ancient Greece, 1780–1880**
Fall. 4 credits.
M. Bernal.
The seminar will investigate images of their own origins held by Greeks in Classical and Hellenistic times and, in particular, the predominant one according to which Greece had been colonized and civilized by Egyptians and Phoenicians. It will also look at the way in which this view went unquestioned until the 18th century. The seminar will then go on to examine the scholarly, social, and cultural reasons for the overthrow of this image between 1780 and 1830 and those behind the creation of a new "Aryan Model" in the middle of the nineteenth century. According to this new model, Hellenic civilization was the result of a conquest of the native "Pre-Hellenes" of the Aegean region by Indo-European speakers who had invaded from the North. Particular attention will be paid to the influences of racism and anti-Semitism on these historiographical shifts. We will conclude by surveying the situation of scholarship in these subjects in the 1980s and focus on the continued viability of the "Aryan Model."

**454 The Herodotean Moment: The Uses and Abuses of "Western Civilization" (also History 454)**
Fall. 4 credits. Prerequisite: permission of instructor.
M. Bernal.
The basic premise of the seminar is that the concept of Western Civilization is a problematic one in need of critical analysis. The course will examine the historical evolution of the concept as seen in selected moments of actual and perceptual encounter with other civilizations. It will also inquire into the political uses and abuses of the concept, as well as its discursive, psychological, and anthropological dimensions.

**[457 Comparative Public Law: Legal Controls on Government in Europe and America**
4 credits. Not offered 1989–90.]

**[459 Politics in Contemporary Europe: The Politics of the Left**
4 credits. Not offered 1989–90.]

**[460 Peasant Politics**
4 credits. Not offered 1989–90.]

## Political Theory

Government 161 is recommended.

**360 Ancient Greek Constitutions (also Classics 340)**
Spring. 4 credits. Prerequisite: one of the following: survey of Greek history, a course in Greek civilization, a course in political theory or comparative politics, or permission of instructor.
L. Abel.
The Greek word *politeia* means *constitution*, but not a single written document. It means the form of political life within a state. This course will survey briefly the variety of forms of political life in ancient Greece from the time of Homer to the classical fourth-century Athenian democracy. The majority of time will be devoted to the history, functioning, and assessment of the Athenian democracy and Athenian law. The second major topic will be the constitutions of Sparta and its role as the oligarchic alternative to democracy. As each constitution is studied, the role of women and ideas of justice within the state will be considered. Required readings will be in translation.

**361 Modern Ideologies: Liberalism and Its Critics**
Fall. 4 credits.
I. Kramnick.
Since the rise of capitalism, one political ideology has been dominant in the Western world—liberalism. However, its hegemony has been questioned by a series of critics: democracy, socialism, anarchism, conservatism, Freudianism, and feminism. This course will study the tensions between liberalism and these critics and speculate on the possible survival or extinction of this venerable and very American ideology.

**362 Directions in Feminist Theory (also Women's Studies 365)**
Spring. 4 credits.
C. A. Martin.
This course is designed to explore developments in contemporary feminist theory with particular attention to feminist critiques, reinterpretations, and uses of Marxist, psychoanalytic, and (post) structuralist thought. We will be concerned throughout the course both with the ways in which radical feminist questions converge with developments in these fields and with the ways in which feminist analyses challenge some of the most basic assumptions embedded in these and other social theories. We will consider the approaches of a variety of feminist thinkers to the relations between "patriarchy" and the political, economic, and racial hierarchies that structure various social systems and ideologies. Texts such as Michele Barrett's *Women's Oppression Today*, which takes account of developments in the three areas explored earlier in the course, and Michel Foucault's *History of Sexuality*, which introduces new conceptions of the relations between sexuality, knowledge, and power, will provide the focus for indepth discussions.

**[363 Classics in Political Thought**
4 credits. Not offered 1989–90.]

**[366 Feminism, Sexuality, and the Politics of Identity (also Women's Studies 366)**
4 credits. Not offered 1989–90.]

**[374 Radical Political Theory**
4 credits. Not offered 1989–90.]

**[375 American Political Thought**
4 credits. Not offered 1989–90.]

**376 Marx**
Fall. 4 credits.
S. Buck-Morss.
The meaning and contemporary relevance of the central concepts of Marxist theory: dialectics, class, ideology, history, social revolution, the state, the family, imperialism, modes of production, the "iron laws" of capitalism, and the communist goal. Readings in the original texts.

**[379 Freud**
4 credits. Not offered 1989–90.]

**465 Philosophy of Social Science**
Spring 4 credits.
M. Goldfield.
Our investigations in this course will focus on several general questions: Is the scientific study of society (and politics) possible and, if so, in what ways, and, if not, how can one legitimately study it? The first part of the course will examine general philosophers of science, including Hempel, Kuhn, Lakatos, and Miller. The majority of the course will examine issues specific to social science, including historical explanation, functional explanation, rational choice, and theories of interpretation.

**[466 The Repressed Feminine in the Writings of Marx (also Women's Studies 466)**
4 credits. Not offered 1989–90.]

**[468 The Theory and Politics of Liberal Feminism (also Women's Studies 468)**
4 credits. Not offered 1989–90.]

**469 Limiting War (also Philosophy 369)**
Fall. 4 credits.
H. Shue.
Modern states employ or threaten violence not only through conventional war but in various other forms including "low-intensity warfare," chemical and biological warfare, terrorism, and nuclear deterrence. This course critically examines the best arguments about limiting or prohibiting various contemporary means and methods of fighting one's enemies, arguments with conclusions ranging from pacifism to "realism." Have traditional doctrines about just war been overtaken by 20th-century events and technologies, or is it still possible to provide a reasonable justification for limiting war? If so, how? Special emphasis is given to moral issues about nuclear weapons. Readings include the U.S. Catholic Bishops' Pastoral Letter on Nuclear Deterrence, *Just and Unjust Wars*, by Walzer, and *Nuclear Deterrence, Morality and Realism*, by Finnis, Boyle, and Grisez.

## International Relations

Government 181 is recommended.

**[381 The Politics of Defense Spending**
4 credits. Not offered 1989–90.]

**[382 Integration In the World System**
4 credits. Not offered 1989–90.]

**[383 Theories of International Relations**
4 credits. Not offered 1989–90.]

**384 War and Peace in the Nuclear Age (also Physics 206)**
Spring. 4 credits.
T. Risse-Kappen.
Intended for students wishing to understand the following: the principles, types, and effects of nuclear weapons; existing and proposed arsenals and delivery systems; the evolution and present state of the nuclear military strategy of the nuclear powers and the history of nuclear arms control negotiations. Additionally, the course will examine critically the important concepts involved in military strategy and arms control, current issues in military posture and arms control negotiations, and the moral and ethical questions involved.

**[385 Contemporary American Foreign Policy**
4 credits. Not offered 1989–90.]

**386 Structure and Process in the Global Political Economy**
Spring. 4 credits.
S. Jackson.
We will examine the global structures and transnational processes that constrain and condition economic development, the operations of multinational corporations, international trade, and world debt. We will also investigate transnational decision making at the nongovernmental, official bilateral, and official multilateral levels, with an emphasis on North-South relations.

**[387 The United States and Asia**
4 credits. Not offered 1989–90.]

**389 International Law**
Fall. 4 credits.
L. Scheinman.
Characteristics of international law: its theoretical foundations, principles, processes, and relation to international politics. Emphasis on law-in-action. Attention to both traditional problems (intervention, coercion, and the scope and limits of adjudication) and contemporary trends and processes (arms control, outer space, exploitation of seabed resources, the individual in international law, and cooperative patterns of socioeconomic relations at the global and regional level). Content may vary according to international events.

**[390 Principles of Strategy**
4 credits. Not offered 1989–90.]

**[391 U.S. National Security Policy**
4 credits. Not offered 1989–90.]

**[392 International Relations of the Middle East**
4 credits. Not offered 1989–90.]

**395 NATO in Crisis? Domestic Politics and Foreign Policies in Western Europe**
Fall. 4 credits.
T. Risse-Kappen.
While the Western Alliance celebrates its 40th anniversary this year, there are growing signs that NATO is drifting apart. The main challenges facing the Alliance today are the changes in the Soviet Union and their repercussions in the domestic politics of several West European countries. This class focuses on the interaction between domestic politics and foreign policies in Western Europe as a way to understand the politics of the Atlantic Alliance. Emphasis will be given to Great Britain, France, West Germany, and the Netherlands. The first part of the class is devoted to an in-depth analysis of the history and the processes of security policy in those countries. The second part will then address issues currently facing the Alliance (such as the response to Gorbachev) from the perspective of these countries.

**[478 Accumulation on a World Scale**
4 credits. Not offered 1989–90.]

**[479 *Dependencia* and the State**
4 credits. Not offered 1989–90.]

**[480 Foreign Economic Policies of Advanced Industrial States**
4 credits. Not offered 1989–90.]

**481 Foreign Policy of the U.S.S.R.**
Spring. 4 credits.
M. Rush.
An analysis of Soviet foreign policy, as it developed out of the revolution and accommodated to the prevailing international system, with a focus on the period since 1945. Particular topics include causes and prospects of the Cold War, the impact of nuclear weapons on Soviet defense and foreign policy, sources and goals of Soviet hegemony in East Europe, causes of the dispute with China, and the impact of domestic politics on the formation of foreign policy.

**482 Build Up to Build Down? The U.S.–Soviet Arms Race and Arms Control**
Fall. 4 credits.
T. Risse-Kappen.
The U.S.–Soviet arms competition seems to be in a crucial stage. When Ronald Reagan left office, he had concluded the first nuclear disarmament treaty in history; an arms treaty leading to the first deep cuts in the U.S.–Soviet strategic arsenals were negotiated to about 80 percent. Hence, did "peace through strength" work? This seminar will first review different explanations of the U.S.–Soviet nuclear arms competition such as the "action-reaction" paradigm and concepts focusing on domestic factors such as the "military-industrial complex" and bureaucratic politics. The seminar will then analyze the conditions under which arms control and security cooperation nevertheless can take place. Depending on students' interests and to give participants some sense of the practical problems involved in arms talks, there will be a simulation of the ongoing U.S.–Soviet negotiations.

**[483 Political and Economic Interdependence**
4 credits. Not offered 1989–90.]

**[484 Defense Strategy**
4 credits. Not offered 1989–90.]

**[485 International Political Economy**
4 credits. Not offered 1989–90.]

**[486 International Security: Soviet Security Policy**
4 credits. Not offered 1989–90.]

**[487 Covert Intervention as an Instrument of American Foreign Policy**
4 credits. Not offered 1989–90.]

**[488 Comparative Capitalism**
4 credits. Not offered 1989–90.]

**489 International Law and Regime Development**
Spring. 4 credits.
L. Scheinman.
The course examines and analyzes the development, maintenance, and transformation of technological, economic, and security regimes, giving particular emphasis to the role of international law processes and institutions. Monetary, oceanic, and arms control regimes, among others, will be covered.

**[491 Superpower Security and Third World Conflicts**
4 credits. Not offered 1989–90.]

## Honors Courses

Each April a limited number of junior majors are admitted to the honors program, their work to begin the following fall. Application forms and a full description of the program may be obtained in 125 McGraw Hall.

**490 Honors Seminar: Research Methods**
Fall. 4 credits. Limited to students admitted to the honors program.
Staff.

**494 Honors Thesis Clarification and Research**
Fall. 4 credits. Limited to students who have successfully completed Government 490 or 500 or who are taking 490 concurrently.
Staff.
Each student works individually with a faculty member. The student initiates the tutorial by interesting a faculty member in his or her likely thesis project and by submitting to the director of undergraduate studies a form outlining the general area the thesis will treat and bearing the faculty tutor's signature. This form is due the third week of classes. The tutorial culminates in a ten-to-fifteen-page paper setting forth the central questions to be addressed by the thesis, the state of existing knowledge regarding those questions, and why they matter.

**495 Honors Thesis: Research and Writing**
Spring. 4 credits. Limited to students who have successfully completed Government 494.
Staff.
Students continue the work of the preceding semester typically with the same faculty tutor. Research on the thesis is completed and writing begun. The tutorial culminates in a thesis of some sixty to eighty pages. The grade for the tutorial is determined by the faculty tutor, while the degree of honors (if any) awarded the thesis is decided by a committee of faculty members established for that purpose.

## Supervised Study

Except under very unusual circumstances, supervised study, Government 499, is open only to government majors doing superior work in the major. The application form may be obtained in 125 McGraw Hall and must be approved by the director of undergraduate studies for credit to be granted. There is no limit established for the total number of credits a government major may take in Government 499 while at Cornell, but he or she may count no more than 4 credits toward fulfillment of the major. Students who want to continue taking the course for more than one semester must select a new theme or subject each semester, and applicants must present a well-defined program of study that cannot be satisfied by taking regular courses. Credit can be given only for work that results in a satisfactory amount of writing. Emphasis is on the capacity to subject a body of related readings to analysis and criticism. Permission of the instructor is required.

**499 Readings Fall or spring.**
1–4 credits.
Staff.

## Graduate Seminars

Qualified undergraduates are encouraged to apply for seminars listed with 600 course numbers but may only register with the permission of the instructor. Students may consult the supplement that lists graduate courses, available in the department office.

### Field Seminars

**601 Scope and Methods of Political Analysis**
Fall. 4 credits.
S. Jackson.
This seminar offers an overview of the main problem areas and theoretical orientations in the four subfields of contemporary political analysis: political theory, American politics, comparative politics, and international relations. Selected topics, including questions of research design, are treated through a reading of the best contemporary literature. The broad issues of the philosophy of social science or specific techniques of analysis may also be addressed.

**[602 Field Seminar in Political Methodology**
4 credits. Not offered 1989–90.]

**603 Field Seminar in American Politics**
Fall. 4 credits.
B. Ginsberg.
The basic issues and institutions of American government and the various subfields of American politics are introduced. The focus is on substantive information and theoretical analysis and problems of teaching and research.

**[604 Field Seminar in Public Policy**
4 credits. Not offered 1989–90.]

**605 Field Seminar in Comparative Politics**
Fall. 4 credits.
S. Tarrow.
An introduction to selected theoretical problems in the study of comparative politics and to their application in empirical analysis. Basic problems are social class and politics, authority and legitimacy, participation and mobilization, economic development and democracy, authoritarian and totalitarian politics, corporatism and pluralism, and nation building and political integration.

**606 Field Seminar in International Relations**
Fall. 4 credits.
P. Katzenstein.
A general survey of the literature and propositions of the international relations field. Criteria are developed for judging theoretical propositions and are applied to the major findings. Participants will be expected to do extensive reading in the literature as well as research.

**607 Field Seminar in Political Thought**
Spring. 4 credits.
I. Kramnick.
An introduction to political theory through a reading of selected classics in political thought from Plato to Marx.

### American Government and Institutions

**618/418 Labor in American Politics**
Spring. 4 credits.
M. Goldfield.
This seminar will examine a series of questions about the "exceptional" character of American politics. We will first examine various theories about why the United States, in contrast to other economically developed capitalist countries, has no strong working class political party. The emphasis will be on distinguishing a series of plausible hypotheses whose validity can be evaluated. We will then attempt to test these hypotheses by a study of the development of U.S. industrial unions. Our goal will be an adequate explanation of why U.S. labor and American politics are "different."

**620/420 American Political Development**
Fall. 4 Credits.
M. Goldfield.
This course will examine a number of theories of how American politics has developed its distinctive aspects. The first half of the course will be devoted to examining five theories of American political development: 1) Pluralist views (e.g., Hartz) on the distinctive liberal values in U.S. society; 2) state-centered theories that stress the importance of the development of the administrative capacities of the federal government; 3) Critical election theories that emphasize the importance of electoral realignments; 4) Theories that point to the changes in structure or regimes of capital accumulation; 5) Analyses that argue for the centrality of political exclusion and divisions by class, race, and gender. The second half of the course will attempt to evaluate the applicability of these theories to American politics by looking at distinctive features of the period from the New Deal to the present.

**[621 Elections and Public Policy**
4 credits. Not offered 1989–90.]

**624 Political Change in the United States**
Spring. 4 credits.
M. Shefter.
This seminar analyzes the sources and consequences of major realignments in American politics.

**625 Models for Research on Politics**
Fall. 4 Credits.
W. Mebane.
Scientific study of politics essentially involves three tasks: developing an abstract scheme in which appropriate features of phenomena of interest are suitably represented; designing and implementing procedures through which evidence bearing on the phenomena can be reliably obtained; reporting results in ways that simultaneously make clear their theoretical foundations, their technical soundness, and their substantive interest. Performance of these tasks needs to be coordinated. Undecidable abstraction, inexplicable technology, and baseless rhetoric are all, from a scientific point of view, undesirable. The point of this seminar is to introduce students to the scientific mode of research on politics, emphasizing in roughly equal proportions the preceding three tasks. Among the thematic topics to be examined are measurement, quasi-experimentation, statistical inference, dynamics, and mathematical representation. Applications will be considered in a number of substantive areas, including (probably) research on economic policy, elections, legislative activity, federalism, and interna-

tional relations. The particular applications selected from these or other areas will depend in part on students' expressed interests. The primary course requirement will be for each student to prepare a realistic proposal for a research project he or she might like to carry out. There will also be a number of short papers due at intervals during the term. Useful contributions to class discussion will also be expected.

### Public Policy

**628 Politics of Technical Decisions I (also Sociology 515, City and Regional Planning 541, Management NBA 686, and Biology and Society 415)**
Fall. 4 credits.
Staff.
Political aspects of decision making in technical areas. Drawing from recent risk disputes, we will examine the origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system.

**[629 Politics of Technical Decisions II (also Sociology 516, City and Regional Planning 542, and Management NBA 687)**
4 credits. Prerequisite: Government 628 or permission of instructor. Not offered 1989–90.]

### Comparative Government

**[632 Politics and Society in France, Italy, and Britain**
4 credits. Not offered 1989–90.]

**[636 Political Development of the European Welfare State**
4 credits. Not offered 1989–90.]

**[637 Peasantry, State, and Revolutionary Socialism**
4 credits. Not offered 1989–90.]

**639 Politics of the Soviet Union**
Fall. 4 credits.
M. Rush.
A reading seminar on major works dealing with the Soviet political system, with special emphasis on higher politics, recent foreign policy, extended crises of economic growth and political succession.

**[642 Comparative Ethnic, Racial, and Religious Politics**
4 credits. Not offered 1989–90.]

**643/443 Socialism and the Market in China**
Spring. 4 credits.
V. Shue.
What are the problems and benefits of China's recent wide-ranging experiments with free market reform? Can the legacies of Maoist socialism be made compatible with a market-based economy and rapid "modernization"? Readings, research, and seminar discussion; open to students with at least some previous coursework on contemporary Chinese society, politics, or economy.

**644 Socio-Technical Aspects of Irrigation (also Agricultural Engineering 754 and Rural Sociology 754)**
Spring. 4 credits.
N. Uphoff, M. Walter, R. Barker, and W. Coward.
Examines irrigated agriculture and its relation to agricultural development. Emphasis on social processes within irrigation systems and interactions with the social setting, including political and administrative aspects. Provides an opportunity to examine systematically the institutional and organizational policy issues associated with the design and operation of systems of irrigated agriculture in developing countries.

**[645 Chinese Politics**
4 credits. Not offered 1989–90.]

**[647 Political Anthropology: Southeast Asia**
4 credits. Not offered 1989–90.]

**648 Political Economy of Change: Rural Development in the Third World**
Fall. 4 credits.
N. T. Uphoff.
The seminar analyzes strategies for economic, social, and political change, using an approach that integrates economic, social, and political factors into a common framework dealing with policy choices and political action. Attention focuses particularly on developing local capacities for initiative and implementation with broader participation from rural communities.

**649 State Institutions and Social Coalitions**
Fall. 4 credits.
T. J. Pempel.
This seminar will focus on macrohistorical analysis of states currently considered "advanced industrial democracies." Central to the seminar will be an examination of the formation of different social coalitions and the ways in which these coalitions have been shaped by, and in turn have shaped, political institutions. Thus one concern will be the evolution of different types of states—liberal, fascist, and corporatist. The seminar will also explore broad policy choices and directions that result from such interactions—guns vs. butter, internationalist vs. domestic economics, public vs. private responsibilities, etc. Finally, it will consider ways in which different regimes respond differently to common international stimuli such as war, recession, territorial aggrandizement, and trade.

**[651 Agrarian Change in South Asia: Politics, Society, and Culture**
4 credits. Not offered 1989–90.]

**[652 Political Problems of Southeast Asia**
4 credits. Not offered 1989–90.]

**[653 The Plural Society Revisited (also Asian Studies 607)**
4 credits. Not offered 1989–90.]

**[655 Latin American Society and Politics**
4 credits. Not offered 1989–90.]

**657 Theoretical Perspectives in Political Economy**
Spring. 4 credits.
J. Pontusson.
This seminar seeks to specify the issues and analytical premises of "comparative political economy" as a subfield of political science. It explores the major theoretical debates among political scientists doing political economy as well as the relationship of this literature to Marxist political economy and institutional economics. The readings deal exclusively with advanced capitalist countries, and special emphasis is placed on Western Europe.

**[658 Indonesia**
4 credits. Not offered 1989–90.]

**[659 Politics in Postwar Western Europe**
4 credits. Not offered 1989–90.]

**[660 Research Topics on Advanced Industrial Democracies: Social Movements, Collective Protest, and Policy Innovation**
4 credits. Not offered 1989–90.]

**692 The Administration of Agricultural and Rural Development**
Spring. 4 credits.
N. T. Uphoff, E. Oyer.
The political, bureaucratic, economic. and technical environments of administration for agricultural and rural development; the various functions involved in administration (personnel management, planning, budgeting, economic analysis, information systems); several major tasks (research, extension services, and infrastructure development); and specific problems of integrating activities, interfacing with rural populations, and utilizing external assistance. Intended primarily for persons who expect to have some future responsibilities in agricultural or rural development administration and Third World countries.

### Political Theory

**665 American Political Thought**
Spring. 4 credits.
W. J. Dannhauser.
Major works by Americans about American problems, including Jefferson, Madison, Paine, Lincoln, Douglass. The course will give special emphasis to the founding and the Civil War but will not be limited to these topics.

**[666 Modern Political Philosophy: The Political Philosophy of Nietsche**
4 credits. Not offered 1989–90.]

**[667 Current Approaches to Political Theory**
4 credits. Not offered 1989–90.]

**669 Modern Social Theory I**
Fall. 4 credits.
S. Buck-Morss.
Readings vary, but topics are drawn from the traditions of Marx, Weber, Durkheim, the Frankfurt School, and Freud. They include political economy, the transformation to "modernity," ideology as the legitimation of power, and social institutions as social constraints. The methods of critical theory, structuralism, poststructuralism, and feminism will be considered.

**670 Modern Social Theory II**
Spring. 4 credits.
S. Buck-Morss.
Issues raised by neo-Marxism, critical theory, poststructuralism, and feminism.

**[675 Gramsci and Cultural Politics (also German Studies 685)**
4 credits. Not offered 1989–90.]

**678 Classics in Political Thought: Tocqueville**
Fall. 4 credits.
W. J. Dannhauser.
Readings of *Democracy in America* and *The Old Regime and the Revolution.*

### International Relations

**680 International Security—Conflict and Cooperation Among States**
Spring. 4 credits.
T. Risse-Kappen.
This seminar is designed as a follow-up to the International Relations Field Seminar (Government 606), introducing students to one particular issue-area in international relations. It will confront students with the relevant theoretical approaches in the field, focusing on the explanation of conflict and cooperation among states.

**[683 Nuclear Arms Control—Theory and Practice**
4 credits. Not offered 1989–90.]

**[684 Politics of the Arms Race**
4 credits. Not offered 1989–90.]

**[685 International Political Economy**
4 credits. Not offered 1989–90.]

**[686 International Strategy**
4 credits. Not offered 1989–90.]

**[687 International Relations of Asia**
4 credits. Not offered 1989–90.]

## GREEK

See Department of Classics.

## HEBREW

See Department of Near Eastern Studies.

## HINDI-URDU

See Modern Languages and Linguistics.

## HISTORY

S. G. Cochran, chair; G. C. Altschuler, D. A. Baugh, S. Blumin, P. R. Dear, T. H. Holloway, C. Holmes, I. V. Hull, P. R. Hyams, J. J. John, M. Kammen, S. L. Kaplan, J. V. Koschmann, D. C. LaCapra, W. F. LaFeber, R. L. Moore, J. M. Najemy (graduate faculty representative, 341 McGraw Hall, 255-6748), M. B. Norton, C. A. Peterson, J. R. Piggott, W. M. Pintner, R. Polenberg, W. B. Provine, D. Sabean, T. Shiraishi, J. H. Silbey, F. Somkin, M. Steinberg, B. Strauss, B. Tierney, D. Usner (director of undergraduate studies, 363 McGraw Hall, 255-6753), M. Washington, J. H. Weiss, L. P. Williams, D. Wyatt

The popularity of history among Cornell students is due to its usefulness as preparation for graduate, professional, or law school and for any career that requires critical thinking and good writing; the reputation of the faculty for scholarship, teaching, and advising; and most of all, the intrinsic interest of the discipline. A wide variety of introductory and advanced courses is offered. The department is particularly strong in ancient, medieval, and modern European history; in American, Latin American, Chinese, and Southeast Asian history; and in the history of science.

### The Major

To complete the history major, a student must fulfill the requirements listed below:

1) Complete the prerequisite requirement by taking either Introduction to Western Civilization (History 151–152) or Introduction to Asian Civilizations (History 190–191) or, alternatively, three courses in European history—one in ancient history; one in medieval, Renaissance, or early modern history; and one in modern history.

2) Take history department courses totaling 36 credits (which may include the prerequisite courses) and complete all these courses with a grade of C or better. Of the 36 credits, a minimum of 20 must be taken in courses numbered 250 and above.

3) Take a minimum of 8 credits in each of two of the following fields: American, European, Asian, or Latin American history or history of science. Alternatively, a student may elect to take a total of 16 credits in three of these fields. Credits taken to fulfill the prerequisite requirement (see item 1, above) do not count toward this requirement.

4) Take at least one course at the advanced (400 or higher) level.

5) Take two courses above the elementary level offered by other departments that relate to the student's area of special historical interest. Prospective majors may want to discuss their projected program with the director of undergraduate studies before formally enrolling with the department.

**Honors.** History majors with an overall B+ average in all their history courses are eligible to enroll in History 400, Honors Proseminar, which is normally taken in the junior year or, at the latest, in the fall of the senior year. (Honors candidates are strongly encouraged to take another 400-level seminar during their junior year.) Upon successful completion of the proseminar, students may become candidates for the degree of Bachelor of Arts with honors in history by submitting to a prospective faculty adviser a written thesis proposal delineating the general area of inquiry for an honors essay and having the proposal approved by the adviser. The proposal should be submitted as soon as possible after the completion of History 400, normally during the junior year or at the beginning of the senior year.

After acceptance of the proposal by an adviser, honors candidates should normally enroll with their advisers in History 401, Honors Research, during the first term of their senior year. History 401 is a 4-credit course that permits honors candidates to conduct research and to begin writing the honors essay. At the end of the first semester of the senior year, as part of the requirements for History 401, the student will submit to his or her adviser a ten-to-fifteen-page overview of the entire thesis and will undergo an oral examination on the broad field of history that the student researched. The examination will be administered by a committee consisting of the student's adviser and one other department member, who will eventually serve as a reader of the thesis. The committee will then recommend whether the student may proceed to enroll in History 402, Honors Thesis, during the final semester of the senior year. History 402 is a 4-credit course that permits honors candidates to complete the honors essay and to prepare both to defend the essay and to demonstrate their understanding of the general historical interests they have pursued with the major. Students who do not take History 400 in their junior year must submit both the thesis proposal and the prospectus by the end of the fall semester of their senior year to be eligible to enroll in History 402 by their final semester.

Honors candidates must complete a minimum of 40 credits in history, 8 of which must be History 400 and 402. The completed thesis will be examined by three readers, including the two faculty members who administered the preliminary oral examination.

The text of the honors essay may not exceed sixty pages except by permission of the chair of the honors committee and the student's adviser. Two copies will be due during the third week of April. In May each honors candidate will be given an oral examination administered by the major adviser and one or both of the essay readers. The examination will focus on the specific issues of the essay as well as the broad field of history in which the student has concentrated his or her research (e.g., Periclean Athens, seventeenth-century science, nineteenth-century America).

To qualify for a Bachelor of Arts degree with honors in history, a student must (1) sustain at least a B+ cumulative average in all history courses and (2) earn at least a *cum laude* grade on the honors essay and on the oral examination.

Students considering the honors program should consult the department during the second term of their sophomore year or early in their junior year.

## Course Offerings

**Freshman writing seminars**

**Comparative history**

**History of science**

**American history**

**Latin American history**

**Asian history**

**Ancient European history**

**Medieval, Renaissance, and early modern European history**

**Modern European history**

**Honors and research courses**

### Course Numbering System

100–level courses are very general introductory courses (like 151–152, 190–191) and freshman writing seminars.

200–249–level courses are similar to freshman writing seminars, except that there is greater emphasis on subject matter and less on writing.

250–299–level courses have no prerequisites and admit freshmen. They cover a relatively broad geographical area, period of time, or subject.

300–399–level courses may have specified prerequisites or deal with more-specialized subjects than do those numbered 250–299. Admission of freshmen varies from course to course and is indicated in the course descriptions.

400–499 are upper level undergraduate courses.

600–699 and 700–799 are graduate level courses.

## Freshman Writing Seminars

**[104 Communes and Utopias: Alternative Life-Styles in American History**
Not offered 1989–90.
G. C. Altschuler.
This course examines individual and group critiques of American society and experiments with alternative lifestyles. Topics include the Puritans, the Oneida community, the Mormons, Walden, the Ferrer Colony and Modern school, Vedanta monasteries, Walden II, and contemporary communes.]

**[106 Democracy and Education: History of Learning in America**
Fall. 3 credits. Not offered 1989–90.
M W F 11:15. G. C. Altschuler.
A survey of the history of educational thought and institutions from Puritan times to the present, with emphasis on the nineteenth and twentieth centuries. Topics include the family and church as educational institutions, the democratization of education, the emergence of the university, educational testing, and vocational education. John Dewey and progressive education, "alternate education," student radicalism.]

**[107 The Family in American History**
Not offered 1989–90.
M. B. Norton.
An examination of the American family in the context of changing times from the seventeenth century to the present day. Readings include both primary and secondary sources. Students research the past experience of their own families as part of the course.]

**[108 Civil Liberties in the United States**
Spring. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
T R 2:30–3:45. R. Polenberg.
Freedom of speech and dissent from Jefferson's time to the present, with emphasis on the twentieth century. Topics include Jefferson and Madison; Lincoln and martial law; Holmes, Brandeis, and the Supreme Court; the relocation of Japanese Americans; the cold war and McCarthyism; religious cults and "brainwashing"; censorship and obscenity; John Milton, John Stuart Mill, and the critique of libertarianism.]

**[112 The North Atlantic Community and the Wider World**
Not offered 1989–90.
T. H. Holloway.
The relationship between the attitudes and values of Europeans and the emergence of the global economic and political network since the Age of Discovery. The voyages of exploration, commercial expansion, and the consolidation and dissolution of modern empires are considered. Texts contemporaneous with these periods will be read and discussed to explore ways members of the North Atlantic community have explained and justified their emerging world influence in religious, racial, technological, and cultural terms.]

**126 Local History: The Smallest History**
Fall or spring.
T R 8:40–9:55. C. Kammen.
In this seminar students will investigate the history of Cornell University. The course will focus on Cornell's place in the history of American education, on Ithaca as the site of a major university, and on the development of the Cornell idea. Highlighted will be the founders, the students, teachers, courses, and activities at Cornell. Readings will be drawn from the documentary history of the University and will also include a host of Cornell authors: Carl Becker, Morris Bishop, Charlotte Conable, K.C. Parsons, E.B. White, and others. Paper assignments will include speculative essays about education and universities, and research topics requiring the use of diaries, manuscripts, and other archival materials.

**[176 Britain and the Second World War**
3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
T 3:35, R 2:30–4:30. D. A. Baugh.
The aim is to uncover the true facts of Britain's conduct and situation from 1936 to 1946. Emphasis is on the fighting on land, sea, and in the air, but preparedness, economic warfare, diplomacy, and imperial power are considered. Topics include the Battle of Britain, the Battle of the Atlantic, and strategic bombing.]

**[192 Japan and the West**
Fall. 3 credits. Prerequisite: permission of instructor. Limited to 12 students. Not offered 1989–90.
J. V. Koschmann.]

**[205 The Growth of Political Democracy in the United States**
Fall. 3 credits. Limited to 14 students. Prerequisite: permission of instructor. Not offered 1989–90.
T 2:30–4:30. J. H. Silbey.
An examination of the democratization of American political life since the American Revolution. Such topics as the expansion of white, Black, and women's suffrage and the changing concepts of participation and leadership in American politics will be explored. A number of books and documents covering the topic will be read and discussed and several short papers written.]

**[214 Seminar on American Foreign Policy**
Fall. 4 credits. Open to freshmen and sophomores. Limited to 14 students; preference will be given to non-history majors. Prerequisite: permission of instructor. Not offered 1989–90.
T 2:30–4:25. W. LaFeber.]

**[219 Freshman Seminar: History of North American Indians**
Spring. 3 credits. Limited to 18 students. Not offered 1989–90.
D. H. Usner.
This seminar examines major themes in Native American history from colonial times to the present. Discussions will consider the cultural histories of particular tribes as well as the comparative elements of Indian relations with non-Indians.]

## Comparative History

**[208 Anarchism in America and Europe**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
P. Polenberg.
Topics include Godwin, Bakunin, and Kropotkin; anarchism and socialism; the libertarian tradition; anarchists in the Russian Revolution; Emma Goldman and Alexander Berkman; the red scare and the Sacco-Vanzetti case; the Spanish civil war; and anarchism and education.]

**[274 Foodways: A Social History of Food and Eating**
Fall. 4 credits. Not offered 1989–90.
T R 2:55–4:10. S. L. Kaplan.
An interdisciplinary examination of the validity of the adage "man is what he eats." Among the topics: food and nutrition, food and social structure, the politics of food control, food and modernization, taste making, and food in religion and literature. Cases will be drawn widely across space and time, from Pharaoh's Egypt to the 1980s.]

**360 Early Warfare, East and West**
Spring. 4 credits.
M W F 1:25. C. A. Peterson.
A study of the principal modes of warfare found both in the East and the West from ancient times up to the eighteenth century. Tactical evolution and the impact of innovations are stressed, but attention is also paid to the general social background and the role of nonmilitary factors.

**[380 Social History of Western Technology**
Fall. 4 credits.
For description see History of Science.]

**[405 Population and History**
4 credits. Open to sophomores. Not offered 1989–90.
R 2:30–4:30. S. L. Kaplan.
Seminar format. An examination of the impact of the methodology and findings of demography on historical scholarship and the implication of historical research for the study of population. Focus will be on the relation of population to family and social structure, economic growth, political stability, collective mentality, etc. Readings in European and American history from the Black Plague through the Industrial Revolution.]

**[407 Death in Past Time**
4 credits. Not offered 1989–90.
S. L. Kaplan.
Every culture has felt an urgent need to deal with death to disarm, rationalize, and integrate it by giving it sense. How a culture perceives and propitiates death reveals a great deal about its social and political structure, religious and artistic values, and economic and scientific goals. The nature of death is considered using a wide variety of examples drawn from throughout history.]

**[409 Seminar on Work in Europe and America**
Fall. 4 credits. Not offered 1989–90.
W 2:30–4:30. S. L. Kaplan.
A comparative study of the meaning of work in different societies from premodern times to the present. Emphasis on the "representations" of work of the actors themselves who worked, as well as of those who for various critical reasons did not work. The seminar will examine not only ideology but also the organization, practice, and physical place of work. It will explore theory as well as "cases," and draw on anthropological and sociological as well as historical materials.]

**[416 The History and Economics of Whaling in North America (also Agricultural Economics 454 and Society for the Humanities 413**
Spring. 4 credits. Not offered 1989–90.
T R 2:30–4:20. D. Usner, J. Conrad.
The whaling industry of nineteenth-century America is a rich source of documents and data describing the people, resources, and technology that contributed to the development of the United States. Social relations, cross-cultural influences, economic motivations, prices, markets, resource dynamics, and technical change will be examined during the rise and fall of this unique American industry.]

**432 The City in History**
Spring. 4 credits. Limited to 12 students.
Prerequisite: permission of instructor.
R 2:30–4:30. S. Blumin.
Reading and discussion of classic interpretations of the rise, role, and character of cities in medieval and early–modern Europe, and in modern Europe and America. Further reading on a topic of the student's own choice.

**[451 Lord and Peasant in Europe: A Seminar in Social History**
4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
S. L. Kaplan.]

**454 The Herodotean Moment: The Uses and Abuses of "Western Civilization" (also Government 454)**
Fall. 4 credits. Limited to 20 students.
Prerequisite: permission of instructor.
TR 1:25–2:40. M. Bernal, J. M. Najemy.
The basic premise of the seminar is that the concept of "Western civilization" is a problematic one in need of critical analysis. The course will examine the historical evolution of the concept as seen in selected moments of actual and perceptual encounter with other civilizations. It will also inquire into the political uses and abuses of the concept, as well as its discursive, psychological, and anthropological dimensions.

**[476 Documenting the Depression: Film, Literature, and Memory**
Not offered 1989–90.
For description see Modern European History.]

**621 Social Memory and the Transformation of Tradition in American Culture**
For description see American History.

**[708 Seminar in the Research on the History of Food**
Not offered 1989–90.
S. L. Kaplan.]

## History of Science

**[233 Agriculture, Technology, and Society**
Spring. 4 credits.
TR 1:25–2:15. M. Rossiter. Not offered 1989–90.
This course will survey the major themes in the development of agriculture and agribusiness in the United States in the 19th and 20th centuries. These include particular individuals (such as Liberty Hyde Bailey, Luther Burbank, G. W. Carver, Henry A. Wallace, and Norman Borlaug), the rise of government support and institutions (including U.S.D.A. and Cornell), the emergence of agricultural sciences, noteworthy events (such as the Dust Bowl and World War II), and the achievements of the recent Green and "Gene" Revolutions.]

**281–282 Science in Western Civilization**
281, fall; 282, spring. 3 credits each term.
History 281 is not a prerequisite to 282.
T R 11:40–12:55. A. D. Wilson.
Traces the changing perceptions of nature, human knowledge, and proper scientific method from Greek antiquity to the twentieth century. The course also traces the emergence and development of the various scientific disciplines and subdisciplines. This course aims to make comprehensible to both science majors and students of the humanities the historical structure and development of modern science and to show science as a cultural phenomenon. 281 runs chronologically up to the death of Newton; 282 covers the eighteenth, nineteenth, and early twentieth centuries.

**287 Evolution (also Biological Sciences 207)**
Fall. 3 credits.
T R 10:10–11; disc to be arranged.
W. Provine.
Evolution is the most central concept in biology. This course examines evolution in historical and cultural context. Aims of the course include understanding of the major issues in the history and current status of evolutionary biology, and exploration of the implications of evolution for culture. Issues range from controversies over mechanisms of evolution in natural populations to the conflict between creationists and evolutionists.

**288 History of Biology (also Biological Sciences 202 and Biology and Society 288)**
Spring. 3 credits. Prerequisite: one year of introductory biology.
T R 10:10–11:25. W. Provine.
An examination of the history of biology, emphasizing the interaction of biology and culture. Original writings of biologists constitute the bulk of reading assignments. This course covers the period from Classical antiquity to the present, but primary emphasis is on twentieth-century biology.

**[380 Social History of Western Technology**
Fall. 4 credits. Not offered 1989–90.
T R 10:10–11:25, disc to be arranged.
J. H. Weiss.
Studies in the interaction between technological changes and social changes in Western Europe and America since the eighteenth century. Readings and lectures will deal both with instances of social transformation that accompanied technological changes and with the role of technology in social thought and cultural expression. Special attention to three periods: Britain during the Industrial Revolution, America in the nineteenth century, and America during the Vietnam War.]

**443 Science and Culture in Austria, 1872–1930**
Fall. 4 credits.
R 2:30–4:25. A. D. Wilson.
This seminar will examine Austrian ideas in science, philosophy, and literature concerning the limitations of reason and language in understanding physical reality and the human condition. Special attention will be paid to the work of Ludwig Boltzmann, Ernst Mach, Sigmund Freud, Hugo von Hofmannsthal, Robert Musil, and Ludwig Wittgenstein.

**[444 Historical Issues of Gender and Science (also Women's Studies 444)**
Spring. 4 credits. Open to sophomores. Not offered 1989–90.
M 2:30–4:30. M. W. Rossiter
One-semester survey of women's role in science and engineering from antiquity to the 1980s with special emphasis on the United States in the twentieth century. Readings will include biographies and autobiographies of prominent women scientists, educational writings and other primary sources, and recent historical and sociological studies. By the end of the semester, we shall have attained a broad view of the problems that have faced women entering science and those that still remain.]

**446 The Origins of Western Science: Plato and Aristotle**
Spring. 4 credits.
R 2:30–4:25. A. D. Wilson.
The seminar will focus on the natural philosophies of Plato and Aristotle. Special attention will be paid to their respective understanding of the epistemological, metaphysical, and methodological foundations of the study of nature.

**[447–448 Seminar in the History of Biology (also Biology and Society 401–402)**
4 credits. Not offered 1989–90.
T 2:30–4:30. W. Provine.]

**[482 The Origins of Modern Science 1500–1700**
Spring. 4 credits. Not offered 1989–90.
R 2:30–4:30. P. R. Dear.
A seminar focusing on the changes in the European conception of nature and of human knowledge that created modern science. A new way of perceiving the world, and a new ideology justifying its experimental manipulation, transformed the finite, earth-centered, organic universe of 1500 into the infinite, mechanical universe of Isaac Newton. The course traces these developments above all through the study of primary materials, using the writings of Copernicus, Galileo, Descartes, Newton, and other lesser-known figures to discover how technical and philosophical innovations emerged from the changing worldview of early modern Europe.]

**487 Science, Technology, and Strategy in the Post–Napoleonic World**
Spring. 4 credits.
T 2:30–4:30. L. P. Williams
An examination of the effects of modern science and modern technology on strategy in modern war. Students will be expected to do one major research paper examining, in both historical and technological detail, some aspect of the strategic effects of science and/or technology.

**[680 Seminar in Historiographical Approaches to Science**
Fall. 4 credits. Not offered 1989–90.
R 2:30–4:30. P. R. Dear.
Examines philosophical and sociological dimensions of recent historiography of science.]

**681 Seminar in the History of Nineteenth-Century Physical Science**
Fall. 4 credits.
T 2:30–4:30. L. P. Williams.

**[781 Advanced Seminar in the History of Nineteenth-Century Physical Science**
Fall and spring. 4 credits each term. Prerequisite: permission of instructor. Not offered 1989–90.
L. P. Williams.]

## American History

**101–102 Introduction to American History**
101, fall; 102, spring. Summer. 3 credits each term. 101 is not a prerequisite to 102. Not open to students who have taken History 201–202.
M W F 11:15. G. C. Altschuler.
A survey of U. S. history designed to introduce students to major themes and interpretations. History 101 traces the origins and evolution of the nation through 1865. Topics include Puritanism, the American Revolution, the Constitution, Jacksonian democracy, and the Civil War. History 102 covers the period from the Civil War to the present. Topics include the Reconstruction, the Gilded Age, the world wars, the 1960s, Vietnam, and Watergate.

**209 Political History of Indians in the United States**
Fall. 4 credits.
T 2:30–4:25. D. H. Usner.
An investigation of political organization and change among Native American societies. Discussions and assignments examine forms of tribal government, diplomacy, and warfare, as well as political relations with European colonies and the United States. Specific topics include pan-Indian confederacies, Indian policy, struggles over sovereignty, and Indian strategies of autonomy and resistance.

**[210 The Supreme Court and Civil Liberties**
Fall. 4 credits. Primarily for sophomores. Enrollment limited to 15 students. Prerequisite: permission of instructor. Not offered 1989–90.
T R 2:55–4:10. R. Polenberg.
The development of free speech doctrine from the era of Holmes and Brandeis to the present, with special attention to the controversies over such issues as dissent, libel, and censorship.]

**[214 Seminar on American Foreign Policy**
Fall. 4 credits. Open to freshmen and sophomores. Limited to 14 students; preference will be given to non–history majors. Prerequisite: permission of instructor. Not offered 1989–90.
T 2:30–4:30. W. LaFeber.]

**[227 Historical Perspectives on Modern American Sex Roles (also Women's Studies 227)**
Spring. 4 credits. Each section limited to 20 students. Intended primarily for sophomores. Not offered 1989–90.
M. B. Norton.
A reading and discussion course. The class will begin by examining sex roles in the United States in the 1980s, looking at a variety of sources such as popular magazines and contemporary commentaries. We will then move backwards in time in an attempt to uncover the roots of current attitudes. The students will help determine which topics the class will investigate in detail.]

**255 The American Dream**
Fall. 4 credits.
M W F 1:25–2:15. F. Somkin.
The culture of the United States is markedly different from that of the rest of the English-speaking world. What makes Americans distinct? Lacking from the beginning the blood-and-soil amalgam of other peoples, America has been primarily a set of promises: the American Dream. The emphasis of the course will be on the ironic contrast between this vision at its most grandiose and present American realities.

**[256 African-American History, 1945–85**
Spring. 4 credits. Open to freshmen with permission. Not offered 1989–90.
T R 11:40–12:55. M. Washington.
This course focuses on the history, culture, and literature of African-American people during the post–World War II, civil rights, and revolutionary nationalist period. It is an introductory course that examines key issues, themes, and events in a context of contemporary relevance. Emphasis will be on the historical evolution of the modern Black community, Black-white race relations, and the impact of modern economic and political institutions on Black life and thought. Topics include the impact of the Cold War on Black leaders and the Black press, integration and Black nationalism, the relevance of socialism and internationalism, the status of Black women, the African-American literary scene, the emergence of Black liberation theology, and the effects of contemporary Black politicization on the total society.]

**[273 Women in American Society, Past and Present**
Spring. 4 credits. Not offered 1989–90.
M W 10:10; disc, F 10:10 or 12:20.
M. B. Norton.
A survey of women's experiences in America from the seventeenth century to the present. Among the topics to be discussed are women's familial roles, the changing nature of household work, the women's rights movement, employment of women outside the home, racial and ethnic differences in women's experiences, and contemporary feminism.]

**[275 Crime and Punishment: From the Puritans to Mickey Spillane**
Spring. 4 credits. Not offered 1989–90.
M W F 1:25–2:15. F. Somkin.
A historical investigation of how the American literary imagination has dealt with the way of the transgressor in novels, short stories, plays, and movies. Readings on murder, guilt, and retribution on land and sea, from the frontier to the urban jungle. Emphasis on the intellectual and social context of moral values.]

**[276–277 Native American History**
276, fall; 277, spring. 4 credits each term. Not offered 1989–90. Next offered 1990–91.
M W F 12:20. D. H. Usner.
A survey of North American Indians from the beginning of European contact to the present. Cultural, political, and economic changes experienced by particular societies will be covered. Emphasis will be given to general themes of Indian-white relations, comparative tribal histories, and the role of Native Americans in the overall history of the United States.]

**303 African-American Women from Slavery to Freedom**
Spring. 4 credits.
T R 11:40–12:55. M. Washington.
This course thematically explores the history of African-American women from a sociopolitical perspective. Topics include the images and depictions of Black women, how Black women have engaged in political struggle, race progress vs. feminism, the relationship between racism and sexism, and Black women in family life.

**[307 The Jewish Immigrant Experience**
Fall. 4 credits. Enrollment limited. Prerequisite: permission of instructor. Not offered 1989–90.
R 2–4. F. Somkin.
In the half century after 1880 several million Eastern European Jews entered the United States with profound cultural consequences for themselves, their descendants, and the dominant Anglo-Saxon capitalist society they encountered here. Through a study of selected fiction and nonfiction materials this course examines what America made of these immigrants and what they made of it.]

**[311–312 The Structure of American Political History**
311, fall; 312, spring. 4 credits each term. Not offered 1989–90; next offered 1990–91.
M W F 10:10. J. H. Silbey.
311 examines the course of American politics from 1787 to the Civil War, focusing on the nature of decision making, popular and legislative voting behavior, and the role of interest groups, political parties, and political elites in shaping our political history. 312 examines the course of American politics from 1865 to the present.]

**313 U.S. Foreign Relations, 1750–1912**
Fall. 4 credits. Open to freshmen with permission of instructor.
T R S 11:15 plus optional sec.
W. LaFeber.
Examines policy and policymakers from Benjamin Franklin to Woodrow Wilson. Emphasis is placed on domestic events that shaped foreign policy. A special section, numbered 301.13, offers an additional 2 credits. Open only to juniors and seniors, it is limited to 20 students. This section will meet weekly and provide an opportunity to write supervised papers on U.S. foreign relations to 1912. Permission is required.

**[314 History of American Foreign Policy, 1912 to the Present**
Spring. 4 credits. Open to freshmen with permission of instructor. Not offered 1989–90.
M W 11:15 plus disc. W. LaFeber.
Students examine the emergence of the United States as a world power in the twentieth century. The course focuses on the domestic sources of foreign policy and the assumptions of the major policymakers (Wilson through Reagan). Important themes include the American response to a revolutionary world since 1910, the increasingly dominant role of the president in the making of U. S. foreign policy, and the changing American position in the international economy.]

**[318 American Constitutional Development**
Spring. 4 credits. Open to freshmen with permission of instructor. Not offered 1989–90.
M W 10:10; disc, F 10:10 or 12:20.
M. B. Norton.
A study of the major themes of the constitutional history of the United States. Among the topics to be considered are the drafting of the Constitution, the Marshall and Taney courts, the constitutional crisis caused by slavery and emancipation, the rise of substantive due process, the expansion of civil rights and liberties for women and men in the twentieth century, and the contemporary court.]

**[319 The Frontier in American Thought and Culture**
4 credits. Not offered 1989–90.
D. H. Usner.
As a kind of place and a cluster of symbols, the West has deeply influenced ideology and intellectual life in the United States. Using fiction, art, popular culture, and social sciences as primary texts, this course examines how concepts about race and class, society and environment, national destiny and development were fused into various forms of a frontier mythology.]

**321 The Origins of American Civilization**
Fall. 4 credits.
M W F 1:25–2:15. M. Kammen.
The colonial genesis of American culture and society, with emphasis on the emergence of distinctive institutions, attitudes, and social patterns. Topics include race relations, religion, politics, movements of protest, and cultural developments. Open to qualified freshmen.

**[325 Age of the American Revolution, 1763–1815**
Fall. 4 credits. Open to freshmen with permission of instructor. Not offered 1989–90.
T R 10:10–11:25. M. B. Norton.
An examination of the process by which the thirteen English colonies became an independent and united nation, with emphasis on political thought and practice, social and economic change, and cultural development. Attention will be paid to the impact of the American Revolution on women, Blacks, and Indians as well as on white males.]

**327–328 American Frontier History**
327, fall; 328, spring. 4 credits each term.
M W 10:10–11; disc F 10:10 or 12:20.
D. H. Usner.
Survey of exploration, settlement, and expansion across North America since the sixteenth century. The first term covers international rivalry over territory, frontier trade systems, Indian-colonial relations, and the early administration of U. S. territories. Topics in the second term include the evolution of land and Indian policies, life in frontier communities, and political movements and economic change in the American West.

**[330 The United States in the Middle Period, 1815–1850**
Fall. 4 credits. Not offered 1989–90; next offered 1991–92.
M W F 10:10. J . H. Silbey.
An analysis of American society from the end of the second war with England to the crisis of 1850, stressing the developing trends of nationalism and sectionalism, the rise and results of Jacksonian democracy, and the internal tensions produced by physical growth and slavery.]

**331 The American Civil War and Reconstruction**
Spring. 4 credits.
M W F 10:10. J. H. Silbey.
An analysis of the factors leading up to the breakup of the Union, the impact of the war in North and South, and the problems of restoration and reconstruction of the seceded states.

**[332–333 The Urbanization of American Society**
332, fall; 333, spring. 4 credits each term. 332 is not prerequisite to 333. Not offered 1989–90. Next offered 1990–91.
M W F 11:15. S. Blumin.
America was born in the country and moved to the city. This course examines the profound effects on American society of the growth and multiplication of cities and of the massive transfer of population from rural to urban and suburban milieux. It is also a history of the city itself, from the small, preindustrial ports of the initial European settlements to the industrial metropolises and urban corridors of the present. Fall term, 1600–1860; spring term, 1860–present.]

**335 African–American History from Slavery to Freedom**
Fall. 4 credits.
T R 11:40–12:55. M. Washington.
This is an introductory course on the history of African–American people from the African background through the Civil War (1619–1865). There will be three areas of concentration: (1) the transition from African societies to the "New World," (2) the experiences of free blacks in the North and South, and (3) life in bondage in the southern states. There are no prerequisites; however, some background in American history would be useful.

**336 The Business of America: Capitalism and Society in the United States, 1776–1900.**
Fall. 4 credits.
M W 11:15 plus disc to be arranged.
S. Blumin.
An examination of capitalism as a developing economic system, and as a force that shaped American society in the most crucial ways. Beginning in the pre-industrial, predominantly rural era of the American Revolution, we will trace the emergence and development of industrial and corporate institutions, the changing social experiences of working, middle, and upper classes, and the evolving ethos of "free enterprise" in the competitive society of the nineteenth century.

**337 The Industrial Transformation of American Society, 1865–1990**
Spring. 4 credits.
M W 11:15 plus disc to be arranged.
S. Blumin.
A history of American society since the Civil War, with emphasis on the transforming effects of industrial development, urbanization, large-scale foreign immigration, and new technologies of transportation and communication, on the social lives of "anonymous Americans."

**340 Recent American History, 1917 to 1945**
Fall. 4 credits.
T R 12:20–1:10; disc to be arranged.
R. Polenberg.
Topics include civil liberties and dissent in World War I; individualism and conformity in the 1920s; radicalism and reform in the New Deal; class, race, and ethnicity; Franklin Roosevelt and World War II; the Holocaust; and the atomic age.

**341 Recent American History, 1945 to the Present**
Spring. 4 credits.
T R 12:20–1:10; plus disc to be arranged. R. Polenberg.
Topics include the Cold War and civil liberties; the Supreme Court and civil rights; Kennedy, Johnson, and social reform; the Vietnam War; the Carter and Reagan presidencies; and class, race, and ethnicity in modern America.

**343 Americans in Profile**
Fall. 4 Credits.
T R 1:25–2:15. D. McCullough.
Lectures on the rise of modern America, from the Battle of Gettysburg to the present, as seen through the lives of Robert E. Lee, Theodore Roosevelt, the Roeblings, Frederic Remington, Geronimo, Louis Agassiz, Willa Cather, Anne Morrow Lindbergh, the Wyeth family, Henry Ford, Huey Long, Harry Truman, Lena Horne, Lyndon Johnson and others. Required reading will include history and fiction, but mainly biography and autobiography.

**[344 American Ideas from the Puritans to Darwin**
4 credits. Not offered 1989–90.
M W F 1:25. F. Somkin.]

**345 The Modernization of the American Mind**
Fall. 4 credits.
M W F 12:20–1:25; disc to be arranged. R. L. Moore.
American thought and culture from 1890 to the present. Emphasizes the intellectual impact of major political and economic events and the adaptation of social ideas and values to new conditions.

**346 Religion and the Cultural Life of Nineteenth-Century Americans**
Spring. 4 credits.
T R 11:40–12:55. R. L. Moore.
An examination of religion as a basic component of popular cultures. The emphasis is not on churches but on how religious attitudes reached beyond formal organizations to shape the ways in which various American ethnic and racial groups organized, understood, and enjoyed their lives.

**410 Politics and Gender in Seventeenth Century Anglo-America (also Soc. Hum. 419 and Women's Studies 573)**
Fall. 3 Credits.
W 2:30–4:30. M. B. Norton.
An examination of the process of change in the seventeenth and eighteenth centuries from a world in which family, state, society, and church were seen as analogous institutions to a world in which the family became the "privatized" domain of women, differentiated from the "public" realm of men. Both primary and secondary sources will be discussed. Readings will include Robert Filmer, *Patriarcha*; John Locke, *Two Treatises of Civil Government*; Mary Astell, *Some Reflections upon Marriage*; John Winthrop, *On Civil Liberty*; Benjamin Wadsworth, *The Well-Ordered Family*; Linda Nicholson, *Gender and History*; Hannah Pitkin, *Fortune Is a Woman*; Margaret Ezwell, *The Patriarch's Wife*; Gordan Schochet, *Patriarchalism in Political Thought*; and Jay Fleigelman, *Prodigals and Pilgrims*.

**[411 Undergraduate Seminar in American Political History**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. J. H. Silbey.]

**414 Motivation of American Foreign Policy**
Fall. 4 credits. Prerequisites: History 314 and permission of instructor.
R 2:30–4:15. W. LaFeber.
Topic to be announced.

**[415 The United States and Russia, 1780 to 1914**
Fall. 4 credits. Enrollment limited to 16 students. Primarily for juniors and seniors. Prerequisite: permission of instructor. Not offered 1989–90.
R 2:30–4:15. W. LaFeber.
The course will analyze diplomatic relations between the United States and Russia between 1780 and 1914. Special attention will be given to the causes of the friendship of the early decades and why it changed to animosity. The domestic origins of the foreign policies of both nations will be stressed. Extensive individual research projects will be assigned.]

**[416 Six Americans**
Spring. 4 credits. Not offered 1989–90.
R 2–4. F. Somkin.
A study of the lives and ideas of John Adams, Joseph Smith, Mark Twain, Jane Addams, Louis Sullivan, and Oliver Wendell Holmes, Jr., emphasizing the relation of personality to intellect within the context of dominant American ideals.]

**418 Undergraduate Seminar in the History of the American South**
Spring. 4 credits. Prerequisite: permission of instructor.
M 2:30. J. H. Silbey.
From Reconstruction to the present era of Jesse Jackson and "Reagan Democrats," race has been one of the most potent forces in the country. Its roots lie in the Southern experience, however, affecting both Whites and Blacks. This course will focus on the ways issues of race have dominated Southern politics since 1865.

**[419 Seminar in American Social History**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
R 2:30–4:30. S. Blumin.
Topic for fall 1988: the character of capitalism in nineteenth-century America. An inquiry into the social and cultural dimensions of economic development.]

**[421 Constitutionalism in American Culture**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
M 2:30–4:30. M. Kammen.
This seminar (for juniors and seniors) will explore various trends, characteristics, episodes, and changes in American constitutionalism from the revolutionary era to the present. Weekly discussions and several essays are required.]

**422 Religion, Gender, and the Family in Early Modern Anglo-America (also Soc Hum 426; Women's Studies 574)**
Spring. 3 credits.
W 2:30–4:25. M. B. Norton.
Continues the themes developed in HIST 410/ Soc Hum 419 (fall 1989), but with primary reference to religion and the family. The course will examine the role of Puritan ideas in shaping the "modern" concept of the family and women's and men's roles therein; the emerging notion of the family as "private" and separated from the broader society; the regulation of moral and sexual behavior by the state, and the reasons for such regulation; and the eventual severing of the theoretical connections among religion, the family, and the state by the time of the American Revolution.

**[426 Undergraduate Seminar in Early American History**
Spring. 4 credits. Not offered 1989–90.
M 1:25–3:20. M. B. Norton.
Topic: women and the family in early America.]

**[428 Undergraduate Seminar in American Frontier History**
4 credits. Not offered 1989–90.
D. H. Usner.]

**429 Undergraduate Seminar in Indians of Eastern North America**
Spring. 4 credits.
T 2:30–4:25. D. H. Usner.
A seminar examining the history of Native Americans in the eastern woodlands from colonial times to the present. The cultural and economic participation of Indians in the evolution of frontier societies will be examined. Major topics include fur-trade networks, political relations, removal, and the persistence of Indian communities in eastern states.

**430 Law and Authority in American Life**
Fall. 4 credits. Enrollment limited to seniors. Prerequisite: permission of instructor.
R 1:25–3:30. F. Somkin.
An investigation of the nature of the American legal system, its assumptions, myths, and illusions.

**439 Undergraduate Seminar in Reconstruction and the New South**
Fall. 4 credits. Prerequisite: senior standing (in history) or permission of instructor.
T 2:30–4:30. M. Washington.
This course focuses on the American South in the nineteenth century as it made the transition from Reconstruction to new forms of social organization and patterns of race relations. Reconstruction will be considered from a sociopolitical perspective, concentrating on the experiences of the freedpeople. The New South emphasis will include topics on labor relations, economic and political changes, new cultural alliances, the rise of agrarianism, and legalization of Jim Crow.

**440 Undergraduate Seminar in Recent American History**
Spring. 4 credits. Prerequisite: permission of instructor.
T R 2:55–4:10. R. Polenberg.
Topic: Benjamin N. Cardozo and the Supreme Court.

**[442 Religion and Politics in the United States**
Fall. 4 credits. Prerequisite: one year of course work in American history. Not offered 1989–90.
T 2:30–4:30. R. L. Moore.
Historical reading on the ways that organized religions have influenced American politics—the attitudes of voters, the behavior of politicians, and the judicial interpretations of the First Amendment. Weekly discussions and a research paper are required.]

**610 Afro-American Historiography**
Spring. 4 credits.
T 2:30–4:30. M. Washington.

**[613–614 Seminar on American Diplomatic History**
613, fall; 614, spring. 4 credits each term. Prerequisite: permission of instructor. Not offered 1989–90.
R 2:30–4:15. W. LaFeber.]

**[615–616 Seminar in American Cultural and Intellectual History**
615, fall; 616, spring. 4 credits.
F. Somkin. Not offered 1989–90.]

**[617]–618 Seminar in Recent American Cultural History**
[617, fall]; 618, spring. 4 credits each term. [617 not offered 1989–90.]
W 2:30–4:30. R. L. Moore.
A reading and research seminar concerned with popular culture in nineteenth-century America (publications, performances, and audiences).

**[619 Seminar in American Social History**
Fall. 4 credits. Not offered 1989–90.
R 2:30–4:30. S. Blumin.

**[620 Seminar in American History**
Fall. 4 credits. Not offered 1989–90.
M. Kammen.]

**621 Social Memory and the Transformation of Tradition in American Culture**
Fall. 4 credits.
W 3:30–6. M. Kammen.
Every society has traditions and myths concerning its evolution and identity. The focus of this seminar will be to examine the role of tradition and memory in American culture in comparative perspective. There will be contextual readings on nationalism and mythology in general. Comparisons will be made with European and Asian cultures.

**[624 Graduate Seminar in American Indian History**
Fall. 4 credits. Not offered 1989–90.
D. H. Usner.]

**[626–627 Graduate Seminar in the History of American Women**
626, fall; 627, spring. 4 credits each term. Not offered 1989–90.
T 2:30–4:30. M. B. Norton.
A reading and research seminar intended primarily for graduate students. Major works in American women's history will be carefully scrutinized, and each student will prepare a lengthy research paper.]

**[633 Seminar in Nineteenth-Century American History**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
M 2–4. J. H. Silbey.]

**[634 Seminar in Nineteenth-Century American History**
Spring. 4 credits. Not offered 1989–90.
J. Silbey.]

**640 Graduate Seminar in Recent American History**
Fall. 4 credits. Prerequisite: permission of instructor.
TBA. R. Polenberg.

**710 Colloquium in American History**
Spring. 4 credits. Required of all first-year American history graduate students. Examination of the major themes, epochs, and interpretations of American history.

## Latin American History

**211 History of Hispanics in the United States**
Fall. 4 credits.
M W F 11:15. F. Masud-Piloto.
A survey of history, politics, and culture of the major Hispanic groups in the United States: Mexicans, Puerto Ricans, Cubans, Dominicans, and Central Americans. The course will trace the history of these groups from the nineteenth century to the present by analyzing their impact on the United States. Major themes include causes for Hispanic migrations, political power of the groups, U.S. immigration policy, cultural contributions, economic impact of the migrations, and long-term implications for the sending and receiving communities.

**295 Colonial Latin America**
Fall. 4 credits.
M W F 10:10. T. H. Holloway.
Survey of Latin America from the rise of pre-Columbian civilizations through the European conquest, the establishment of the Spanish and Portuguese colonial societies, imperial rivalries in the New World, the background of the independence movements, and the achievement of political independence.

**296 Latin America in the Modern Age**
Spring. 4 credits.
M W F 10:10. T. Holloway.
Survey of the Latin American nations from independence to the present. Major themes include the persistence of neocolonial economic and social institutions, the development of nationalist and populist politics, revolutionary movements of the twentieth century, and United States–Latin American relations.

**347 Agrarian Societies in Latin American History**
Fall. 4 credits.
T R 10:10–11:25. T. H. Holloway.
The development of rural patterns of wealth, status, and power, focusing on the role of country people in the larger society. Topics include disruption of the conquest, evolution from *encomienda* to *hacienda*, rise of plantation agriculture and export enclaves, decline of Indian communities, peasant protest, and land reform and development programs of the recent past.

**[348 Contemporary Brazil**
Fall. 4 credits. Not offered 1989–90.
M W F 1:25. T. H. Holloway.
A study of the style of development in economy, policy, and society followed by contemporary Brazil and an analysis of the contradictions that led to the military coup of 1964 and its aftermath. Some comparisons are made with other Latin American countries. Readings in English.]

**424 The Caribbean Migration to the United States (also ILR 304)**
Fall. 4 credits.
M W F 2:30–4:45. F. Masud-Piloto.
The main purpose of this seminar is to examine the causes and effects of the increasing migration of people from the Caribbean (Cubans, Dominicans, Puerto Ricans, Haitians, and Jamaicans) to the United States. Particular emphasis will be placed on U.S. immigration policy for the area and the political, economic, and humanitarian factors affecting policy. In addition, each group's migratory experience will be analyzed separately within their cultural, political, and historical context.

**427 Political History of Hispanics in the United States**
Spring. 4 credits.
F. Masud-Piloto.
The focus of this seminar will be to examine the current political power of the major Hispanic groups (Mexicans, Puerto Ricans, Dominicans, Central Americans) by tracing each group's political activities in the United States from the nineteenth century to the present. In addition, efforts will be made to have Hispanic political leaders address the class.

**449 Undergraduate Seminar in Latin American History**
Spring. 4 credits. Prerequisite: permission of instructor.
M 2:30–4:25. T. Holloway.
Topic: Race and class in Latin American History.

**[649 Seminar in Latin American History**
Not offered 1989–90.
T H. Holloway.]

## Asian History

**190 Introduction to Asian Civilizations**
Spring. 4 credits.
W F 11:15; disc, M 11:15, 12:20, or 2:30.
C. A. Peterson, J. R. Piggott, D. K. Wyatt.
An introduction to the distinctive cultures of China, India, and Japan that features an intensive examination of selected topics and periods of particular significance in the history of each.

**191 Introduction to Asian Civilizations in the Modern Period**
Fall. 4 credits.
W F 11:15; disc, M 11:15, 1:25, or 2:30.
J. V. Koschmann, T. Shiraishi.
The history of Asian civilizations in modern times is introduced, focusing on the relationship between key figures and societies. English translations of autobiographies, novels, short stories, diaries, and other documents written by Asians are used to assess the perspectives, social priorities, and historical significance of intellectual and political leaders.

**243 China and the West before Imperialism**
Fall. 3 credits. Open to freshmen and sophomores. Prerequisite: permission of instructor. Limited to 15 students.
T 2:30–4:20. C. A. Peterson.

**293 History of China up to Modern Times**
Fall. 4 credits.
T R 9:05 plus an additional hour, M 11:15 or 1:25. C. A. Peterson.
A survey of the principal developments in the history of China from the earliest times to the eighteenth century that also undertakes a topical introduction to Chinese culture and civilization, in part by the use of visual materials.

**294 History of China in Modern Times**
Spring. 4 credits.
T R 10:10 plus additional hour, R 11:15, 1:25, or 2:30. S. Cochran.
A survey that concentrates on the rise of the last imperial dynasty in the seventeenth and eighteenth centuries, the upheavals resulting from domestic rebellions and foreign imperialism in the nineteenth century, and the twentieth-century efforts to achieve social mobilization and political unity.

**297 State, Society, and Culture in Japan to 1750**
Fall. 4 credits.
T R 1:25 plus disc, F 1:25 or 2:30.
J. R. Piggott.
A survey of Japanese history from its beginnings to the early modern period. Attempts to draw relationships among such factors as political and institutional change, social structure, aesthetic sensibility, literary form, and religious consciousness. Primary texts in translation will be read whenever feasible.

**298 State, Society, and Culture in Modern Japan**
Spring. 4 credits.
T R 1:25 plus disc, F 1:25 or 2:30.
J. V. Koschmann.
A survey of Japan from the mid-eighteenth century to the present, with special attention to changing configurations of institutional structure, knowledge, action, and conceptions of history. Japanese works in translation will be read and discussed in addition to secondary sources.

**342 Hiroshima and Nagasaki**
Summer. 4 credits.
J. V. Koschmann.
The biological, psychological, and social impact and lasting significance of the atomic bombings of Japan during World War II are reconsidered through historical and scientific studies, first-person memoirs, literature, and film. Evaluation of recent historical research on the American decision to use the bombs. Consideration of the relevance of Hiroshima and Nagasaki to the present American defense strategy and the danger of nuclear war.

**360 Early Warfare, East and West**
Spring. 4 credits.
For description see Comparative History.

**391 Premodern India**
Fall. 4 credits.
M W F 12:20–12:05.

**392 History of Modern India**
Spring. 4 credits.
M W F 12:20–12:05.

**395 Southeast Asia to the Eighteenth Century**
Fall. 4 credits.
T R 11:15–12:05 plus one hour to be arranged. D. K. Wyatt.
A survey of the earlier history of Southeast Asia, concentrating particularly on regional movements of economic, social, cultural, and political change and using, to the extent possible, readings in primary sources.

**396 Southeast Asian History from the Eighteenth Century**
Spring. 4 credits.
T R 11:15–12:05 plus disc F 11:15, 2:30.
T. Shiraishi.
A survey of the modern history of Southeast Asia with special attention to the formation of modern states (colonial as well as national), changing economic and social structure, and consciousness. Primary texts will be read in translation whenever feasible.

**[399 War as Myth and History in Postwar Japan (also Asian Studies 381)**
Fall. 4 credits. Not offered 1989–90.
T R 1:25. B. deBary, J. V. Koschmann.
How is the "war story" told in postwar Japan? The course will examine persisting manifestations of the war memory in contemporary Japanese cultural life, with emphasis on ways in which the story of World War II has been retold, reinterpreted, and given new symbolic and factual significance in light of changing historical circumstances. Class discussion will focus on the interpretation of texts, ranging from political thought and history to fiction, film, and poetry.]

**[489 Ideology in the Meiji Restoration**
Fall. 4 credits. Prerequisites: History 297 (formerly 397) or 298 (formerly 398) or equivalent, and permission of instructor.
T 2:55–4:10. J. V. Koschmann.
In honor of the anniversary of the French Revolution, this undergraduate seminar will explore major ideological origins, processes, and legacies related to Japan's own modern revolution, the "Meiji Restoration." Readings will be drawn from both primary sources in translation and recent secondary works.

**[492 Undergraduate Seminar in Medieval Chinese History**
Fall. 4 credits. Prerequisite: History 393 or 360 or permission of instructor. Not offered 1989–90.
Hours to be arranged. C. A. Peterson.]

**[493 Self and Society in Late Imperial and Twentieth-Century China**
Fall. 4 credits. Prerequisite: History 191 or 394 or permission of instructor. Not offered 1989–90.
R 2:30–4:30. S. Cochran.
Conceptions of self and relations between the individual and society in China from the seventeenth century to the present.]

**495 Japanese Kingship in Comparative Perspective**
Fall. 4 credits.
T 2:30–4:30. J. R. Piggott.
In 1989 Emperor Hirohito, Japan's monarch for some sixty-four years, was laid to rest amidst funerary pageantry witnessed by an unprecedented global audience. During the coming fall and winter, his successor Emperor Akihito will participate in enthronement ceremonies that date back to the early centuries A.D. These rituals, like the emperorship itself, are provoking intense discussion in Japan concerning the imperial institution and its place in a modern society. In this seminar we will look at the early and medieval development of one of the oldest ruling institutions in the world today. Theoretical and comparative readings will provide a frame of reference.

**[499 Art and Society in Modern China**
Spring. 4 credits. Not offered 1989–90.
W 2:30–4:30. S. Cochran, M. Young.
The relation between the visual arts and social change in China from the seventeenth century to the present. The value of art as a reflection of social reality and as an agent for social reform is analyzed on the basis of a variety of visual materials that range from calligraphy, paintings, and porcelains of the seventeenth and eighteenth centuries to woodblock prints, photographs, and films of the nineteenth and twentieth centuries.]

**691 Chinese Historiography and Source Materials**
Spring. 4 credits. Prerequisite: permission of instructor.
Hours to be arranged. C. A. Peterson.

**693–694 Problems in Modern Chinese History**
693, fall; 694, spring. 4 credits. Prerequisite: permission of instructor.
F 2:30–4:25. S. Cochran.

**695 Early Southeast Asia: Graduate Proseminar**
Fall. 4 credits.
Hours to be arranged. D. K. Wyatt.
Introduction to the history of Southeast Asia for graduate students. Students will be expected to attend the lectures and complete the readings for History 395, and they will meet separately as a group to further explore selected topics.

**[696 Modern Southeast Asia: Graduate Proseminar**
Spring. 4 credits. Not offered 1989–90.
Hours to be arranged. T. Shiraishi.
Introduction to the modern history of Southeast Asia for graduate students. Students will be expected to attend the lectures and complete the readings for History 396, and they will meet separately as a group to further explore selected topics.]

**[791–792 Seminar in Medieval Chinese History**
791, fall; 792, spring. 4 credits each term. Prerequisite: permission of instructor. Not offered 1989–90.
C. A. Peterson.]

**[793–794 Seminar in Modern Chinese History**
793, fall; 794, spring. 4 credits each term. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. S. Cochran.]

**795 Seminar in Modern Southeast Asian History**
Fall. 4 credits. Prerequisite: History 696.
Hours to be arranged. T. Shiraishi.
Advanced seminar in modern Southeast Asian history.

**796 Seminar in Southeast Asian History**
Spring. 4 credits.
Hours to be arranged. D. K. Wyatt.

**[797]–798 Seminar in Japanese Thought**
[797, fall]; 798, spring. 4 credits each term. [797 not offered 1989–90.]
Hours to be arranged. J. V. Koschmann.

## Ancient European History

**265 Ancient Greece from Homer to Alexander the Great**
Fall. 4 credits. Open to freshmen.
T R 10:10–11; disc, W 3:35, R 12:20 or 2:30. B. Strauss.
A survey of Greece from the earliest times to the end of the Classical period in the late fourth century B.C. The course focuses on the Greek genius: its causes, its greatness, its defects, and its legacy. The Heroic Age, the city-state, ancient democracy, and the intellectual ferment of the Greek Enlightenment are the main topics of study. Readings in translation from Homer, Aristophanes, Sophocles, Herodotus, Thucydides, Plato, Aristotle, and from the evidence of ancient inscriptions, coins, art, and architecture.

**[268 A History of Rome: from Republic to Holy City**
Spring. 4 credits. Open to freshmen. Not offered 1989–90; next offered 1990–91.
M W 11:15, disc, T 10:10 or 12:20, or W 3:35. B. Strauss.
A survey of Rome from the founding of the Republic to the end of the Western Empire. The focus is on the Roman conquest of the Mediterranean world and on the cultural reconquest of Rome by the vanquished. Roman politics, peasant society, Imperialism, and propaganda are the main topics of the first half. The government of the Caesars, society during the Roman peace, and the fertile interaction of Romans, Jews, and Greeks that produced Christianity are the main topics of the second. Readings in translation include Cicero, Polybius, Josephus, Tacitus, Petronius, Plutarch, and Saint Augustine.]

**[373 The Greek City from Alexander to Augustus**
4 credits. Not offered 1989–90.
M W 11:15; disc, T 12:20 or 2:30. B. Strauss.
A twofold search for Alexander the conqueror and the man and for the character of the world he created, in which the Greek city was planted as far as Egypt and India. These new cities saw a change from republicanism to monarchy, from community values to individualism, from particularism to ecumenicalism; embraced the new philosophies of Stoicism and Epicureanism; and were the hothouses of a new religion: Christianity. Readings in translation include Arrian, Plutarch, Aristophanes, Menander, Theocritus, Polybius, the Book of Maccabees, Epicurus, and Lucretius.]

**[452 The Tragedy of Classical Athens, 462–404 B.C.**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
M 2:30–4:30. B. Strauss.
The nature of Athenian democracy, society, and culture in the "golden age" of Athens. The course will examine the influence of Athenian political life on the great tragedians of the age and the influence of tragedy on the Athenians' conception of their character and history. Readings from Herodotus, Thucydides, Aeschylus, Sophocles, Euripides, Aristophanes, Plato, Aristotle, and Plutarch.]

**[453 Crisis of the Greek City-State, 415–336 B.C.**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
M 2:30–4:30. B. Strauss.
The fortunes of the city-state and citizen in an age of uncertainty. The focus is on Athens with some attention paid to the wider Greek world. Topics include the nature of Athenian politics, Athenian society, cultural change, the war between the city-states, crisis as a historical concept, and anthropology and ancient Greece. Readings in translation include Thucydides, Sophocles, Euripides, Aristophanes, Plato, Aristotle, Demosthenes, and Xenophon.]

**455 The Family and Politics in Ancient Greece and Rome**
Fall. 4 credits. Prerequisite: History 265, 268, or 461 or permission of instructor.
T 2:30–4:30. B. Strauss.
If Greece and Rome are the foundation, at least symbolically, of Western civilization, then the family is the foundation of Greece and Rome. We shall consider such topics in the ancient family as parents and children, sibling rivalry, marriage, gender roles, birth control, the family and social crisis, the family and politics, and the family in the early church. Wherever possible, analogies to, comparisons with, and the implications for, the United States in the 1980s will be suggested. Readings include legal and political speeches, comedy, tragedy, philosophy, sermons and religious texts, inscriptions, and modern scholarship.

**[461 The Greco-Roman World in Late Antiquity and Early Byzantine Times, A.D. 306–565**
Spring. Not offered 1989–90.
For description see Medieval, Renaissance, and Early Modern European History.]

## Medieval, Renaissance, and Early Modern European History

**151 Introduction to Western Civilization**
Fall. Summer. 4 credits.
T R 11:15–12:05; disc to be arranged. L. P. Williams.
History 151 has three goals: to introduce students to the basic ideas and institutions of what, for better or for worse, has come to be known as Western Civilization; to teach students to read texts critically and analyze them intelligently; to write clear, precise English and to construct logical arguments utilizing historical data. The two lectures per week and the textbook should accomplish the first task; it is in the discussion sections that emphasis will be placed on the latter two. As soon as students have demonstrated their competence in critical reading and clear writing, they will be permitted to write only optional papers. Competence is defined as two consecutive papers bearing a grade of B+ or better. There are two preliminary examinations and a final examination.

**152 Introduction to Western Civilization**
Spring. 4 credits.
For description see Modern European History.

**222 Public Life and Literature in Tudor England**
Fall. 4 credits. Prerequisite: permission of instructor.
M W 9:05–9:55. F. G. Marcham.
A study of the chief developments in the political, governmental, and religious life of England in the sixteenth century and weekly discussions of a selection of Tudor prose, poetry, and drama.

**[257 English History from Anglo-Saxon Times to the Revolution of 1688**
Fall. 3 or 4 credits. Not offered 1989–90.
M W F 12:20. C. Holmes.
A survey of the government, social organization, and cultural and religious experience of the English, laying particular stress on the unification of the realm, the rise of Parliament, changes in agrarian organization, and the development of urban and commercial classes.]

**259 The Crusades**
Fall. 4 credits.
M W F 11:15–12:05 plus disc to be announced. P. R. Hyams.
This lecture course examines the Crusading Movement and the states it produced from the eleventh century to the fall of the mainland Kingdom of Jerusalem in 1292. Central themes include: the history of the Church and its contextual intellectual history, political narrative and military history, social and economic analysis of Europeans in Outremer (the Mid-East), and the conflict of cultures and religions during a formative period in Western civilization.

**[263 The Earlier Middle Ages**
Spring. 4 credits. Not offered 1989–90.
M W F 12:20. J. J. John.
A survey of Medieval civilization from ca. 300 to ca. 1100 dealing with religious, intellectual, political, and economic developments in Western Europe.]

**[264 The High Middle Ages**
Fall. 4 credits. Not offered 1989–90.
A survey of Medieval civilization from ca. 1100 to ca. 1450 dealing with religious, intellectual, political, and economic developments in Western Europe. Lectures and class discussions.]

**350 Early Renaissance Europe**
Fall. 4 credits.
T R 10:10–11:25. J. M. Najemy.
An exploration of intellectual, cultural, and religious developments in Western Europe, but with special attention to Italy, from the age of Dante and Marsilius, from Petrarch to Alberti to Pico, down to the generation of Machiavelli, More, and Erasmus. The course will seek to problematize the notion of a "Renaissance" in the period's ambivalent attitudes toward history, learning, culture, language, and the role of intellectuals in politics and society. Emphasis will be placed on the close reading of primary sources and on issues of interpretation.

**351 Machiavelli**
Spring. 4 credits.
T R 11:40–12:55. J. M. Najemy.
This course will present Machiavelli in a variety of historical and interpretive contexts: European and Italian politics in the early sixteenth century; the decline of the Florentine republic and the rise of the Medicean principate; Machiavelli's own career in government and his, and the republic's, crisis in 1512–13; the intellectual traditions of Renaissance humanism, political thought, and the revival of antiquity; vernacular literary currents and popular culture; and the remarkable generation of political figures, writers, and theorists with whom Machiavelli associated and corresponded. Emphasis will be placed on a close reading of the major works (including the letters, *The Prince*, the *Discourses*, *The Mandragola*, and selections from *The Art of War* and the *Florentine Histories*, all in translation) and a critical examination, in the light of that reading, of some major modern interpretations of Machiavelli.

**[361 The Culture of the Early Renaissance (also Comparative Literature 361 and History of Art 350)**
Fall. 4 credits. Not offered 1989–90. Next offered 1990–91.
T R 11:40–12:30; disc to be arranged. C. Lazzaro, E. Morris, and staff.
Renaissance culture is introduced through six major figures: Petrarch, Alberti, Machiavelli, Leonardo, Erasmus, and Rabelais. Each figure will be the focal point for the critical examination of problematic issues in the areas of humanism, religious and political thought, literature, art, and architecture. In the discussion sections problems of interpretation will be approached through the analysis of primary source readings and works of art.]

**[364 Introduction to the Culture of the Later Renaissance (also Comparative Literature 362 and History of Art 351)**
Spring. 4 credits. Not offered 1989–90.
T R 11:40–12:30 plus disc, R or F 1:25. E. G. Dotson, C. Kaske, and staff.
Although History 361 (also Comparative Literature 361 and History of Art 350) is not a prerequisite, this course is a continuation of it in that it is similarly organized and deals with the period immediately succeeding. Members of several departments will lecture on Luther, Michelangelo, Dürer, Montaigne, Edmund Spenser, Bodin, and Cervantes. Close reading of texts, literary and visual. Discussion will include methods of interpretation and historical analysis.]

**365 Medieval Culture, 400–1150**
Spring. 4 credits. Prerequisite: History 263 or permission of instructor.
T R 2:55–4:10. J. J. John.
Intellectual and cultural developments in the age of monasticism, from St. Augustine and St. Benedict to St. Anselm and St. Bernard of Clairvaux.

**[366 Medieval Culture, 1100–1300**
Spring. 4 credits. Prerequisite: History 264 or permission of instructor. Not offered 1989–90.
T R 2:55–4:10. J. J. John.
The origin and development of the universities will be studied as background for a consideration of the scholastic mentality and its influence on the art, literature, philosophy, science, script, and theology of the period. Readings from Abelard, Hugh of St. Victor, Bonaventure, Thomas Aquinas, Dante, and others.]

**[369 The History of Florence in the Time of the Republic, 1250–1530**
Spring. 4 credits. Not offered 1989–90. Next offered 1990–91
J. M. Najemy.
Florentine politics and society from the communal period through the age of Dante, the rise and decline of the guild republic, the age of the civic humanism, and the rise of the Medici to the time of Machiavelli. Economic structures and social classes, corporate politics, family history, and political and historical ideas are considered in the context of the emergence and transformation of Republican government.]

**[371 History of England under the Tudors and Stuarts**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
C. Holmes.
An examination of the relation between the intellectual developments of the period and political, social, and religious change. Topics for discussion will include political thought, religious toleration, witchcraft, and the role of women and the family.]

**374 War, Trade, and Empire, 1500–1815**
Spring. 4 credits.
M W 2:30–4. D. A. Baugh.
Maritime enterprise, imperial policy, and naval power in the age of expansion. The rise and decline of the Portuguese and Spanish empires are considered, but the emphasis is on English, French, and Dutch rivalry in the Atlantic and Caribbean.

**387 Social and Cultural History of Sixteenth-Century Europe**
Fall. 4 credits.
T R 1:25–2:15 plus disc F 2:30, 3:35. D. Sabean.
This course examines social processes and perceptions of change during the Reformation era. Topics include social differentiation in the countryside, forms of aristocratic domination, rural and urban attempts at resistance and rebellion, violence, the exercise of state power and its representation, religious and political ideology, popular culture, and the reform of manners.

**388 Social and Cultural History of Seventeenth-Century Europe**
For description, see Modern European History.

**[405 Population and History**
Not offered 1989–90.
For description see Comparative History.]

**[409 Seminar on Work in Europe and America**
Not offered 1989–90.
For description see Comparative History.]

**[437 Church and State during the Middle Ages**
Fall. 4 credits. Not offered 1989–90.
T R 3–4:15. B. Tierney.
Relationships between ecclesiastical and secular authorities and the ways in which these relationships influenced the growth of government in the Middle Age are considered. Particular attention is given to the growth of Medieval constitutionalism.]

**438 Francis of Assisi and the Franciscans**
Fall. 4 credits.
T 2:30–4:30. B. Tierney.
A seminar with lectures, class papers, and class discussions. The course will begin with detailed study of the early lives of Francis in translation, then consider the impact of the Franciscans on the medieval church and vice versa.

**[451 Lord and Peasant in Europe: A Seminar in Social History**
Not offered 1989–90.
For description see Comparative History.]

**[461 The Greco-Roman World in Late Antiquity and Early Byzantine Times, A.D. 306–565**
Spring. 4 credits. Prerequisite: History 263, 265, or 268 or permission of instructor. Not offered 1989–90.
T 2:30–4:30. B. Strauss.
A seminar in the cultural, socioeconomic, and political history of the period. Topics include the interaction of paganism and Christianity; art form, civic life, and the individual; the family; Julian and Justinian; and the concept of decline and fall.]

**[468 Undergraduate Seminar in Renaissance History**
Fall. 4 credits. Not offered 1989–90.
J. M. Najemy.]

**473 History of Sexuality**
For description, see Modern European History.

**[663 Seminar in Renaissance History**
Spring. 4 credits. Not offered 1989–90.
J. M. Najemy.]

**[664–665 Seminar in Latin Paleography**
664, fall; 665, spring. 4 credits each term. Not offered 1989–90.
Hours to be arranged. J. J. John.]

**[666 Seminar in Medieval History**
Fall. 4 credits. Not offered 1989–90.
Hours to be arranged. J. J. John.]

**669 Seminar in Medieval History**
Fall. 4 credits.
Hours to be arranged. B. Tierney.

## Modern European History

**151 Introduction to Western Civilization**
Fall. Summer. L. P. Williams.
For description see Medieval, Renaissance, and Early Modern European History.

**152 Introduction to Western Civilization (1600 to the end of World War II)**
Spring. 4 credits.
T R 11:15–12:05; disc to be arranged.
L. P. Williams.
Emphasis in this course is on the interpretation of important historical issues. A small number of papers is required in which the student will enjoy the pleasure of putting historical data together into a satisfying interpretive whole. Readings include a number of novels that cast light upon various periods or events, as well as original documents and interpretations by professional historians. History 151 is not a prerequisite for History 152, although it is recommended.

**[218 The Russian Military Effort and Foreign Policy**
Spring. 4 credits. Not offered 1989–90.
W 2:30–4:30. W. M. Pintner.
An examination of the interrelation of the Imperial Russian military effort and Russian foreign policy. Examples will be taken from various periods ranging from the early Muscovite period to the First World War.]

**226 Public Life and Literature in Twentieth-Century Great Britain**
Spring. 4 credits. Prerequisite: permission of instructor.
T R 9:05–9:55. F. G. Marcham.
A study of British political, social, and constitutional history is paralleled by the reading of plays. Both history and literature are considered. The development of parliamentary democracy in Great Britain, the consequences for her of the two world wars, the emergence of the welfare state, the application to the economy of nationalization, and Great Britain's withdrawal from imperialism are presented. Among the writers read and discussed are Shaw, Maugham, O'Casey, Sherriff, and Osborne.

**229 A History of European Childhood**
Fall. 4 credits.
T R 1:25–2:40. N. Karwan–Cutting.
Surveys the history of childhood in Europe from the mid–seventeenth century to the present. Comparisons are made across Western, Eastern, and Mediterranean European Societies. The course delineates those cultural, demographic, religious, political, and economic factors that shaped childhood, both in periods of transition and in times of violent instability. Changing perceptions of childhood are treated in the context of, for example: religious conflict, urbanization, development in science and technology, war, and occupation. All readings are in English.

**242 Europe since 1789**
Spring. 4 credits.
M. P. Steinberg.
An introduction to major themes, problems, and interpretations in European history from the French Revolution to the consolidation of the Common Market in our own day. The organization will be chronological, but focus will be on the varying forms of political and industrial revolution, liberalism, conservatism, socialism, nationalism, imperialism, fascism, and world war. Readings will include primary materials in political and social theory (Marx and Mill) as well as literature (Thomas Mann, Peter Schneider).

**[252 Russian History to 1800**
4 credits. Not offered 1989–90.
T R 10:10–11:25. W. M. Pintner.
The origin and development of the fundamental social, political, economic, and cultural institutions that have determined the nature of contemporary Soviet society.]

**253 Russian History since 1800**
Spring. 4 credits.
R 10:10–11:25.
Nineteenth- and twentieth-century Russia, with emphasis on the major social, political, and economic changes that have transformed Russia since the mid-nineteenth century.

**[258 English History from the Revolution of 1688 to the Present**
Spring. 4 credits. Not offered 1989–90.
T R 1:25–2:40. D. A. Baugh.
An introductory course encompassing political, social, economic, imperial, and constitutional developments. Major themes are the significance of 1688, eighteenth-century society and politics, the rise and decline of liberalism, the Irish Question, the impact of the two world wars, and the challenges and difficulties of the welfare state.]

**283 Contemporary European Society and Politics (also Government 343)**
Fall. 4 credits.
T R 2:55–4:10; disc to be arranged.
N. Karwan-Cutting, J. Pontusson.
An interdisciplinary and comparative investigation of Western European society, politics, culture, and contemporary history. Topics include the differing experiences of the generations coming of age after World War II, the dynamics of class relations, economic policy, social movements, family and community life, cultural institutions, and modes of cultural criticism.

**[352 The End of the Austro-Hungarian Monarchy, 1848–1919**
Fall. 4 credits. Open to freshmen with permission of instructor. Not offered 1989–90.
M W 9:05; disc, W 10:10 and 2:30.
I. V. Hull.
The decline and fall of the multinational empire. Emphasis is on the political and social problems presented to the monarchy both by industrialization and by the increasingly restive subject nationalities (Poles, Czechs, Serbs, Croats). How did the monarchy handle these problems? Why did it fail? Focus is on cultural matters. Readings are drawn from Freud, Schnitzler, Hofmannsthal, Karl Kraus, Joseph Roth, and others.]

**353 Nineteenth-Century European Intellectual History**
Fall. 4 credits.
T R 11:40–12:55. M. P. Steinberg.
The focus is on social and cultural thought in France, Germany, and England. Topics include reactions to the French Revolution and industrialization; the definition of conservative, liberal, and radical perspectives; and the relation between literature and social thought. Readings include Tocqueville, Mill, Hegel, Marx, Stendhal, Flaubert, Dostoevsky, Nietzsche, and Durkheim.

**[354 Twentieth-Century European Intellectual History**
Fall. 4 credits. Not offered 1989–90.
T R 11:40–12:55. D. LaCapra.
This course examines significant currents in twentieth-century thought in France, Germany, and England. Topics include the varieties of existentialism, the development of the social sciences, psychology, the modern novel, structuralism, and poststructuralism. Readings include Weber, Freud, Heidegger, Sartre, Camus, Mann, Woolf, Foucault, and Derrida.]

**[355 The Old Regime: France in the Seventeenth and Eighteenth Centuries**
4 credits. Not offered 1989–90.
T R 2:55–4:10. S. L. Kaplan.
A systematic examination of the social structure, economic life, political organization, and collective mentalities of a society that eclipsed all others in its time and then, brutally and irreversibly, began to age. France, in European perspective, from the wars of religion through the age of Voltaire.]

**[356 The Era of the French Revolution and Napoleon**
Spring. 4 credits. Not offered 1989–90.
T R 2:55–4:10. S. L. Kaplan.
A study of the failure of the traditional system, its dismantling and replacement in France, and the international consequences. Focus will be on the meaning of the revolutionary experience, the tension between the desires to destroy and to create, and the implications of the Revolution for the modern world.]

**357 Survey of German History, 1648–1890**
Fall. 4 credits. Open to freshmen with permission of instructor.
M W 11:15–12:05; undergrad disc, W 1:25 or 2:30; grad disc, W 1:25.
I. V. Hull.
An examination of the social, political, intellectual, and diplomatic history of the German states from the devastation of the Thirty Years' War, through absolutism, the bourgeois revolutions of 1848, and the struggle for unification, to the beginning of the modern industrial state.

**358 Survey of German History, 1890 to the Present**
Spring. 4 credits. Open to freshmen with permission of instructor.
M W F 11:15–12:05; undergrad disc, W 1:25 or 2:30; grad disc, W 1:25.
I. V. Hull.
The "German problem" is examined. Major topics include tensions caused by rapid industrialization presided over by a preindustrial, political elite; origins of World War I; growth of anti-Semitism; social dislocations of World War I; failure of the socialist revolution of 1918–1919; unstable Weimar democracy and the rise of nazism; the Nazi state; World War II; and the two Germanies.

**[379 War and Society: The Origins of the First World War, 1870–1919**
Fall. 4 credits. Open to freshmen with permission of instructor. Not offered 1989–90.
M W F 11:15. I. V. Hull, W. M. Pintner, D. Baugh.
The First World War destroyed the European world: its hegemony in international politics, its international balance, its social and economic structures, its intellectual certainties. This course examines the long-term and immediate causes of this cataclysm, with special focus on the relations between the various countries' domestic politics and their foreign policies, the changing balance of power, economic rivalries, imperialism, the growth of extreme nationalism, and the arms race. It ends by considering why the war was so long and destructive and why, afterwards, no one could put the pieces back together again.]

**[380 Social History of Western Technology**
Fall. Not offered 1989–90.
For description see History of Science.]

**[384 Europe in the Twentieth Century**
Spring. 4 credits. Not offered 1989–90.
T R 10:10–11:25; disc to be arranged. J. H. Weiss.
An investigation of the major developments in European history since 1900. Emphasis on the development of democratic political systems and their alternatives. Topics include the reorientation of liberalism and democratic socialism, the transforming effects of war and depression, the dynamics and diplomacy of fascism, the European response to the economic and ideological influence of America and the Soviet Union, and the interaction between politics and social structure. Topics include the origins and course of the Cold War in Europe, the emergence of welfare states, ethnic and regional movements, the crises of 1968, the end of dictatorship in Spain and the socialist experiment in France, and the politics of the arms race.]

**388 Social and Cultural History of Seventeenth-Century Europe**
Spring. 4 credits.
M W 1:25 plus disc F 1:25 or 2:30. D. Sabean.
An examination of cultural formations in a period of social and political crisis. Topics include the ideology of the patriarchal household, church and state programs of discipline, the reconstruction of the aristocracy, court society, Baroque culture, local and social systems, peasant revolts, gender construction, and representations of the self.

**[405 Population and History**
Not offered 1989–90.
For description see Comparative History.]

**406 The People in the French Revolution (also Soc Hum 413)**
Fall. 4 credits.
T R 1:25–3:20. S. L. Kaplan, C. Lucas.
The Revolution was nothing if not a mass event. Mass action played a critical part in shaping its course. The "re-invention" of France affected the population down to each village and demanded decisions from virtually every adult. This course will focus on the people as actors: their collective memory, their ideologies, their repertoire of intervention, the formation of a popular political culture. It will examine the encounters between the people (in their multiple incarnations) and the revolutionary elites who sought to articulate and appropriate the Revolution. A major theme will be the tension between the ambitions to achieve liberty and equality.

**[409 Seminar on Work in Europe and America**
Not offered 1989–90.
For description see Comparative History.]

**431 Legacy of the Resistance in Postwar Europe (also Soc Hum 430)**
Spring. 3 credits. Limited to 17 students.
T 2:30–4:30. J. Weiss.
For some of its participants, the antifascist Resistance became an attempt to carry out a revolution in European politics, society, and personal relations. The course will deal with how Resistance visions became articulated, how they were challenged, and how their reformation in response to those challenges contributed to shaping political culture. The course will examine contemporary films, literature, and political writings as well as later scholarship that examines the functioning of the collective memory and the process of commemoration.

**[435 Collective Action and Politics in Modern Europe (also Government 435)**
4 credits. Not offered 1989–90.
W 2:30 4:25. S. L. Kaplan, S. Tarrow.
An interdisciplinary seminar examining the causes, dynamics, and outcomes of social movements in modern and contemporary Europe. Ranging from the carnivalesque uprisings, bread riots, and tax revolts of early modern Europe to the strikes and revolutions of the nineteenth century, to the student, peace, and women's movements of the present, these movements have deeply marked the development of contemporary state and society. Cases will be drawn mainly from Europe with ventures into America and the non-Western world. Our ambition is to assess the ways in which popular collective action both shaped and was shaped by the development of the modern state. A senior seminar in modern European studies.]

**441 Seminar in the European Enlightenment**
Spring. 4 credits. Prerequisite: permission of instructor.
T 2:55–4:20. I. V. Hull.
This seminar examines the eighteenth-century Enlightenment from a number of different vantage points: its intellectual debates, the social bases carrying it, the institutions (state, social, and economic) that spread it, and the ways historians have (re-) interpreted it over the years. The reading mixes primary sources (major thinkers of the period in England, Germany, Italy, and France) with secondary analyses by scholars. The specific topic for spring 1990 is the development of the sex/gender system.

**[450 Seminar in European Imperialism**
Spring. 4 credits. Open to upper-level undergraduates. Prerequisite: permission of instructor. Not offered 1989–90.
M 12:20–2:20. I. V. Hull.
Focuses on the various theories of imperialism with particular reference to the domestic causes, uses, and repercussions of late nineteenth century imperialism in Germany, France, and Great Britain.]

**[451 Lord and Peasant in Europe: A Seminar in Social History**
Not offered 1989–90.
For description see Comparative History.]

**[457 Seminar in European Fascism**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
M 1:25–3:25. I. V. Hull.
An attempt to define and understand the social, political, and intellectual origins, mechanisms, and goals of European fascist movements of the 1920s and 1930s by detailed study of German national socialism, Italian fascism, and the Action Française.]

**[459 The Making of the English Ruling Class, 1660–1780**
Spring. 4 credits. Not offered 1989–90.
M 2:30–4:30. D. A. Baugh.
Perspectives on the landed aristocracy's continuing domination of politics. Topics include the political system, political and social thought, aristocratic lifestyle, religion, crime and criminal justice, the Old Poor Law, land and commerce, the role of London, and relations with Scotland, Ireland, and America. Readings are drawn from both modern historians and eighteenth-century authors.]

**465 Seminar on Modernity and Modernism**
Spring. 4 credits.
M. P. Steinberg.
An exploration of the definitions of "modernity" from the Enlightenment to the present and of the varied responses, political, cultural, and aesthetic, known as "modernism." Discussion as well of the questions of the end of modernity, of the post-modern, and their implications.

**[467 Seminar in Modern European Political History**
Spring. 4 credits. Not offered 1989–90.
R 2:30–4:30. J. H. Weiss.]

**[470 Social and Cultural History of Contemporary Europe**
Spring. 4 credits. Not offered 1989–90.
T R 2:55. J. H. Weiss.
Topic: the "other Europe": language, culture, and nation among the minority peoples of Europe. A comparative investigation of the development of the cultural and historical identity of non-dominant European ethnic groups and their relation to the formation and policies of European national states: the Basques, the Welsh, the Catalans, the Bretons, the Occitans, the Gaelic Irish, the Faroese, the Gypsies, the Romansh, and others. The course will combine historical, literary, and sociolinguistic approaches.]

**[471 Russian Social History**
Spring. 4 credits. Prerequisite: one semester of Russian history or permission of instructor. Not offered 1989–90.
W 12:20–2:20. W. M. Pintner.
A seminar devoted to an examination of the diverse social groups that comprise imperial Russia and Soviet society. Includes systematic comparison with other countries.]

**473 History of Sexuality**
Fall. 4 credits.
W 2:30–4:30. D. Sabean.
A seminar devoted to recent historical approaches to the history of sexuality in Europe from late antiquity to the present, looking at issues of politics, power, ideology, perception, representation, and gender.

**[474 Topics in Modern European Intellectual History**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
M 2:30–4:30. D. LaCapra.]

**[476 Documenting the Depression: Film, Literature, and Memory**
4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged: one screening session and one disc per week.
J. H. Weiss.
Social and intellectual history of Britain and America in the 1930s with special attention to modes of documentary expression and to subjects lending themselves to treatment by film or oral history: work, popular culture, changes in urban and rural communities, family life, and poverty and unemployment.]

**[477 Seminar on the Politics of the Enlightenment**
Fall. 4 credits. Not offered 1989–90.
W 2:30–4:30. S. L. Kaplan.
An inquiry into the historical origins of European (especially French) political, social, and economic thought, beginning in the 1680s, at the zenith of Louis XIV's absolutism, and culminating in the French Revolution a century later. Emphasis is on the relation of criticism and theory to actual social, economic, religious, and political conditions. An effort is made to assess the impact of enlightened thought on the eighteenth-century world and to weigh its implications for modern political discourse. Readings in translation from such authors as Bayle, Montesquieu, Voltaire, Rousseau, Diderot, and others as well as from modern scholarly and polemical literature.]

**[478 Seminar in Eighteenth-Century French Social History**
Spring. 4 credits. Not offered 1989–90.
W 2:30–4:30. S. L. Kaplan.
An assessment of the work and influence of F. Braudel, with attention to the trajectory of the "Annales" school.]

**[480 Twentieth-Century Britain**
Spring. 4 credits. Not offered 1989–90.
R 2:30–4:30. D. A. Baugh.
Seminar topics include Ireland, the 1930s, the world wars and their impact, the decline of liberalism, the roots of Britain's economic problems, the decline of empire, the condition of the political parties, and the character of English society.]

**[483 Seminar in Modern European Social History**
Fall. 4 credits. Not offered 1989–90.
J. H. Weiss.]

**605 Graduate Seminar in European Intellectual History**
Spring. 4 credits.
Hours to be arranged. M. P. Steinberg.
Analysis and evaluation of Walter Benjamin's historical thinking as a paradigm of a historical theory of modernity. Focus will be on the interplay of political, cultural, and aesthetic methods and objects of analysis, in Benjamin's work as well as that of contemporaries (Adorno, Cassirer, Warburg), models (Goethe, Hofmannsthal, Baudelaire), and inheritors (Habermas).

**[655 Seminar in Eighteenth-Century British History**
4 credits. Not offered 1989–90.
D. A. Baugh.]

**656 Seminar in Nineteenth-Century British History**
Spring. 4 credits.
Hours to be arranged. D. A. Baugh.

**661 Graduate Seminar in Twentieth-Century German History**
Fall. 4 credits. Prerequisite: permission of instructor.
T 4–6. I.V. Hull.
This course explores selected topics in the political, social, and cultural history of Germany from 1900 to the present. It is designed to introduce graduate students to the history and historiography of modern Germany and to allow those with sufficient preparation to pursue directed research during the semester.

**[671 Seminar in the French Revolution**
Not offered 1989–90.
S. L. Kaplan.]

**[672 Seminar in European Intellectual History**
Fall. 4 credits. Not offered 1989–90.
Hours to be arranged. D. LaCapra.]

**[673 Seminar in European Intellectual History**
Spring. 4 credits. Not offered 1989–90.
Hours to be arranged. D. LaCapra.]

**[674 Graduate Seminar in German History, 1789–1918**
Spring. 4 credits. Not offered 1989–90.
M 12:20–2:15. I. V. Hull.
This course explores selected topics in the political, social, and cultural history of Germany from 1770 to 1918. It is designed to introduce graduate students to the history and historiography of modern Germany and to allow those with sufficient preparation to pursue directed research during the semester.]

**[677 Seminar in Russian History**
Fall or spring. 4 credits each term. Not offered 1989–90.
Hours to be arranged. W. M. Pintner.]

**[678 Seminar in Modern European Social History**
Spring. Not offered 1989–90.
Hours to be arranged. J. H. Weiss.]

**[679 Seminar in European History**
Not offered 1989–90.
S. L. Kaplan.]

**682 Seminar in European Social and Cultural History**
Spring. 4 credits.
T 3–5. D. Sabean.
A research seminar devoted to selected topics on the construction of the self in European history.

### Honors and Research Courses

*Note:* History 301–302 are not regular courses for which students may sign up at will. They are personal arrangements between an instructor and a particular student. Students must first gain the consent of a particular instructor to work with them.

**301 Supervised Reading**
Fall or spring. 2 credits. Open only to upperclass students. Prerequisite: permission of instructor.

**302 Supervised Research**
Fall or spring. 3 or 4 credits. Open only to upperclass students.
Prerequisite: permission of instructor.

**400 Honors Proseminar**
Fall or spring. 4 credits. Limited to 15 students. For prospective honors candidates in history. Prerequisite: permission of instructor.
Fall: W 2:30–4:30. R. L. Moore.
An introduction to the limits and possibilities of historical inquiry. Readings include Carr, Collingwood, Bloch, Demos, Braudel, Gibbon, and Spence. Written assignments consist of a few brief commentaries and a long paper on the work of one historian
Spring: W 2:30–4:30. D. Wyatt.
An examination of major approaches to historical inquiry and analysis. Masterworks of historical writing (traditional as well as recent) will be discussed. There will be one short essay and a longer paper (a study of the work of one major historian). The readings will be drawn from all time periods and diverse cultures.

**401 Honors Research**
Fall or spring. 4 credits. Prerequisites: History 400 and permission of instructor.

**402 Honors Thesis**
Fall or spring. 4 credits. Prerequisites: History 400 and permission of instructor.

**703–704 Supervised Reading**
703, fall; 704, spring. 4 credits each term. Limited to graduate students. Prerequisite: permission of instructor.

**709 Introduction to the Graduate Study of History**
Fall. 4 credits. Required of all first-year graduate students. Not offered 1989–90.
R 3:30–5. S. Blumin, M. Steinberg.
The course is designed to introduce entering graduate students to crucial issues and problems in historiography that cut across various areas of specialization.

## HISTORY OF ART

M. W. Young, chair; L. L. Meixner, director of undergraduate studies; J. E. Bernstock, R. G. Calkins, C. Lazzaro, T. W. Leavitt, S. McTighe, S. J. O'Connor, N. Prendergast, A. Ramage

The visual arts—painting, sculpture, and architecture—are a principal mode of human expression. Art historians investigate works of art to understand them in their artistic, historical, and cultural contexts. Courses offered by the department cover the mainstream of Western art (Classical, Medieval, Renaissance, Baroque, and nineteenth and twentieth century) and non-Western art, including that of East and Southeast Asia. Art history is an integral part of interdisciplinary programs such as the Archaeology Program, the East Asia Program, Medieval Studies, and the Southeast Asia Program.

Course offerings vary in scope from introductory courses designed to acquaint the student with the ways of seeing, discussing, and writing about works of art to advanced seminars that concentrate on more-specialized topics. The resources of the Herbert F. Johnson Museum of Art frequently serve as the focus for discussion sections and research assignments.

## The Major

Students who want to major in the history of art should complete two courses in the Department of History of Art by the end of their sophomore year. These courses are prerequisites for admission to the major but may not be counted toward fulfillment of the major requirements. Prospective majors should apply to the director of undergraduate studies and in their junior and senior years work closely with their advisers to determine a course of study that takes into account the richness and diversity of art history. The program should include at least 30 credits in history of art courses and a minimum of two additional courses in this department or in a related field (such as anthropology, literature, or history) approved by their adviser. Ordinarily the 30 credits in history of art will include the proseminar History of Art 400, that all majors are expected to take in their junior year and at least two additional seminars selected from courses at the 400 or 500 level. Majors are required to have at least one non-Western art course in their program. Majors are encouraged to take studio courses offered by the Department of Art, but these are considered to be electives and do not fulfill major requirements.

## Honors

To become a candidate for the degree of Bachelor of Arts with honors in the history of art, a student must have a cumulative average of B+ for all courses taken in the department and a cumulative average of B in all arts and sciences courses. Admission to the program requires application to the director of undergraduate studies during the second term of the junior year. The application must include a summary of the proposed project, an endorsement by a faculty sponsor, and a copy of the student's transcript. In the senior year the honors candidate will include among the regular requirements History of Art 600 and 601, which entail the preparation of a senior thesis. This program may not be condensed into one semester.

## Freshman Writing Seminars

The history of art courses listed below are offered in the freshman writing seminar program and as freshman electives but may not be used to satisfy the distribution requirement.

**103 Freshman Writing Seminar in Visual Analysis**
Fall or spring. 3 credits. Not open to students who have taken History of Art 104.
Staff.
The Eiffel Tower, the *Mona Lisa*, and *The Thinker*—what makes them art? Using slides, campus field trips, and visits to the Herbert F. Johnson Museum of Art, students address this question in both discussions and essays.

**104 How to Look at Works of Art**
Fall or spring. 3 credits. Not open to students who have taken History of Art 103.
N. Prendergast.
What questions should we ask when we look at a painting? Through trips to the Herbert F. Johnson Museum of Art the viewing of slides and classroom discussions this seminar introduces students to a number of intellectual tools such as formal and stylistic analysis available to viewers who want to understand art. We will also approach works of art through biography, history, and criticism. In the process students will learn to translate their visual experiences into writing.

**[112 Pictorial Narrative**
3 credits. Not offered 1989–90.
S. McTighe.]

## Courses

**220 Introduction to Art History: The Art of the Classical World (also Classics 220)**
Spring. 3 credits.
M W F 10:10–11. J. Coleman.
The archaeology of the ancient Greeks and Romans as seen from a critical perspective. Major developments in Classical archaeology will be traced, from treasure hunting to modern scientific research. Examples illustrating various approaches will be chosen: sculpture, vase painting, and architecture of the ancient Greeks, from the Geometric period through the Hellenistic; and the art of the Romans from the early Republic to the late Empire.

**[221 Introduction to Art History: Minoan-Mycenaean Art and Archaeology (also Classics 221 and Archaeology 221)**
3 credits. Not offered 1989–90.
P. Kuniholm.]

**[223 Etruscan Art and Archaeology (also Classics 250 and Archaeology 250)**
3 credits. Not offered 1989–90.
J. Whitehead.]

**230 Introduction to Art History: Monuments of Medieval Art**
Spring. 3 credits.
M W F 12:20–1:10. R. G. Calkins.
An introduction to the approaches to art history through a study of selected works of art from the Middle Ages: architecture, sculpture, painting, manuscript illumination, metalwork, and ivory.

**245 Introduction to Art History: Renaissance and Baroque Art**
Fall. 3 credits. Not open to students who have taken History of Art 240 or 250.
M W and alternate F 10:10–11; discs alternate weeks W 2:30 or 3:35, R 2:30 or 3:35, or F 10:10 or 11:15. C. Lazzaro.
A survey of selected works of European painting, sculpture, and architecture from 1400 to 1700. The artists considered include Botticelli, Michelangelo, Rembrandt, Velazquez, and Bernini. These and other major artists will be emphasized and viewed through the context of the principal trends and ideas of the time. In addition to distinguishing artists' styles and aesthetic concerns, the course will consider other cultural factors shaping the work of art, such as patronage, religion, politics, and economics. This course is committed to improving student writing as well as teaching how to look at works of art.

**260 Introduction to Art History: The Modern Era**
Fall. 3 credits. Not open to students who have taken History of Art 261.
T R 11:40–12:55. J. E. Bernstock.
A discussion of the most important developments in art during the nineteenth and twentieth centuries. The emphasis is on major movements and artists such as Impressionism (Monet), Post-Impressionism (van Gogh, Cēzanne), Cubism (Picasso), Fauvism (Matisse), Surrealism (Miro), Abstract Expressionism (Pollock), Pop Art (Warhol), and Psychological Realism (Fischl).

**[270 Introduction to Art History: American Art to 1945**
3 credits. Not offered 1989–90.]

**280 Introduction to Art History: Asian Traditions**
3 credits. Not offered 1989–90.
S. J. O'Connor.]

**[320 The Archaeology of Ancient Greece (also Classics 320)**
4 credits. Not offered 1989–90.
J. Coleman.]

**[322 Arts of the Roman Empire (also Classics 350)**
4 credits Not offered 1989–90.
A. Ramage.]

**[323 Painting in the Greek and Roman World (also Classics 323)**
4 credits. Not offered 1989–90.]

**[324 Architecture in the Greek and Roman World (also Classics 324)**
4 credits. Not offered 1989–90.]

**325 Greek Vase Painting (also Classics 325)**
Spring. 4 credits. Prerequisite: previous enrollment in a History of Art or Classics course or permission of instructor.
M W F 10:10–11. A. Ramage.
A stylistic and iconographical approach to an art in which the Greeks excelled. The course will be arranged chronologically from the early (eleventh century B.C.), anonymous beginnings to the "personal" hands of identifiable masters of the fifth and fourth centuries B.C. Styles other than Attic will be stressed.

**[326 Art and Archaeology of Archaic Greece (also Classics 326)**
4 credits. Not offered 1989–90.]

**327 Greek and Roman Coins (also Classics 327)**
Fall. 4 credits. Prerequisite: History of Art 220, Classics 220, or permission of instructor.
M W F 11:15–12:05. A. Ramage.
The varied issues of Greek cities and the Roman state are examined. Coins are considered as art objects as well as economic and historical documents. The changes in design, value, and metals from the origins of coinage to the late Roman period are studied. Lectures, student presentations, and work with actual examples.

**[328 Greeks and Their Neighbors (also Classics 322)**
4 credits. Not offered 1989–90.
J. Coleman.]

**[329 Greek Sculpture (also Classics 329)**
4 credits. Not offered 1989–90.]

**332 Architecture in the Middle Ages (also Architecture 382)**
Fall. 4 credits.
M W F 12:20–1:10. R. G. Calkins.
A survey of medieval architecture from the Early Christian period to the Late Gothic (A.D. 300–1500). Considerable emphasis will be placed on the development of structural systems and upon the form, function, and meaning of important medieval buildings.

**[333 Early Medieval Art and Architecture**
4 credits. Not offered 1989–90.
R. G. Calkins.]

**[334 Romanesque Art and Architecture**
4 credits. Not offered 1989–90.
R. G. Calkins.]

**[335 Gothic Art**
4 credits. Not offered 1989–90.]

**[336 Prelude to the Italian Renaissance**
4 credits. Not offered 1989–90.
R. G. Calkins.]

**[337 The Medieval Illuminated Book**
4 credits. Not offered 1989–90.
R. G. Calkins.]

**[341 Flemish Painting**
4 credits. Not offered 1989–90.]

**[342 Medieval and German Renaissance Art**
4 credits. Not offered 1989–90.
R. G. Calkins.]

**343 Italian Renaissance of the Fifteenth Century**
Spring. 4 credits. Prerequisite: History of Art 240, 245, 250, or any 300-level course in the art, history, or literature of the Renaissance, or permission of instructor.
T R 10:10–11:25. C. Lazzaro.
The course examines the painting, sculpture, and architecture of the fifteenth century in Italy, including the works of Masaccio, Botticelli, Donatello, Ghiberti, Brunelleschi, and many others. Emphasis is on Florence as the center of creative activity, but the art produced in other city-states in north and central Italy are also studied. The principal artists of the period will be considered, as well as the political and moral role of art in this changing society, and the significance of such newly popular subjects as portraiture and mythological themes. Effective writing and critical thinking are stressed in student papers.

**[344 Italian Renaissance of the Sixteenth Century: Leonardo, Michelangelo, and Raphael**
4 credits. Not offered 1989–90.
C. Lazzaro.]

**[350 The Culture of the Early Renaissance (also Romance Studies 361 and Comparative Literature 361)**
4 credits. Not offered 1989–90.
C. Lazzaro.]

**[351 The Culture of the Later Renaissance (also Comparative Literature 362 and History 364)**
4 credits. Not offered 1989–90.]

**[354 European Painting of the Seventeenth Century**
4 credits. Not offered 1989–90.
S. McTighe.]

**[355 Painting and Public Life in Seventeenth-Century Northern Europe**
4 credits. Not offered 1989–90.
S. McTighe.]

**[357 European Art of the Eighteenth Century**
4 credits. Not offered 1989–90.]

**[359 Major Masters of the Graphic Arts**
4 credits. Not offered 1989–90.
C. Lazzaro.]

**[360 Nineteenth-Century American Art**
4 credits. Not offered 1989–90.]

**361 Nineteenth-Century European Art**
Fall. 4 credits. Prerequisite: History of Art 250 or 261.
A study of the major movements in nineteenth-century art history: Neo-Classicism, Romanticism, Realism, Impressionism, Post-Impressionism, and Symbolism. The primary artists discussed include Jacques-Louis David, Eugene Delacroix, Francisco Goya, Caspar D. Friedrich, Joseph W. M. Turner, Claude Monet, Vincent van Gogh, and Paul Gauguin. Literary and political developments are examined with respect to the broader cultural contexts of the specific art movements.

**362 European Art 1900–1940**
Spring. 4 credits. Prerequisite: History of Art 261.
An examination of the major movements in European art during the first half of the twentieth century: Fauvism, German Expressionism, Cubism and its satellite schools, Dada, and Surrealism. Emphasis will be placed on major artists, including Matisse, Picasso, Kirchner, Kandinsky, and Duchamp. Relevant political background influencing the period is included as well.

**[364 American Art 1900–1940**
4 credits. Not offered 1989–90.]

**365 Art from 1940 to the Present**
Spring. 4 credits.
T R 11:40–12:55. J. E. Bernstock.
Major artists and movements in the United States since 1940, beginning with Jackson Pollock and Abstract Expressionism, and continuing through recent developments in art. Attention is devoted to the critical reception that artists have received and to the artists' statements themselves.

**371 Architectural History of Washington, D.C.**
Fall or spring. Variable credit. Only for students in the Cornell-in-Washington program. Only for non-architects.
P. Scott.
A historical and critical survey of the architecture of Washington. Attention will be given to the periods, styles, architects, and clients—public and private—of the notable buildings and to the urbanscape of the nation's capital. The vocabulary of architectural analysis and criticism will be taught. Field trips required.

**[376 Painting and Sculpture in America: 1850–1950**
4 credits. Not offered 1989–90.
T. W. Leavitt.]

**[380 Introduction to the Arts of China**
4 credits. Not offered 1989–90.
M. W. Young.]

**[381 Buddhist Art in Asia**
4 credits. Not offered 1989–90.
S. J. O'Connor.]

**[383 The Arts of Early China**
4 credits. Not offered 1989–90.
M. W. Young.]

**384 The Arts of Japan**
Fall. 4 credits.
M W 1:25–2:15, plus a disc section to be arranged. M. W. Young.
A general introduction to the arts of Japan, intended to summarize the cultural achievements of the Japanese in such areas as architecture, gardens, painting, and sculpture. Although the course will follow a general chronological pattern, the arts will be approached topically, with special concentration on developments in the later periods of Japanese history, with particular emphasis on the arts related to Zen Buddhism. The tea ceremony, ceramics, and the minor arts will receive special attention through study of the Herbert F. Johnson Museum collection. The course will begin with an examination of Japan's earliest pottery traditions and end with a consideration of the wood-block prints of the nineteenth century. The museum collection will be used for written assignments.

**[385 Chinese Painting**
4 credits. Not offered 1989–90.
M. W. Young.]

**[386 Studies in Indian and Southeast Asian Art**
4 credits. Not offered 1989–90.
S. J. O'Connor.]

**[388 Architecture and Gardens of Japan**
4 credits. Not offered 1989–90.]

**[389 Japanese Painting**
4 credits. Not offered 1989–90.]

**396 The Arts of Southeast Asia**
Spring. 4 credits.
M W F 11:15–12:05. S. J. O'Connor.
The arts of Southeast Asia will be studied in their social context since in traditional societies art plays a role in most of the salient occasions of life. Special emphasis will be devoted to developments in Cambodia, Thailand, and Bali. Among topics covered will be the shadow puppet theater of Java, ceramics, architecture, and sculpture.

## Seminars

Courses at the 400 and 500 level are open to upperclass students, majors, and graduate students. All seminars involve the writing and presentation of research papers. Enrollment is limited to 15 students, and permission of the instructor is required. Students may repeat courses that cover a different topic each semester.

**400 Proseminar for Art History Majors: The History and Practice of Art History**
Fall. 4 credits. Prerequisite: History of Art majors only. Enrollment is limited.
M 2:30–4:30. R. G. Calkins.
This seminar, limited to majors in the department, will serve a dual purpose. It will provide intensive training in the skills of visual analysis, critical method, and writing. Five short papers will be assigned, each analyzing a different art form and type of art historical problem, from connoisseurship and stylistic analysis to research in the social history of art. The course will also provide a basic introduction to the historiography of the field and major writers and modes of inquiry that have been adopted for the study of the visual arts and architecture. Readings will include selections from Heinrich Wolfflin, Roger Fry, Erwin Panofsky, Jacob Rosenberg, and Michael Fried.

**401 Independent Study**
Fall or spring. 2–4 credits. May be repeated for credit. Prerequisite: permission of a department faculty member.
Hours to be arranged. Staff.
Individual investigation and discussion of special topics not covered in the regular course offerings, by arrangement with a member of the department.

**402 Independent Study**
Fall or spring. 2–4 credits. May be repeated for credit. Prerequisite: permission of a department faculty member.
Hours to be arranged. Staff.
Individual investigation and discussion of special topics not covered in the regular course offerings, by arrangement with a member of the department.

**404 Women Artists (also Women's Studies 404)**
Fall. 4 credits. Prerequisite: permission of instructor.
T 2:30–4:30. J. E. Bernstock.
This seminar will be devoted to a study of the work of women artists from antiquity to the present. The works of the most important women artists from each period will be studied in relation to the changing roles of women in society, and to the art produced contemporaneously by men. The artists to be studied include Sofonisba Anguissola, Artemisia Gentileschi, Elizabeth Vigee-Lebrun, Mary Cassatt, Kaethe Kollwitz, Georgia O'Keeffe, Louise Nevelson, Helen Frankenthaler, Judy Chicago, and Audrey Flack.

**[406 Introduction to Museums**
2 credits. Not offered 1989–90.
T. W. Leavitt.]

**[407 Seminar on Museum Issues**
4 credits. Not offered 1989–90.
T. W. Leavitt.]

**[421 History of Art Criticism**
4 credits. Not offered 1989–90.
S. J. O'Connor.]

**[423 Ceramics (also Classics 423 and Archaeology 423)**
4 credits. Not offered 1989–90.
A. Ramage.]

**427 Seminar on Roman Art (also Classics 435)**
Fall. 4 credits. Prerequisite: permission of instructor.
M 2:30–4:30. J. Whitehead.
Topic for fall 1989: Social Stratification in Roman Art.

Roman art has been described as the first "modern" art in history. Uniquely among ancient cultures, Rome offered its art patrons a wide variety of styles and motifs to express the diverse ideals of its highly complex and mobile society.

The course begins with a chronological overview of Roman art and with concepts of *romanitas*: underlying all this diversity is there an essence that can be considered purely Roman? The rest of the course will explore the dichotomies, the contrasting ideals and ideologies as expressed in the art of the different segments of society: artisan and aristocrat, freedmen and emperor, provincial and urbanite, foreign and domestic, rich and nouveau riche. The course seeks to define the degree to which artistic taste is bound to social class.

**[431 Greek Sculpture (also Classics 431)**
4 credits. Not offered 1989–90.
A. Ramage.]

**432 Sardis and the Cities of Asia Minor (also Archaeology 432 and Classics 432)**
Fall. 4 credits. Prerequisite: permission of instructor.
T 2:30–4:30. A. Ramage.
The growth and interaction of the Greek and Roman cities and their art will be studied using the finds and conclusions from the Cornell-Harvard excavations at Sardis as a focal point. The magnificent works of art and architecture will be set beside domestic remains and objects of daily life. We shall examine local themes in the context of the history, the topography, and the larger political and economic scene in Asia Minor. We shall concentrate on the Golden age of Lydia and Ionian Greece.

**[434 The Rise of Classical Greece (also Classics 434)**
4 credits. Prerequisite: Classics 220 or History of Art 220, Classics 221 or History of Art 221, or permission of instructor. Not offered 1989–90.
P. Kuniholm.]

**[447 The Artist's Self-Image in the Renaissance and Baroque**
4 credits. Not offered 1989–90.
C. Lazzaro.]

**449 Studies in Italian Renaissance Art**
Fall. 4 credits. Prerequisite: History of Art 240, 245, 250, or any 300-level course in the art, history, or literature of the Renaissance, or permission of instructor.
R 2:30–4:30. C. Lazzaro.
Topic for fall 1989: Problems in Interpretation of Italian Renaissance Art. This seminar considers various methods of interpretation of individual, problematic works of art. Research tools, such as contemporary sources and bibliographic materials, are discussed, but the emphasis will be on a critical analysis of selected works of art and of modern scholarly articles about them. Among the works to be investigated are Donatello's bronze *David*, Piero della Francesca's *Flagellation*, Giorgione's *Tempest*, Bronziono's *Venus, Cupid, Folly, and Time*, and Michelangelo's Medici Chapel. Both traditional art historical methods, including iconography, social history, and patronage, and more recent psychoanalytic and deconstructionist approaches are considered.

**451 Prints of the Fifteenth through the Seventeenth Century**
Spring. 4 credits. Prerequisites: some background in the Renaissance or Baroque (preferably History of Art 240, 245, and 250, or any 300-level course), and permission of instructor.
T 2:30–4:30. C. Lazzaro.
The course will investigate the developments in European printmaking and its major masters from the fifteenth through the seventeenth century, focusing primarily on the prints in the Herbert F. Johnson Museum of Art. Classes meet in the museum, and student papers are based on prints in the collection. Emphasized along with connoisseurship (the uniqueness of woodcut, engraving, and etching as expressive mediums, originals and copies, early and late impressions) are the early history of printmaking in Northern Europe and Italy, the subjects of prints and the styles appropriate to them, especially in contrast to other art forms, and the social functions of prints in the centuries.

**[456 The Social History of Art: Images of Labor and Problems in the Tradition of European Genre Painting, ca. 1550–1880**
4 credits. Not offered 1989–90.
S. McTighe.]

**[459 Caravaggio and Caravaggism in Seventeenth-Century Painting**
4 credits. Not offered 1989–90.
S. McTighe.]

**[462 Barbizon and Impressionist Art in Nineteenth-Century France**
4 credits. Not offered 1989–90.
L. L. Meixner.]

**[463 Studies in Modern Art: The Image of the Self**
4 credits. Not offered 1989–90.
J. E. Bernstock.]

**464 Studies in Modern Art**
Spring. 4 credits. Prerequisite: permission of instructor. Auditing is not permitted.
T 2:30–4:30. J. E. Bernstock.
Topic for 1990: Modern Sculpture. Developments in modern sculpture will be explored from their beginnings in the late nineteenth century. A wide range of styles, media, and content will be studied. The focus will be on major sculptors such as Auguste Rodin, Constantin Brancusi, Henry Moore, David Smith, Alberto Giacometti, Louise Nevelson, George Segal, Donald Judd, Robert Morris, Eva Hesse, Richard Serra, and others.

**476 Seminar in American Art**
Fall. 4 credits. Class will meet at Herbert F. Johnson Museum. Prerequisite: permission of instructor.
W 2:30–4:30. T. W. Leavitt.
An exploration of aspects of American painting represented in the collection of the Herbert F. Johnson Museum of Art. Works will be examined in many different contexts, and a hypothetical exhibition will be organized by the class.

**[477 Impressionism in America and France**
4 credits. Not offered 1989–90.
L. L. Meixner.]

**[478 Post-Impressionism in France**
4 credits. Not offered 1989–90.
L. L. Meixner.]

**481 The Arts in Modern China**
Spring. 4 credits. Prerequisites: History of Art 383, or a course in Chinese history or Chinese literature, and permission of instructor.
R 2:30–4:30. M. W. Young.
This seminar will consider in detail the relationship between art and society in China after the collapse of Imperial power. The focus will be on developments in the art of painting, particularly painting of the contemporary period, but other art froms that had a large impact on the formation of a modern viewpoint will be examined and discussed. Background lectures will cover the earlier landscape tradition, the rise of the literati culture, and the development of critical theories about the arts of painting, calligraphy, and poetry. Seminar topics will investigate the impact of western thought on Chinese aesthetics, the role of photography and the wood-block print medium in changing the perceptions of the west about China, the response of the Chinese artists to the political upheavals of the early 20th century, the arts in the service of the state, and the arts since the end of the Cultural Revolution. Weekly readings and class discussion expected, with a final research paper to be developed for presentation.

**[482 Ceramic Art of China and Southeast Asia**
4 credits. Not offered 1989–90.
S. J. O'Connor.]

**[483 Chinese Art of the T'ang Dynasty**
4 credits. Not offered 1989–90.
M. W. Young.]

**[484 Studies in Japanese Art and Architecture**
4 credits. Not offered 1989–90.]

**[485 The Ceramic Arts of Japan**
4 credits. Not offered 1989–90.]

**[486 Studies in Chinese Painting**
4 credits. Not offered 1989–90.
M. W. Young.]

**[488 Traditional Arts of Southeast Asia**
4 credits. Not offered 1989–90.
S. J. O'Connor.]

**[491 Japanese Prints**
4 credits. Not offered 1989–90.]

**531 Problems in Medieval Art and Architecture**
Spring. 4 credits. Prerequisite: permission of instructor.
M 2:30–4:30. R. G. Calkins.
Topic for spring 1990: Narrative in Medieval Illumination.

**[540 Seminar in Renaissance Art**
4 credits. Not offered 1989–90.
C. Lazzaro.]

**[550 Seminar in Baroque Art**
4 credits. Not offered 1989–90.
S. McTighe.]

**[564 Problems in Modern Art: Post-1940 American Art**
4 credits. Not offered 1989–90.]

**580 Problems in Asian Art**
Spring. 4 credits. Prerequisite: permission of instructor.
W 2:30–4:30. S. J. O'Connor.
Topic for 1990: critical review of selected works on earlier Southeast Asian Art.

**591–592 Supervised Reading**
591, fall; 592, spring. 4 credits. May be repeated for credit. Limited to graduate students.
Staff.

**[595 Methodology Seminar**
4 credits. Not offered 1989–90.
R. G. Calkins.]

**[596 Problems in Art Criticism**
4 credits. Not offered 1989–90.
S. J. O'Connor.]

**600 Honors Work**
Fall or spring. 4 credits. Intended for senior art history majors who have been admitted to the honors program.
Hours to be arranged. Staff.
Basic methods of art historical research will be discussed and individual readings assigned, leading to the selection of an appropriate thesis topic.

**601 Honors Work**
Fall or spring. 4 credits. Prerequisite: History of Art 600.
Hours to be arranged. Staff.
The student under faculty direction will prepare a senior thesis.

## INDONESIAN

See Department of Modern Languages and Linguistics.

**FALCON Program**
J. U. Wolff, 307 Morrill Hall, 255-0733.

## ITALIAN LANGUAGE AND LINGUISTICS

See Department of Modern Languages and Linguistics.

## ITALIAN LITERATURE

See Department of Romance Studies.

## JAPANESE

See Departments of Asian Studies and Modern Languages and Linguistics.

## JAVANESE

See Department of Modern Languages and Linguistics.

## KHMER (CAMBODIAN)

See Department of Modern Languages and Linguistics.

## KNIGHT, JOHN S., WRITING PROGRAM

See John S. Knight Writing Program, p. 21 and p. 319.

## LATIN

See Department of Classics.

## LINGUISTICS

J. W. Gair, director of undergraduate studies (407 Morrill Hall, 255-5110).

See Department of Modern Languages and Linguistics.

## MATHEMATICS

R. K. Dennis, chair; D. Barbasch, B. Barkee, I. Berstein, L. Billera, J. Bramble, K. Brown, L. Brown, S. Chase, M. Cohen, R. Connelly, R. Cruz, R. K. Dennis, J. Deuschel, R. Durrett, E. Dynkin, C. Earle, R. Farrell, M. Fisher, L. Gross, J. Guckenheimer, A. Hatcher, D. Henderson, P. Holmes, J. Hubbard, J. Hwang, P. Kahn, H. Kesten, C. King, A. Knapp, D. Kozen, S. Lichtenbaum, R. C. Liu, G. Livesay, J. Marsden, M. Morley (associate chair and director of undergraduate studies, 216 White Hall, 255-4105), A. Nerode, L. Payne, R. Platek, T. Rishel, O. Rothaus, A. Schatz, S. Sen, J. Smillie, R. Shore, B. Speh, F. Spitzer, M. E. Stillman, R. Strichartz, B. Sturmfels, M. Sweedler, K. Vogtmann, L. Wahlbin, J. West, Y. Ye, A. C. Zitronenbaum. (Emeritus: W. Fuchs, A. Rosenberg)

Mathematics is the language of modern science; basic training in the discipline is essential for those who want to understand, as well as for those who want to take part in, the important scientific developments of our time. Acquaintance with mathematics is also extremely useful for students in the social sciences and valuable for anyone interested in the full range of human culture and the ways of knowing the universe in which we live.

The Department of Mathematics faculty has strong groups specializing in algebra, number theory, real and complex analysis, Lie groups, topology and geometry, logic, probability and statistics, mathematical physics, and applied mathematics. Related departments at Cornell have specialists in computer science, operations research, linear programming, and game theory, and courses in these topics can be integrated readily into the mathematics major.

The department offers a rich variety of undergraduate courses, and many of its beginning graduate courses are suitable for advanced undergraduates as well. Under some conditions, a student may carry out an independent reading and research project for college credit under the supervision of a faculty member.

Members of the department are available to discuss with students the appropriate course for their levels of ability and interest, and students are urged to avail themselves of this help.

Students who want to take any of the courses numbered 300 or above are invited to confer, before registering, with the instructor concerned. The level of a course is indicated by the first digit of the course number: roughly, 1, 2, indicate underclass courses; 3, 4, upperclass courses; 5, 6, graduate courses. The subject matter of courses is indicated by the second digit: 0, general; 1, 2, analysis; 3, 4, algebra; 5,6, topology and geometry; 7, probability and statistics; 8, logic; 9, other.

Midterm grades, when required, will be S or U only, except in special circumstances. In all 600-level courses, in all grades will be S-U only, with the exception of 690. In courses with numbers below 600, students will receive letter grades, with the exception of non-mathematics majors who have requested an S-U grade.

## Advanced Placement

Secondary school students are strongly urged to take one of the two advanced placement examinations of the College Entrance Examination Board in their senior year. Freshmen who have had some calculus but who have not taken an advanced placement examination should take the placement examination in mathematics offered at Cornell just before the beginning of classes in the fall. It is most important that anyone with any knowledge of calculus carefully read "Advanced Placement of Freshmen," p. 23.

## The Major

The mathematics major adapts to a number of purposes. It can emphasize the theoretical or the applied. It can be appropriate for professionals and nonprofessionals alike. It can be broad or narrow. Questions concerning the major should be brought to a departmental representative.

For students interested in secondary school teaching there are several programs available, including a five-year B.S./M.A.T. program. These programs are administered jointly by the departments of Education and Mathematics. For more information, contact professors D. Henderson or A. Solomon (mathematics), or professors J. Confrey or J. Volmink (education).

Prerequisites: The preferred prerequisites are Mathematics 221–222 or 293–294. A unit on infinite series is required. Such a unit is offered in Mathematics 112, 122, and 192. Normally students will be admitted to the major only when they have grades of B– or better in all sophomore-level mathematics courses they have taken. Alternative prerequisites are Mathematics 213, 231, normally with grades of B+ or better.

### Requirements

There are five requirements for the major:

1) Computer Science 100 Students are urged to take this course before the end of the sophomore year

2) Two courses in algebra. Eligible courses are Mathematics 431 or 433, 432 or 434 or 332, 336.

3) Two courses in analysis. Eligible courses are Mathematics 411 or 413, 412 or 414, 418, 421, 422, 423.

4) Further high-level mathematical courses. Any one of the following is sufficient:

   a) three mathematics courses numbered 371 or higher, other than those used to satisfy the previous two requirements. Computer Science 621 and/or 622 may also be used toward satisfying this requirement.

   b) four Computer Science courses numbered 310 or higher.

   c) four Operations Research and Industrial Engineering courses numbered 320 to 383 or 431 to 472, but not 350.

5) One course dealing with mathematical models. Any one of the following is sufficient:

   a) Mathematics 305 (not offered every year).

   b) Physics 208, 213, or 217.

   c) Computer Science 211, provided no Computer Science course has been used toward satisfying the previous requirement.

   d) One course other than Physics 112 or 207 from outside mathematics with serious mathematical content and dealing with scientific matters, provided the course has not been used toward satisfying the previous requirement.

Major advisers can alter these requirements upon request of an advisee, provided the intent of the requirements is met.

### Sample Major Programs

Below are some suggestions for what the schedule of a student with a mathematics major might look like. Many variations are possible.

*For Graduate School in Mathematics*

First two years: Mathematics 111–122–221–222, Computer Science 100, Physics 207–208.

Last two years: Mathematics 433–434, 413–414, 453–454; two of 418, 428, 471.

The sophomore courses Mathematics 221–222 are more suitable than 293–294 in this case. A student planning to enter graduate school may get by with 411–412 and 431–432 instead of the honors versions 413–414 and 433–434, but the honors versions are strongly recommended.

*For Many Technical Careers*

First two years: Mathematics 111–122–221–222 or 191–192–293–294, Computer Science 100–211, Physics 112–213 or 207–208.

Last two years: Mathematics 431–336, 421–422, 428, 471–472.

Two or more semesters of computer science are highly recommended.

*For Emphasis on Computer Science*

First two years: Mathematics 111–122–221–222, Computer Science 100–211.

Last two years: Mathematics 431–432, 421–422, Computer Science 314, 381, 410, 414, 421.

Requirement 5 is met by Computer Science 381 in this sample program. Students interested in computer science should give consideration to a double major in mathematics and computer science.

*For Emphasis on Operations Research*

First two years: Mathematics 111–122–221–222 or 191–192–293–294, Computer Science 100–211.

Last two years: Mathematics 431–432, 421–422, 471; Operations Research and Industrial Engineering 320, 321, 361, two of 431, 432, 435, and possibly 462 or 471.

*For Prelaw or Premed (first example)*

First two years: Mathematics 111–122–221–222, Computer Science 100, Physics 207–208.

Last two years: Mathematics 431–336, 411–421, 381, 471–472.

The sophomore courses Mathematics 221–222 are recommended rather than 293–294 in this sample because they provide better preparation for 411.

*For Prelaw or Premed (second example) or Prebusiness*

First two years: Mathematics 111–112–213–231, Computer Science 100–211

Last two years: Mathematics 332–336, two of 411–421–418, and also 381, 403, 451.

A course in statistics is also strongly recommended.

*For Secondary School Teachers*

First two years: Mathematics 111–122–221–222–305, Computer Science 100.

Last two years: Mathematics 431–336, 411–421, 451, 403, 471, 408.

**Honors.** Honors in mathematics will be awarded on the basis of a high level of performance in departmental courses. Further requirements, if any, will be announced during the year.

## Distribution Requirement

The distribution requirement is satisfied in mathematics by any 6 credits, not including more than one course from Mathematics 105 or 403. Computer Science 100 may be used for three of these credits. The mathematics distribution requirement is also satisfied by a score of 3 or higher on the CEEB calculus BC examination. Mathematics 109 or ALS 115 (College of Agriculture and Life Sciences) may not be used to satisfy the requirement.

## Basic Sequences

### Precalculus

| *Description* | *Course Numbers* |
|---|---|
| 1) Algebra and trigonometry to prepare students for calculus | Mathematics 109* or Agriculture and Life Sciences 5* |
| 2) Algebra, analytic geometry, elements of calculus | Agriculture and Life Sciences 115** |

*Mathematics 109 and ALS 5 do *not* carry credit for graduation.

**Students who want a second semester of mathematics after ALS 115 may take Mathematics 105 or if they need more calculus, 111.

### Calculus

| *Description* | *Mathematics Course Numbers* |
|---|---|
| 1) Standard three-semester sequence for students who do not expect to take advanced courses in mathematics | 111–112–213 |
| 2) Usual sequence for prospective mathematics majors and others who expect to take advanced courses in mathematics | 111–122–221–222 |
| 3) Calculus for engineers (also taken by some physical science majors) | 191–192–293–294 |

Mathematics 191 may be substituted for 111 in sequences 1 and 2. Sequences 2 and 3 are two-year sequences that include some linear algebra.

Students who take sequence 1 may learn some linear algebra by taking Mathematics 231. A student whose performance in 112 is exceptional may switch to sequence 2 and take 221.

### Special-Purpose Sequences

| *Description* | *Mathematics Course Numbers* |
|---|---|
| 1) Finite mathematics and calculus for biology majors | 105–106 |
| 2) Other possible finite mathematics and calculus sequence | 105–111 |

Students who want to take two semesters of calculus are advised to take the first two semesters of one of the three calculus sequences. It is also possible to follow Mathematics 106 with 112 or 122.

*Switching between calculus sequences is often difficult, especially at the 200-level. Students should not attempt such a switch without consulting the associate chair.*

## Courses with Overlapping Content

Because the department offers many courses with overlapping content, students must choose their courses carefully to ensure that they will receive credit for each course they take. Listed below are groups of courses with similar content. *Students will receive credit for only one of the courses in each group.*

| | |
|---|---|
| | 213 and 294 |
| 106, 111, 191 | 213 and 222 |
| 112, 122, and 192 | 221, 294, and 231 |
| 132 and 332 | 332 and 432 |
| 213 and 293 | 372 and 472 |

## Basic Sequences

**105 Finite Mathematics for Biologists (also Theoretical and Applied Mechanics 105)**

Fall. 3 credits. Prerequisite: three years of high school mathematics, including trigonometry and logarithms.*

Lecs, T R 12:20, plus 2 hours to be arranged. Prelims: 7:30 p.m., Oct. 4, Nov. 2, Dec. 7.

Mathematical modeling, sets, functions, and graphing (including use of log and semi-log paper). Probability (with some applications to genetics). Matrices, systems of linear equations, and Markov chains. Examples from biology are used.

**106 Calculus for Biologists (also Theoretical and Applied Mechanics 106)**

Spring. 3 credits. Prerequisite: Mathematics 105 or 109 or ALS 115 or permission of instructor. (A strong background in functions is required.) Mathematics 111, rather than 106, is recommended for those planning to take 112.*

Lecs, T R 11:15, plus 2 hours to be arranged. Prelims: 7:30 p.m., Feb. 20, Mar. 27, Apr. 26.

Introduction to differential and integral calculus, partial derivatives, elementary differential equations. Examples from biology are used.

**109 Precalculus Mathematics**

Summer. 3 transcript credits only; cannot be used toward graduation.

M–F 8:30.

This course is designed to prepare students for Mathematics 111. Algebra, trigonometry, logarithms, and exponentials are reviewed.

**111 Calculus**

Fall, spring, or summer. 4 credits. Limited to 22 students a section. Prerequisite: Mathematics 109 or three years of high school mathematics, including trigonometry.*

Hours to be arranged. Prelims: fall, 7:30 p.m., Oct. 4, Nov. 2, Nov. 30; spring, 7:30 p.m., Feb. 20, Mar. 27, Apr. 26.

Plane analytic geometry, differentiation and integration of algebraic and trigonometric functions, applications of differentiation, logarithmic and exponential functions. One section will be taught experimentally with use of computers in fall term.

*See the list of courses with overlapping content at the end of the introduction.

**112 Calculus**

Fall, spring, or summer. 4 credits. Limited to 22 students a section. Prerequisites: Mathematics 106 or 111 with a grade of C or better. Those who do extremely well in Mathematics 111 should take 122 instead of 112, unless they plan to continue with 213.*

Hours to be arranged. Prelims: fall, 7:30 p.m., Oct. 4, Nov. 2, Dec. 7; spring, 7:30 p.m., Feb. 20, Mar. 27, Apr. 26.

Methods and applications of integration, plane curves and polar coordinates, vectors and solid analytic geometry, introduction to partial derivatives. One section will be taught experimentally with use of computers in spring term.

**122 Calculus**

Fall or spring. 4 credits. Prerequisite: performance at a high level in Mathematics 111 or permission of the department. Students planning to continue with Mathematics 213 are advised to take 112 instead of this course.*

Fall: M W F 10:10 or 11:15, plus one hour to be arranged. Spring: M W F 11:15 or 12:20, plus one hour to be arranged. Prelims: fall, 7:30 p.m., Oct. 4, Nov. 2, Dec. 7; spring, 7:30 p.m., Feb. 20, Mar. 27, Apr. 26.

Differentiation and integration of elementary transcendental functions, the techniques of integration, applications, polar coordinates, infinite series, and complex numbers, as well as an introduction to proving theorems. The approach is more theoretical than in Mathematics 112.

**191 Calculus for Engineers**

Fall. 4 credits. Prerequisite: three years of high school mathematics, including trigonometry.

Lecs, M W F 9:05 or 11:15, plus 2 hours to be arranged. Prelims: 7:30 p.m., Oct. 4, Nov. 2, Dec. 7.

Plane analytic geometry, differential and integral calculus, and applications.

**192 Calculus for Engineers**

Fall, spring, or summer. 4 credits. Prerequisite: Mathematics 191.

Fall: lecs, M W F 9:05 or 11:15, plus 2 hours to be arranged. Spring: lecs, M W F 9:05 or 11:15, plus 2 hours to be arranged. Prelims: fall, 7:30 p.m., Oct. 4, Nov. 2, Dec. 7; spring, 7:30 p.m., Feb. 20, Mar. 27, Apr. 26.

Methods of integration, polar coordinates, vectors and parametric equations, vector functions of one variable, infinite series, complex numbers, introduction to partial derivatives.

**213 Calculus**

Fall, spring, or summer. 4 credits. Prerequisite: Mathematics 112, 122, or 192.

Lecs M W F 10:10, plus 2 hours to be arranged. Prelims: fall, 7:30 p.m., Oct. 4, Nov. 9; spring, 7:30 p.m., Feb. 22, Apr. 3.

Vectors, vector-valued functions, line integrals. Multivariable calculus, multiple integrals. First- and second-order differential equations with applications. Introduction to numerical methods, series solutions, systems of differential equations, elementary partial differential equations.

**221 Linear Algebra and Calculus**
Fall or spring. 4 credits. Prerequisite: Mathematics 122 with a grade of B or better, or permission of instructor.
Fall: M W F 8, 9:05, 10:10, or 11:15, plus one hour to be arranged. Spring M W F 10:10 or 11:15, plus one hour to be arranged. Prelims: fall, 7:30 p.m., Oct. 4, Nov. 2, Dec. 7; spring, 7:30 p.m., Feb. 22, Mar. 27, May 1.
Linear algebra and differential equations. Topics include vector algebra, linear transformations, matrices, linear differential equations, as well as an introduction to proving theorems.

**222 Calculus**
Fall or spring. 4 credits. Prerequisite: Mathematics 221.
Fall: M W F 11:15 or 12:20, plus one hour to be arranged. Spring: M W F 9:05 or 10:10 or 11:15, plus one hour to be arranged. Prelims: fall, 7:30 p.m., Oct. 4, Nov. 2, Dec. 7; spring, 7:30 p.m., Feb. 22, Mar. 27, May 1.
Vector differential calculus, calculus of functions of several variables, multiple integrals.

**293 Engineering Mathematics**
Fall or spring. 4 credits. Prerequisites: Mathematics 192 plus a knowledge of computer programming equivalent to that taught in Engineering Common Courses 105. In exceptional circumstances, Mathematics 192 and 293 may be taken concurrently.
Fall: lecs, M W 10:10, 11:15, or 12:20, plus one hour to be arranged, plus four three-hour computer labs during the semester. Spring: lecs, M W 10:10 or 12:20, plus one hour to be arranged, plus four three-hour computer labs during the semester. Prelims: fall, 7:30 p.m., Sept. 28, Nov. 2, Nov. 30; spring: 7:30 p.m., Feb. 22, Mar. 27, May 1.
Partial derivatives, multiple integrals, first- and second order ordinary differential equations with applications in the physical and engineering sciences. Includes microcomputer experiments using computer algebra to solve problems.

**294 Engineering Mathematics**
Fall or spring. 4 credits. Prerequisite: Mathematics 293.*
Fall: lecs, M W 10:10 or 12:20, plus one hour to be arranged, plus four three-hour computer labs during the semester. Spring: lecs, 10:10, 11:15, or 12:20, plus one hour to be arranged, plus four three-hour computer labs during the semester. Prelims: fall, 7:30 p.m., Sept. 28, Nov. 2, Nov. 30; spring, 7:30 p.m., Feb. 22, Mar. 27, May 1.
Vector spaces and linear algebra, matrices, eigenvalue problems, and applications to systems of linear differential equations. Vector calculus. Boundary-value problems and introduction to Fourier series. Includes microcomputer experiments using computer algebra to solve problems.

## General Courses

**101 History of Mathematics**
Summer. 4 credits. Prerequisite: three years of high school mathematics.
The history of the main ideas of mathematics from Babylonian, Egyptian, and Greek times to the present day.

*See the list of courses with overlapping content at the end of the introduction.

**103 Mathematical Explorations**
Fall. 3 credits. Limited to 15 students. This course may be used to satisfy the distribution requirement in mathematics.
Lecs, T R 8:40.
This course is for students who wish to experience how mathematical ideas naturally evolve; especially for students who have not yet found mathematics to be a world in which they move comfortably. The homework will consist in the students actively investigating mathematical ideas such as the nature of infinity and geometric reality and the ideas leading to calculus. The course will emphasize ideas and imagination as opposed to techniques and calculations.

**[104 Mathematics and Art**
Fall. 3 credits. Limited to 12 students. Does not satisfy the mathematics distribution requirement; for graduation credit only. Not offered 1989–90.
The impact of mathematical ideas on the arts and the impact of the arts on mathematical ideas through the ages, with a special emphasis on theories of perspective in the visual arts. The course will be cooperatively taught by a mathematician and an art historian. There will be both mathematical and artistic assignments based on the theories, and assignments of readings from the original texts.]

**[117 Foundations of Calculus**
Spring. 3 credits. Limited to 20 students. Not offered 1989–90. Prerequisite: Mathematics 111 or 106 or equivalent. Intended for nonscientists who will not need all the techniques of Mathematics 112 in their future work. May be used toward the distribution requirement in mathematics. Students may not get credit for this and any other second-semester calculus course. Mathematics 117 by itself will not satisfy the prerequisites for Mathematics 213, 221, or 293.
Prelims: Feb. 20, Mar. 27, Apr. 26.
A second-semester calculus course for those who would like to go more deeply into the questions concerning limits and infinite processes that puzzled scholars for over two thousand years. Students study anew the real number system, the theory of limits, continuity, differentials, derivatives and the definite integral, and learn about improper integrals, L'Hôpital's rule and infinite sequences and series. Pedagogical method is partly historical, viewing the development of these interlocked topics from the time of the ancient Greeks (Zeno's paradoxes, the discovery of irrationals, Eudoxus' Method of Exhaustion, and the work of Archimedes) through modern times.]

**150 From Space to Geometry**
Spring. 4 credits. Enrollment limited to 18 students.
Over the centuries mathematicians have interpreted the concept of "space" in numerous ways. This course will survey some of these approaches from the time of Euclid to the later perspective of non-Euclidean systems. We will evaluate the impact of these viewpoints on such concepts as distance, angle measurement, straightness and curvature, dimension, and surface. We will make and analyze models to get a feel for the concepts and to assess the relevance of various approaches to geometry.

**151 The Geometry of Tilings, Polyhedra, and Structural Engineering**
Spring. 3 credits. Limited to 15 students.
An introduction to topics in geometry, including the classification of tilings by the group of symmetries that act on them, examples of artists such as Escher, the aperiodic tilings of R. Penrose, the study of polyhedra, Euler's formula, regular polyhedra, linkages that draw straight lines, "Buckminster Fuller's" geodesic domes, and tensegrities. Emphasis will be on the geometric ideas involved, with formal proofs studied only as needed for overall understanding.

**227 Mathematical Model Modeling**
Spring. 4 credits. Limited to 25 students. Prerequisite: Mathematics 111 or 106 or equivalent. May be used to satisfy the mathematics distribution requirement. Not intended for upperclass science majors.
Mathematical modeling is the process of bringing mathematical methods to bear on problems arising in the real world. In this course students will study selected mathematical models, learn general modeling techniques, and gain experience in constructing original mathematical models and comparing their predictions with reality, both to appreciate the usefulness of mathematical models and to be aware of their limitations.

**305 Mathematics in the Real World**
Summer. 4 credits.
Selected uses of mathematics to solve current relevant problems; illustration of, and active student involvement in, the complete applied mathematical methodology.

**403 History of Mathematics**
Spring. 4 credits. Prerequisites: two courses in mathematics above 300, or permission of instructor.
T R 1:25–2:40.
Survey of the development of mathematics from antiquity to the present, with an emphasis on the achievements, problems, and mathematical viewpoints of each historical period and the evolution of such basic concepts as *number*, *geometry*, *construction*, and *proof*. Readings from original sources in translation. Students will be required to give oral and written reports.

**408 Mathematics in Perspective**
Spring. 4 credits. Prerequisite: consent of instructor (intended for senior mathematics majors and other students with strong mathematics backgrounds).
The purpose of this course is for students to step back and to form an overview of the mathematics which they have learned.

**490 Supervised Reading and Research**
Fall, spring, or summer. 1–6 credits.
Supervised reading and research by arrangement with individual professors. Not applicable for material currently available in regularly scheduled courses.

**508 Mathematics for Secondary School Teachers**
Fall, spring, or summer. 1–6 credits. Prerequisite: secondary school mathematics teacher, graduate standing, or permission of instructor. May not be taught every semester.
An examination of the principles underlying the content of the secondary school mathematics curriculum, including connections with the history of mathematics and current mathematics research.

**690 Supervised Reading and Research**
Variable credit (maximum 6 each term).

## Analysis

**411–412 Introduction to Analysis**
411, fall; 412, spring. 4 credits each term. Prerequisite: Mathematics 222. Students who need measure theory and Lebesgue integration for advanced probability courses should take Mathematics 413–414 or arrange to audit the first few weeks of Mathematics 521. Undergraduates who plan to attend graduate school in mathematics should take 413–414.
T R 8:40–9:55.
An introduction to the theory of functions of real variables, stressing rigorous logical development of the subject rather than technique of applications. Topics include Euclidean spaces, the real number system, continuous and differentiable functions, Riemann integral, uniform convergence and approximation theorems, Fourier series, calculus in several variables, and differential forms.

**413–414 Introduction to Analysis**
413, fall; 414, spring. 4 credits each. Prerequisite: Mathematics 222.
413: T R 8:40 or 10:10; 414: T R 8:40.
Honors version of Mathematics 411–412. Metric spaces are included in Mathematics 413, and 413 proceeds at a faster pace than 411. The second semester includes an introduction to the Lebesgue integral.

**418 Introduction to the Theory of Functions of One Complex Variable**
Spring. 4 credits. Prerequisite: Mathematics 222 or 294 or 213. May be offered only in alternate years.
T R 1:25–2:40.
A rigorous introduction to complex variable theory. Complex numbers. Differential and integral calculus for functions of a complex variable, including Cauchy's theorem and the calculus of residues. Elements of conformal mapping.

## Applied Mathematics and Differential Equations

**421 Applicable Mathematics**
Fall, spring, or summer. 4 credits. Prerequisites: high level of performance in Mathematics 294, or 221 and 222, or 213 and 231. Graduate students who need mathematics extensively in their work and who have had a solid advanced calculus course and complex variables course as undergraduates should take Mathematics 515–516. With less preparation, they should take Mathematics 421–422–423.
T W R F 9:05 or 12:20. Prelims: fall, 7:30 p.m., Oct. 17, Nov. 28; spring, 7:30 p.m., Mar. 6, Apr. 19.
Theorems of Stokes, Green, Gauss, etc. Sequences and infinite series. Fourier series and orthogonal functions. Ordinary differential equations. Solution of partial differential equations by separation of variables.

**422 Applicable Mathematics**
Fall, spring, or summer. 4 credits. Prerequisite: Mathematics 421.
T W R F 12:20. Prelims: fall, 7:30 p.m., Oct. 17, Nov. 28; spring, 7:30 p.m., Mar. 6, Apr. 19.
Complex variables Fourier transforms, Laplace transforms. An introduction to generalized functions. Applications to partial differential equations.

**423 Applicable Mathematics**
Fall or spring. 4 credits. Prerequisite: Mathematics 421; however, students who have not taken 422 should talk to the instructor before taking this course.
T W R F 12:20. Prelims: fall, 7:30 p.m., Oct. 17, Nov. 28; spring, 7:30 p.m., Mar. 6, Apr. 19.
Normed vector spaces. Elementary Hilbert space theory. Projections. Fredholm's alternative. Eigenfunction expansions. Applications to elliptic partial differential equations and to integral equations.

**425 Numerical Solutions of Differential Equations**
Spring. 4 credits. Prerequisites: Mathematics 222 or 294, one course numbered 300 or higher in mathematics, and Computer Science 321, or permission of instructor. This course is a natural sequel to Computer Science 321. Methods and basic theory for the numerical solution of ordinary and partial differential equations. Linear multistep methods, Runge-Kutta methods, and the problem of stiffness for ordinary differential equations. Finite difference methods and Galerkin finite element methods for partial differential equations. Homework will involve use of a computer.

**427 Introduction to Ordinary Differential Equations**
Fall. 4 credits. Prerequisite: Mathematics 222 or 294 or permission of instructor.
T R 8:40.
Covers the basic existence, uniqueness, and stability theory together with methods of solution and methods of approximation. Topics include singular points, series solutions, Sturm-Liouville theory, transform methods, approximation methods, and application to physical problems.

**428 Introduction to Partial Differential Equations**
Spring. 4 credits. Prerequisite: Mathematics 222 or 294 or permission of instructor.
T R 10:10–11:25.
Topics selected from first-order quasilinear equations, classification of second-order equations, with emphasis on maximum principles, existence, uniqueness, stability Fourier series methods, approximation methods.

## Algebra

**231 Linear Algebra**
Spring or summer. 3 credits. Prerequisite: Mathematics 111 or equivalent.*
M W F 10:10. Prelims: spring, Feb. 22, Mar. 27, May 1.
Vectors, matrices, and linear transformations, affine and Euclidean spaces, transformation of matrices, and eigenvalues.

**332 Algebra and Number Theory**
Fall. 4 credits. Prerequisites: one year of calculus and one course from Mathematics 221, 231, and 294. Mathematics 332 does not satisfy prerequisites for courses numbered 500 and above.
M W F 9:05.
Various topics from modern algebra and number theory, usually including rings, fields, and finite groups. Motivation and examples are derived mostly from geometry, arithmetic, and congruence problems on the integers.

*See the list of courses with overlapping content at the end of the introduction.

**336 Applicable Algebra**
Spring. 4 credits. Prerequisites: Mathematics 221, 294, or 231.
M W F 9:05 or 10:10.
An introduction to concepts and methods of abstract algebra that are of importance in science and engineering. Applications of the theory to concrete problems will be stressed. Each year the course will treat aspects usually chosen from the following topics: partially ordered sets, lattices, graph theory, and Boolean algebras; finite machines and languages; applications of groups, fields, and modular arithmetic, such as Latin squares, elementary coding theory, or fast Fourier transform; difference equations. Additional topics may be chosen by the instructor.

**431–432 Introduction to Algebra**
431, fall; 432, spring. 4 credits each. Prerequisite: Mathematics 221 or 231. Undergraduates who plan to attend graduate school in mathematics should take 433–434.
431: M W F 9:05 or 10:10; 432: M W F 10:10.
431: An introduction to linear algebra, including the study of vector spaces, linear transformations, matrices, and systems of linear equations; quadratic forms and inner product spaces; canonical forms for various classes of matrices and linear transformations; determinants. 432: an introduction to various topics in abstract algebra, including groups, rings, fields, factorization of polynomials and integers, congruences, and the structure of finitely generated modules over Euclidean domains with application to canonical forms of matrices.

**433–434 Introduction to Algebra**
433, fall; 434, spring. 4 credits each. Prerequisite: Mathematics 221 or 231.
M W F 10:10.
Honors version of Mathematics 431–432 Mathematics 433–434 will be more theoretical and rigorous than 431–432 and will include additional material such as multilinear and exterior algebra.

## Geometry and Topology

**451–452 Classical Geometries**
451, fall or summer; 452, spring. 4 credits each term. Prerequisite: Mathematics 221 or 231 or permission of instructor. 451 is not usually a prerequisite for 452.
Fall: T R 2:55, spring: M W F 9:05.
Foundations of geometry. Various geometric topics, including Euclidean, non-Euclidean, and projective geometry and rigidity theory.

**453 Introduction to Topology**
Fall. 4 credits. Prerequisites: Mathematics 411 and 221, or permission of instructor.
M W F 11:15.
Basic point set topology, connectedness, compactness, metric spaces, fundamental group. Application of these concepts to surfaces such as the torus, the Klein bottle, the Moebius band.

**454 Introduction to Differential Geometry**
Spring. 4 credits. Prerequisites: Mathematics 222 or 294, plus at least one mathematics course numbered 300 or above. Mathematics 453 is not a prerequisite.
M W F 11:15.
Differential geometry of curves and surfaces. Curvature, geodesics, differential forms. Introduction to n-dimensional Riemannian manifolds. This material provides some background for the study of general relativity; connections with the latter will be indicated.

## Probability and Statistics

**372 Elementary Statistics**
Fall. 4 credits. Prerequisites: one year of calculus, and Computer Science 100 or 101 or 108 or permission of instructor. A terminal course for students who will take no further courses in statistics.*
M W F 9:05. Evening prelims may be given.
Introduction to the principles underlying modern statistical inference, to the practical application of statistical techniques, and to the rationale underlying the choice of statistical methods in various situations. Topics in probability that are essential to an understanding of statistics. Homework involves statistical analysis of data sets on hand calculators and on a computer by means of packaged programs.

**471 Basic Probability**
Fall. 4 credits. Prerequisite: Mathematics 221. May be used as a terminal course in basic probability. Intended primarily for those who will continue with Mathematics 472.
Lecs, M W F 11:15; rec, R 12:20. Prelims: 7:30 p.m., Oct. 17, Nov. 28.
Topics include combinations, important probability laws, expectations, moments, moment-generating functions, limit theorems. Emphasis is on diverse applications and on development of use in statistical applications. See also the description of Mathematics 571.

**472 Statistics**
Spring. 4 credits. Prerequisite: Mathematics 471 and knowledge of linear algebra such as taught in Mathematics 221. Some knowledge of multivariate calculus helpful but not necessary.*
M W F 9:05. Prelims: 7:30 p.m., Mar. 7, Apr. 18.
Classical and recently developed statistical procedures are discussed in a framework that emphasizes the basic principles of statistical inference and the rationale underlying the choice of these procedures in various settings. These settings include problems of estimation, hypothesis testing, large sample theory.

**[473 Further Topics in Statistics**
Fall. 4 credits. Prerequisite: Mathematics 472 or 574. Not offered 1989–90.
M W F 11:15.
More detailed discussion of some of the topics not covered at length in Mathematics 472. Design and analysis of experiments. Multivariate analysis. Nonparametric inference; robustness. Sequential analysis. For corresponding subject matter taught in more detail, see description of Mathematics 573 and 675.]

## Mathematical Logic

**[481 Mathematical Logic**
Spring. 4 credits. Prerequisite: Mathematics 221. Not offered 1989–90.
Propositional and predicate logic. Classical proof procedures. Completeness and compactness. Decidability and undecidability. The Gödel incompleteness theorem. Elements of set theory.]

*See the list of courses with overlapping content at the end of the introduction.

**486 Applied Logic (also Computer Science 486)**
Fall or summer. 4 credits. Prerequisites: Mathematics 222 or 294, Computer Science 100, and some additional course in mathematics or Computer Science 381.
T R 10:10–11:25, plus one-hour lab to be arranged.
Propositional and predicate logic, compactness and completeness by tableaux. Equational logic. Herbrand Universes, the resolution method, and unification. Rewrite rules and equational logic. Knuth-Bendix method and the congruence closure algorithm and lamda-calculus reduction strategies. Restrictions on resolution and their completeness. Introduction to automatic theorem proving. Topics in Prolog, Lisp, or ML on microcomputers or, possibly, exposure to a larger system such as Nuprl. Input resolution and Prolog. Applications to expert systems and program verification.

**487 Applied Logic II**
Spring. 4 credits. Prerequisite: Mathematics 221 or equivalent.
Intuitionistic propositional and predicate logic. Natural deduction and tableaux as proof procedures. Curry partial application structures. Their polynomial extensions as lambda calculi. Typed and untyped lambda calculi, cartesian closed categories. Heyting semantics of constructions as interpretations in partial combinatory structures, Kleene realizabilities. Curry-Howard isomorphisms. Intuitionistic first order arithmetic and Gödel's system T. Intuitionistic higher order logic and polymorphism. Weak and strong nomalizations for simple and polymorphic calculi. Application to consistency proofs. Term extraction as the context for understanding compilers and interpreters for applicative languages such as LISP, NUPRL, MIRANDA, etc.

## Graduate Courses

Students interested in taking graduate courses in mathematics should consult the department for further course details, times, and possible changes in courses as described below.

**[503 History of Mathematics**
4 credits. Prerequisites: Mathematics 511 and 531. Intended for graduate students in the mathematical sciences. Not offered 1989–90. This course will be devoted to the history of mathematics in the nineteenth century from the original sources, with emphasis on the history of the foundations of analysis and of the foundations of commutative algebra. Typical authors in algebra who will be studied are Lagrange, Ruffini, Gauss, Abel, Galois, Dirichlet, Kummer, Kronecker, Dedekind, Weber, M. Noether, Hilbert, Steinitz, Artin, and E. Noether. Typical authors in analysis who will be studied are Cauchy, Fourier, Bolzano, Dirichlet, Riemann, Weierstrass, Heine, Cantor, Peano, and Hilbert. If time permits, a sketch will be given of the history of probability and statistics from Bernoulli to Pearson. Students will be required to read and explain one important nineteenth-century paper.]

**511–512 Real and Complex Analysis**
511, fall; 512, spring.
511: measure and integration, functional analysis. 512: complex analysis, Fourier analysis, and distribution theory.

**513–514 Topics in Analysis**
513, fall; 514, spring.

**515–516 Mathematical Methods in Physics**
515, fall; 516, spring. 4 credits each. Intended for graduate students in physics or related fields who have had a strong advanced calculus course and at least two years of general physics. A knowledge of the elements of finite dimensional vector space theory, complex variables, separation of variables in partial differential equations, and Fourier series will be assumed. The course overlaps with parts of Mathematics 421–422–423. Undergraduates will be admitted only with permission of instructor. Mathematics 515 is a prerequisite for 516.
M W F 12:20–1:25.
Topics designed to give a working knowledge of the principal mathematical methods used in advanced physics. A brief discussion of some basic notions: metric space, vector space, linearity, continuity, integration. Generalized functions (Schwartz distributions). Fourier series and Fourier integrals. Saddle point method. Linear operators. Differential operators and integral operators, the equations and eigenvalue problems connected with them and the special functions arising from them. Elements of group theory. The rotation group and its representations.

**517–518 Ordinary Differential Equations**
Basic theory of ordinary differential equations.

**[519–520 Partial Differential Equations**
519, fall; 520, spring.
Basic theory of partial differential equations. Not offered 1989–90.]

**521 Measure Theory and Lebesgue Integration**
Fall.
Measure theory, integration, and Lp spaces.

**522 Applied Functional Analysis**
Spring.
Spectral theorem for bounded operators, spectral theory for unbounded operators in Hilbert space, compact operators, distributions. Applications.

**531–532 Algebra**
531, fall; 532, spring.
531: finite groups, field extensions, Galois theory, rings and algebras, tensor and exterior algebra. 532: Wedderburn structure theorem, Brauer group, group cohomology, Dedekind domains, primary decomposition, Hilbert basis theorem, local rings.

**537 Elementary Number Theory**
Prerequisites: Mathematics 432 and 412. Introduction to number theory suitable for first-year graduate students and advanced undergraduates. Choice of topics discussed depends on the instructor. In previous years the text has been *A Course in Arithmetic*, by J. P. Serre; the topics covered have included quadratic forms, quadratic reciprocity, and modular forms.

**[549 Lie Groups and Differential Geometry**
Fall. Not offered 1989–90.]

**551 Introductory Algebraic Topology**
Spring.
Fundamental group and covering spaces. Homology theories for complexes and spaces.

**552 Differentiable Manifolds**
Fall. Prerequisites: advanced calculus and some elementary point-set topology (e.g., knowledge of the concepts of continuity, compactness, and connectedness). This course will be an introduction to differential topology, intended for undergraduate seniors and beginning graduate students. The first part of the course will emphasize examples and constructions of manifolds. Topics will include Cr and analytic structures, non-smooth manifolds, immersions and imbeddings, tangent bundles, tubular neighborhoods, transversality, cobordism, vector fields and dynamical systems, foliations.

**[561 Geometric Topology**
Topics from general topology. Introduction to geometric properties of manifolds. Not offered 1989–90.]

**571–572 Probability Theory**
571, fall; 572, spring. Prerequisite: a knowledge of Lebesgue integration theory, at least on the real line. Students can learn this material by taking parts of Mathematics 413–414 or 521.
Properties and examples of probability spaces. Sample space, random variables, and distribution functions. Expectation and moments. Independence, Borel-Cantelli lemma, zero-one law. Convergence of random variables, probability measures, and characteristic functions. Law of large numbers. Selected limit theorems for sums of independent random variables. Markov chains, recurrent events. Ergodic and renewal theorems. Martingale theory. Brownian motion and processes with independent increments.

**571–574 Probability and Statistics**
571, fall; 574, spring. This course is a prerequisite to all advanced courses in statistics.
571: same as Mathematics 571 above. 574: topics include an introduction to the theory of point estimation, consistency, efficiency, sufficiency, and the method of maximum likelihood; the classical tests of hypotheses and their power; the theory of confidence intervals; the basic concepts of statistical decision theory; the fundamentals of sequential analysis. Intended to furnish a rigorous introduction to mathematical statistics.

**[573 Experimental Design, Multivariate Analysis**
Fall. Not offered 1989–90.
Rationale for selection of experimental designs and algorithms for constructing optimum designs. Optimum properties and distribution theory for classical analysis of variance procedures and their simplest multivariate analogues.]

**575 Sequential Analysis, Multiple Decision Problems**
Fall. Prerequisite: a course in mathematical statistics such as Mathematics 574.

**[577 Nonparametric Statistics**
Fall. Not offered 1989–90.
A study of nonparametric techniques, especially order statistics, rank order statistics, scores, local optimality properties, and perhaps some asymptotic theory.]

**581 Logic**
Spring.
Basic topics in mathematical logic, including propositional and predicate calculus; formal number theory and recursive functions; completeness and incompleteness theorems.

**611–612 Seminar in Analysis**
611, fall; 612, spring.

**[613 Functional Analysis**
Fall. Not offered 1989–90.
Topological vector spaces. Banach and Hilbert spaces, Banach algebras. Additional topics to be selected by instructor.]

**615 Fourier Analysis**
Spring.

**622 Riemann Surfaces**
Fall.

**[623 Several Complex Variables**
Not offered 1989–90.]

**627–[628] Seminar in Partial Differential Equations**
627, spring; [628 not offered 1989–90.]

**631–632 Seminar in Algebra**
631, fall; 632, spring.

**635 Topics in Algebra**
Fall.
Selection of advanced topics from algebra, algebraic number theory, and algebraic geometry. Course content varies.

**[637 Algebraic Number Theory**
Fall. Not offered 1989–90.]

**[639 Topics in Algebra II**
Spring. Not offered 1989–90.
Selection of advanced topics from algebra, algebraic number theory, and algebraic geometry. Course content varies.]

**640 Homological Algebra**
Spring.

**651–652 Seminar in Topology**
651, fall; 652, spring.

**653–654 Algebraic Topology**
653, fall; 654, spring.
Duality theory in manifolds, applications, cohomology operations, spectral sequences, homotopy theory, general cohomology theories, categories and functors.

**[655 Mathematical Foundations for Computer Modeling and Simulation (also Computer Science 655)**
Spring. 4 credits. Prerequisites: Mathematics 431 and 432 or the equivalent, both in content and in the level of mathematical sophistication, or permission of instructors. Not offered 1989–90.
M W F 10:10.
This course will have two parts, one purely mathematical, the other applied. The former is intended to introduce students to theoretical tools that are relevant to the study of robotics, solid modeling, and simulation. These tools will be drawn from the areas of (real and complex) algebraic geometry, topology, differential geometry, and differential equations. The latter part of the course will provide applications that illustrate uses of the mathematics and point the way to needed further developments.]

**657–658 Advanced Topology**
657, fall; 658, spring.
Selection of advanced topics from modern algebraic, differential, and geometric topology. Course content varies.

**661–662 Seminar in Geometry**

**667 Algebraic Geometry**
Spring.

**670 Topics in Statistics**
Spring.
A course taught occasionally to cover special topics in theoretical statistics not treated in other listed courses. Typical of the subjects that will be treated are time series analysis, and classification and cluster analysis.

**671–672 Seminar in Probability and Statistics**

**[674 Multivariate Analysis**
Spring. Not offered 1989–90.]

**[675 Statistical Decision Theory**
Spring. Not offered 1989–90.]

**677–678 Stochastic Processes**
677, fall; 678, spring.

**681–682 Seminar in Logic**
681, fall; 682, spring.

**[683 Model Theory**
Spring. Not offered 1989–90.]

**684 Recursion Theory**
Fall.
Theory of effectively computable functions. Classification of recursively enumerable sets. Degrees of recursive unsolvability. Applications to logic. Hierarchies. Recursive functions of ordinals and higher type objects. Generalized recursion theory.

**685 Topics in Logic**
Fall.
Topics in metamathematics. Course content varies.

**687 Set Theory**
Spring.
Models of set theory. Theorems of Gödel and Cohen, recent independence results.

**688 Automated Theorem Proving**
Fall.

**701–702 Oliver Club Seminar**

**703–704 Olivetti Club Seminar**

**711–712 Seminar in Analysis**

**727–728 Seminar in Numerical Analysis**

**731–732 Seminar in Algebra**

**733–734 Seminar in Computational Algebra**

**751–752 Topics in Geometry and Topology**

**776 Qualitative Theory of Dynamical Systems**
Spring. 3 credits. Suggested prerequisite: T&AM 675, Mathematics 517, or equivalent. Offered alternate years.
Review of planar (single-degree-of-freedom) systems. Local and global analysis. Structural stability and bifurcations in planar systems. Center manifolds and normal forms. The averaging theorem and perturbation methods. Melnikov's method. Discrete dynamical systems, maps and difference equations, homoclinic and heteroclinic motions, the Smale Horseshoe and other complex invariant sets. Global bifurcations, strange attractors, and chaos in free and forced oscillator equations. Applications to problems in solid and fluid mechanics.

# MODERN LANGUAGES AND LINGUISTICS

S. McConnell-Ginet, chair; W. Harbert, graduate faculty representative (214 Morrill Hall); C. Rosen, director of undergraduate studies (312 Morrill Hall); L. Babby, J. Bowers, W. Browne, G. Chierchia, N. Clements, A. Cohn, G. Diffloth, J. Gair, J. Grimes, J. Huang, J. Jasanoff, J. Kingston, H. Kufner, F. Landman, R. Leed, J. Noblitt, A. Nussbaum, C. Shih, D. Sola, M. Suner, L. Waugh, J. Whitman, J. Wolff

The Department of Modern Languages and Linguistics offers courses in linguistics (the study of the general nature, structure, and history of language) and elementary, intermediate, and advanced courses in many of the languages of Europe, Africa, and south, southeast, and east Asia.

Most courses in modern languages and linguistics are offered by the Department of Modern Languages and Linguistics; see listings below under individual language names (e.g., Spanish) and under Linguistics. Courses in foreign language literatures and certain language courses as well are taught in the following departments; consult entries under the department name for course listings.

Africana Studies and Research Center: Ewe, Swahili

Asian Studies: Chinese, Japanese, Korean, Vietnamese

Classics: Greek, Latin

German Studies: German

Near Eastern Studies: Akkadian, Arabic, Aramaic, Hebrew, Turkish

Romance Studies: French, Italian, Spanish

Russian Literature: Russian

The Full-year Asian Language Concentration (FALCON Program) offers intensive instruction in Chinese, Japanese, or Indonesian to students wishing to gain fluency in the language in a single year.

## Arabic

See listings under Near Eastern Studies.

## Bengali

**121–122 Elementary Bengali**
121, fall; 122, spring. 4 credits each term. Prerequisite: for Bengali 122, Bengali 121 or examination.
Hours to be arranged. B. MacDougall and staff.
The emphasis is on basic grammar, speaking, and comprehension skills; Bengali script will also be introduced.

**203–204 Intermediate Bengali**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Bengali 203, Bengali 122 or examination; for Bengali 204, Bengali 203 or examination.
Hours to be arranged. B. MacDougall and staff.
Continuing instruction in grammar with attention to speaking and reading skills.

## Burmese

**101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite: for Burmese 102, Burmese 101 or equivalent.
Hours to be arranged. G. Diffloth.
A semi-intensive course for beginners or for those who have been placed in the course by examination. Gives a thorough grounding in all the language skills: listening, speaking, reading, and writing.

**201–202 Intermediate Burmese Reading**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Burmese 201, Burmese 102; for Burmese 202, Burmese 201.
Hours to be arranged. G. Diffloth.

**203–204 Intermediate Composition and Conversation**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Burmese 203, Burmese 102; for Burmese 204, Burmese 203.
Hours to be arranged. G. Diffloth.

**301–302 Advanced Burmese Reading**
301, fall; 302, spring. 4 credits each term. Prerequisites: for Burmese 301, Burmese 202 or permission of instructor; for Burmese 302, Burmese 301.
Hours to be arranged. G. Diffloth.
Selected Burmese readings in various fields.

**401–402 Burmese Directed Individual Study**
Fall or spring. 4 credits each term. Prerequisite: permission of instructor.
Hours to be arranged. G. Diffloth.
For students who wish to address special problems in the speech, grammar, or literature.

## Cambodian

See Khmer.

## Cebuano (Bisayan)

**101–102 Elementary Course**
101, fall; 102, spring. Offered according to demand. 6 credits each term. Prerequisite for Cebuano 102: Cebuano 101 or equivalent.
Hours to be arranged. J.U. Wolff.
A semi-intensive course for beginners.

## Chinese

For literature courses see Asian Studies.

**Fees.** Depending on the course, a small fee may be charged for photocopied texts for course work.

**101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite for Chinese 102: Chinese 101 or equivalent.
Lecs, M W F 9:05; drill, M–F 8 or 2:30.
J. Wheatley, and staff.
A semi-intensive course for beginners or for those who have been placed in the course by examination. The course gives a thorough grounding in all the language skills: listening, speaking, reading, and writing.

**111–112 Cantonese Elementary Speaking**
111, fall; 112, spring. 3 credits each term. Prerequisites: for Chinese 111, permission of instructor; for Chinese 112, Chinese 111. Both Chinese 112 and 114 or equivalents are necessary to fulfill any language requirements.
Lec T 12:20; drills, M W F 9:05. E. Leung.
Conversation in standard Cantonese as spoken in Hong Kong and Canton.

**113–114 Cantonese Elementary Readings**
113, fall; 114, spring. 3 credits each term. Prerequisites: for Chinese 113, permission of instructor; for Chinese 114, Chinese 113. Both Chinese 112 and 114 or equivalents are necessary to fulfill any language requirements.
Lec, R 12:20; drills, T R 9:05. E. Leung.
Readings in modern expository prose with Cantonese pronunciation.

**201–202 Intermediate Chinese**
201, fall or summer; 202, spring or summer. 4 credits each term. Prerequisite: for Chinese 201, Chinese 102 or equivalent; for Chinese 202, Chinese 201.
M–F 9:05 or 11:15. Staff.

**211–212 Intermediate Cantonese**
211, fall; 212, spring. 4 credits each term. Prerequisites: for Chinese 211, Chinese 112 and 114 or equivalent; for Chinese 212, Chinese 211.
M W F 9:05. E. Leung.

**301–302 Advanced Chinese**
301, fall; 302, spring. 4 credits each term. Prerequisites: for Chinese 301, Chinese 202 or equivalent; for Chinese 302, Chinese 301.
M W F 11:15. Staff.
Readings and drill in modern expository Chinese.

**303–304 Advanced Chinese Conversation**
303, fall; 304, spring. 1 credit each term. Prerequisites: Chinese 201–202. S-U grades only.
T R 11:15. Staff.
Guided conversation and oral composition and translation. Corrective pronunciation drill.

**311–312 Advanced Cantonese**
311, fall; 312, spring. 4 credits each term. Prerequisites: for Chinese 311, Chinese 212 or equivalent; for Chinese 312, Chinese 311.
Hours to be arranged. E. Leung.

**[401 History of the Chinese Language**
Fall or spring, according to demand. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. Staff.
Survey of phonological and syntactic developments in Chinese.]

**403 Linguistic Structure of Chinese I**
Fall. 4 credits. Prerequisite: permission of instructor. Offered alternate years.
W 1:25–4:00. Staff.
Introductory course in the phonology of modern Mandarin Chinese.

**404 Linguistic Structure of Chinese II**
Spring, according to demand. 4 credits. Prerequisite: permission of instructor.
Hours to be arranged. J. Huang.
Syntax of modern Mandarin Chinese.

**[405 Chinese Dialects**
Fall or spring, according to student demand. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. Staff.
Introductory survey of modern dialects and their distinguishing characteristics.]

**411–412 Readings in Modern Chinese**
411, fall; 412, spring. 4 credits each term. Prerequisites: for Chinese 411, Chinese 302 or equivalent; for Chinese 412, Chinese 411.
M W F 1:25. Staff.

**413–414 Chinese Reading Tutorials**
413, fall; 414, spring. 2 credits each term. Prerequisites: Chinese 302; or equivalent and permission of instructor.
Hours to be arranged. Staff.
Individual or small-group guidance in advanced Chinese texts, designed primarily for Asian studies majors taking other courses with reading assignments in Chinese.

**[607 Chinese Dialect Seminar**
Fall or spring, on student demand. 4 credits. Prerequisites: Chinese 405 and permission of instructor. Not offered 1989–90.
Hours to be arranged. Staff.
Analysis and field techniques in a selected dialect area.]

### FALCON

J. Wheatley, 416 Morrill Hall (255–9301).

**161–162 Intensive Mandarin Course**
161, fall; 162, spring. 16 credits each term. Prerequisites: for Chinese 161, Chinese 160 (Cornell summer intensive course) or permission of instructor; for Chinese 162, Chinese 161.
M–F 6 hours each day. J. Wheatley and staff.
*Foreign language requirement: Proficiency is attained by passing 161.*

## Danish

**131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Prerequisite for Danish 132, Danish 131 or equivalent. This language series cannot be used to satisfy the language requirement.
M W F 8. P.M. Mitchell.

## Dutch

**131–132 Elementary Course**
131, fall or summer; 132, spring or summer. 3 credits each term. Prerequisite: permission of instructor.
Hours to be arranged. Staff.

**133–134 Continuing Course**
133, fall; 134, spring. Offered according to demand. 3 credits each term. Prerequisites: for Dutch 133, Dutch 132 or equivalent; for Dutch 134, Dutch 133 or equivalent.
Hours to be arranged. Staff.

**[Seminar in Dutch Linguistics (German 740)]**

## English

**Intensive English Program**, see p. 317.

**205 English as a Second Language**
Fall. 4 credits. Prerequisite: placement by examination.
M T W R 10:10. M. Martin.
Advanced spoken and written English, with emphasis on speaking, understanding, and reading.

**206 English as a Second Language**
Spring. 3 credits. Prerequisite: English 205 or placement by examination.
M W F 10:10. M. Martin.
Designed for those who have completed English 205 and who require or desire further practice. Emphasis is on developing control of written as well as spoken language.

**209 English as a Second Language**
Fall or spring. 1 credit. Prerequisite: placement by examination.
Hours to be arranged. M. Martin.
Practice in informal conversational English pronunciation, techniques for gaining information, informal conversation, and classroom speaking. Students also practice giving informal presentations. Personal conferences with the instructor supplement class work.

**210 English as a Second Language**
Spring. 1 credit. Prerequisite: placement by examination.
Hours to be arranged. M. Martin.
Practice in academic speaking. Formal classroom discussion techniques and presentation of information in various forms. Personal conferences supplement class work.

**211–212 English as a Second Language**
211, fall, spring, or summer; 212, spring. 3 credits each term. Prerequisite: placement by examination.
211: M W F 9:05, 11:15, 12:20, or 2:30. T R 10:10–11:25 or 2:55–4:10.
212: M W F 9:05 or 11:15; T R 2:55–4:10.
D. Campbell.
Advanced writing, with emphasis on improving vocabulary, grammar, and control of college-level written English.

**213 Written English for Non-Native Speakers**
Spring. 3 credits. Prerequisite: placement by examination.
T R 10:10, plus a weekly conference.
M. Martin.
Designed for those whose writing fluency is sufficient for them to carry on regular academic work but who feel the desire for refining and developing their ability to express themselves clearly and effectively. As much as possible, students receive individual attention.

### Freshman Writing Seminar

**215–216 English for Later Bilinguals**
215, fall or summer; 216, spring. 3 credits each term. Not designed for students whose schooling has been mostly in English. Prerequisite for English 216: English 215.
M W F 2:30. M. Martin.
A course designed to strengthen the English-language skills of students from other countries who have studied for one to five years in American high schools and whose language in the home is not English. Intensive work in written English is offered, with emphasis on sentence structure, cohesion, vocabulary expansion, grammatical structure, and maturity of style. Individual conferences on papers supplement class work. The focus of English 216 is the process of producing a full-length library research paper.

## Ewe

See listings under Africana Studies and Research Center.

## French

A. Cohn, J.S. Noblitt, L.R. Waugh (director of undergraduate studies, 315 Morrill Hall, 255–0717).

For literature courses see Romance Studies.

### The Major

The major in French linguistics is designed to give students proficiency in the oral and written language, and to develop skills in the linguistic analysis of French. (For the major in French literature see the description under Romance Studies).

While prospective majors should try to plan their programs as far ahead as possible, no students will be refused admission merely because of a late start. It is even possible for a student to begin French and/or Linguistics at Cornell and become a major. Students wishing to major in French linguistics should consult the director of undergraduate studies of the Department of Modern Languages and Linguistics, Professor Linda Waugh, who will admit them to the major.

### The Core

1) All majors are expected to acquire a sound degree of competence in language. This competence is demonstrated by the successful completion of French 312 or by the passing of a special examination to be taken no later than the end of the junior year. A typical program will involve two semesters of language at the 200 level (to be taken no later than the end of the sophomore year) and two semesters of language at the 300 level (French 311–312). Students may bypass any part of the sequence through placement examinations.
2) All majors are expected to take French 201 and 202. At least one of these should be completed successfully no later than the end of the sophmore year.
3) All majors must have successfully completed Linguistics 101–102, or Linguistic 101–Linguistic 400, or the equivalent.

### The Linguistic Option

1) The successful completion of six courses in French and general linguistics (in addition to Linguistics 101–102), of which at least 3 will be in French Linguistics. These courses will include at least one course concerning the history of French (e.g., French 401, Romance Linguistics 321) and one course concerning the structure of French (e.g., French 408, 410, or 602).
2) The successful completion of two courses (preferably a sequence) in some allied area, for example, (a) French literature and civilization, (b) psycholinguistics, (c) philosophy of language, (d) French history, culture, music, or history of art or architecture.

### Study Abroad in France

French majors or other interested students may study in France for one or two semesters during their junior year. Opting for one of several study-abroad plans recognized by the departments of Romance Studies and Modern Languages and Linguistics facilitates the transfer of credit. Information about these plans is available from Jacques Bereaud, director of undergraduate studies, Department of Romance Studies. (See the description of the program in Paris sponsored by Cornell under the Department of Romance Studies.)

**Honors.** The honors program encourages well-qualified students majoring in French linguistics to do independent work in French outside the structure of courses. The preparation of the senior honors essay, generally spread over two terms, provides a unique learning opportunity, since it allows for wide reading, and extensive rewriting to a degree not practically possible in the case of course papers.

No special seminars or courses are required of honors students, but they will have regular meetings with the faculty advisers who have agreed to supervise their work. They may receive course credit by enrolling in French 429–430, but these independent study courses must be taken in addition to the courses that meet the minimum requirements for the major. At the end of the senior year each honors student is examined orally on the honors essay by a jury consisting of his or her faculty adviser and two other faculty members. The awarding of honors is determined by the student's grades in the major and the quality of the honors essay.

**Fees.** Depending on the course, a small fee may be charged for copies of texts for course work.

#### 121–122 Elementary Course

121, fall only; 122, fall and spring. 4 credits each term. Intended for beginner students placed by examination. Prerequisite for French 122: French 121 or previous French, CPT less than 450. Prerequisite for French 121: no previous French. Students who obtain a CPT score of 560 after French 121–122 attain qualification and may enter the 200–level sequence; otherwise French 123 is required for qualification.

Lec, R 9:05, 10:10, 11:15, or 1:25; drills, M T W F 8, 9:05, 10:10, 11:15, 12:20, 1:25, or 2:30. N. Gabriel.

The four recitation sections per week offer the opportunity for student interaction and intensive practice in listening to, speaking, reading, and writing basic French in meaningful contexts. Lectures offer insights into French language, culture, and society.

#### 123 Continuing French

Fall, spring, or summer. 4 credits. Fall enrollment strictly limited. Limited to students who have previously studied French and have a CPT achievement score between 450 and 559. Satisfactory completion of French 123 fulfills the qualification portion of the language requirement.

Lec, T 9:05, 10:10, or 12:20; drills, M W R F 8, 9:05, 10:10, 11:15, 12:20, 1:25, 2:30, or 3:35. A. Levy.

An all-skills course meant to reinforce basic grammar, improve pronunciation, encourage oral communication, further reading ability, and establish groundwork for writing, all in the context of French daily life.

*Note: Students placed in 200-level courses have the option of taking language and literature courses, See listings under Romance Studies for descriptions of the literature courses, any of which may be taken concurrently with the 203–204 language courses described below.*

#### 203 Intermediate Composition and Conversation

Fall, spring, or summer. 3 credits. Prerequisite: qualification in French (French 123 or CPT score 560–649).

Lec, T 11:15 or 1:25, W 2:30, or R 11:15; drills, M W F 8, 9:05, 10:10, 11:15, 12:20, 1:25, 2:30, or 3:35. I. Daly.

Improved control of French grammatical structure and vocabulary through guided conversation, composition, and reading. Lectures include grammar review, listening comprehension exercises, and videos on current topics. Taught in French.

#### 204 Intermediate Composition and Conversation

Fall or spring. 3 credits. Enrollment limited. Prerequisite: French 203, permission of instructor, or placement by Cornell Advanced Standing Examination (CASE) offered by the Department of Modern Languages and Linguistics.

Fall: lec, T 10:10 or 2:30; drills, M W F 10:10, 11:15, 12:20, or 2:30. Spring: lec, T 10:10 or 2:30; drills, M W F 9:05, 10:10, 11:15, 12:20, or 1:25. C. Waldron.

Emphasis on improving oral and written expression of accurate, idiomatic French. Includes enrichment of vocabulary, readings in contemporary prose, treatment of specific problems in grammar, guest speakers, and presentations of videos and films. Taught in French.

#### [401 History of the French Language

Fall. 4 credits. Prerequisites: qualification in French and Linguistics 101, or permission of instructor. Offered alternate years.

M W F 2:30. J.S. Noblitt.

Diachronic development of French from Latin, with emphasis on phonological and morphological change. Course work includes problems in reconstruction, textual analyses, discussions of theoretical topics, and external history.]

#### [407 Applied Linguistics: French

Fall. 4 credits. Prerequisite: qualification in French. Offered alternate years.

M W F 10:10. J.S. Noblitt.

Designed to equip the student with the ability to apply linguistic descriptions in teaching French, with special emphasis on phonetics and morphology.]

#### 408 Linguistic Structure of French I (also Linguistics 408)

Fall. 4 credits. Prerequisites: qualification in French and Linguistics 101 or Linguistics 400, or permission of instructor.

Hours to be arranged. A. Cohn.

A synchronic study and analysis of modern French, with emphasis on its phonology, morphology, and syntax.

#### [410 Linguistic Structure of French II

Fall. 4 credits. Prerequisite: permission of instructor. Offered alternate years.

Hours to be arranged. L. Waugh.

A synchronic study and analysis of modern French, with emphasis on semantics, pragmatics, and discourse analysis.]

#### [602 Linguistic Structure of Old and Middle French

Spring. 4 credits. Prerequisite: French 408 or permission of instructor. Offered alternate years.

Hours to be arranged. J.S. Noblitt.

Through study of Old and Middle French texts, student analyze synchronically aspects of the grammar of the language at different periods.]

#### 604 Contemporary Theories of French Grammar

Spring. 4 credits. Prerequisite: permission of instructor.

Hours to be arranged. L. Waugh.

Selected readings of twentieth-century French linguistics.

#### 630 French for Reading—Graduate Students

Spring. 3 credits. Limited to graduate students.

Hours to be arranged. Staff.

The primary aim of this course is to develop skill in reading French. (Those interested in an all-skills approach should consider French 121–122.) Some flexibility in selecting texts according to field of interest is offered. One hour per week is devoted to vocabulary building and preparation for standardized tests.

#### 700 Seminar in French Linguistics

Fall or spring, according to demand. Credit to be arranged.

Hours to be arranged. Staff.

Seminars are offered according to faculty interest and student demand. Topics in recent years have included current theories in French phonology, current theories in French syntax, and semantics of French.

## German

W. Harbert, J.H. Jasanoff, H.L. Kufner (director of undergraduate studies, 211 Morrill Hall, 255–0723).

For literature courses see German Studies.

### The German Major

See German Studies.

### Study Abroad

Cornell has a formal agreement with the University of Hamburg enabling its undergraduates to take courses in any field offered by the German university. The program offers a challenging course of study and the experience of total immersion in German life and culture. Participants in this program attend a required 3-credit orientation course in September, which is designed to help them adjust to the academic and social life of Germany. Special field trips are organized as part of the orientation session. Beginning in mid-October, students enroll as fully matriculated students at the University of Hamburg.

Cornell maintains a center in Hamburg with appropriate support staff. The resident director is a faculty member from Cornell, who teaches a special seminar each semester, provides academic advice, and helps ensure the quality of the courses. The center, which includes a classroom, a small library, and word-processing facilities, is used by students for the orientation session, special seminars, tutorials, lectures, and informal gatherings.

Applicants are expected to have attained at least proficiency in German prior to departure. Students are strongly encouraged to study abroad for the entire year rather than for one semester. For further information, students should contact H.L. Kufner, Director of undergraduate studies, Department of Modern Languages and Linguistics, and the Cornell Abroad Office (474 Uris Hall, 255- 6224).

### German Area Studies Major

See German Studies.

**Honors.** The honors program in German is open to superior students who want to work independently in an area of their own choice. Students are free to select any faculty member of the Field of Germanic Studies (in the case of area studies majors, the appropriate member of their committee) to assist them in designing their honors program, to supervise their work, and to help them select a suitable topic for an honors essay. The independent study courses, German 451 and 452, may form part of the program.

### Freshman Writing Seminar Requirement

See German Studies.

**Fees.** Depending on the course, a small fee may be charged for photocopied texts for course work.

**121–122 Elementary Course**
121, fall or summer; 122, spring or summer. 4 credits each term. Prerequisite for German 122: German 121 or equivalent. Intended for beginners or students placed by examination. Students who obtain a CPT score of 560 after German 121–122 attain qualification and may enter the 200–level sequence; otherwise German 123 is required for qualification.
Lec, T 9:05, 11:15, or 1:25; drills, M W R F 8, 9:05, 10:10, 11:15, 12:20, 1:25, or 2:30. H.L. Kufner.
A thorough grounding in all the language skills is given: listening, speaking, reading, and writing. Language practice is in small groups. Lectures cover grammar, reading, and cultural information.

**123 Continuing German**
Fall, spring, or summer. 4 credits. Limited to students who have previously studied German and have a CPT achievement score between 450 and 559. Satisfactory completion of German 123 fulfills the qualification portion of the language requirement.
Fall: Lec, M 2:30; drills, T–F 9:05, 10:10, 11:15, or 12:20. Spring: Lec, M 2:30; drills, T–F 10:10 or 12:20 H.L. Kufner.
An all-skills course designed to prepare students for study at the 200 level.

**203 Intermediate Composition and Conversation**
Fall or spring. 3 credits. Prerequisite: qualification in German (German 123 or CPT score of 560–649).
Fall: M W F 9:05, 10:10, 11:15, or 1:25. Spring: M W F 9:05, 10:10, or 1:25. Staff.
Guided conversation, composition, reading, and grammar review emphasizing the development of accurate and idiomatic expression.

**204 Intermediate Composition and Conversation**
Fall or spring. 3 credits. Prerequisite: German 203 or permission of instructor.
Fall: M W F 11:15. Spring: M W F 10:10, 11:15, or 1:25. Staff.

**303–304 Advanced Composition and Conversation**
303, fall; 304, spring. 4 credits each term. Prerequisite for German 303: German 204 or equivalent. Prerequisite for German 304: German 303 or equivalent.
Fall: M W F 10:10 or 11:15; Spring: M W F 11:15. Staff.
Emphasis is on increasing the student's oral and written command of German. Detailed study of present-day syntax and different levels of style.

**306 Zeitungsdeutsch**
Fall. 4 credits. Prerequisite: German 304 or equivalent.
M W F 12:20. E. Augsberger.

**[401 Introduction to Germanic Linguistics**
Fall. 4 credits. Prerequisite: Linguistics 101 or permission of instructor. Not offered 1989–90.
Hours to be arranged. W.E. Harbert.
Survey of major issues in Germanic linguistics, with emphasis on historical and dialectal problems.]

**[402 History of the German Language**
Spring. 4 credits. Prerequisites: German 204 and Linguistics 101 or permission of instructor. Offered alternate years. Not offered 1989–90.
Hours to be arranged. Staff.
Phonological, morphological, syntactic, and semantic developments from pre-Old High German times to the present.]

**[403 Modern German Phonology**
Fall. 4 credits. Prerequisites: German 304 or equivalent, and Linguistics 101 or 301. Not offered 1989–90.
Hours to be arranged. Staff.
The phonological system of German is viewed from various theoretical approaches.]

**404 Modern German Syntax**
Spring. 4 credits. Prerequisite: German 304 or equivalent, and Linguistics 101 or 303.
Hours to be arranged. W.E. Harbert.
An application of selected theoretical syntactic models to problems in the syntax of modern German.

**[405 German Dialectology**
Spring. 4 credits. Prerequisite: German 304 or equivalent, and Linguistics 101 or equivalent. Not offered 1989–90.
Hours to be arranged. H.L. Kufner.
Survey of German dialects, the work done at the *Sprachatlas*, and a discussion of modern approaches to dialectology.]

**[406 Runology**
Fall. 4 credits. Prerequisite: German 401. Not offered 1989–90.
Hours to be arranged. Staff.
A study of the inscriptions in the older *futhark* and their relevance to historical Germanic linguistics.]

**407 Applied Linguistics: German**
Fall. 4 credits.
M W F 9:05. H.L. Kufner.
Designed to equip the teacher of German with the ability to apply current linguistic theory to the second-language learning situation.

**[408 Linguistic Structure of German**
Spring. 4 credits. Prerequisites: German 204 and Linguistics 101–102, or permission of instructor. Not offered 1989–90.
Hours to be arranged. H.L. Kufner.
A descriptive analysis of present-day German, with emphasis on phonology and syntax.]

**[602 Gothic**
Spring. 4 credits. Prerequisite: Linguistics 101. Offered alternate years.
Hours to be arranged. W.E. Harbert.
Linguistic structure of Gothic, with extensive readings of Gothic texts.]

**[603 Old High German, Old Saxon**
Fall. 4 credits. Prerequisite: Linguistics 102. Offered alternate years. Not offered 1989–90.
Hours to be arranged. J. Jasanoff.]

**[604 Old Low Franconian, Old Frisian**
Spring. 4 credits. Prerequisite: Linguistics 102. Offered alternate years. Not offered 1989–90.
Hours to be arranged. Staff.]

**[605 Structure of Old English**
Fall. 4 credits. Prerequisite: German 401. Not offered 1989–90.
Hours to be arranged. W.E. Harbert.
Linguistic overview of Old English, with emphasis on phonology and syntax.]

**[606 Topics in Historical Germanic Phonology**
Fall. 4 credits. Prerequisite: German 401. Not offered 1989–90.
Hours to be arranged. Staff.
The development of the sound system from Proto-Germanic to its daughter languages.]

**[607 Topics in Historical Germanic Morphology**
Fall. 4 credits. Prerequisite: German 401. Not offered 1989–90.
Hours to be arranged. J. Jasanoff.
The Germanic verbal system and its Indo-European origins.]

**608 Topics in Historical Germanic Syntax**
Fall. 4 credits. Prerequisite: German 401.
Hours to be arranged. W.E. Harbert.
A diachronic and comparative investigation of syntactic processes in the older Germanic languages.

**609–610 Old Norse**
609, fall; 610, spring. 4 credits each term.
Hours to be arranged. Staff.
Study of the linguistic structure of Old Norse, with extensive reading of Old Norse texts.

**[611 Readings in Old High German and Old Saxon**
Spring. 4 credits.
Hours to be arranged. J. Jasanoff.
Texts are chosen to suit the interests of the students taking the course but normally include selections from the more extensive Old High German and Old Saxon sources (Otfrid, Tatian, *Heliand*) as well as representative shorter works such as *Hildebrandslied, Muspilli,* and *Genesis.*]

**[612 Germanic Tribal History**
Spring. 4 credits. Prerequisite: German 401. Not offered 1989–90.
Hours to be arranged. Staff.
The history of the Germanic tribes from about 500 B.C. to A.D. 500; introduces the study of Proto-Germanic and the separation of the Germanic languages.]

**631–632 Elementary Reading I**
631, fall or summer; 632, spring or summer. 3 credits each term.
Limited to graduate students. Prerequisite for German 632: German 631 or equivalent.
M W F 9:05 D. McGraw.
Emphasis is on developing skill in reading, although some attention will be devoted to the spoken language, especially to listening comprehension.

**710 Seminar in Germanic Linguistics**
Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits.
Hours to be arranged. Staff.

**[720 Seminar in Comparative Germanic Linguistics**
Fall or spring, subject to the needs of students and to the limitations of staff time. 4 credits. Not offered 1989–90.
Hours to be arranged. Fall: staff; spring: W.E. Harbert.
Topics include phonology, morphology, syntax, and dialectology of the older Germanic languages.]

**730 Seminar in German Linguistics**
Fall or spring, subject to the needs of students and the limitations of staff time. 4 credits.
Hours to be arranged. Staff.
Selected topics including the history, structure, and dialects of German.

**[740 Seminar in Dutch Linguistics**
Fall, subject to the needs of students and to the limitations of staff time. 4 credits. Not offered 1989–90.
Hours to be arranged. Staff.
Selected topics including the history, structure, and dialects of modern Dutch.]

## Modern Greek

See listings under Classics.

## Modern Hebrew

See listings under Near Eastern Studies.

## Hindi-Urdu

**101–102 Hindi-Urdu Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite for Hindi 102: Hindi 101 or equivalent.
Lecs, M W 2:30; drills, M–F 10:10. Staff.
A semi-intensive course for beginners. A thorough grounding in all the language skills is given: listening, speaking, reading, and writing.

**201–202 Intermediate Hindi Reading**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Hindi 201, Hindi 102; for Hindi 202, Hindi 201 or permission of instructor.
M W F 9:05. Staff.

**203–204 Intermediate Composition and Conversation**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Hindi 203, Hindi 102; for Hindi 204, Hindi 203 or permission of instructor.
Hours to be arranged. Staff.

**[301–302 Advanced Readings in Hindi Literature**
301, fall; 302, spring. 4 credits each term. Prerequisites: for Hindi 301, Hindi 202; for Hindi 302, Hindi 301 or equivalent. Not offered 1989–90.
Hours to be arranged. Staff.]

**[303–304 Advanced Composition and Conversation**
303, fall; 304, spring. 4 credits each term. Prerequisites: for Hindi 303, Hindi 204 or equivalent; for Hindi 304, Hindi 303 or equivalent. Not offered 1989–90.
Hours to be arranged. Staff.]

**[305–306 Advanced Hindi Readings**
305, fall; 306, spring. 4 credits each term. Prerequisites: for Hindi 305, Hindi 202 or equivalent; for Hindi 306, Hindi 305 or equivalent. Not offered 1989–90.
Hours to be arranged. Staff.
Intended for those who wish to do readings in history, government, economics, etc., instead of literature.]

*Note: For complete descriptions of courses numbered 600 and above, consult the appropriate instructor.*

**[700 Seminar in Hindi Linguistics**
Fall or spring. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. Staff.]

## Hungarian

**[131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. This language series cannot be used to satisfy the language requirement. Offered alternate years. Not offered 1989–90.
M W F 9:05. Staff.
Intended for beginners or students with limited knowledge of the language.]

## Indonesian

For students who have completed Indonesian 101–102 or its equivalent there is the option of a one-semester program in Malang, East Java, during the junior year. The program combines a variety of cultural and artistic options with area course work and advanced language study. Complete information is available through Cornell Abroad.

Students who have completed a minimum of 18 credits or the equivalent are eligible to apply for a summer program in the Advanced Indonesian Abroad Program. Further information is available from Professor J.U. Wolff.

**101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite for Indonesian 102: Indonesian 101.
M–F 8, plus 2 hours to be arranged. J.U. Wolff.
A semi-intensive course for beginners.

**201–202 Intermediate Indonesian Reading**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Indonesian 201, Indonesian 102; for Indonesian 202, Indonesian 201 or permission of instructor.
Hours to be arranged. J.U. Wolff.

**203–204 Intermediate Composition and Conversation**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Indonesian 203, Indonesian 102; for Indonesian 204, Indonesian 203 or permission of instructor.
Hours to be arranged. J.U. Wolff.

**300 Linguistic Structure of Indonesian**
Fall or spring. 4 credits. Prerequisites: Indonesian 101–102 or equivalent, and Linguistics 101.
Hours to be arranged. J.U. Wolff.

**301–302 Advanced Readings in Indonesian and Malay**
301, fall; 302, spring. 4 credits each term. Prerequisites: for Indonesian 301, Indonesian 201–202 or equivalent; for Indonesian 302, Indonesian 301.
Hours to be arranged. J.U. Wolff.

**303–304 Advanced Indonesian Conversation and Composition**
303, fall; 304, spring. 4 credits each term. Prerequisites: for Indonesian 303, Indonesian 204; for Indonesian 304, Indonesian 303 or equivalent.
Hours to be arranged. J.U. Wolff.

**305–306 Directed Individual Study**
305, fall; 306, spring. 2–4 credits. Prerequisite: Indonesian 301–302 and 303–304 or equivalent knowledge of Indonesian or Malay.
Hours to be arranged. J.U. Wolff.
A practical language course on an advanced level in which the students will read materials in their own field of interest, write reports, and meet with the instructor for two hours a week for two credits and twice a week for four credits.

**401–402 Advanced Readings in Indonesian and Malay Literature**
401, fall; 402, spring. 4 credits each term. Prerequisites: for Indonesian 401, Indonesian 302 or equivalent; for Indonesian 402, Indonesian 401 or equivalent.
Hours to be arranged. J.U. Wolff.

### FALCON

**161–162 Intensive Course**
161, fall; 162, spring. 16 credits each term. Prerequisite: permission of instructor.
M–F 6 hours each day. J.U. Wolff and staff.

### Related Course

Seminar in Austronesian Linguistics (Linguistics 655–656).

## Italian

G. Chierchia, C. Rosen.

For literature courses see Romance Studies.

## The Italian Major

See Romance Studies.

### Study Abroad

Italian majors may study in Italy, generally during their junior year, under any of those study-abroad plans organized by American universities that allow the transfer of grades and credit, such as the Cornell program in Rome.

The College of Architecture, Art, and Planning maintains a program open to all qualified students attending Cornell. The program is housed in the sixteenth-century Palazzo Massimo, designed by the architect Baldassare Peruzzi, on the Corso Vittorio Emanuele, in the heart of Rome. Students may enroll for a semester in the fall or spring. Courses regularly taught at the Palazzo Massimo include: Architecture 300, 401, 402, 500, 502, Design Studio; Architecture 338 and 399, Special Topics in Architectural History; Architecture 458, Special Projects in Design Communications; Architecture 367, Contemporary Italian Culture; Architecture 510, Thesis Introduction; Art 251, 311, 322, and 371; and History of Art 371, Renaissance and Baroque

Art in Rome; Italian 111, 112, elementary Italian 111 and 112 correspond to Cornell courses 121 and 122 respectively (see below). Students having passed satisfactorily 021 in Rome will be admitted to 122 when they get back to Cornell. Students having passed 112 in Rome will be granted credit but will have to take the CPT for satisfaction of the language requirement and for placement into more advanced courses upon their return to Cornell.

To be eligible, students must have completed the first two years of their curriculum requirements and be in good academic standing.

**Fees.** Depending on the course, a small fee may be charged for copies of texts for course work.

**121–122 Elementary Course**
121, fall; 122, spring. 4 credits each term. Prerequisite for Italian 122: Italian 121 or equivalent. Intended for beginners or students placed by examination. Students who obtain a CPT score of 560 after Italian 121–122 attain qualification and may enter the 200–level sequence; otherwise Italian 123 is required for qualification.
Lec, T 10:10, 12:20, or 2:30; drills, M W R F 8, 9:05, 10:10, 11:15, 12:20, 1:25, 2:30 or 3:35. M. Swenson.
A thorough grounding is given in all the language skills: listening, speaking, reading, and writing. Language practice is in small groups. Lectures cover grammar and cultural information.

**123 Continuing Italian**
Fall and summer. 4 credits. Limited to students who have previously studied Italian and have a CPT achievement score between 450 and 559. Satisfactory completion of Italian 123 fulfills the qualification portion of the language requirement.
M–F 9:05, 10:10, or 11:15. J. Scarpella.

**203–204 Intermediate Composition and Conversation**
203, fall or spring; 204, spring. 3 credits each term. Prerequisites: for Italian 203, qualification in Italian (Italian 123 or CPT score 560–649); for Italian 204, 203 or equivalent.
203, fall: M W F 10:10, 12:20, or 1:25. I. Chierchia. 203, spring: M W F 1:25. J. Scarpella. 204, spring: M W F 12:20 or 1:25. I. Chierchia.
Guided conversation, composition, reading, pronunciation, and grammar review emphasizing the development of accurate and idiomatic expression in the language.

*Note: Students placed in 200–level courses also have the option of taking courses in introductory literature; see separate listing under Italian 201 for description of this course, which may be taken concurrently with the Italian 203–204 language courses described above. The introductory literature courses are offered by the respective literature departments, and the 203–204 language courses by the Department of Modern Languages and Linguistics.*

**300 Advanced Italian: Language in Italian Culture**
Spring. 3 credits. Prerequisite: Italian 204 or equivalent or permission of instructor.
M W F 11:15. M. Swenson.
Further development of all skills, with emphasis on self-expression. Readings center on two themes: (1) contemporary Italian life and (2) the Italian language, its origins, development, and present state, including the role of the dialects. Emphasis on vocabulary building and awareness of stylistic levels.

**[402 History of the Italian Language**
Spring. 4 credits. Prerequisites: Linguistics 101 (or equivalent) and qualification in Italian, or permission of the instructor. Not offered 1989–90.
Hours to be arranged. Staff.]

**403 Linguistic Structure of Italian**
Spring. 4 credits. Prerequisites: Linguistics 102 or equivalent, and qualification in any Romance language.
Hours to be arranged. G. Chierchia, C. Rosen.
Survey of Italian grammar in the light of current linguistic theories. Central topics in syntax (auxiliaries, modals, clitics, agreement, impersonal constructins, causatives) and in phonology (syllable format, stress, *raddoppiamento* phenomena).

**[432 Italian Dialectology**
Spring, according to demand. 4 credits. Not offered 1989–90.
Hours to be arranged. C. Rosen.]

**631 Readings in Italian Opera Libretti**
Spring. 2 credits. For graduate students only. Prerequisite: permission of instructor.
Hours to be arranged. C. Rosen.
Several Metastasio libretti and two or three libretti from later periods are read with the aim of understanding the syntax, literal meaning, and immediate metaphorical meanings. Some discussion of metrics. Intended primarily for grads concurrently enrolled in a related music course.

**[700 Seminar in Italian Linguistics**
Offered according to demand. 4 credits. Not offered 1989–90.
Hours to be arranged. C. Rosen.]

## Japanese

For literature courses see Asian Studies.

**101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite for Japanese 102: Japanese 101 or placement by the instructor during registration. Intended for beginners or for those who have been placed in the course by examination.
Lecs, M W F 10:10 or 12:20; Drills, M–F 8, 9:05, 10:10, 11:15, 12:20, 1:25, 2:30, or 3:35. T. Kusumoto and staff.
A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.

**123 Accelerated Introductory Japanese**
Fall. 6 credits. Prerequisite: placement by the instructor during registration.
Lecs, M W F 12:20 (with Japanese 101); drills, M W F 1:25. T. Kusumoto and staff.
Accelerated training in listening, speaking, reading, and writing for students who have already acquired a limited facility in Japanese through residence in Japan or brief formal study but who require additional training to qualify for admission to Japanese 102.

**[141–142 Introductory Japanese for Business Purposes**
141, fall; 142, spring. 4 credits each term. Prerequisite for Japanese 142: Japanese 141 or placement by the instructor during registration. (For undergraduates only; graduates see Japanese 541–542). Not offered 1989–90.
Lecs, T R 1:25; secs, M W F 9:05 or 1:25. Staff.
Introductory Japanese for students interested in international business and economics.]

**201–202 Intermediate Japanese Reading I**
201, fall; 202, spring. 2 or 3 credits each term. Students having had Japanese 203 and 204 register for 2 credits and attend the W drill and the F lecture; other students register for 3 credits (with permission of instructor) and attend the W drill and the M, W, F lectures. Prerequisites: for Japanese 201, Japanese 203 or placement by the instructor during registration; for Japanese 202, Japanese 201 and 204 or placement by the instructor during registration.
Lecs, M W F 1:25; drill, W 10:10, 2:30, or 3:35. Staff.
Reading of elementary texts with emphasis on expository style.

**203–204 Intermediate Japanese Conversation**
203, fall and summer; 204, spring and summer. 4 credits each term. Prerequisites: for Japanese 203, Japanese 102 or placement by the instructor during registration; for Japanese 204, Japanese 203, 205, or 223, or placement by the instructor during registration.
Lecs, M W 1:25; drills, M T R F 10:10, 11:15, 12:20, 2:30, or 3:35. Staff.
Training in listening and speaking for students who have acquired a basic oral proficiency. Students are strongly encouraged to enroll in Japanese 201–202 concurrently.

**[205–206 Intermediate Japanese Reading I and Conversation**
205, fall; 206, spring. 6 credits each term. Prerequisites: for Japanese 205, Japanese 102 or placement by the instructor during registration; for Japanese 206, Japanese 205 or placement by the instructor during registration. Not offered 1989–90.
Lecs, M W F 1:25; drill, M–F 10:10, 2:30, or 3:35. Staff.
A combination of Japanese 201, 202 and 203–204, for students interested in developing both written and oral skills. Students who have completed Japanese 102 are strongly encouraged to register for Japanese 205. Students intending to take Japanese 205–206 should enroll in Japanese 201–202 *and* 204–205.]

**[223 Transition to Intermediate Japanese Conversation**
Fall. 6 credits. Prerequisite: Japanese 160 (Cornell intensive summer course) or placement by the instructor during registration. Not offered 1989–90.
Lecs, T R 1:25 plus one hour to be arranged; drills, M–F 12:20. Staff.
Provides transition, primarily for summer course students, into regular program. After Japanese 223 the students will have covered the same material that 203 students have covered. Japanese 223 satisfies prerequiste for 204 but not for 206. Recommended also for students with insufficient background to qualify for Japanese 203, determined by examination during registration period.]

**301–302 Intermediate Japanese Reading II**
301, fall; 302, spring. 4 credits each term. Prerequisites: for Japanese 301, Japanese 202 or 206 or placement by the instructor during registration; for Japanese 302, Japanese 301 or placement by the instructor during registration.
M W F 11:15 or 2:30. K. Smith or K. Selden.
Reading of selected modern texts with emphasis on expository style.

**303–304 Communicative Competence**
303, fall; 304, spring. 3 credits each term. Prerequisite for Japanese 303, Japanese 204 or 206 or placement by the instructor during registration; for Japanese 304, Japanese 303 or placement by the instructor during registration.
M W F 1:25 or 3:35; lec to be arranged. Staff.
Drill in the use of spoken Japanese within the constraints set by Japanese social settings.

**341–342 Advanced Japanese for Business Purposes**
341, fall; 342, spring. 4 credits each term. Prerequisite: permission of instructor.
Hours to be arranged. Staff.
This course sequence will offer advanced training in Japanese with concentration on topics relating to the conduct of business. The emphasis will be on spoken skills, with provision for an optional reading component.

**401–402 Advanced Japanese Reading**
401, fall; 402, spring. 4 credits each term. Prerequisites: for Japanese 401, Japanese 302 or placement by the instructor during registration; for Japanese 402, Japanese 401 or placement by the instructor during registration.
M W F 2:30 or 3:35. K. Smith and K. Selden.
Reading of selected modern texts with emphasis on expository style.

**404 Linguistic Structure of Japanese**
Spring. 4 credits. Prerequisites: Japanese 102 or permission of instructor, and Linguistics 101, or equivalent introductory course in linguistics.
Hours to be arranged. J. Whitman.

**407–408 Oral Narration and Public Speaking**
407, fall; 408, spring. 2 credits each term. Prerequisites: for Japanese 407, Japanese 304 or placement by the instructor during registration; for Japanese 408, Japanese 407 or placement by the instructor during registration.
T R 1:25. K. Noguchi.
Instruction in storytelling, lecturing, and speechmaking, with emphasis on both the construction of discourse and Japanese patterns of oral delivery.

**410 History of the Japanese Language**
Spring. 4 credits. Prerequisite: Japanese 206 or permission of instructor. Offered alternate years.
Hours to be arranged. J. Whitman.
An overview of the history of the Japanese language followed by intensive examination of issues of interest to the participants. Students should have a reading knowledge of Japanese or a background in historical or comparative linguistics. Interests of both groups will be addressed.

**421–422 Directed Readings**
421, fall; 422, spring. Credit to be arranged. Limited to advanced students and offered according to staff-time availability. Prerequisite: placement by the instructor during registration.
Hours to be arranged. Staff.
Topics are selected on the basis of student needs.

**[541–542 Introductory Japanese for Business Purposes**
For graduate students only; undergraduates register for Japanese 141–142. Not offered 1989–90.
M–F 1:25. Staff.
For description see Japanese 141–142.]

**543–544 Intermediate Japanese for Business Purposes**
For graduate students only.
Meets concurrently with Japanese 203–204.

**545–546 Advanced Japanese for Business Purposes**
For graduate students only; undergraduates register for Japanese 341–342.
Hours to be arranged. Staff.
For description see Japanese 341–342.

## FALCON

R. Sukle, 412 Morrill Hall (255–0734)

**161–162 Intensive Japanese (FALCON)**
161, fall; 162, spring. 16 credits each term. Prerequisites: for Japanese 161, Japanese 102 or 160 (Cornell summer intensive course) at Cornell, or placement by the instructor during registration; for Japanese 162, Japanese 161 at Cornell or placement by the instructor during registration.
M–F, 6 hours each day. R. Sukle and staff.

## Javanese

**131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Prerequisite: for Javanese 132, Javanese 131 or equivalent.
Hours to be arranged. J.U. Wolff.
An elementary language course for those who have had no previous experience in the language.

**133–134 Continuing Course**
133, fall; 134, spring. 3 credits each term. Prerequisites: for Javanese 133, Javanese 132 or equivalent; for Javanese 134, Javanese 133 or equivalent.
Hours to be arranged. J.U. Wolff.

**203–204 Directed Individual Study**
203, fall; 204, spring. 3 credits. Prerequisite: Javanese 134 or equivalent.
Hours to be arranged. J.U. Wolff.
This is a practical language course on an intermediate level in which the students will work through readings and conversations under the guidance of a native speaker for three contact hours a week.

## Old Javanese

See Linguistics 651–652.

## Khmer (Cambodian)

**[101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite for Khmer 102: Khmer 101 or equivalent.
Hours to be arranged. G. Diffloth.]

**[201–202 Intermediate Khmer Reading**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Khmer 201, Khmer 102; for Khmer 202, Khmer 201.
Hours to be arranged. G. Diffloth.]

**[203–204 Intermediate Composition and Conversation**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Khmer 203, Khmer 102; for Khmer 204, Khmer 203.
Hours to be arranged. G. Diffloth.]

**[301–302 Advanced Khmer**
301, fall; 302, spring. 4 credits each term. Prerequisites: for Khmer 301, Khmer 202 or equivalent; for Khmer 302, Khmer 301.
Hours to be arranged. G. Diffloth.]

**[401–402 Directed Individual Study**
401, fall; 402, spring. For advanced students. 4 credits each term. Prerequisite: permission of instructor.
Hours to be arranged. G. Diffloth.]

**[404 Structure of Khmer**
Spring. 4 credits. Prerequisite: Linguistics 101–102 or equivalent. Not offered 1989–90.
Hours to be arranged. G. Diffloth.]

## Korean

**101–102 Elementary Korean**
101, fall; 102, spring. 4 credits.
Lec, T R 9:05; drills: M T W R 8, 11:15, or 3:35. J. Whitman.
Covers basics of speaking, reading, and writing. Introduces Hangul writing system and rudiments of grammar.

## Latin

See listings under Classics.

## Linguistics

Linguistics, the systematic study of human speech, lies at the crossroads of the humanities and the social sciences, and much of its appeal derives from the special combination of intuition and rigor that the analysis of language demands. The interests of the members of the Department of Modern Languages and Linguistics span most of the major subfields of linguistics, phonetics and phonology, the study of speech sounds; syntax, the study of sentence structure; semantics, the study of meaning; historical linguistics, the study of language change in time; sociolinguistics, the study of language as a social and cultural artifact; and applied linguistics, which relates the results of linguistic research to problems of bilingual education, second-language learning, and similar practical concerns.

Studying linguistics is not a matter of studying many languages. Linguistics is a theoretical discipline with ties to such areas as cognitive psychology, philosophy, logic, computer science, and anthropology. Nonetheless, knowing particular languages (e.g., Spanish or Japanese) in some depth can enhance understanding of the general properties of human language. Not surprisingly, then, many students of linguistics owe their initial interest to a period of exposure to a foreign language, and those who come to linguistics by some other route find their knowledge about languages enriched and are often stimulated to embark on further foreign language study.

Students interested in learning more about linguistics and its relationship to other disciplines in the humanities and social sciences are encouraged to take Linguistics 101–102, which is a prerequisite for most other courses in the field. The Cornell Linguistic Circle, a student organization, sponsors frequent colloquia on linguistic topics; these meetings are open to the university public, and anyone wishing to learn more about linguistics is most welcome to attend.

### The Major

The prerequisite for a major in linguistics is completion of Linguistics 101–102. The major has its own language requirement, which should be completed as early as possible: qualification in two languages other than English, one of which must be non-European or non-Indo-European. With approval of the department's director of undergraduate studies, this requirement may be waived (i.e., reduced to the normal arts college language requirement) for students taking the cognitive studies concentration or a double major.

The other requirements for the linguistics major are:

1) Linguistics 301 (phonology), Linguistics 303 (syntax), Linguistics 309 or 310 (morphology), and Linguistics 410 (historical linguistics)
2) a course at or beyond the 300 level in the structure of English or some other language or a typological or comparative structure course such as Linguistics 401
3) two additional linguistics courses totaling at least 8 credits, one of which may be a course with significant linguistic content in a related field.

Prospective majors should see Professor Rosen, 312 Morrill Hall.

For other courses relevant to linguistics, see anthropology, psychology, human development and family studies, computer science, cognitive studies, and philosophy.

**Honors.** Applications for honors should be made during the junior year. Candidates for admission must have a 3.0 (B) average overall and should have a 3.2 average in linguistic courses. In addition to the regular requirements of the major, the candidate for honors will complete an honors thesis and take a final oral examination in defense of it. The thesis is usually written during the senior year but may be begun in the second term of the junior year when the student's program so warrants. The oral examination will be conducted by the honors committee, consisting of the thesis adviser and at least one other faculty member in linguistics. Members of other departments may serve as additional members if the topic makes this advisable. Linguistics 493 and 494 may be taken in conjunction with thesis research and writing but are not required.

### Distribution Requirement

The distribution requirement in the social sciences may be satisfied by taking Linguistics 101 and (1) any other course in linguistics or (2) any other course offered by the Department of Modern Languages and Linguistics for which this introductory linguistics course is a prerequisite.

*Note: See also courses on the structure and history of particular languages or language families listed at the end of this section.*

**101–102 Theory and Practice of Linguistics**
101, fall or summer; 102, spring. 4 credits each term
M W F 11:15; disc to be arranged.
A. Cohn.
An introductory course designed to provide an overview of the science of language, especially its theoretical underpinnings, methodology, and major findings. Linguistics 101 plus any other course in linguistics or any DMLL course for which Linguistics 101 is a prerequisite satisfies the social science distribution requirement.

**113–114 Hispanic Bilingualism**
113, fall; 114, spring. 3 credits each term. Linguistics 113 is not a prerequisite for 114; Freshman Seminar.
T R 2:55–4:10. Staff.
An introductory sociolinguistics course on the speech of the Hispanic bilingual in the United States. Fall semester topics include the relationship between standard languages and dialects, ebonics, Spanish-English code switching vs. interference, and variation related to social function. Spring semester topics concentrate on variation in the use of Spanish and English in the different Hispanic communities established in the United States.

**118 Varieties of Human Language**
Spring. 3 credits. Applicable toward the social science distribution requirement.
M W F 10:10. J.E. Grimes.
Language diversity is a fact of our complex world. Whether spoken by a handful of speakers or by hundreds of millions, each language manages the same tasks of communication and fits in with its social environment. Language identification, literacy, and multilingualism are among the issues touched on.

**200 Traditional English Grammar for Foreign Language Students**
Fall. 1 credit. S-U grades only.
M 1:25. H.L. Kufner.
Rapid review of grammatical terminology and those features and processes of English that are of particular relevance and usefulness in the learning of French, German, Italian, Russian, or Spanish. Weekly homework assignments; no prelims; no final examinations.

**[220 Linguistics for Students of Literature (also Comparative Literature 220)**
Spring. 4 credits.
Hours to be arranged. L. Waugh.
Since literature is merely a highly specialized sector of language in general, the science of language has much to contribute even to humanists whose primary interest is in literary texts. This course will survey many of the basic linguistic divisions: phonology, morphology, syntax, and language change and will explore in some depth the implications of all the selected topics for literary studies.]

**[244 Language and Gender/Sex (also Women's Studies 244)**
Spring. 4 credits. For non-majors or majors.
Hours to be arranged.
S. McConnell-Ginet.
This course explores connections between language (use) and gender/sex systems, addressing such questions as the following. How do sex and gender affect the ways we speak, the ways we interpret and evaluate speech? How do sociocultural differences in women's and men's roles affect their language use, their relation to language change? What is meant by sexist language? How does conversation structure the social worlds of women and men? Readings draw from work in linguistics, anthropology, philosophy, psychology, literature, and general women's studies and feminist theory.]

**[264 Language, Mind, and Brain**
Fall. 4 credits. For non-majors or majors. Prerequisite: a basic course in linguistics and/or psychology is desirable.
T R 1:25–2:40. J. S. Bowers.
An introductory course that emphasizes the formal structure of natural language and its biological basis. The following topics are covered: the formal representation of linguistic knowledge, principles and parameters of universal grammar, the basic biology of language, mechanisms of linguistic performance, the modularity hypothesis, and language and cognition. This course is especially suited for majors in fields such as psychology, philosophy, computer science, and linguistics (and also for those enrolled in the concentration in cognitive studies) who want to take a one-semester introduction to linguistics that concentrates on the formal principles that govern linguistic knowledge, along with some discussion of their biological realization and their use in perception and production.]

**300 Multilingual Societies and Cultural Policy**
Spring. 4 credits.
T R 2:55–4:10. D. F. Sola.
An interdisciplinary analysis of the impact of bilingualism on society, particularly in education and communication arts. The FLEX model is used to suggest a method of evaluating policy and program alternatives.

**301–302 Phonology I, II**
301, fall; 302, spring. 4 credits each term. Prerequisites: for Linguistics 301, Linguistics 102; for Linguistics 302, Linguistics 301 or permission of instructor.
M W F 11:15. N. Clements.
An introduction to contemporary phonology, which studies the system of rules and representations underlying the human ability to produce and understand speech; 301: an overview of descriptive phonetics and phonetic transcription, the phoneme, principles of phonological analysis, phonological rules and their interaction, distinctive features, and the syllable. 302: using American English as a case study, explores in detail the nature of rule systems and rule interaction, levels of representation, stratal organization of phonological rules, lexical and morphonological conditioning of rules, and the relation between phonology and syntax.

**303–304 Syntax I, II**
303, fall; 304, spring. 4 credits each term. Prerequisites: for Linguistics 303, Linguistics 102; for Linguistics 304, Linguistics 303 or permission of instructor.
T R 10:10–11:25. J.S. Bowers.
303 is an introduction to syntactic theory, with emphasis on the classical theory of transformational grammar. 304 is an advanced course, surveying current syntactic models and dealing with such issues as the nature of syntactic representation, levels of representation, principles of universal grammar, and the relation of syntax and semantics.

**306 Functional Syntax**
Fall. 4 credits. Prerequisite: Linguistics 102 or permission of instructor.
M W F 9:05. D.F. Sola.
A general survey of syntactic theories that highlight grammatical function and reveal its role in discourse structure.

**309–310 Morphology I, II**
[309, fall;] 310, spring. 4 credits each term. Prerequisite: Linguistics 102 or equivalent or permission of instructor. 309: Not offered 1989.
T R 11:40–12:55. G. Webelhuth.
309 is a general survey focusing on the relationship of meaning and form in morphology and introducing techniques of morphological analysis. Current research on form meaning questions is discussed. 310 considers recent discussions in morphological theory.

**[311–312 The Structure of English**
311, fall; 312, spring. 4 credits each term. Prerequisites: for Linguistics 311, Linguistics 102 or permission of instructor; for Linguistics 312, Linguistics 311 or permission of instructor. Not offered 1989–90.
M W F 11:15. S. McConnell-Ginet.
311 provides an overview of the syntactic structure of English, drawing upon relevant theoretical approaches. 312 deals with phonology, morphology, and special problems of English structure and semantics.]

**313 English for Teachers of English**
Fall. 4 credits. Prerequisites: for undergraduate majors, Linguistics 101–102 or equivalent; for graduate students, concurrent registration in Linguistics 101 or equivalent.
M W F 11:15, plus one hour to be arranged. M. Martin.
A course in modern English for teachers of non-native speakers. An analysis of the phonetics, grammar, and semantics of the language in terms applicable to both classroom teaching and materials development.

**314 Teaching English as a Foreign Language**
Spring. 4 credits. Prerequisite: Linguistics 313.
M W F 11:15, plus one hour to be arranged. M. Martin.
Methods and techniques used in the teaching of English language skills to non-native speakers are examined. Attention is given to materials design and to current issues and new trends in the fields.

**[316 Introduction to Mathematical Linguistics**
Spring. 4 credits. Prerequisite: Linguistics 101–102 or equivalent. Offered alternate years. Not offered 1989–90.
Hours to be arranged. F. Landman.
The course is an introduction to the mathematical concepts and techniques most frequently used in theoretical linguistics. Topics will include the following: elementary set theory, elementary logic, formal systems and algorithms, and trees, automata, and formal grammars. The course is designed for students who are interested in formal linguistics but feel they have a weak mathematical background. It presupposes no previous knowledge of formal methods and it will try to overcome any "anxiety" that such methods may give rise to.]

**319 Phonetics I**
Fall. 3 credits.
T R 1:25–2:40; disc to be arranged. J. Kingston.
An introduction to phonetic theory, with an equal emphasis on the general properties of speech production, acoustics, and perception. Training in production and transcription in a discussion section, in conjunction with Linguistics 301.

**320 Phonetics II**
Spring. 3 credits. Prerequisite: Linguistics 319.
T R 1:25–2:40; disc to be arranged. J. Kingston.
Surveys current controversies in research on articulation, acoustics, or perception. Possible topics include: phonetic explanation in phonology; testing of the psychological reality of theoretical constructs in phonology; and phonetic implementation of phonological representations.

**321 History of the Romance Languages**
Fall. 4 credits. Prerequisites: Linguistics 101 or equivalent, and qualification in any Romance language. Offered alternate years.
M W F 1:25. C. Rosen.
Popular Latin. Pan-Romance trends in phonology, morphology, syntax, and the lexicon. Regional divergence. Non-Latin influences. Medieval diglossia and emergence of Romance standards.

**[323 Comparative Romance Linguistics**
Fall. 4 credits. Prerequisites: Linguistics 101 or equivalent, and qualification in any Romance language. Offered alternate years. Not offered 1989–90.
M W F 1:25. C. Rosen.
The Romance language family in a typological perspective. Salient features of eight Romance languages; broad and localized trends in phonology, syntax, and the lexicon; and elements of dialectology.]

**325 Pragmatics**
Fall. 4 credits. Prerequisite: Linguistics 102 or permission of instructor.
M W F 10:10. S. McConnell-Ginet.
An introduction to the study of such topics as speech acts, presupposition, deixis, implicatures, and conversational strategies.

**366 Spanish in the United States (also Spanish 366)**
Fall. 4 credits. Prerequisite: some knowledge of Spanish. Offered alternate years. Applicable toward the social science distribution requirement.
M W F 11:15. M. Suner.
Examination of major Spanish dialects in the United States from a linguistic perspective. Contrast with the standard language. Borrowing, interference, and code switching. Syntactic, morphological, and phonological characteristics. Sex-related phenomena.

**[370 Language and Cognition (also Psychology 370)**
Spring. 4 credits. Prerequisites: Linguistics 101 or 264, Psychology 215, or permission of one of the instructors. Not offered same years as Psychology 416.
T R 1:25–2:40. J. Bowers, H. Kurtzman.
Examination of current research on selected topics on language from both linguistic and psychological perspectives. Topics include Universal Grammar and language acquisition, syntactic parsing, word recognition, sentence production, aphasia, and schizophrenic language.]

**400 Semiotics and Language (also Comparative Literature 410)**
Spring. 4 credits. Prerequisite: some background in an area relevant to semiotics: e.g., linguistics, philosophy, psychology, anthropology, or literature: or permission of instructor.
Hours to be arranged. L. Waugh.
An introduction to the study of semiotics in general and to particular semiotic theories (for example, those of Saussure, Peirce, Jakobson) and to language as a semiotic system. The particular topics to be discussed will depend on the interest of the students.

**401 Language Typology**
Fall. 4 credits. Prerequisite: Linguistics 102 or equivalent.
M W F 10:10. C. Rosen.
Study of a basic question of contemporary linguistics: in what ways do languages differ, and in what ways are they all alike? Efforts to formalize universals of syntax and to characterize the total repertory of constructions available to natural languages. Common morphological devices and their syntactic correlates. Emphasis on systems of case, agreement, and anaphora.

**402 Languages in Contact**
Fall. 4 credits. Prerequisite: Linguistics 102 or permission of instructor. Offered alternate years.
M W F 9:05. H.L. Kufner.
Examination of a variety of areas where languages exhibit interference phenomena: diglossia, bilingualism, dialects, second-language acquisition.

**403 Introduction to Applied Linguistics**
Spring. 4 credits. Prerequisite: a course in the structure of a language at the 400 level.
M W F 3:35. C. Kramsch.
Examination of the theoretical bases of applied linguistics, including second-language learning and current language-teaching methodologies.

**405–406 Sociolinguistics**
405, fall; 406, spring. 4 credits each term. Prerequisite: Linguistics 102 or permission of instructor. Linguistics 405 is not a prerequisite to 406.
Hours to be arranged. Staff.
405: Social differences in the use of language according to sex, class, age, race, situation, etc. Societal multilingualism, diglossia, etc. Social attention to language: norms and standards, taboo and euphemism, and language planning. 406: the study of language variation. Theoretical and methodological issues in the study of sociolinguistic differences. Variable rules, locating variation in the grammar, and quantitative methods in linguistics.

**410 Introduction to Historical Linguistics**
Spring. 4 credits. Prerequisite: Linguistics 102 or permission of instructor.
M W F 10:10. J. Jasanoff.
A survey of the basic mechanisms of linguistic changes, with examples from a variety of languages.

**[411 Cognitive Studies: Knowledge, Belief, and Mental Representations (also Psychology 519 and Philosophy 467)**
Fall. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. F. Landman and staff.
An interdisciplinary seminar on issues surrounding theories of knowledge and belief and their semantic consequences, team-taught by linguists, philosophers, psychologists, and computer scientists.]

**412 Process and Knowledge in Speech Perception and Word Recognition**
Spring. 4 credits. Prerequisite: Linguistics 319 or permission of instructor.
T R 1:25–2:40. J. Kingston.
This course examines how speech sounds are received and how words are recognized. The focus in the discussion of speech perception is on the question of whether speech perception requires mechanisms which are unique to it, or if instead general auditory mechanisms are sufficient. Word recognition is examined in terms of the role of phonetic and phonological processes, structures, and knowledge in recognizing words.

**[415–416 Social Functions of Language**
415, fall; 416, spring. 4 credits each term. Prerequisites: linguistics 102 or permission of instructor. Not offered 1989–90.
Hours to be arranged. Staff.
The function of language in society; social constraints on linguistic behavior, including taboos, jargons, registers, social and socially perceived dialects.]

**[417 History of the English Language**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. Staff.
Development of modern English; external history; phonological, grammatical, and lexical change. The English language in America.]

**418 Nonlinear Phonology**
Spring. 4 credits. Prerequisite: Linguistics 302.
Hours to be arranged. J. Kingston.
Explores a comprehensive model of phonological description arising out of work in autosegmental and metrical phonology. Particular topics include tone systems, syllable structure, quantity, stress and intonation, vowel harmony, and feature organization. These topics are related to fundamental issues in phonological theory such as naturalness, markedness, learnability, and universals.

**420 Fundamentals of Speech Acoustics**
Spring, according to demand. 4 credits. Prerequisites: Linguistics 319 and at least 1 year of college calculus, including the mathematics of complex variables.
T R 10:10–11:25. J. Kingston.
This course develops a model of vocal tract acoustics, based on the fundamental principles of acoustic theory.

**421–422 Semantics I, II**
421, fall; 422, spring. 4 credits each term. Prerequisites: for Linguistics 421, Linguistics 102; for Linguistics 422, Linguistics 421 or permission of instructor.
T R 2:55–4:10. G. Chierchia.
421: an introduction to semantics of natural language. The course starts from basic foundational questions concerning the nature of meaning and the empirical domain of semantic theory. Truth-conditional and logical theories and their application to the investigation of the structure of natural languages are extensively explored (with some comparisons with other approaches). Through the study of quantification, scope, anaphora, modalities, presuppositions, and the like, one tries to gain insight into general characteristics of the cognitive apparatus that is at the basis of our capacity for understanding sentences.

422: guides students into current work in semantic theory. The first half of the course is an introduction to Montague-style semantics, whose influence on current research is quite extensive. The second half of the course focuses on selected topics that have grown out of (and sometimes against) classical Montague semantics. Such topics are usually drawn from the following: generalized quantifiers and anaphora, type-shifting, problems of tense and aspect, the linguistic relevance of algebraic approaches to properties, propositions, events and thematic roles, and discourse representation theory.

**[425–426 Structure of Bantu I and II**
425, fall; 426, spring. 4 credits each term. Prerequisites: for Linguistics 425, Linguistics 301 or permission of instructor; for Linguistics 426, Linguistics 303 and 425 or permission of instructor. Not offered 1989–90.
Hours to be arranged. G.N. Clements.
425 is an introduction to descriptive and historical Bantu linguistics. Following a review of basic features of Proto-Bantu grammar and lexicon, we examine the phonology and morphology of a selected Bantu language with the help of a native speaker assistant. 426 is a sequel to Linguistics 425 and investigates aspects of Bantu syntax and its relation to phonology, morphology, and discourse function.]

**[430 Structure of Korean**
Spring. 4 credits. Offered alternate years. Not offered 1989–90.
Hours to be arranged. J. Whitman.
Intensive examination of the syntax and phonology of a non-Indo-European language with the objective of testing principles of current linguistic theory. No previous knowledge of Korean required.]

**436 Language Development (also Psychology 436 and Human Development and Family Studies 436)**
Spring. 4 credits. Prerequisite: at least one course in developmental psychology, cognitive psychology, cognitive development, or linquistics. Offered alternate years.
T R 11:40–12:55. B. Lust.
A survey of basic issues, methods, and research in study of first-language acquisition. Major theoretical positions in the field are considered in the light of experimental studies in first-language acquisition of phonology, syntax, and semantics from infancy on. The fundamental linguistic issues of universal grammar and the biological foundations for acquisition are discussed, as are the issues of relations between language and thought. The acquisition of communication systems in nonhuman species such as chimpanzees are addressed, but major emphasis is on the child.

**438 Literature in Language Teaching**
Fall. 4 credits. Prerequisite: permission of instructor.
M W F 3:35. C. Kramsch.
This course will explore the uses of literature, both fictional and non-fictional, to sensitize language learners to all aspects of language in discourse. Topics will include: text and discourse, the nature of literary discourse, text types, reading/writing and the acquisition of literacy in a foreign language, writer/reader relationship, the difficulties of the non-native reader, literature and cultural understanding. Pedagogical applications will focus on the reading, interpretation and creation of literary texts as individual and group activities at all levels of proficiency, on various styles of intensive reading including "explication de texts," and on the development of esthetic consciousness.

**[440 Dravidian Structures**
Spring, according to demand. 4 credits. Prerequisite: Linguistics 102.
Hours to be arranged. Staff.
A comparative and constrative analysis of the structures of several Dravidian languages.]

**[442 Indo-Aryan Structures**
Fall, according to demand. 4 credits. Prerequisite: Linguistics 102.
Hours to be arranged. J.W. Gair.
Typological discussion of the languages of the subfamily. Specific topics and emphasis may vary depending on the interest of the students.]

**493 Honors Thesis Research**
Fall. 4 credits.
Hours to be arranged. Staff.
May be taken before or after Linguistics 494, or may be taken independently.

**494 Honors Thesis Research**
Spring. 4 credits.
Hours to be arranged. Staff.
May be taken as a continuation of, or before, Linguistics 493.

**600 Field Methods**
Fall or spring. 4 credits. Prerequisites: Linguistics 101 or 319.
Hours to be arranged. G. Diffloth.
Elicitation, recording, and analysis of data from a native speaker of a non-Western language not generally known to students.

**601 Topics in Phonological Theory**
Fall. 4 credits. Prerequisites: Linguistics 301 and one other course in phonology.
Hours to be arranged. N. Clements.
Selected topics in current phonological theory. 1989–90: Phonological feature representation.

**[603 History of Linguistics**
Fall. 4 credits. Not offered 1989–90.
Hours to be arranged. Staff.
The history of linguistics from early Greek and Sanskrit grammarians to the modern period.]

**604 Research Workshop**
Spring. 4 credits. Prerequisite: three or more semesters of graduate study in linguistics.
Hours to be arranged. Staff.
Participants will present their own ongoing research and discuss it with their colleagues. Individual topics will be chosen on the basis of interest, experience, and probable focus of dissertation research.

**608 Discourse Analysis**
Fall. 4 credits. Prerequisite: permission of instructor.
M 2:30–4:30. J.E. Grimes.
Linguistic theory applied to relationships beyond the sentence.

**[609 Greek Comparative Grammar (also Classics 421)**
Fall. 4 credits. Prerequisite: thorough familiarity with the morphology of classical Greek. Not offered 1989–90.
M W F 10:10. A. Nussbaum.
The prehistory and evolution of the sounds and forms of ancient Greek as reconstructed by comparison with the other Indo-European languages.]

**[610 Latin Comparative Grammar (also Classics 422)**
Fall or spring. 4 credits. Prerequisite: thorough familiarity with the morphology of classical Latin. Not offered 1989–90.
Hours to be arranged. A. Nussbaum.
The prehistory and evolution of the sounds and forms of classical Latin as reconstructed by comparison with the other Indo-European languages.]

**[611 Greek Dialects (also Classics 425)**
Fall or spring. 4 credits. Not offered 1989–90.
Hours to be arranged. A. Nussbaum.
A survey of the dialects of ancient Greek through the reading and analysis of representative epigraphical and literary texts.]

**612 Italic Dialects (also Classics 424)**
Fall. 4 credits.
T R 11:40–12:55. A. Nussbaum.
The phonology and morphology of Faliscan, Oscan, and Umbrian studied through the reading of epigraphical texts. Attention to the relations of these languages to Latin and the question of proto-Italic.

**[613 Homeric Philology (also Classics 427)**
Fall or spring. 4 credits. Prerequisite: ability to read Homeric Greek. Not offered 1989–90.
Hours to be arranged. A. Nussbaum.
The language of the Homeric epics: dialect background, archaisms, epicisms, and modernizations. The notion of a *Kunstsprache*: its constitution, use, and internal consistency. The phonological and morphological aspects of epic compositional technique.]

**[614 Archaic Latin (also Classics 426)**
Spring. 4 credits. Prerequisite: reading knowledge of Latin. Not offered 1989–90.
Hours to be arranged. A. Nussbaum.
Reading of epigraphic and literary preclassical texts with special attention to archaic and dialectal features. The position of Latin among the Indo-European languages of ancient Italy, the rudiments of Latin historical grammar, and aspects of the development of the literary language.]

**[615 Mycenaean Greek (also Classics 429)**
Fall or spring. 4 credits. Prerequisite: thorough familiarity with the morphology of classical Greek. Not offered 1989–90.
Hours to be arranged. A. Nussbaum.
An introduction to the epigraphy, language, and content of the Linear B tablets with special attention to their implications for Greek historical grammar and dialectology.]

**[617–618 Hittite**
617, fall; 618, spring. 4 credits each term. Prerequisites: for Linguistics 617, permission of instructor; for Linguistics 618, Linguistics 617 or permission of instructor. Not offered 1989–90.
Hours to be arranged. J. Jasanoff.]

**[619 Rigveda**
Fall. 4 credits.
Hours to be arranged. J. Jasanoff.
Reading and linguistic analysis of selected Vedic hymns.]

**620 Area Topics in Romance Linguistics**
Spring. 4 credits. May be repeated for credit. Offered alternate years.
Hours to be arranged. J.S. Noblitt.
Topic for 1989: reading and linguistic analysis of the Old Provencal text *Flamenca*.

**[621 Problems and Methods in Romance Linguistics**
Spring. 4 credits. Prerequisites: one syntax course and qualification in two Romance languages. Offered alternate years. Not offered 1989–90.
Hours to be arranged. C. Rosen.
Central topics in Romance syntax in the light of current theories of universal grammar.]

**[622 Romance Dialectology**
Spring. 4 credits. Offered every third year. Not offered 1989–90.
Hours to be arranged. C. Rosen.
Diachronic and synchronic survey of dialects of the Romance language areas.]

**[623–624 Old Irish**
623, fall; 624, spring. 4 credits each term. Prerequisite for 624: 623 or permission of instructor. Not offered 1989–90.
Hours to be arranged. J. Jasanoff.]

**[625–626 Middle Welsh**
625, fall; 626, spring. 4 credits each term. Prerequisites: for Linguistics 625, knowledge of one ancient or medieval European language or permission of instructor; for Linguistics 626, Linguistics 625 or equivalent. Not offered 1989–90.
Hours to be arranged. Staff.]

**[627 Advanced Old Irish**
Spring. 3 credits. Prerequisite: one year of Old Irish. Not offered 1989–90.
Hours to be arranged. Staff.]

**631 Comparative Indo-European Linguistics**
Fall. 4 credits. Prerequisite: permission of instructor.
T R 10:10–11:25. J. Jasanoff.
An introduction to the comparative grammar of the Indo-European languages.

**633 Seminar in First-Language Acquisition: Cross-linguistic Studies of the Acquisition of Anaphora (also Human Development and Family Studies 633)**
Fall or spring. 1–4 credits. Prerequisite: Linguistics 436 or equivalent or permission of instructor.
Hours to be arranged. B. Lust.
This seminar will review and critique current theoretical and experimental studies of the first-language acquisition of anaphora, with a concentration on insights gained by cross-linguistic study of this area. The seminar will focus on relating current developments in linguistic theory regarding anaphora to current experimental research on first-language acquisition of anaphora. Attention will also be given to the development of research proposals.

**[635–636 Indo-European Workshop**
635, fall; 636, spring. 4 credits each term. Prerequisite: permission of instructor.
Hours to be arranged.
Fall: A. Nussbaum; spring: J. Jasanoff.
An assortment of subjects intended for students with previous training in Indo-European linguistics: problems in the reconstruction of Proto Indo-European, topics in the historical grammars of the various IE languages, reading and historical linguistic analysis of texts, and grammatical sketches of "minor" IE languages.]

**[639–640 Introduction to Pali**
639, fall; 640, spring. 3 credits each term.
Hours to be arranged. J.W. Gair.
639 is an introduction to the language of the canonical texts of Theravada Buddhism. Reading of authentic texts with emphasis on both content and grammatical structure. Familiarity with Sanskrit is *not* required. 640 is a continuation of 639 with further readings.]

**641–642 Elementary Sanskrit**
641, fall; 642, spring. 3 credits each term. Prerequisite for Linguistics 642: Linguistics 641.
Hours to be arranged. C. Minkowski.

**[643 Dialects in Contact**
Fall. 4 credits. Not offered 1989–90.
Hours to be arranged. Staff.
This course will analyze the sociolinguistic repercussions of frequent communication among speakers of different dialects of the same language, including the implications for panlectal, polylectal grammars. Special topics include language change, linguistic accommodation, and speech community identity. Although dialects of Spanish in the United States and of English in the United States and Great Britain will be the focus of the readings, applications to dialects of other languages are welcomed. Particular attention will be paid to methodology, both qualitative and quantitative approaches.]

**647–648 Speech Synthesis by Rule**
647, fall; 648, spring. 4 credits each term. Prerequisite: phonology and phonetics or knowledge of computer programming and permission of instructor. Offered alternate years.
Hours to be arranged. S.R. Hertz.
Linguistics 647 is an introduction to speech synthesis by rule. Particular emphasis will be given to synthesizing English, with a consideration of how to derive phonetic values on the basis of multi-tiered phonological representations (e.g., coordinated phrase, word, syllable, and phoneme units). Students will have first-hand experience synthesizing speech in the Cornell Phonetics Laboratory using the Delta System, which provides a special-purpose programming language for research in non-linear phonology, phonetics, and speech synthesis. Linguistics 648 is a less formal workshop, in which students will use the Delta System to work on selected projects.

**651–652 Old Javanese**
Fall or spring, according to demand. 4 credits.
Hours to be arranged. J.U. Wolff.
Grammar and reading of basic texts.

**653–654 Seminar in Southeast Asian Linguistics**
653, fall; 654, spring. 4 credits each term. Prerequisite: Linguistics 303 or permission of instructor. Linguistics 653 is not a prerequisite for 654.
Hours to be arranged. G. Diffloth.
Languages of mainland Southeast Asia. Topics, chosen according to student interests, may include description, dialectology, typology, comparative reconstruction, and historical studies.

**655–656 Seminar in Austronesian Linguistics**
655, fall; 656, spring. 4 credits each term. Prerequisites: for Linguistics 655, Linguistics 102 and permission of instructor; for Linguistics 656, Linguistics 655.
Hours to be arranged. J.U. Wolff.
Descriptive and comparative studies of Malayo-Polynesian languages.

**657–658 Seminar in Austroasiatic Linguistics**
657, fall; 658, spring. 4 credits each term. Prerequisites: Linguistics 102 or permission of instructor.
Hours to be arranged. G. Diffloth.
Descriptive and comparative studies of Austroasiatic languages.

**700 Seminar**
Fall or spring, according to demand. Credit to be arranged.
Hours to be arranged. Staff.
Seminars are offered according to faculty interest and student demand. Topics in recent years have included subject and topic, Montague grammar, speech synthesis, lexicography, classical and autonomous phonology, Japanese sociolinguistics, relational grammar, semantics and semiotics, and others.

**701–702 Directed Research**
701, fall; 702, spring. 1–4 credits.
Hours to be arranged. Staff.

**[753 Tibeto-Burman Linguistics**
Fall. 4 credits. Prerequisites: Linguistics 404 or equivalent, and permission of instructor. Not offered 1989–90.
Hours to be arranged. Staff.
Comparative reconstruction of Tibeto-Burman with emphasis on the Lolo-Burmese branch and historical study of Burmese.]

**774 Proseminar in Cognitive Studies II (also Computer Science 774)**
Spring. 2 credits.
T R 1:30–3. Staff.
The focus will be on the contribution of linguistics, computer science, and neuroscience to the study of cognition. Topics may include the phonology, syntax, and semantics of natural language; artifical intelligence work in natural language processing, vision, and reasoning; parallel distributed processing; and neuropsychology.

### Additional Linguistics Courses

**[Chinese 401 History of the Chinese Language]**

**Chinese 403 Linguistic Structure of Chinese I**

**Chinese 404 Linguistic Structure of Chinese II**

**[Chinese 405 Chinese Dialects]**

**[Chinese 607 Chinese Dialect Seminar]**

**[French 401 History of the French Language]**

**[French 407 Applied Linguistics: French]**

**French 408 Linguistic Structure of French**

**[French 410 Semantic Structure of French]**

**[French 602 Linguistic Structure of Old and Middle French]**

**[French 604 Contemporary Theories of French Grammar]**

**French 700 Seminar in French Linguistics**

**[German 401 Introduction to Germanic Linguistics]**

**[German 402 History of the German Language]**

**[German 403 Modern German Phonology]**

**German 404 Modern German Syntax**

**[German 405 German Dialectology]**

**[German 406 Runology]**

**German 407 Applied Linguistics: German**

**[German 408 Linguistic Structure of German]**

**[German 602 Gothic]**

**[German 603 Old High German, Old Saxon]**

**[German 604 Old Low Franconian, Old Frisian]**

**[German 605 Structure of Old English]**

**[German 606 Topics in Historical Germanic Phonology]**

**[German 607 Topics in Historical Germanic Morphology]**

**German 608 Topics in Historical Germanic Syntax**

**German 609–610 Old Norse**

**[German 611 Readings in Old High German and Old Saxon]**

**[German 612 Germanic Tribal History]**

**German 710 Seminar in Germanic Linguistics**

**[German 720 Seminar in Comparative Germanic Linguistics]**

**German 730 Seminar in German Linguistics**

**[German 740 Seminar in Dutch Linguistics]**

**[Hindi 700 Seminar in Hindi Linguistics]**

**Indonesian 300 Linguistic Structure of Indonesian**

**[Italian 402 History of the Italian Language]**

**Italian 403 Linguistic Structure of Italian**

**[Italian 432 Italian Dialectology]**

**Italian 631 Readings in Italian Opera Libretti**

**[Italian 700 Seminar in Italian Linguistics]**

**Japanese 404 Linguistic Structure of Japanese**

**Japanese 410 History of Japanese Language**

**[Khmer 404 Structure of Khmer]**

**[Portuguese 700 Seminar in Portuguese Linguistics]**

**Quechua 403 Linguistic Structure of Quechua**

**Quechua 700 Seminar in Quechua Linguistics**

**Russian 301–302 Advanced Russian Grammar and Reading**

**[Russian 401–402 History of the Russian Language]**

**[Russian 403–404 Linguistic Structure of Russian]**

**Russian 601 Old Church Slavic**

**Russian 602 Old Russian**

**Russian 651–652 Comparative Slavic Linguistics**

**Russian 700 Seminar in Slavic Linguistics**

**Spanish 401 History of the Spanish Language**

**Spanish 407 Applied Linguistics: Spanish**

**Spanish 408 The Grammatical Structure of Spanish**

**Spanish 601 Hispanic Dialectology**

**Spanish 602 Linguistic Structure of Ibero Romance**

**[Spanish 603 Contemporary Theories of Spanish Phonology]**

**[Spanish 604 Contemporary Theories of Spanish Grammar]**

**[Spanish 700 Seminar in Spanish Linguistics]**

**Tagalog 300 Linguistic Structure of Tagalog**

## Nepali

**101–102 Elementary Nepali**
101, fall; 102, spring. 6 credits each term. Prerequisite: for Nepali 102, 101 or examination.
Hours to be arranged. K.S. March and staff.
Intended for beginners. The emphasis is on basic grammar, speaking and comprehension skills, utilizing culturally appropriate materials and texts. Devanagari script for reading and writing is also introduced.

**201–202 Intermediate Nepali Conversation**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Nepali 201, Nepali 102 or examination; for Nepali 202, Nepali 201 or examination.
Hours to be arranged. K.S. March and staff.
Intermediate instruction in spoken grammar and verbal comprehension skills, with special attention to developing technical vocabularies and other verbal skills appropriate to students' professional fields.

**203–204 Intermediate Nepali Composition**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Nepali 203, Nepali 102 or examination; for Nepali 204, Nepali 203 or examination.
Hours to be arranged. K.S. March and staff.
A systematic review of written grammar and reading comprehension, with special attention to the technical vocabularies, necessary writing skills, and published materials typical of advanced students' professional fields.

## Pali

See Linguistics 639–640.

## Polish

**[131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Prerequisite for Polish 132: Polish 131 or equivalent. Offered alternate years. Not offered 1989–90.
M W F 10:10 or 1:25. E.W. Browne.]

**133–134 Continuing Course**
133, fall; 134, spring. 3 credits each term. Prerequisites: for Polish 133, Polish 132 or equivalent; for Polish 134, Polish 133 or equivalent.
Hours to be arranged. E.W. Browne.

## Portuguese

**121–122 Elementary Course**
121, fall; 122, spring. 4 credits each term. Intended for beginners. Students may attain qualification upon completion of 122 by achieving a satisfactory score on a special examination.
M–F 10:10. J. Oliveira.
A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.

**203–204 Intermediate Composition and Conversation**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Portuguese 203, Portuguese 122 or permission of instructor; for Portuguese 204, Portuguese 203 or permission of instructor.
M W F 11:15. J. Oliveira.
Conversational grammar review with special attention to pronunciation and the development of accurate and idiomatic oral expression. Includes readings in contemporary Portuguese and Brazilian prose and writing practice.

**303–304 Advanced Composition and Conversation**
303, fall; 304, spring. 4 credits each term. Prerequisite: for Portuguese 303, Portuguese 204 or equivalent; for Portuguese 304, Portuguese 303 or equivalent.
Hours to be arranged. J. Oliveira.

**[700 Seminar in Portuguese Linguistics**
Fall or spring, according to demand. 4 credits. Not offered 1989–90.
Hours to be arranged. Staff.
Selected problems in the structure of Portuguese.]

## Quechua

**131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Prerequisite: qualification in Spanish.
Hours to be arranged. D.F. Sola.
A beginning conversation course in the Cuzco dialect of Quechua.

**133–134 Continuing Course**
133, fall; 134, spring. 3 credits each term. Prerequisites: for Quechua 133, Quechua 131–132 or equivalent; for Quechua 134; Quechua 133 or equivalent.
Hours to be arranged. D.F. Sola.
An intermediate conversation and reading course. Study of the Huarochiri manuscript.

**135–136 Quechua Writing Lab**
135, fall; 136, spring. 1 credit each term. Prerequisites: concurrent enrollment in Quechua 131–132 or instructor's approval. Letter grade only.
Hours to be arranged. D.F. Sola.
Computer-assisted drill and writing instruction in elementary Quechua.

**403 Linguistic Structure of Quechua**
Fall. 4 credits.
Hours to be arranged. D.F. Sola.
Survey of the grammatical structure of Quechua dialects.

**700 Seminar in Quechua Linguistics**
Fall or spring. Credit to be arranged. Prerequisite: permission of instructor.
Hours to be arranged. D.F. Sola.

## Romance Linguistics

**321 History of the Romance Languages**
Fall. 4 credits. Prerequisites: Linguistics 101 or equivalent, and qualification in any Romance language. Offered alternate years.
M W F 1:25. C. Rosen.
For description see Linguistics 321.

**[323 Comparative Romance Linguistics**
Fall. 4 credits. Prerequisites: Linguistics 101 or equivalent, and qualification in any Romance language. Offered alternate years. Not offered 1989–90.
M W F 1:25. C. Rosen.
For description see Linguistics 323.]

**[620 Area Topics in Romance Linguistics**
Spring. 4 credits. May be repeated for credit. Offered alternate years. Not offered 1989–90.
Hours to be arranged. J.S. Noblitt.
For description see Linguistics 620.]

**[621 Problems and Methods in Romance Linguistics**
Spring. 4 credits. Prerequisites: one syntax course and qualification in two Romance languages. Offered alternate years. Not offered 1989–90.
Hours to be arranged. C. Rosen.
For description see Linguistics 621.]

**[622 Romance Dialectology**
Spring. 4 credits. Offered every third year. Not offered 1989–90.
Hours to be arranged. C. Rosen.
For description see Linguistics 622.]

## Rumanian

**[131–132 Elementary Course**
131, fall; 132, spring. Offered according to demand. 3 credits. Prerequisite for Rumanian 132: Rumanian 131 or equivalent. Not offered 1989–90.]

**[133–134 Continuing Course**
133, fall; 134, spring. Offered according to demand. 3 credits. Prerequisite for Rumanian 134: Rumanian 133 or equivalent. Not offered 1989–90.]

## Russian

L.H. Babby, E.W. Browne, R.L. Leed (director of undergraduate studies, 302 Morrill Hall, 255-2322).

For literature courses see Russian Literature.

### The Russian Major

See Russian Literature.

### Study Abroad

Cornell is an affiliated institution in the program for Russian language study at Leningrad State University. Opportunities are available for study during the summer, a single semester, or the full year. Further information is available from Professor Wayles Browne.

**Honors.** Students taking honors in Russian undertake individual reading and research and write an honors essay.

**Fees.** Depending on the course, a small fee may be charged for photocopied texts for course work.

### Freshman Writing Seminar Requirement

See Russian Literature.

### Russian and Soviet Studies Major

See "Special Programs and Interdisciplinary Studies," which follows the department listings.

**121–122 Elementary Course**
121, fall; 122, spring. 4 credits each term. Prerequisite for Russian 122: Russian 121 or equivalent. Intended for beginners or students placed by examination. Students who obtain a CPT achievement score of 560 after Russian 121–122 attain qualification and may enter the 200–level sequence; otherwise Russian 123 is required for qualification.
Recitation, M–F 8, 9:05, 12:20, or 1:25. Staff.
A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.

**123 Continuing Russian**
Fall or summer. 4 credits. Limited to students who have previously studied Russian and have a CPT achievement score between 450 and 559. Satisfactory completion of Russian 123 fulfills the qualification portion of the language requirements.
Recitation, M–F 12:20, 1:25, or 3:35. Staff.
A prequalification course designed to prepare students for study at the 200 level. Passing this course is equivalent to qualification.

**203–204 Intermediate Composition and Conversation**
203, fall, spring or summer; 204, spring. 3 credits each term. Prerequisite: qualification in Russian (Russian 123 or CPT score 560–649). Prerequisite for Russian 204: Russian 203 or equivalent.
203, fall: M T R F 10:10, 11:15, or 2:30; Spring: M T R F 11:15. L. Paperno and V. Tsimberov 204, spring: M T R F 10:10, 11:15, or 2:30. L. Paperno, S. Paperno, and V. Tsimberov.
Guided conversation, composition, reading, pronunciation, and grammar review, emphasizing the development of accurate and idiomatic expression in the language.

**205–206 Russian for Scientists**
205, fall; 206, spring. 2 credits each term. Prerequisites: qualification in Russian (Russian 102 or 123 or CPT score 560–649). Both semesters must be taken in order to satisfy the proficiency level for the language requirement. This course cannot be used to satisfy the humanities requirement.
Hours to be arranged. S. Paperno, R.L. Leed.
Reading unabridged articles on a variety of topics in social science, mathematics, physics, chemistry, biology, and engineering.

*Note: Students placed in the 200-level courses also have the option of taking courses in introductory literature; see separate listings under Russian 201 and 202 for descriptions of these courses, any of which may be taken concurrently with the 203–204 and 205–206 language courses described above. The introductory literature courses are offered by the Department of Russian Literature, and the 203–204 and 205–206 language courses by the Department of Modern Languages and Linguistics.*

**[301–302 Advanced Russian Grammar and Reading**
301, fall; 302, spring. 4 credits each term. Prerequisites: for Russian 301, second-year Russian or permission of instructor; for Russian 302, Russian 301. Offered alternate years. Not offered 1989–90.
T R 2:55–4:10. L.H. Babby.
This course is intended primarily to increase the student's active command of difficult Russian syntactic constructions. Special attention is paid to word order, impersonal sentences, voice, negation, participles, gerunds, and also by building active vocabulary through reading modern Russian prose. Problems of phonology are also discussed.]

**303–304 Advanced Composition and Conversation**
303, fall; 304, spring. 4 credits each term. Prerequisites: for Russian 303, Russian 204 or equivalent; for Russian 304, Russian 303 or equivalent.
M W F 10:10 or 2:30. L. Paperno, S. Paperno, and V. Tsimberov.
Grammar review, reading, viewing, and listening to authentic language materials (newpapers, TV, radio).

**305–306 Directed Individual Study**
305, fall; 306, spring. 2 credits. Prerequisites: for Russian 305, Russian 303–304 or equivalent; for Russian 306, Russian 305.
Hours to be arranged. Staff.

**[401–402 History of the Russian Language**
401, fall; 402, spring. 4 credits each term. Prerequisites: for Russian 401, permission of instructor; for Russian 402, Russian 401 or equivalent. Offered alternate years. Not offered 1989–90; next offered 1990–91.
T R 10–11:40. L.H. Babby.
Phonological, morphological, and syntactic developments from Old Russian to modern Russian.]

**[403–404 Linguistic Structure of Russian**
403, fall; 404, spring. 4 credits each term. Prerequisite for Russian 403: permission of instructor, Linguistics 101–102 recommended. Prerequisite for Russian 404: Russian 403 or equivalent. Offered alternate years. Not offered 1989–90.
T R 10:10–11:40. L.H. Babby.
A synchronic analysis of the structure of modern Russian. Russian 403 deals primarily with morphology and its relation to syntax and 404 with syntax and word order. Topics covered include case theory, the functions of word order, voice, agreement, impersonal constructions, negation, and the relation between morphology and syntax.]

**413–414 Advanced Conversation and Stylistics**
413, fall; 414, spring. 2 credits each term. Prerequisites: for Russian 413, Russian 303–304 or the equivalent, for Russian 414, Russian 413.
T R 3:35–4:25. L. Paperno, S. Paperno, or V. Tsimberov.
Discussion of authentic unabridged Russian texts and TV series in a variety of nonliterary styles and genres.

**601 Old Church Slavic**
Fall. 4 credits. This course is prerequisite to Russian 602. Offered alternate years.
M W F 10:10. E.W. Browne.
Grammar and reading of basic texts.

**602 Old Russian Texts**
Spring. 4 credits. Prerequisite: Russian 601. Offered alternate years.
Hours to be arranged. L.H. Babby.
Grammatical analysis and close reading of Old Russian texts.

**633–634 Russian for Graduate Specialists**
633, fall; 634, spring. 2 credits each term. Prerequisite: four years of college Russian. For graduate students only.
Hours to be arranged. L. Paperno and S. Paperno.
The course is designed for graduate students who specialize in an area of Russian studies requiring fine active control of the language. Students will have an opportunity to speak formally and informally on topics in their specialty. Fine points of syntax, usage, and style will be discussed.

**651–652 Comparative Slavic Linguistics**
651, fall; 652, spring. 4 credits each term. Prerequisites: for Russian 651, Russian 601 taken previously or simultaneously or permission of instructor; for Russian 652, Russian 651 or permission of instructor. Offered alternate years.
Hours to be arranged. E.W. Browne.
Sounds and forms of the Slavic languages and of prehistoric common Slavic; main historical developments leading to the modern languages.

**700 Seminar in Slavic Linguistics**
Offered according to demand. Variable credit.
Hours to be arranged. Staff.
Topics chosen according to the interests of staff and students.

## Sanskrit

See Linguistics 641–642.

## Serbo-Croatian

**[131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Prerequisite for Serbo-Croatian 132: Serbo-Croatian 131 or equivalent. Offered alternate years. Not offered 1989–90.
Hours to be arranged. E.W. Browne.]

**133–134 Continuing Course**
133, fall; 134, spring. 3 credits each term. Prerequisites: for Serbo-Croatian 133, Serbo-Croatian 132 or equivalent; for Serbo-Croatian 134, Serbo-Croatian 133 or equivalent.
Hours to be arranged. E.W. Browne.

## Sinhala (Sinhalese)

**101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite for Sinhala 102: Sinhala 101 or equivalent.
Hours to be arranged. J.W. Gair and staff.
A semi-intensive course for beginners. A thorough grounding is given in all the language skills; listening, speaking, reading, and writing.

**201–202 Intermediate Sinhala Reading**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Sinhala 201, Sinhala 102; for Sinhala 202, Sinhala 201 or equivalent.
Hours to be arranged. J.W. Gair and staff.

**203–204 Intermediate Composition and Conversation**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Sinhala 203, Sinhala 102 or permission of instructor; for Sinhala 204, Sinhala 203 or equivalent.
Hours to be arranged. J.W. Gair and staff.

### Related Courses
See also Linguistics 442, 631, 639, 640.

## Spanish

M. Suner (director of undergraduate studies, 218 Morrill Hall, 255-0714).

For advanced Spanish language and literature courses see Romance Studies.

### The Major
The major is designed to give students proficiency in the oral and written language, to acquaint them with Hispanic culture, and to develop their skill in the linguistic analysis of Spanish. (For the major in Spanish literature see the description under Romance Studies.) Satisfactory completion of the major should enable students to meet language requirements for teaching, to continue with graduate work in Spanish or other appropriate disciplines, or to satisfy standards for acceptance into the training programs of the government, social agencies, and business concerns. A Spanish major combined with another discipline may also allow a student to undertake pre-professional training for

graduate study in law or medicine. Students interested in a Spanish major are encouraged to seek faculty advice as early as possible. For acceptance into the major, students should consult the director of undergraduate studies of the Department of Modern Languages and Linguistics, Professor Suner (218 Morrill Hall), who will admit them to the major.

### The Core

All majors will work out a plan of study in consultation with their advisers. Previous training and interests as well as vocational goals are taken into account when the student's program of courses is determined. Spanish 201 and 204 or 212 (or equivalent) are prerequisite to entering the major in Spanish. All majors normally include the following core courses in their programs:

1) Spanish 315–316–317

2) Spanish 311 and 312 (or equivalent)

Spanish majors have great flexibility in devising their programs of study and areas of concentration.

### The Linguistic Option

Spanish linguistics, for which the program normally includes 366, 401, 407, 408, and at least 8 additional credits in general or Spanish linguistics. (Linguistics 101–102 are recommended before entering this program.)

The J. G. White Prize and Scholarships are available annually to students who achieve excellence in Spanish.

### Study Abroad in Spain

Cornell and the University of Michigan cosponsor an academic year in Spain program. Students enrolled in this program spend the first four weeks before the fall semester begins in a residential college located on the campus of the University of Madrid, where they take a course in Spanish language and contemporary society and take advantage of special lectures and field trips to Madrid and Castile. This course carries three credits. In early October the program moves to Seville, where students enroll in as many regular classes at the University of Seville as their language competency and general education permit. Their academic work is supplemented by courses designed explicitly for the program by Seville faculty, as well as a seminar regularly offered by the resident director, who is chosen from the faculty of either Cornell or Michigan. The special courses normally include history of art and architecture, Spanish composition and syntax, and modern Spanish history. In Seville students live with selected families or in a few cases in *colegios mayores.* Cornell-Michigan also maintains a center in Seville, which is used by students for special seminars, tutorials, lectures, and informal gatherings.

Applicants are expected to have attained at least proficiency in Spanish prior to departure. Students are strongly encouraged to study abroad for the entire year rather than for one semester. Students interested in the study abroad program should consult with the Cornell Abroad office for further information (474 Uris Hall, 255-6224).

**Honors.** Honors in Spanish may be achieved by superior students who want to undertake guided independent reading and research in an area of their choice. Students in the senior year select a member of the Spanish faculty from either the Department of Romance Studies or the Department of Modern Languages and Linguistics to supervise their work and direct the writing of their honors essays (see Spanish 429–430).

**Fees.** Depending on the course, a small fee may be charged for copies of course work.

#### 121–122 Elementary Course

121, fall; 122, spring. 4 credits each term. Prerequisite for Spanish 122: Spanish 121. Special sections of this course are available for students with qualification in another language. Intended for beginners or students placed by examination. Students who obtain a CPT achievement score of 560 after Spanish 121–122 attain qualification and may enter the 200-level sequence; otherwise Spanish 123 is required for qualification.

Lec R 12:20 or 2:30, or F 11:15 or 1:25; drills, M–R 8, 9:05, 10:10, 11:15, 12:20, 1:25, 2:30, or 3:35. Evening prelims: fall, 7:30 p.m., Oct. 26; spring, 7:30 p.m., March 6, April 26. Z. Iquina.

A thorough grounding is given in all language skills: listening, speaking, reading, and writing. Language practice is in small groups. Lecture covers grammar, reading, and cultural information.

#### 123 Continuing Spanish

Fall, spring, or summer. 4 credits. Limited to students who have previously studied Spanish and have a CPT achievement score between 450 and 559. Satisfactory completion of Spanish 123 fulfills the qualification portion of the language requirement.

Fall: lec, M 11:15, 1:25 or 2:30; drills, T–F 8, 9:05, 10:10, 11:15, 12:20, 1:25, or 2:30. Spring: lec, M 11:15 or 1:25; drills, T–F 9:05, 10:10, 11:15, or 12:20. Evening prelims: fall, 7:30 p.m., Oct. 5, Nov. 16; spring, 7:30 p.m., Feb. 27, April 19. J. Routier-Pucci.

An all-skills course designed to prepare students for study at the 200-level.

#### 123.8 Special section of Spanish for business communication

Fall. Prerequisite: permission of instructor. T–F 1:25. J. Routier-Pucci.

Same as Spanish 123 but with emphasis on business communication.

*Note: Students placed in the 200-level courses have the option of taking language and/or literature courses; see the listing under Spanish 201 for a description of the literature course that may be taken concurrently with the 203, 204, or 213 language courses described below.*

#### 203 Intermediate Composition and Conversation

Fall, spring or summer. 3 credits. Prerequisite: qualification in Spanish (Spanish 123 or CPT score 560–649).

Fall: M W F 8, 9:05, 10:10, 11:15, 12:20, 1:25, or 2:30. Spring: M W F 8, 9:05, 10:10, 11:15, 12:20, 1:25, or 2:30. Evening prelims: fall, 7:30 p.m., Oct. 17; spring, 7:30 p.m., March 6. E. Dozier.

Conversational grammar review with special attention to the development of accurate and idiomatic oral expression. Includes readings in contemporary Spanish prose and practice in writing.

#### 204 Intermediate Composition and Conversation

Fall or spring. 3 credits. Prerequisite: Spanish 203 or permission of instructor.

Fall: M W F 9:05 (204.1: for bilinguals only), 12:20, or 1:25. Spring: M W F 8, 9:05, 10:10, 11:15, 12:20, or 1:25. M. Rice.

Practice in conversation with emphasis on improving oral and written command of Spanish. Includes treatment of specific problems in grammar, expository writing, and readings in contemporary prose.

#### 213 Intermediate Spanish for the Medical and Health Professions

Fall or Spring. 3 credits. Prerequisite: qualification in Spanish (Spanish 123 or CPT score 560–649), or permission of instructor.

Fall: M W F 9:05; Spring: M W F 1:25. M. Rice.

Conversational grammar review, with dialogues, debates, compositions and readings on health-related themes. Fulfills proficiency requirement.

#### 310 Advanced Conversation and Pronunciation

Spring. 2 credits. Prerequisite: Spanish 204 or equivalent.

M W F 9:05. Z. Iguina.

A conversation course with intensive oral practice obtained through the production of video programs. Study of the fundamental aspects of communication in the standard spoken and written Spanish, with some focus on dialectal variations. Weekly phonetic labs to improve pronunciation.

#### 366 Spanish in the United States (also Linguistics 366)

Fall. 4 credits. Prerequisite: some knowledge of Spanish. Offered alternate years. Counts toward the social science distribution requirement.

M W F 11:15. M. Suner.

Examination of major Spanish dialects in the United States from a linguistic perspective. Contrast with the standard language. Borrowing, interference, and code switching. Syntactic, morphological, and phonological characteristics. Sex-related phenomena.

#### 401 History of the Spanish Language

Spring. 4 credits. Prerequisite: Linguistics 101 and qualification in Spanish, or permission of the instructor.

M W F 11:15. Staff.

A historical analysis of the phonology, morphology, syntax, and lexicon of the Spanish language up to the seventeenth century. Selected medieval documents are read and discussed.

#### 407 Applied Linguistics: Spanish

Fall. 4 credits. Prerequisites: qualification in Spanish, or permission of instructor.

M W F 9:05. M. Suner.

Designed to equip the student or future teacher of Spanish with insights into problem areas for second-language learners by using linguistic descriptions.

#### 408 The Grammatical Structure of Spanish

Spring. 4 credits. Prerequisites: proficiency in Spanish and Linguistics 101 or permission of instructor.

Hours to be arranged. Staff.

Survey of the salient morphological and syntactic characteristics of contemporary Spanish.

**601 Hispanic Dialectology**
Fall, according to demand. 4 credits.
Hours to be arranged. Staff.
Survey of dialects of Latin America and the Caribbean.

**602 Linguistic Structure of Ibero-Romance**
Fall or spring, according to demand. 4 credits.
Hours to be arranged. Staff.
Phonological, morphological, and syntactic characteristics of the Romance languages (Catalan, Galician, Portuguese, Sephardic) and of the main dialects of the Iberian Peninsula, studied in relation to each other and to Castillian Spanish.

**[603 Contemporary Theories of Spanish Phonology**
Fall or spring, according to demand. 4 credits. Not offered 1989–90.
Hours to be arranged. Staff.
The sounds of Spanish analyzed according to Prague, structuralist, generative, and natural generative theory.]

**[604 Contemporary Theories of Spanish Grammar**
Fall or spring, according to demand. 4 credits.
Hours to be arranged. Staff.
Selected readings of contemporary Spanish linguists who exemplify different theoretical points of view.]

**[700 Seminar in Spanish Linguistics**
Fall or spring, according to demand. Variable credit.
Hours to be arranged. Staff.
Topics in synchronic and diachronic Spanish linguistics.]

## Swahili

See listings under Africana Studies and Research Center.

## Swedish

**131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Prerequisite for Swedish 132, Swedish 131 or equivalent.
T R 2:55–4:10. L. Trancik.
The aim of this course is to develop skill in reading, although some attention will be devoted to speaking and listening comprehension.

**133–134 Continuing Course**
133, fall; 134, spring. 3 credits each term. Prerequisites: for Swedish 133, Swedish 132 or equivalent; for Swedish 134, Swedish 133 or equivalent.
Hours to be arranged. L. Trancik.
Continues developing skills in spoken and written Swedish.

**201 Intermediate Swedish**
Fall. 3 credits. Prerequisites: Swedish 134 or permission of instructor.
Hours to be arranged. L. Trancik.
Emphasis on development of all skills, through writing, reading and discussion of culturally significant texts. Audiovisual material will further enhance language comprehension.

## Tagalog

**101–102 Elementary Course**
101, fall: 102, spring. 6 credits each term. Offered according to demand. Prerequisite for Tagalog 102: Tagalog 101.
Hours to be arranged. J.U. Wolff.

**201–202 Intermediate Tagalog Reading**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Tagalog 201, Tagalog 102 or equivalent; for Tagalog 202, Tagalog 201 or equivalent.
Hours to be arranged. J.U. Wolff.

**300 Linguistic Structure of Tagalog**
Fall or spring. 4 credits. Prerequisite: Linguistics 101.
Hours to be arranged. J.U. Wolff.

## Tamil

**101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Offered according to demand. Prerequisite for Tamil 102, Tamil 101 or equivalent.
Hours to be arranged. J.W. Gair.

## Thai

**101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite for Thai 102, Thai 101 or equivalent. Intended for beginners or students placed by examination.
Hours to be arranged. G. Diffloth.
A thorough grounding is given in all the language skills: listening, speaking, reading, and writing.

**201–202 Intermediate Thai Reading**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Thai 201, Thai 102; for Thai 202, Thai 201 or equivalent.
Hours to be arranged. G. Diffloth.

**203–204 Intermediate Composition and Conversation**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Thai 203, Thai 102; for Thai 204, Thai 203.
Hours to be arranged. G. Diffloth.

**301–302 Advanced Thai**
301, fall; 302, spring. 4 credits each term. Prerequisite: Thai 202 or equivalent.
Hours to be arranged. G. Diffloth.
Selected readings in Thai writings in various fields.

**303–304 Thai Literature**
303, fall; 304, spring. 4 credits each term. Prerequisite: Thai 302 or equivalent.
Hours to be arranged. G. Diffloth.
Reading of significant novels, short stories, and poetry written since 1850.

**401–402 Directed Individual Study**
401, fall; 402, spring. 4 credits each term. For advanced students or students with special problems or interests. Prerequisite: permission of instructor.
Hours to be arranged. G. Diffloth.

## Turkish

**[131–132 Introduction to the Turkish Language (also Near Eastern Studies 131–132)**
131, fall; 132, spring. 3 credits each term. This language series cannot be used to satisfy the language requirement. Offered alternate years.
Hours to be arranged. L.H. Babby.
The purpose of this course is to introduce students of linguistics to the basic morphological and syntactic structures of modern Turkish.]

## Ukrainian

**[131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Prerequisite for Ukranian 132, Ukranian 131 or equivalent. Not offered 1989–90.
Hours to be arranged. E.W. Browne.]

## Vietnamese

**101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Prerequisite for Vietnamese 102, Vietnamese 101 or equivalent. Intended for beginners or students placed by examination.
Hours to be arranged. G. Diffloth.

**201–202 Intermediate Vietnamese Reading**
201, fall; 202, spring. 3 credits each term. Prerequisites: for Vietnamese 203, Vietnamese 102: for Vietnamese 204, Vietnamese 203.
Hours to be arranged. G. Diffloth.

**203–204 Intermediate Composition and Conversation**
203, fall; 204, spring. 3 credits each term. Prerequisites: for Vietnamese 203, Vietnamese 102; for Vietnamese 204, Vietnamese 203.
Hours to be arranged. G. Diffloth.

**301–302 Advanced Vietnamese**
301, fall; 302, spring. 4 credits each term. Prerequisite: Vietnamese 202 or equivalent.
Hours to be arranged. G. Diffloth.

**401–402 Directed Individual Study**
401, fall; 402, spring. 4 credits each term. Prerequisite: permission of instructor. Intended for advanced students.
Hours to be arranged. G. Diffloth.

**403–404 Vietnamese Literature**
403, fall; 404, spring. 4 credits each term. Prerequisite: Vietnamese 302 or permission of instructor.
Hours to be arranged. G. Diffloth.
A historical survey of Vietnamese literature, including poetry, prose, and drama. Lectures in Vietnamese supplemented by selected readings in original texts. Fall: modern literature (1907–1975); spring: classical literature (beginning to late nineteenth century), including oral and nôm literature.

## Yoruba

**131–132 Elementary Course (also Africana Studies and Research Center 131–132)**
131, fall; 132, spring. 3 credits each term. Prerequisite for Yoruba 132, Yoruba 131 or equivalent.
Hours to be arranged. V. Carstens.

**133–134 Continuing Course (also Africana Studies and Research Center 133–134)**
133, fall; 134, spring. 3 credits each term. Prerequisites: for Yoruba 133, Yoruba 132 or equivalent; for Yoruba 134, Yoruba 133 or equivalent.
Hours to be arranged. V. Carstens.

# MUSIC

T. Sokol, chair; M. Hatch, director of undergraduate studies (110 Lincoln Hall, 255-5049); D. Randel, graduate faculty representative (211 Lincoln Hall, 255-5059); V. K. Agawu, W. Austin, M. Bilson, D. Borden, L. Coral, L. Cranham, M. Gilman, R. Harris-Warrick, J. Hsu, K. Husa, S. Jeneary, J. LaBarbera, J. Lindorff, S. Monosoff, E. Murray, R. Parker, D. Paterson, D. Rosen, M. Scatterday, J. Shames, S. Stucky, J. Webster, S. Davenny Wyner, N. Zaslaw

## Musical Performance and Concerts

Musical performance is an integral part of Cornell's cultural life and an essential part of its undergraduate academic programs in music. The department encourages music making through its offerings in individual instruction and through musical organizations and ensembles that are directed and trained by members of the faculty. Students from all colleges and departments of the university join with music majors in all of these ensembles:

Big Red Marching Band
Cornell Symphony Orchestra
Cornell Chamber Orchestra
Cornell Chamber Ensemble
Cornell Symphonic Band
Cornell Wind Ensemble
Small wind and brass ensembles
Collegium Musicum
Cornell Chorale
Cornell Gamelan Ensemble
Chamber music ensembles
Cornell Chorus
Cornell Glee Club
Chamber Singers
Sage Chapel Choir
Cornell Jazz Ensembles

Information about requirements, rehearsal hours, and conditions for academic credit can be found in the following listings for the Department of Music. Announcements of auditions are posted during registration each fall term and, where appropriate, each spring term as well.

The Department of Music and the Faculty Committee on Music sponsor more than one hundred formal and informal concerts each year by Cornell's ensembles, faculty, and students and by distinguished visiting artists. A special feature is the annual Cornell Festival of Contemporary Music. The great majority of concerts are free and open to the public. Lectures and concerts are listed in special monthly posters and the usual campus media.

## Nonmajors

In addition to its performing, instructional, and concert activities, the department offers numerous courses for nonmajors, many of which carry no prerequisites and presuppose no previous formal training in music. Consult the following course listings, and for further information apply to the department office, 104 Lincoln Hall (255-4097), or to the director of undergraduate studies, Professor Martin Hatch.

## The Major

Two options are available to the student planning to major in music. Each carries the study of music to an advanced level through the integration of performance, music theory, and music history. Option I is a general course, not necessarily oriented toward eventual graduate or professional work in music. Option II is a more specialized and concentrated program, suitable for students who want to prepare for graduate or professional work in music.

All students contemplating a major in music under either option should arrange for placement examinations and advising in the department *as early as possible, usually during the freshman orientation period.* Information is available from the director of undergraduate studies, Professor Martin Hatch, 110 Lincoln Hall (255-5049), or from the chair, Professor Thomas Sokol, 106 Lincoln Hall (255-3671 ). All students are expected to have chosen an adviser from among the department faculty at the time of application for major status.

**Option I** presupposes some musical background before entering Cornell. Prerequisites for admission to the major are the satisfactory completion of Music 152, at the latest by the end of the sophomore year (the freshman year is preferable), with a final grade of C or better, including an average grade of C or better in all the musicianship components of Music 152 and failure in none of them; and the passing of a simple piano examination (details are available from the department office). Students must apply to the department for formal acceptance as a music major.

The requirements for the Bachelor of Arts degree with a major in music under Option I comprise the following:

1) in music theory:
Music 251–252, 351, and 352.

2) in music history:
sixteen credits in courses numbered at the 300 level or above listed under Music History. At least three of these courses must be drawn from the four-course sequence Music 381–384.

3) in performance:
four semesters of participation in a musical organization or ensemble sponsored by the Department of Music.

**Option II** presupposes considerable musical study before entering Cornell. Prerequisites for admission into the Option II program are previous acceptance as an Option I major and satisfactory completion of Music 252, normally by the end of the sophomore year. Students must apply to the department for formal acceptance as an Option II major. An Option II major concentrates in one of the three areas listed below. For Option II in performance, exceptional promise must be demonstrated, in part by a successful solo recital before the end of the sophomore year.

The requirements for the Bachelor of Arts degree with a major in music under Option II are:

1) completion of all the requirements for Option I, except as noted below, and

2) in addition:

a) in performance:

(1) the requirement for four semesters of participation in a musical organization or ensemble is waived (but such majors are expected to participate actively in chamber and other ensembles sponsored by the department);

(2) sixteen credits in individual instruction in the student's major instrument, or voice, earned by taking Music 391–392 throughout the junior and senior years

b) in theory and composition or in history:

(1) for two of the four semesters of participation in a musical organization or ensemble, Music 462 or 463 may be substituted;

(2) twelve additional credits in this area of concentration at the 300 level or above, of which either four may be earned in Music 301 or 302 when taken once for four credits, or eight may be earned in Music 401–402.

**Honors.** The honors program in music is intended to provide special distinction for the department's ablest undergraduate majors. To become a candidate for honors in music, a student must be invited by the faculty at the beginning of the second semester of the junior year. As soon as possible thereafter, the student will form a committee of three faculty members to guide and evaluate the honors work. In the senior year the candidate will enroll in Music 401–402, with the chair of the honors committee as instructor. Candidates will be encouraged to formulate programs that will allow them to demonstrate their total musical ability. The level of honors conferred will be based on the whole range of the independent work in this program, of which a major part will culminate in an honors thesis, composition, or recital to be presented not later than April 1 of the senior year, and a comprehensive examination to be held not later than May 1.

## Distribution Requirement

The distribution requirement in the expressive arts may be satisfied with 6 credits in music, except freshman writing seminars. A maximum of 4 credits in Music 321–322 and a maximum of 3 credits in Music 331 through 338 and 441 through 450 may be used to satisfy this requirement.

## Facilities

**Music Library.** The Music Library, in Lincoln Hall, has an excellent collection of standard research tools. Its holdings consist of approximately ninety thousand books, periodicals, and scores and forty thousand recordings. Particularly noteworthy are the collections of opera from all periods; twentieth-century scores and recordings; a large microfilm collection of Renaissance sources, both theoretical and musical; and a collection of eighteenth-century chamber music. In addition, the Department of Rare Books, in Olin Library, houses a collection of early printed books on music and musical manuscripts.

**Concert Halls.** The Department of Music sponsors more than one hundred concerts annually. Cornell's principal concert halls are Bailey Hall Auditorium (about 2,000), Alice Statler Auditorium (about 900), Sage Chapel (about 800) and Barnes Hall Auditorium (about 280).

**Rehearsal Spaces.** The orchestras and bands rehearse in Bailey Hall, Barnes Hall, and Barton Hall; the Jazz Ensembles, Gamelan, and Chamber Ensembles rehearse in Lincoln Hall; and the choral ensembles are quartered in Sage Chapel. Eleven practice studios in Lincoln Hall are available for individual practice by pianists, vocalists, and instumentalists.

**Musical Instruments.** Twenty-two grand pianos and eight upright or studio pianos are housed in Cornell's offices, classrooms, rehearsal spaces, and concert halls. In addition our Center for Keyboard Studies includes a 1953 Bösendorfer Imperial Concert Grand Piano; an 1841 Ignaz Bösendorfer fortepiano (seven octaves); a copy of a 1784 Anton Walter fortepiano; and a copy of a 1784 Johann Stein fortepiano. Three harpsichords (Dowd, Hubbard, and Challis) and a clavichord are available for practice or concerts. A large 1940 Aeolian Skinner Organ is located in Sage Chapel and there is a Hellmuth Wolff tracker organ in Anabel Taylor Hall Chapel. A self-contained tracker organ by Schlicker and a 1989 portative organ by Derwood Crocker are housed in Barnes Hall Auditorium. The Department of Music also owns a quartet of stringed instruments in eighteenth-century proportions, with bows.

**Digital/Electronic Equipment.** A Macintosh-computer-based MIDI studio is available for independent studio work and live performance. The instruments include a Yamaha KX88 MIDI Controller Keyboard, a Yamaha TX802 FM Synthesizer, and a Casio FZ 10M Sampler. In addition, there are two MIDI work stations with additional instruments.

## Freshman Seminars

**111 Sound, Sense, and Ideas**
Spring. 3 credits. Each section limited to 20 students. No prerequisites; no previous training in music required. May not be counted for the distribution requirement in the expressive arts.
M W F 11:15. E. Hudson
Ways of listening, thinking, talking, and writing about music. Non-Western and popular music are considered, as well as Western classical music. Student performances in class are welcome.

**115 Popular Musics Today**
Fall. 3 credits. Each section limited to 20 students. No prerequisites; no previous training in music required. May not be counted for the distribution requirement in the expressive arts.
M W F 11:15. M. Hatch.
Musical and social aspects of diverse popular repertories found in selected regions of Asia, Africa, and the Americas today. Students will be asked to attend and write about several local performances of music during the semester. Readings and other listening and writing assignments will focus on questions of the definition of terms for analysis and description of music today.

**117 Popular Music since 1950**
Fall or spring. 3 credits. Each section limited to 20 students. No prerequisites; no previous training in music required. May not be counted for the distribution requirement in the expressive arts.
M W F 10:10. R. Will. T R (spring 1990) 1:25. D. Brackett.
Readings will focus on the musical, social, and historical aspects of popular music since 1950. Additional assignments will include listening to recordings and attending concerts. Students will be given the opportunity to write about current popular music with which they are already familiar.

## Introductory Courses

**101 The Art of Music**
Fall. 3 credits.
T R 11:15; 1-hour disc to be arranged. W. Austin and staff.
Explorations designed to speed up the continuing, unending development of various independent tastes. Each student chooses individually what to study from diverse styles of music and how far to study at least two contrasting styles through recordings, through singing and playing, through reading and writing; instructors help refine these choices through the term. Everyone studies a few assigned works to facilitate exchanging ideas with concrete references: in 1989 these are the 48 Preludes and some of the Fugues from Bach's Well-Tempered Clavier. Other things—from Vedic chant to songs of Bobby McFerrin—can be related to Bach with respect to qualities of sound, intervals of pitch, timing, and functional contexts. Orchestral and vocal works of Bach make likely optional contexts for the keyboard pieces that constitute the common center.

**[103 Introduction to the Musics of the World**
Fall. 3 credits. No previous training in music required. Not offered 1989-90.
T R 11:15; 1-hour disc to be arranged. M. Hatch.
A survey of folk, popular, and art music in several regions of the world. Topics include pitch, scale, rhythm, meter, timbre, and form in instrumental and vocal music. Recordings are the main material for study; labs present opportunities to begin performance on instruments from the regions covered.]

**105–106 Introduction to Music Theory**
105, fall or summer; 106, spring. 3 credits each term. Some familiarity with music is desirable. Prerequisite for Music 106: 105 with grade of B– or better. Music 106 is limited to 50 students.
Fall: M W 9:05–10:10 plus 2 hrs to be arranged. Spring: M W F 9:05 plus 1 hr to be arranged. D. Randel, fall; D. R. M. Paterson, spring.
An elementary, self-contained introduction to music theory emphasizing fundamental musical techniques, theoretical concepts, and their application. Music 105: notation, pitch, meter; intervals, scales, triads; basic concepts of tonality; extensive listening to music in various styles; analysis of representative works of Bach, Mozart, Beethoven, and Debussy. Music 106: systematic introduction to writing tonal harmony and melody; ear training.

**108 Bach to Debussy**
Spring. 3 credits. Prerequisite: Music 105 or permission of instructor.
M W 11:15; 1-hour disc to be arranged. N. Zaslaw.
A chronological survey of major works in the Western concert repertory in all genres, from works of Bach and Handel that embody the newly consolidated language of tonality to works of Mahler and Debussy that signal the beginning of new strategies for many composers of the twentieth century.

**120 Learning Music through Digital Technology**
Fall or spring. 3 credits. Enrollment limited. Prerequisite: permission of instructor.
M W F 2:30. D. Borden.
This course uses selected commercially available technological resources to produce live music. The student is expected to master the Macintosh computer, several music software programs, and several synthesizers using MIDI. Each student must learn to read music if he or she has not already done so. The course will also cover the rudimentary procedures for making a good-quality tape recording. The final is a live concert presentation of the student's final project.

**[173 Music and Poetry from Dowland to Dylan**
Spring. 3 credits. Not offered 1989–90.
M W 1:25–2:15. R. Parker
The course will consider a broad range of musical responses to poetry, with examples from each of the last four centuries. There will be an emphasis on class discussion and encouragement of live performances within class.]

## Music Theory

**151–152 Elementary Tonal Theory**
151, fall; 152, spring. 5 credits each term. Prerequisite for Music 151: knowledge of the rudiments of music and some ability to perform demonstrated through proficiency tests given on the first two days of the term (registration is provisional, contingent on passing this test). Prerequisite for Music 152: 151 or equivalent. Intended for students expecting to major in music and other qualified students. Required for admission to the music major. All students intending to major in music, especially those intending to elect Option II should if possible enroll in Music 151–152 during the freshman year.
M W F 11:15; 2 discs to be arranged. J. Lindorff and staff.
Detailed study of the fundamental elements of tonal music; rhythm, scales, intervals, triads; melodic movement, two-part counterpoint, harmonic progression in the chorale style of J. S. Bach; and introduction to analysis of small forms. Drill in aural discrimination, sight singing, keyboard harmony, and elementary figured bass; rhythmic, melodic, and harmonic dictation; and score reading.

**220 Learning Counterpoint through Digital Technology**
220, fall. 3 credits each term. Enrollment limited. Prerequisite: 151/152 and/or permission of instructor.
T R 1:25–2:40. D. Borden.
This course is a study of traditional contrapuntal techniques from the fourteenth century to the present, with emphasis on the structures used by J. S. Bach. Synthesizers, samplers, MIDI, and music software will be covered.

**245–246 Introduction to the Gamelan**
245, fall; 246, spring. 2 credits each term. No previous knowledge of musical notation or performance experience necessary. Music 245 is not a prerequisite to 246.
M W 1:30–3 or R 3:30–5. M. Hatch.
Concentrated instruction in the repertories and practices of Indonesian gamelan traditions. Related aspects of culture—drama, dance, literature, and oral poetry—will be studied in their influence on musical practices. Research into performance styles and the history of the instruments. This sequence concentrates on instruction in elementary techniques of performance on the gamelan. The student is required to submit a short paper showing research on the history, theory, or practice of Indonesian music. Music 445–446 is a one-credit course for beginners in gamelan that meets at the same times as 245–246 and covers only instruction in elementary gamelan performance techniques.

**251–252 Intermediate Tonal Theory**
251, fall; 252, spring. 5 credits each term. Prerequisite for Music 251: 152 or the equivalent or a suitable level of performance on a proficiency test given by the department during orientation each fall term. Prerequisite for Music 252: 251.
M W F 10:10; 2 discs to be arranged.
V. K. Agawu and staff.
Continuation of the study of harmony by composition and analysis, including seventh chords, secondary dominants, and chromatic harmony. Students are expected to write several short pieces in eighteenth- and nineteenth-century styles and forms, such as two-part inventions and minuets scored for string quartet. Continuation of analysis of forms, with emphasis on large forms, e.g., sonata form. Ear training, keyboard harmony, figured bass, sight singing, dictation, and score reading.

**351 Advanced Tonal Theory**
Fall. 4 credits. Prerequisite: Music 252 or permission of instructor.
M W F 11:15. W. Austin.
Inventions, chromatic harmony, analysis of larger forms and nineteenth-century music, ear training, score reading, and advanced keyboard studies, including figured bass. Students probe questions about the meaning of "theory" and "analysis" in music and in other realms of study. They question and refine their own usages of the word "tonal" in relation to older and newer music, while returning often to short pieces of Chopin with which to consider applications of tonal theory in practice.

**352 Materials of Twentieth-Century Music**
Spring. 4 credits. Prerequisite: Music 351.
M W F 11:15. E. Murray.
Introduction to some techniques of composers from 1900 to 1950, including expanded tonal resources, atonality, and new approaches to form and rhythm. Analysis of representative smaller works by Bartok, Hindemith, Schoenberg, Stravinsky, Webern, and some American composers. Writing assignments in various styles.

**456 Orchestration**
Fall. 4 credits. Prerequisite: Music 252 or permission of instructor.
T 10:10–12:05. K. Husa.
A study of the instruments of the orchestra and their use in representative works from 1700 to the present. Scoring for various instrumental groups, including large orchestra. Students will occasionally attend rehearsals of Cornell musical organizations and ensembles.

**462 Orchestral Conducting**
Spring. 2 credits. Prerequisite: Music 352.
T 10:10–12:05. K. Husa.
The fundamentals of score reading and conducting technique; study of orchestral scores from baroque, classical, romantic, and contemporary periods. Occasionally the class will visit rehearsals of Cornell musical organizations.

**[463 Choral Conducting**
Fall. 2 credits. Prerequisite: Music 252 or permission of instructor. Not offered 1989–90.
M 1:25–2:40. T. Sokol.]

## Music History

**217 The Organ and Its Literature**
Fall. 3 credits. Prerequisite: Music 105 or permission of instructor.
M W F 11:15. D. R. M. Paterson.
An analytical survey of the history of the organ, including its design and construction and its most significant repertoire.

**222 Topics in Jazz History**
Spring. 3 credits. Enrollment limited. Prerequisite: permission of instructor.
TR 11:15; one disc to be arranged.
M. Hatch.
Lectures will introduce various jazz styles and techniques from around 1900 to the 1970s. Sections will present progressive exercises in analysis of fundamental aspects of jazz, including rhythm, meter, melody, harmony, timbre, and form. Focus: the recorded anthology *Smithsonian Collection of Classical Jazz.*

**271 Monteverdi and the Birth of the Baroque**
Fall. 3 credits. Prerequisite: any three-credit music course or permission of instructor.
M W 10:10. N. Zaslaw.
Using as its focal point the career and music of Claudio Monteverdi (1567–1643), the course will examine the changes music underwent between the second half of the 16th century and the first half of the next century. Monteverdi's operas *Orpheus* and *The Coronation of Poppea* as well as representative canzonettas, madrigals, and church works will be studied alongside works of his contemporaries. Attention will also be paid to the social, political, and cultural contexts of the music discussed.

**[272 Music and the Dance (also Theatre Arts 272)**
Spring. 3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1989–90.
T R 9:05. R. Harris-Warrick.
This course will explore selected topics in the interrelations between music and dance in the Western tradition. Some of the areas to be examined include the influence of dance movement on musical composition, composer-choreographer relationships, and a comparison of music composed for dancing with dance music composed for listening. Examples will be drawn from the Renaissance, the baroque period, and the modern era. Students will be asked to pursue an independent project.]

**274 Opera**
Fall. 3 credits.
M W F 12:20–1:10. D. Rosen
An introduction to major works of the operatic repertory, with discussion of texts and theatrical performances as well as music. Video recordings will be an integral part of the course; optional trips to live performances will be scheduled where possible.

**275 The Choral Tradition**
Spring. 3 credits. Prerequisite: any three-credit music course or permission of instructor.
M W F 10:10. R. Harris-Warrick
A survey of representative works, both sacred and secular, in the Western choral tradition from the Middle Ages to the twentieth century. Class will include discussion of performances as well as historical and stylistic issues, and will be integrated with local concert offerings whenever possible.

**[277 Baroque Instrumental Music**
Spring. 3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1989–90.
M W F 12:20. N. Zaslaw.
Topics covered will include the rise of purely instrumental music; Renaissance string bands; the English virginalists and viol consorts; the Italian violin school; the German organ school; lute and guitar music; the invention of the baroque winds, orchestra, and fortepiano; and the sonatas, concertos, and suites of Bach, Corelli, Couperin, Handel, Purcell, Rameau, Telemann, and Vivaldi.]

**[281 Music of the Baroque Period**
Fall or spring. 3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1989–90.
T R 9:05. R. Harris-Warrick.]

**[282 Music of the Classical Period**
3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1989–90.
M W 1:25. J. Webster.]

**[283 Music of the Romantic Era**
3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1989–90.]

**[285 Music in the Middle Ages**
Fall. 3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1989–90.
M W F 10:10. D. Randel.]

**[286 Music in the Renaissance**
Spring. 3 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1989–90.
M W F 10:10. D. Randel.]

**[287 Mozart**
Fall. Prerequisite: any three-credit music course or permission of instructor. 3 credits. Not offered 1989–90.
T R 10:10–11:25. N. Zaslaw.
A chronological tour of the life and works of Wolfgang Amadeus Mozart by means of original documents, scores, recordings, and live performances. As a postlude, an evaluation of Peter Shaffer's play and movie *Amadeus* will be undertaken.]

**[374 Music and Drama**
Fall. 4 credits. Prerequisite: any three-credit music course or proficiency in German or Italian. Not offered 1989–90.
T 1:25–4:25. A. Groos, R. Parker.
A team-taught study of major works of the German and Italian repertory between 1780 and 1920. Among the issues to be considered will be source-libretto and words-music relationships, reception, and criticism. Works to be studied will include operas by Mozart, Verdi, Wagner, Puccini, and Strauss.]

**[379 The Study of Non-Western Musics**
4 credits. Prerequisite: any three-credit music course or permission of instructor. Not offered 1989–90.
Staff.]

**Music History Seminars for Majors and Qualified Non-Majors**
Prerequisite: Music 152 or permission of instructor. Intended primarily for music majors, these seminars will investigate selected topics and repertories from each period in some detail. Each seminar will include listenings, readings, oral and written papers, and analyses.

**381 Music in Western Europe to 1700**
Fall. 4 credits.
T R 8:40. R. Harris-Warrick.

**382 Music of the Eighteenth Century**
Spring. 4 credits.
T R 8:40. J. Webster.

**[383 Music of the Nineteenth Century**
Fall. 4 credits.
Not offered 1989–90.]

**[384 Music of the Twentieth Century**
Spring. 4 credits.
Not offered 1989–90.]

**398–399 Independent Study in Music History**
398, fall; 399, spring. 4 credits. Prerequisite: Music 152 and permission of instructor.
Staff.
Advanced study of various topics in music history. Students enrolling in Music 398–399 participate in, but do not register for, an approved 200-level music history course and, in addition, pursue independent research and writing projects.

## Independent Study

**301–302 Independent Study in Music**
301, fall; 302, spring. Credit to be arranged. Prerequisite: departmental approval. Presupposes experience in the proposed area of study.
Hours to be arranged. Staff.

## Honors Program

**401–402 Honors in Music**
401, fall; 402, spring. 4 credits each term. Limited to honors candidates in their senior year.
Staff.

## Musical Performance

**321–322 Individual Instruction in Voice, Organ, Harpsichord, Piano, Strings, Woodwinds, and Brass**
The number of places is strictly limited. Prerequisite: successful audition with the instructor. Students may register only with the prior permission of the instructor. Students may register for this course in successive years. For information, consult the music department office, Lincoln Hall.

Students may sign up for individual instruction in music performance, *with permission of the instructor only*, following a successful audition. *Lessons without credit* (Music 321–322): The fee for one half-hour lesson weekly, *without credit* during the term is $90. For a one-hour lesson or two half-hour lessons *without credit* the fee is $180. Practice-room fees for six hours weekly are $30 *per term* for a room with a piano; $10 for a room without a piano; $50 for use of a pipe organ.

*Lessons for credit* (Music 321–322): Advanced students, at the sole discretion of the instructor, may earn 2 credits each term for a one-hour lesson (or two half-hour lessons) weekly accompanied by an appropriate practice schedule. For every 4 credits earned in Music 321–322, the student must have earned, or currently be earning, at least 3 credits in music courses (not including Freshman Seminars, Music 321–322, 331 through 338, 391–392, or 441 through 450); these 3 credits must be earned prior to, or simultaneously with, the first 2 credits in 321–322. The fee for a one-hour lesson (or two half-hour lessons) weekly, *for credit*, during the term is $135. Practice-room fees for twelve hours weekly are $40 *per term* for a room with a piano; $20 for a room without a piano; $75 for use of a pipe organ.

Fees are non-refundable once lessons begin, *even if the course is subsequently dropped.*

Music majors receive a scholarship equal to the lesson fee listed above. Members of department-sponsored performance ensembles and organizations may, with permission of the director of the organization, receive a scholarship of up to one-half the Cornell fee for the type of lessons chosen during the term. (These scholarships are intended for lessons in the student's primary performing medium.)

Under certain conditions students may earn credit for lessons taken outside Cornell (Music 321h–322h). Arrangements must be made through the Department of Music office. Lesson-fee scholarships apply, when awarded, in the same dollar amounts as those for lessons taken at Cornell.

**321a–322a Individual Instruction in Voice**
321a, fall; 322a, spring. 2 credits each term.
Hours to be arranged.
S. Davenny Wyner.
The Vocal Coaching Program (non-credit) is administered through individual choral ensembles, coordinated by Ms. Gilman.

**321b–322b Individual Instruction in Organ**
321b, fall; 322b, spring. 2 credits each term.
Hours to be arranged. D. R. M. Paterson.

**321c–322c Individual Instruction in Piano**
321c fall; 322c, spring. 1–2 credits each term.
Hours to be arranged. M. Bilson
J. Shames, and staff.

**321d–322d Individual Instruction in Harpsichord**
321d, fall; 322d, spring. 2 credits each term.
Hours to be arranged. J. Lindorff.

**321e–322e Individual Instruction in Violin or Viola**
321e, fall; 322e, spring. 2 credits each term.
Hours to be arranged. S. Monosoff.

**321f–322f Individual Instruction in Cello or Viola da Gamba**
321f, fall; 322f, spring. 2 credits each term.
Hours to be arranged. J. Hsu.

**321g–322g Individual Instruction in Brass**
321g fall; 322g, spring. 2 credits each term.
Hours to be arranged. M. Scatterday.

**321h–322h Individual Instruction outside Cornell**
321h, fall; 322h, spring. 2 credits each term.
Staff sponsored.
All the standard orchestral and band instruments and guitar may, under certain conditions, be studied for credit with outside teachers. This course is available primarily for the study of instruments not taught at Cornell and for the use of those who for reasons of space cannot be admitted to Music 321a–g or 322a–g. Prior approval by a member of the faculty in the department is required. For information and a list of approved teachers, consult the department office, 104 Lincoln Hall.

**391–392 Advanced Individual Instruction**
391, fall; 392, spring. 4 credits each term. Open only to juniors and seniors majoring in music under Option II with concentration in performance and to graduate students. Option II majors whose lessons must be taken outside Cornell may apply to the department for financial assistance toward the cost of lessons; $135 per semester will normally be awarded to such students and a larger amount may be awarded under certain circumstances. Music 391 is not a prerequisite to 392.
Hours to be arranged. Staff.

## Musical Organizations and Ensembles

Students may participate in musical organizations and ensembles throughout the year. Permission of the instructor is required, and admission is by audition only, except that the Sage Chapel Choir and the Cornell Gamelan Ensemble are open to all students without prior audition. Registration is permitted in two of these courses simultaneously and students may register in successive years, but no student may earn more than 6 credits in these courses. Membership in these musical organizations and ensembles is also open to qualified students who wish to participate without earning credit.

**331–332 Sage Chapel Choir**
331, fall or summer; 332, spring. 1 credit. No audition for admission.
M 7–8:30 p.m., R 7–8:30 p.m., Sunday 9:30 a.m. D. R. M. Paterson.

**333–334 Cornell Chorus or Glee Club**
333, fall; 334, spring. 1 credit. Prerequisite: permission of instructor.
Chorus: T 7:15–9:15 p.m., plus 2 hours to be arranged. Glee Club: W 7:15–9:15 p.m., plus 2 hours to be arranged. S. Davenny Wyner or T. Sokol.

**335–336 Cornell Orchestra**
335, fall; 336, spring. 1 credit. Prerequisite: permission of instructor.
Rehearsals for the Cornell Symphony Orchestra: W 7:30–10 p.m. E. Murray.

**337–338 University Bands**
337, fall; 338, spring. 1 credit.
Symphonic band: fall or spring, T and W 4:30–5:45. Wind ensemble: spring, M 7:30–9:30 p.m. and R 4:30–5:45.
M. Scatterday.
Students interested in participating in the Big Red Marching Band should consult Mr. Jeneary. For information about the Jazz Ensembles, please speak with Mr. LaBarbera.

**421–422 Cornell Chamber Ensemble**
1 credit. Prerequisite: permission of instructor.
R 5–6:30. J. Hsu.
Study and performance of the chamber symphonies of Haydn, Mozart, and their contemporaries. For strings, woodwinds, and horns.

**441–442 Chamber Music Ensemble**
441, fall; 442, spring. 1 credit. Prerequisite: permission of instructor.
J. Hsu, fall; S. Monosoff, spring.
Study and performance of chamber music literature: strings, winds, piano; duos, trios, quartets, etc. Emphasis on interpretation.

**443 Chamber Singers**
Fall. 1 credit. Prerequisite: permission of instructor.
M 4:45–6:45. S. Davenny Wyner.
Study and performance of selected vocal chamber music.

**444 Chorale**
Spring. 1 credit. Prerequisite: permission of instructor.
F 4:30–6:30. T. Sokol.
Study and performance of selected vocal chamber music.

**445–446 Performance on the Gamelan**
445, fall; 446, spring. 1 credit each term.
M 1:30–3 or R 3:30–5 (beginners); Cornell Gamelan Ensemble (advanced), R 7:30–10 p.m. M. Hatch.
Basic performance techniques and theories of central Javanese gamelan. Tape recordings or gamelan and elementary cypher notation are provided. Some instruction by Indonesian musicians is offered in most years.

**[447–448 Collegium Musicum**
1 credit. Prerequisite: permission of instructor. Not offered 1989–90.
M 5–6: 30. J. Hsu.]

## Graduate Courses

Open to qualified undergraduates with permission of instructor.

**601 Introduction to Bibliography and Research**
Fall. 4 credits.
M 1:30–4:25. L. Coral.
This course explores the nature of the discipline and introduces the many types of bibliographic tools needed to pursue research in music.

**602 Analytical Technique**
Spring. 4 credits. Not offered 1988–89.
W 12:20–4. E. Murray.
A critical survey of various analyical methods in current use. Frequent analytical assignments and class presentations.

**[603 Editorial Practice**
Spring. 4 credits. Not offered 1989–90.
F 10:10–12:05. R. Harris-Warrick.
Fundamental techniques of source study and filiation, the nature of a musical text, and the editorial process. Opportunity to make a critical edition based on original sources.]

**[604 Ethnomusicology: Areas of Study and Methods of Analysis**
Spring. 4 credits. Not offered 1989–90. Open to graduate students in anthropology, linguistics, psychology, sociology, and other cognate fields with permission of instructor. Major aspects of research into musical cultures of the world. Problems, theories, and methods, especially those affecting analytical terminology, transcription and analysis of sound events, and fieldwork.]

**[622 Historical Performance Practicum**
Spring. 4 credits. Not offered 1989–90.
R 2:30–4:25. N. Zaslaw, M. Bilson.
The study of eighteenth-century instrumental manuals and its application to modern performance.]

**653 Topics in Tonal Theory and Analysis**
Fall. 4 credits.
R 1:30–4:25. V. K. Agawu.
Topic for spring 1990–TBA.

**[654 Topics in Post-tonal Theory and Analysis**
Spring. 4 credits. Not offered 1989–90.
M 1:25–4:30. E. Murray.
Various approaches to the post-tonal repertory will be explored, including set theory, voice leading, and rhythmic factors. Music studied will include works by Berg, Webern, Stravinsky, Dallapiccola, Boulez, and others.]

**[656 Modern Orchestration**
Fall. 4 credits. Not offered 1989–90.
T 10:10–12:05. K. Husa.]

**657–658 Composition**
657, fall; 658, spring. 4 credits each term.
TBA. S. Stucky.

**659–660 Composition**
659, fall; 660, spring. 4 credits each term.
T 2:30–4:25. K. Husa and staff.

**[662 Orchestral Conducting**
Spring. 4 credits. Not offered 1989–90.
T 10:10–12:05. K. Husa.]

**[668 Shostakovich's Twenty-four Preludes and Fugues**
Spring. 4 credits. Not offered 1989–90.
T 2:30. Staff.
Study of twenty-four short pieces in many contexts: theoretical, historical, and practical. This study needs some ability to read either Russian (with a dictionary) or music (finding on some instrument a melody written in the treble clef).]

**[669–670 Debussy to the Present**
[669, fall]; 670, spring. 4 credits each term. Not offered 1989–90.
T R 11:15. Staff.
Attendance in Music 369 provides a common foundation for studies on a graduate level, which may be interdisciplinary—treating bird song, color perception, French poetry, James Joyce, Francis of Assisi, etc.—or more technically musical.]

**677 Mozart: His Life, Works, and Times (also German 757)**
Fall. 4 credits.
T 2:30–5. N. Zaslaw.
After an introduction to the current state of Mozart studies, students will pursue individual research projects while the seminar undertakes a group investigation of the manuscript and printed sources for, and historical context of, Mozart's Symphony in D major, K. 297.

**[680 Topics in Ethnomusicology**
Spring. 4 credits. Not offered 1989–90.
W 2:30–4:25. M. Hatch.
Advanced readings in ethnomusicology, with attention focused on a particular topic.]

**[681 Seminar in Medieval Music**
Fall. 4 credits. Not offered 1989–90.
D. Randel.]

**[683–684 Seminar in Renaissance Music**
683, fall; 684, spring. 4 credits each term. Not offered 1989–90.
D. Randel.]

**[686 Seminar in Baroque Music**
Spring. 4 credits. Not offered 1989–90.
T 2:30–4:25. N. Zaslaw.]

**[687 Seminar in Classical Music**
Fall. 4 credits. Not offered 1989–90.
T 2:30–4:25. J. Webster.]

**688 Seminar in Classical Music**
Spring. 4 credits.
W 1:30–4:25. J. Webster.
Topic for spring 1990: the operas of Mozart, with particular attention to interpretation based on close analysis.

**689–[690] Seminar in Music of the Romantic Era**
Fall. 4 credits. 690 Not offered 1989–90.
R 1:25–4. V. K. Agawu.
Topic: music of Mahler.

**[691–692 Performance Practice**
691, fall; 692, spring. 4 credits each term. Not offered 1989–90.
W 2:30. N. Zaslaw.
The rise of the orchestra in the late seventeenth and early eighteenth centuries.]

**697–698 Independent Study and Research**
697, fall; 698, spring. Credit to be arranged.
Hours to be arranged. Staff.

**[699 Musical Notation**
Fall. 4 credits. Not offered 1989–90.
N. Zaslaw, K. Husa, J. Hsu, M. Hatch.]

**[785–786 History of Music Theory**
785, fall; 786, spring. 4 credits each term. Not offered 1989–90.
J. Webster.]

**[788 History and Criticism**
Spring. 4 credits. Not offered 1989–90.
T 2:30. D. Randel.
The nature of history and criticism in musicology in the light of current thought in other disciplines such as literary criticism, history, and philosophy.]

**789 Liturgical Chant in the West**
Fall. 4 credits.
F 10:10–12:05. D. Randel.
The formation of the major Western liturgical repertories, their interrelation, and their early history.

# NEAR EASTERN STUDIES

R. Brann, chair; S. Gilman (director of Program of Jewish Studies), S. Katz, R. Kevin Lacey, S. Mehrez, D. I. Owen, L. Peirce, D. Powers (graduate faculty representative), G. Rendsburg (director of undergraduate studies), N. Scharf, N. Sher, M. Zamir

Joint faculty: M. Bernal, S. Gilman, B. Lewis (A. D. White Professor-at-Large)

## The Department

The Department of Near Eastern Studies (360 Rockefeller Hall, 255-6275) offers courses in the archaeology, civilization, history, languages, and literatures of the Near East. Students are encouraged to take an interdisciplinary approach to the cultures of this region that has had such an important impact on the development of our own civilization and that plays so vital a role in today's world community. The department's course offerings treat the Near East from ancient times to the modern period and emphasize methods of historical and literary analysis. Near Eastern Studies also provides the basic courses in the Program of Jewish Studies.

**Faculty exchange with the Dayan Center, Tel Aviv University.** The Department of Near Eastern Studies has established a faculty exchange program with the Dayan Center for Middle Eastern and African Studies at Tel Aviv University. Since spring semester 1982, the department has had a professor visiting from the center to teach a course or courses on the modern Middle East in his or her area of specialty. Courses have included a general survey on the history of the modern Middle East and seminars on Egypt, Lebanon, Saudi Arabia, and the Arab-Israeli conflict.

## Distribution Requirements

Any two Near Eastern studies history or archaeology courses at the 200 or 300 level that form a reasonable sequence or combination satisfy the distribution requirement in the social sciences or history. Any two Near Eastern studies civilization or literature courses at the 200 or 300 level that form a reasonable sequence or combination satisfy the distribution requirement in the humanities. NES 197 or NES 198 plus any other Near Eastern studies course will constitute a sequence to fulfill the distribution requirement in either social sciences or humanities, depending on the second course. All 200- and 300-level language courses may fulfill the humanities requirement.

## The Major

The student who majors in Near Eastern Studies may concentrate in one of the following five areas:

1. Near Eastern languages and literatures
2. Ancient Near Eastern studies
3. Judaic studies
4. Islamic studies
5. Contemporary Near Eastern studies

The precise sequence and combination of courses chosen to fulfill the major is selected in consultation with the adviser; all majors, however, must satisfy the following requirements (S-U options not allowed):

1) Qualification in one of the languages offered by the department
2) Eight NES courses (which may include intermediate and advanced language courses), including NES 197 or NES 198
3) Four courses in subjects related to the student's concentration, which may, in some cases, be taken outside the department

Prospective majors should discuss their plans with the director of undergraduate studies before formally enrolling in the department. To qualify as a major, a cumulative grade average of C or better is required.

**Study abroad.** There are many opportunities for study in the Near East. Cornell has agreements with Ben-Gurion University, the University of Haifa, Hebrew University, Tel Aviv University, and the Technion in Israel, and with the American University in Cairo, that will permit students to enroll for a year or in some cases for a semester. Study in regular university courses at Haifa, Hebrew University, and Tel Aviv University will be permitted for students with adequate language preparation; otherwise, students enroll in the Overseas Study Program of the institution. Beginning in 1988–89, students attending the Technion may take course work in English in aeronautical engineering and in agricultural engineering in special programs in those fields but must take all course work in Hebrew in all other fields. Courses at the American University in Cairo are taught in English. Students planning to study overseas during their junior year should develop language skills during their freshman and sophomore years.

**Honors.** Candidates for the degree of Bachelor of Arts with honors in Near Eastern languages and literatures, Ancient Near Eastern studies, Judaic studies, or Islamic studies must fulfill the requirements of the appropriate major study and enroll in the honors course, NES 499, in the first semester of their senior year. For admission to the honors program, candidates must have a cumulative average of B+ or better and have demonstrated superior performance in Near Eastern studies courses. After consulting their major adviser, candidates should submit an outline of their proposed honors work to the department during the second semester of their junior year.

## Program of Jewish Studies

The field of Jewish studies encompasses a broad spectrum of disciplines that include civilization, language, literature, philology, and history. The Department of Near Eastern Studies offers students the opportunity to take a wide variety of courses in Jewish studies whose subjects are not represented in this department. Students interested in planning a program in Jewish studies should consult the Department of Near Eastern Studies. For further details see Program of Jewish Studies under "Special Programs and Interdisciplinary Studies."

## Freshman Writing Seminars

**[115 Literature and Politics in the Arab World**
Fall. 3 credits. Not offered 1989–90.]

**[154 Harems, Houris, and Hashish: Western Perceptions of the Middle East**
Spring. 3 credits. Freshman writing seminar. Not offered 1989–90.]

**156 Classics of Islamic Literature**
Spring. 3 credits. A freshman writing seminar.
M W F 2:30–3:20. R. Kevin Lacey.
This seminar will examine, through literary texts, the astonishingly rapid rise of the society of Medieval Islam and the subsequent growth and development of that society. It will concentrate on several of the genres of Islamic literature, such as scripture, love poetry, prose essay, epic, and romance, seeking the view of the world and of Islamic society that it conveys. In addition to genre, concepts such as literary convention and originality will be dealt with at length. The materials assigned will all be premodern, except for a concluding book of some modern Middle Eastern fiction.

**191–192 Violence and the Sacred**
191, fall; 192, spring. 3 credits each term. A freshman writing seminar.
Fall, M W F 11:15–12:05; spring, M W F 12:20–1:10. J. Pasto.
What is the relationship between violence and religious values? Is violence an integral part of religion? Are some religions more violent than others? These are some of the questions that will be explored in this seminar. Readings will be taken from religious texts and commentaries of both the "major" religions such as Christianity, Islam, Judaism, and Hinduism, as well as religious traditions in pre-colonial Africa and America. Readings for the course will be taken from such works as Girard's *Violence and the Sacred*; Horsley's *Jesus and the Spiral of Violence*; and Said's *Orientalism*. Films such as *The Mission* will also be utilized in our analysis.

## Language Courses

**101–102 Elementary Modern Hebrew I and II**
101, fall; 102, spring. 6 credits each term. Prerequisite for NES 102: 101 or permission of instructor. Satisfactory completion of NES 102 fulfills the qualification portion of the language requirement. Enrollment limited to 15 students in each section.
M–F 9:05, 10:10, or 1:25. N. Scharf.
Intended for beginners (section 1 for students without any previous background). A thorough grounding is given in all the language skills, emphasizing reading, writing, grammar, listening, and speaking. (1) Oral comprehension and production: (*a*) in the class room—ability to understand the basic dialogues and passages without the aid of written texts, to use these texts in variation, and to create new ones; (*b*) in the outside world—ability to meet basic travel needs and daily routine needs, both at work and in a study situation. (2) Reading: (*a*) in the classroom—ability to read the texts in the lessons, as well as new texts based on materials presented in class, and to deal with extensive readings (i.e., materials based on texts presented in the classroom as well as additional contextually relevant vocabulary items); (*b*) in the outside world—ability to read simple road signs, train and bus

schedules, menus, simple directions, etc. (3) Writing: (*a*) in the classroom—ability to communicate by writing short sentences and to construct short dialogues based on simple sentences or brief passages on topics included in classroom discussions; (*b*) in the outside world—ability to construct simple, very short letters or notes, or brief summaries or reports. (4) Culture: meet basic courtesy needs in informal situations, know basic geographic facts, and become aware of the composition of the people of the country.

**103 Elementary Hebrew**
Summer (six-week session). 4 credits. Enrollment limited to 15 students.
M–F 8:30–9:45. N. Scharf.
The fundamentals of grammar, syntax, and vocabulary as applied to both conversational and written Hebrew in the modern idiom. Students are expected to know the Hebrew alphabet for the first session of class.

**111–112 Elementary Arabic**
111, fall; 112, spring. 6 credits each term. Prerequisite for Arabic 112: Arabic 111 or permission of instructor.
M–F 10:10–11. R. Kevin Lacey.
The fundamentals of literary and formal spoken Arabic are introduced, through practice in reading, writing, listening, and speaking. By closely studying short, textbook dialogues and reading selections, and through extensive oral-aural and written drills and exercises, the student develops the skills that provide the proper foundation for doing more advanced study of that form of Arabic taught in schools throughout the Arabic-speaking world. Within the limits of the material presented in the textbook, an appreciation of Arabic culture is also sought.

**113–114 Egyptian Arabic**
113, fall; 114, spring. 4 credits each term. 113: no prerequisite. Prerequisite for NES 114: 113 or permission of instructor. All texts in Roman alphabet.
M–F 9:05–9:55. R. Kevin Lacey.
This course focuses on developing conversational abilities. Classes are supplemented with audiovisual material. The students learn the basic structure of Egyptian spoken Arabic. Students are required to spend one to two hours per week in the language lab with sessions monitored by the instructor.

**[121–122 Elementary Classical Hebrew**
121, fall; 122, spring. 4 credits each term. Prerequisite: for NES 122: 121 or equivalent with permission of instructor. Not offered 1989–90.]

**[137–138 Elementary Turkish (also Turkish 131–132)**
137, fall; 138, spring. 6 credits each term. Not offered 1989–90.]

**201–202 Intermediate Modern Hebrew I and II**
201, fall; 202, spring. Enrollment limited to 15 students each term. 3 credits each term. Prerequisites for NES 201, 102 or permission of instructor; for NES 202, 201 or permission of instructor. Satisfactory completion of NES 202 fulfills the proficiency portion of the language requirement.
M W F 12:20. N. Scharf.
Second-year modern Hebrew. Continued development of reading, writing, composition, listening, and speaking skills. (1) Oral comprehension and production: (*a*) in the classroom—ability to carry on a conversation, listen to a short lecture, or deliver a short lecture on topics covered in the classroom or related topics; (*b*) in the outside world—ability to interact with speakers of Hebrew and exchange ideas on basic interests and current events, in work or study situations or informal gatherings, and to relay simple information and give directions. (2) Reading: (*a*) in the classroom—ability to read simplified short stories, short news items, and newspaper headlines; (*b*) in the outside world—ability to read short newspaper items, work directions, maps, plans, etc. (3) Writing: (*a*) in the classroom—ability to write short compositions, take notes in class, compose schedules, write out directions, etc.; (*b*) in the outside world—ability to write letters, reports, and summaries of events, and to complete questionnaires. (4) Culture: expand knowledge of culture into some areas of literature, popular culture, and historical background.

**211–212 Intermediate Arabic**
211, fall; 212, spring. 3 credits each term. Prerequisites: for NES 211, one year of Arabic or permission of instructor; for NES 212, 211 or permission of instructor.
T R 11:40–12:55. R. Kevin Lacey.
A sequel to NES 111–112. The main objectives of the course are (1) mastery of more complex grammatical structures in standard Arabic; (2) vocabulary expansion; (3) higher levels of proficiency in reading and speaking; and (4) improved skills in listening comprehension and writing. Students will read standard written Arabic in different fields and genres, listen to audio materials, and be given oral and writing practice. By the end of the year the successful student should be able to read and comprehend written Arabic of average difficulty, to express himself in writing and in speech in a manner appropriate for his level, and to pick up the main ideas of formal conversations and speech as it is presented on radio or television.

**[221 Readings in Classical Hebrew Literature: The Art of Biblical Narrative**
Fall. 3 credits. Prerequisite: one year of Hebrew, modern or biblical. Not offered 1989–90.]

**[222 Reading in Classical Hebrew Literature: The Art of Biblical Poetry**
Spring. 3 credits. Not offered 1989–90.]

**[238 Aramaic**
Spring. 3 credits. Not offered 1989–90.]

**283–284 Intermediate Turkish**
283, fall; 284, spring. 3 credits.
Fall: T R 11:40–12:55. L. Peirce.
The course aims at the continuing development of reading, composition, and oral comprehension and production skills. Readings include selections from modern short stories, newspapers, and non-fiction prose. Both formal and informal contexts for writing and speaking are emphasized. The course will begin with a brief review of formal grammar.

**301–[302] Advanced Modern Hebrew I and II**
301, fall; [302, spring]. 4 credits each term. Entire sequence may be repeated for credit. Prerequisite for NES 301: 202 or equivalent with permission of instructor. Prerequisite for NES 302: 301 or equivalent with permission of instructor. This sequence may be used as literature to fulfill the humanities distribution requirement. Material varies from one year to the next. [302 not offered 1989–90.]
T R 1:25–2:40. R. Brann.
Advanced study of Hebrew through the analysis of literary texts and expository prose. This course employs a double perspective: the language is viewed through the literature and the literature through the language. Students will develop composition skills by studying language structures, idioms, and various registers of style.

**[311–312 Advanced Arabic: Classical Historical Texts**
311, fall; 312, spring. 4 credits each term. Prerequisite for NES 311: NES 212 or permission of instructor; prerequisite for NES 312: NES 311. Not offered 1989–90.]

**[330–331 Hieroglyphic Egyptian**
330, fall; 331, spring. 4 credits each semester. Not offered 1989–90.]

**333–334 Elementary Akkadian**
333, fall; 334, spring. 4 credits each term. Prerequisite for NES 334: NES 333 or permission of instructor.
T R 2:55–4:10. D. I. Owen.
An introduction to the Semitic language of the Akkadians and Babylonians of ancient Mesopotamia. Utilizing the inductive method, students are rapidly introduced to the grammar and the cuneiform writing system of Akkadian through selected readings in the Code of Hammurabi, the Descent of Ishtar, and the Annals of Sennacherib. Secondary readings on the history and culture of Mesopotamia provide the background for the student of the language. Knowledge of another Semitic language helpful but not essential.

**[335–336 Readings in Akkadian Texts**
335, fall; 336, spring. 3 credits. Prerequisite: NES 333–334. Not offered 1989–90.]

**337–338 Ugaritic**
337, fall; 338, spring. 4 credits.
T R 1:25–2:40. G. Rendsburg.
Study of the language and literature of ancient Ugarit, an important site in northern Canaan. Special attention is paid to the relationships between Ugaritic and Hebrew and between Canaanite literature and the Bible.

**[402 Seminar in Hebrew Literature and Poetics**
Spring. 4 credits. Prerequisites: NES 301 or equivalent and permission of instructor. Not offered 1989–90.]

## Archaeology

**[243 The History and Archaeology of Ancient Israel to 450 B.C.E.**
Spring. 4 credits. Not offered 1989–90.]

**[261 Ancient Seafaring (also Archaeology 275)**
Fall. 3 credits. Not offered 1989–90.]

**[263 Introduction to Biblical History and Archaeology**
Summer. 3 credits. Not offered 1989–90.]

**264 Agriculture and Society in the Ancient Near East**
Spring. 3 credits.
T R 11:40–12:55. D. I. Owen.
This course will briefly survey the early developmental stages of agriculture in the Ancient Near East up to the introduction of writing. Thereafter it will concentrate on the numerous written and archaeological sources relating to many aspects of agriculture, including the following topics: crop production, irrigation, and food processing. These sources contain evidence for types of crops, planting methods, yields, salinity, crop management, processing of grain, fruits, and lumber; dairy production (milk, butter, and cheese); herding (cattle, sheep, and equids); wine and beer production (grapes and barley); food processing (milling, baking, drying, and salting); fishing and fowling; and other varied topics. In addition, we will discuss the social organization of the peasant farmer with respect to public (temple and palace estates) and private (semifree and free) landholders. And finally, we will use the many literary sources of the ancient Near East, including the Bible, to illustrate the rich agriculture imagery that permeated written and oral literature and speech, a clear indication of the seminal role that agriculture has played in the Near East to the present.

**267 Mediterranean Archaeology (also Classics 219)**
Fall. 3 credits.
M W F 12:20–1:10. J. Coleman.
This course will provide a survey of the archaeological foundations of ancient Mediterranean civilization with special focus on contacts and interrelationships in the Bronze Age (ca. 3000–1200 B.C.). Topics to be considered will include the rise of civilization in Egypt; the Bronze Age city-states of Syro-Palestine (e.g., Ebla, Byblos, Ugarit, Megiddo); the Hittites and Bronze Age Anatolia; the Minoans and Mycenaeans and their eastern and western contacts; the role of Cyprus in the Bronze Age; the invention and spread of writing; and ancient shipping and trade. The lectures will be supplemented with invited talks by other scholars.

**[361 Interconnections in the Eastern Mediterranean World in Antiquity**
Fall. 4 credits. Not offered 1989–90.]

**[362 The History and Archaeology of Ebla**
Fall. 4 credits. Prerequisite: Archaeology 100 or any introductory course in ancient history or archaeology. Not offered 1988–89.]

**364 Introduction to Field Archaeology in Israel**
Summer. 6 credits.
D. I. Owen.
An introduction to archaeology fieldwork—excavation techniques, pottery analysis, and recording. Materials studied will range from the early Bronze Age to the Roman period. Emphasis also on the role archaeology plays in the reconstruction of biblical history and the various approaches used to achieve that reconstruction. On-site supervision will be supplemented by regular lectures on the history, culture, and literature of the peoples whose remains will be exposed. Requirements include regularly assigned readings and two papers. Graduate credit by special arrangement. Please contact department (255-6275) for further details.

**[365 The Divided Monarchy**
Fall. 4 credits. Prerequisite: NES 243 or permission of instructor. Not offered 1989–90.]

**[366 The History and Archaeology of the Ancient Near East (also Archaeology 310)**
Fall. 4 credits. Not offered 1989–90.]

**367 The History and Archaeology of Ancient Egypt**
Fall. 4 credits.
T R 11:40–12:55. D. I. Owen.
A detailed survey of the history and archaeology of Egypt from prehistoric times to the end of the pharaonic period. Beginning with an introduction to the development of Egyptology, the course will then focus on the continuity of Egyptian history and culture integrated with discussions of the major archaeological discoveries and their relationship to the reconstruction of Egyptian history and civilization. Relevant aspects of the Egyptian language, mythology, religion, art, and architecture will be discussed. The particular role of Egypt in the history and archaeology of Syro-Palestine will be highlighted.

**[461 Seminar in Syro-Palestinian Archaeology: The Israelite Conquest of Canaan**
Fall. 4 credits. Not offered 1989–90.]

## Civilization

**157 Introduction to Islamic Civilization**
Fall. 3 credits.
T R 2:55–4:10. D. Powers.
During the course of the semester we will consider the major themes of Islamic civilization as they developed from the lifetime of Muhammad until the twentieth century. While the readings will provide the student with the chronology of Islamic history, lectures will be devoted to an analysis of thematic units, such as art and architecture, sciences, or cities. The class meets two times weekly, and the classroom format is that of a lecture/discussion in which students are encouraged to participate actively. Lectures will be accompanied by slide presentations, when appropriate.

**[197]–198 Introduction to Near Eastern Civilization**
[197 not offered 1989–90]; 198; spring. 3 credits. Required for all department majors. NES 197 or 198 and any other Near Eastern studies course will constitute a sequence to fulfill the distribution requirement in either the social sciences or the humanities, depending on the second course used in combination with 197.
T R 1:25–2:40. R. Brann.
This course is designed to provide an introductory overview of Near Eastern society and culture from ancient to modern times for students with little or no previous training. Lectures will focus on four major periods of Near Eastern history: ancient, biblical, Islamic, and modern. In each historical period we will consider the development of major religious ideas, social and political institutions, economic structures, and literary forms. Readings will be chosen from primary sources in translation and modern secondary materials. In addition, movies, slides and other visual materials will be used as integral parts of the course.

**[234 Muslims, Christians, and Jews in Islamic Spain: Literature and Society (also Comparative Literature 234)**
Spring. 3 credits. Not offered 1989–90.]

**[241 The Holocaust: The Destruction of European Jewry, 1935–1945**
Spring. 3 credits. Not offered 1989–90.]

**246 Seminar on Jewish Mysticism: From the Zohar to Hasidism**
Spring. 3 credits.
M W F 1:25–2:15. M. Faierstein.
This seminar will deal with the development of Jewish mysticism in its classical late medieval and early modern forms. It will begin with the study of the Zohar (thirteenth century), the greatest of all Jewish mystical works, then continue with an analysis of the novel ideas of Isaac Luria and his circle in Safed (sixteenth C.), and culminate in the historically consequential formation of the Hasidic movement in the eighteenth century, centering around the founder of Hasidism, R. Israel Baal Shem Tov. All texts will be in translation and no knowledge of Hebrew is required.

**282 Culture and Society of the Turks**
Spring. 3 credits.
M W 2:30–3:45. L. Peirce.
A new course. The course will survey the civilizations of the Turks throughout history, starting with their central Asian origins, moving through their contributions to Islamic civilization, and ending with a brief look at the way modern Turkish culture accommodates (or fails to) this complex heritage. We will examine cultural forms (literature, political philosophy, arts, architecture, music)—both elite and popular—as well as social structure.

**[293 Judaism and Islam in Comparative Perspective (also Medieval Studies 293)**
Spring. 3 credits. Not offered 1989–90.]

**[297 Beyond the Stereotype: Images of Women in the Middle East (also Women's Studies 297)**
Spring. 3 credits. Not offered 1989–90.]

**324 The History of the Early Church: Apostles to Chalcedon (also Medieval Studies 324)**
Spring. 4 credits.
T R 2:55–4:10. P. Perkins.
History of Christianity in the Roman Empire from the end of the New Testament period to the Council of Chalcedon (100–451 C.E.), treats the socio-cultural changes in Christian communities as well as developments in Christian doctrines and practices. Emphasis on the following areas of research in church history: (1) Christianity's development as an institution in late Roman society; (2) development of Christian orthodoxy over/against Judaism and heretical, gnostic movements; (3) role of Greek philosophy in shaping Christian doctrine; (4) emergence of special patterns of Christian holiness in the ascetic movements of the period; (5) Christian views of political and social responsibility.

**[343 The Jewish Community throughout History**
Spring. 4 credits. Not offered 1989–90.]

**346 Jews of Arab Lands**
Fall. 4 credits.
T R 11:40–12:55. D. Powers.
The continuing conflict in the Middle East has made the topic of the historical relations

between Jews and Arabs one of urgent significance. The present course seeks to explore the nature of the Jewish experience under Arab rule from the advent of Islam and the Arab conquests (when the majority of world Jewry came under Muslim rule), through the flourishing of Jewish culture during the Islamic High Middle Ages, to the decay of the Muslim world and the rise of the West. Topics to be considered will include the contribution of Judaism to the formation of Islamic civilization; the social, economic, and legal status of Jews living in Arab countries; Judaeo-Islamic culture; and mutual perceptions of Arabs and Jews in modern times.

**351 Introduction to Islamic Law**
Spring. 4 credits.
T R 2:55–4:10. D. Powers.
An examination of the historical development of Islamic law from its formative period to modern times, with special emphasis on the laws of personal status (marriage, divorce, and inheritance). Topics to be discussed will include the origins of Islamic law; the relationship between law and society; the nature and function of legal documents; the impact of colonialism on legal institutions; and the problems and challenges of legal reform.

**352 Islam and the West**
Spring. 3 credits.
For description see NES 352 under Near Eastern History.

**[357 Islamic Law and Society**
Fall. 4 credits. Not offered 1989–90.]

## History

**[243 History and Archaeology of Ancient Israel to 450 B.C.E.**
Spring. 4 credits. Not offered 1989–90.
For description see NES 243 under Near Eastern Archaeology.]

**244 Jurisprudence and the Holocaust**
Fall. 2 credits.
M 9:05–11. N. Sher.
This seminar will trace the history of judicial efforts to bring to justice the perpetrators of the Holocaust. Emphasis will be on the principles established at the Nuremberg trials, as well as on analysis of measures taken and legal precedent established in Europe, Israel, and the United States to uncover and prosecute alleged Nazi criminals.

**[245 The Emergence of the Modern Jew, 1648–1948**
Spring. 4 credits. Not offered 1989–90.]

**248 Introduction to Classical Jewish History**
Fall. 3 credits.
M W F 11:15–12:05. M. Faierstein.
A survey of the major developments in Jewish history between the destruction of the first temple in 586 B.C.E. and the rise of Islam. Topics will include the return under Ezra and Nehemiah; the encounter with Hellenism; the Antiochene persecutions; the growth of Roman influence; the rebellion of 70 C.E.; the rise of such Jewish groups as the Sadducees, Pharisees, and Essenes; the conflict with early Christianity; and the nature of rabbinic Judaism.

**249 Introduction to Modern Jewish History**
Spring. 3 credits.
M W F 11:15–12:05. M. Faierstein.
A survey of the major developments in Jewish history between the expulsion from Spain (1492) until 1900. Topics will include the growth of mysticism and Hasidism; the development of Eastern European Jewry; the impact of emancipation; the rise of Jewish pluralism, e.g., Reform Judaism, Conservative Judaism, Neo-Orthodoxy; the character of modern anti-Semitism; the origins and growth of American Jewry; and the beginnings of political Zionism.

**[258 Islamic History, 600–1517**
Fall. 3 credits. Not offered 1989–90.]

**[259 The Ottoman Empire from 1517 to 1923**
Spring. 3 credits. Not offered 1989–90.]

**[261 Ancient Seafaring (also Archaeology 275)**
Not offered 1989–90.]

**264 Agriculture and Society in the Ancient Near East**
Spring. 3 credits.
For description see NES 264 under Near Eastern Archaeology.

**[277 Seminar in Jewish History**
Spring. 3 credits. Not offered 1989–90.]

**281 Gender and Society in the Muslim Middle East (also Women's Studies 281)**
Fall. 3 credits.
T R 1:20–2:40. L. Peirce.
This course examines conceptions of gender in traditional Muslim society and the ways in which they have affected the experiences of Muslim women. Topics to be covered include the position of women in the religious law of Islam, female seclusion and the harem, social hierarchies and family structure, sexuality, and the problem of Western perceptions of Muslim women. Although attention will be given to gender issues in the contemporary Middle East, the course focuses on the historical roots of the present-day situation of Muslim women. Readings include primary sources in translation; visual materials (slides, movies) form an integral part of the course.

**294 Modern History of the Middle East: Changing Politics, Society, and Ideas (also Government 358)**
Fall. 4 credits. Fulfills the college distribution requirement in history or the social sciences.
M W F 2:30–3:20. M. Zamir.
This introductory course is designed to acquaint students with the main political, social, and cultural trends that have shaped the modern and contemporary history of the Middle East. While discussing developments in the region during the nineteenth and twentieth centuries, the lectures will focus on such themes as modernization, nationalism, Islamic response, and Arab politics in the global and regional contexts. The course does not presuppose the knowledge of Middle Eastern languages.

**349 Anti-Semitism in Germany and the Jewish Response (also German Studies 349)**
Fall. 3 credits. Reading knowledge of German helpful, though the basic texts will be read in English.
M 1:25–3:20. S. L. Gilman.
An overview of the history of German anti-Semitism from Luther to Hitler. Readings from political, theological, and literary texts ranging from the Church Fathers (as background to a reading of Luther) to the anti-Semitic literary novels of the nineteenth century to *Mein Kampf*. Parallel texts will be examined to judge the Jewish intellectual and literary response to evolving forms of German anti-Semitism.

**351 Introduction to Islamic Law**
Spring. 4 credits.
For description see NES 351 under Near Eastern Civilization.

**352 Islam and the West**
Spring. 3 credits.
W 7:30–9:30. D. Powers.
An examination of the relationship between the Islamic world and Europe from the rise of Islam to modern times. Topics to be discussed will include the theological challenge of Islam; commercial relations between the Near East and Europe; the Crusades; the role of al-Andalus in the movement of ideas between Islam and Europe; and Western images of Islam.

**[355 Islam and Politics**
Spring. 4 credits. Not offered 1989–90.]

**[358 The Islamic Resurgence**
Spring. 4 credits. Prerequisite: NES 258 or NES 294. Not offered 1989–90.]

**[361 Interconnections in the Eastern Mediterranean World in Antiquity**
Fall. 4 credits. Not offered 1989–90.]

**[362 The History and Archaeology of Ebla**
Not offered 1989–90.]

**[365 The Divided Monarchy**
Not offered 1989–90.]

**[366 Archaeology of the Ancient Near East (also Archaeology 310)**
Fall. 4 credits. Not offered 1989–90.]

**[367 The History and Archaeology of Ancient Egypt**
Fall. 4 credits.
For description see NES 367 under Near Eastern Archaeology.

**397 Topics in the Middle East: The Formation and Destruction of the Lebanese State (also Government 352)**
Fall. 4 credits.
M W 10:10–12:05. M. Zamir.
The course will discuss the processes leading to the establishment of the Lebanese state and its disintegration. Topics will include the emergence of a Lebanese entity after the civil war of 1860 and intersectarian relations, the rise of the National Lebanese Maronite Christian Movement and its relations with France and the Arab National Movement, and the development of the unique Lebanese political system as well as the social and economic changes that took place after the establishment of independence. The course will analyze the Lebanese position in the inter-Arab and international arenas and the repercussions of the Arab-Israeli conflict, the causes and outcome of the civil war of 1975–76, the Syro-Israeli confrontation in Lebanon, and the war in 1982 and American intervention.

## Literature

**[155 Classics of the Arabic Literary Tradition**
Fall. 4 credits. Not offered 1989–90.]

**[207 Modern Hebrew Literature in Translation**
Spring. 3 credits. Open to freshmen. Not offered 1989–90.]

**[221 Readings in Classical Hebrew Literature: The Art of Biblical Narrative**
Fall. 3 credits. Prerequisite: one year of Hebrew, biblical or modern. May be used as literature to satisfy the humanities distribution requirement. Not offered 1989–90.]

**[222 Readings in Classical Hebrew Literature: The Art of Biblical Poetry**
Spring. 3 credits. Not offered 1989–90.]

**223 Introduction to the Bible**
Fall. 3 credits. Not offered 1989–90.]

**[224 Wisdom Literature: An Introduction**
Spring. 3 credits. Not offered 1989–90.]

**[225 Judaic Literature in Late Antiquity: Dead Sea Scrolls and Sectarian Literature**
Spring. 3 credits. Not offered 1989–90.]

**226 Exodus and Conquest**
Spring. 3 credits.
T R 10:10–11:25. G. Rendsburg.
An in-depth study of the biblical books of Exodus, Numbers, and Joshua, detailing the Israelite exodus from Egypt, the wandering period, and the conquest of Canaan. Particular attention paid to literary, historical, cultural, and theological concerns.

**[227 Introduction to the Prophets**
Spring. 3 credits. Not offered 1989–90.]

**228 Genesis (also NES 628)**
Fall. 3 credits.
T R 10:10–11:25. G. Rendsburg.
An in-depth study of the biblical Book of Genesis within its ancient Near Eastern setting. Particular attention will be paid to literary, historical, cultural, and theological concerns. Concentration on the patriarchal narratives and the story of Joseph.

**229 Introduction to the New Testament**
Fall. 3 credits.
T R 2:55–4:10. P. Perkins.
An introduction to study of the New Testament and Christian Origins, which focuses on careful reading on the gospels, major letters of Paul, and Revelation. Study of the historical and cultural background to the New Testament writings will emphasize the Jewish background of early Christianity, with attention to both archaeological finds and literary materials. Treatment of theology and ethics in the Pauline letters will relate the religious and ethical language of Christianity to the development of new communities in the greco-roman cities.

**[231 Classics of Hebrew Literature: A Survey of the Hebrew Literary Tradition (also Comparative Literature 231)**
Fall. 3 credits. Not offered 1989–90.]

**[233 The Lyrics of Love and Death: Medieval Hebrew Poetry in Translation (also Medieval Studies 233 and Comparative Literature 333)**
Spring. 3 credits. Not offered 1989–90.]

**[236 Israel through Its Literature (in Translation)**
Spring. 3 credits. Not offered 1989–90.]

**[251 The Modern Arabic Novel**
Spring. 3 credits. Not offered 1989–90.]

**[252 Arabian Nights in the East and the West**
Spring. 3 credits. Not offered 1989–90.]

**[256 A Quest for Identity: The Arabic Short Story**
Fall. 3 credits. Not offered 1989–90.]

**[291 Women in Jewish Literature: Tradition and the Literary Imagination (also Women's Studies 291)**
Spring. 3 credits. Open to freshmen. Not offered 1989–90.]

**[292 Women in the Hebrew Bible (also Women's Studies 292)**
Fall. 3 credits. Open to freshmen. May be used for distribution requirements in the humanities, or for a concentration/major in Jewish studies or women's studies or Near Eastern studies. Not offered 1989–90.]

**[303 Seminar in Modern Hebrew Literature: The Short Story**
Fall. 4 credits. Not offered 1989–90.]

**[304 Seminar in Modern Hebrew Literature: The Novel**
Spring. 4 credits. Not offered 1989–90.]

**[313 The Arab Writer and the State**
Fall. 4 credits. Not offered 1989–90.]

**[322 Undergraduate Seminar in Biblical Literature: Prophecy in Ancient Israel**
Spring. 4 credits. Not offered 1989–90.]

**[332 Ancient Near Eastern Literature**
Spring. 4 credits. Not offered 1989–90.]

**[375 The Shtetl in Modern Yiddish Fiction in English Translation (also German Literature 375)**
Fall. 4 credits. Not offered 1989–90.]

**[377 The Yiddish Novel (also German Literature 377)**
Spring. 4 credits. Not offered 1989–90.]

**[409 The Double Identity Crisis: German Jewish Women from Rahel Varnhagen to Hannah Arendt (also German Studies 409, Society for the Humanities 409, and Women's Studies 409)**
Fall. 4 credits. Not offered 1989–90.]

**[420 Readings in the Hebrew Bible**
Fall. 4 credits. Prerequisite: one year of Hebrew, biblical or modern. May be repeated for credit. Not offered 1989–90.]

**[421 Readings in Biblical Hebrew Poetry**
Fall. 4 credits. Prerequisite: one year of biblical or modern Hebrew. May be repeated for credit. Not offered 1989–90.]

**[428 Medieval Biblical Hebrew Exegesis**
Spring. 4 credits. Not offered 1989–90.]

**429 Readings in the New Testament (also Comparative Literature 429)**
Spring. 4 credits. Limited to 25 students.
M W F 1:25–2:15. J. P. Bishop.
Close readings of representative texts from the New Testament in modern scholarly editions, with the help of appropriate commentary, introductory and specialized. The focus for 1990 will be on Acts and Paul. All readings will be in English, but repeated reference to the Greek original will be made. Graduate students and undergraduates from other colleges who are interested in the material should not feel inhibited from enrolling. The approach will be primarily exegetical; that is, we will try to find out what the texts say. Thus we can hope to stay open to scholarly and religious issues alike.

**[432 Readings in Judeo-Arabic: Medieval Judeo Arabic and Hebrew Poetics**
Spring. 4 credits. Prerequisite: Arabic 212, Hebrew 202, or equivalents. Designed for graduate students but open to undergraduates with permission of instructor. Entire sequence may be repeated for credit; readings will vary from year to year. Not offered 1989–90.]

**[444 The Holocaust Survivor as Author (also German Studies 444/644)**
Spring. 4 credits. Reading knowledge of German helpful, but the two major novels are available in English. Not offered 1989–90.]

**[451 Racism, Resistance, and Contestation: Francophone North African Literature (also Society for the Humanities 423)**
Fall. 3 credits. Prerequisite: knowledge of French. Not offered 1989–90.]

## Special Topics and Independent Study

**[341–342 Special Topics in Near Eastern Studies**
4 credits. Limited to 25 students; preference will be determined by class standing and prior enrollment in Near Eastern Studies. Not offered 1989–90.]

**491–492 Independent Study, Undergraduate Level**
Fall or spring. Variable credit. Prerequisite: permission of instructor.
Staff.

**499 Honors Seminar: Independent Study**
Fall or spring. Variable credit. Prerequisite: permission of instructor.
Staff.

**628 Genesis (also NES 228)**
Fall. 4 credits.
T R 2:55–4:10. G. Rendsburg.
Readings in the Book of Genesis from the Hebrew Bible. Attention is paid to philological, grammatical, historical, and literary analysis.

**691–692 Independent Study, Graduate Level**
Fall or spring. Variable credit. Prerequisite: permission of instructor.
Staff.

## Related Courses in Other Departments

**Archaeology**

**Introduction to Archaeology (Archaeology 100)**

**Introduction to Archaeology (Archaeology 101)**

**[Popular Archaeology (Archaeology 107)**
Not offered 1989–90.]

**Early People (Archaeology 203)**

**[Stone Age Archaeology (Archaeology 317)**
Not offered 1989–90.]

**Practical Archaeology (Archaeology 356 and Classics 356)**

**Archaeological Research Design (Archaeology 402)**

**Approaches to Archaeology (Archaeology 404)**

**[Bronze Age Archaeology: Graduate (Classics 629)**
Not offered 1989–90.]

### Economics, Government, and Sociology

**Comparative Economics (Economics 368)**

**[Eastern Europe Today (Government 326)**
Not offered 1989–90.]

**Government and Politics of the Soviet Union (Government 333)**
Fall.

**[The Ethnic Dimensions in Politics (Government 336)**
Not offered 1989–90.]

**[Politics of the Military (Government 349)**
Not offered 1989–90.]

**[Comparative Revolutions (Government 350)**
Not offered 1989–90.]

**America in the World Economy (Government 354)**

**[Theories of International Relations (Government 383)**
Not offered 1989–90.]

**Contemporary American Foreign Policy (Government 385)**
Not offered 1989–90.]

**Sociology of War and Peace (Sociology 310)**

### History

**Russian History since 1800 (History 253)**
Fall.

**[History of American Foreign Policy (History 314)**
Not offered 1989–90.]

**Survey of German History (History 358)**
Spring.

**[Church and State During the Middle Ages (History 367)**
Not offered 1989–90.]

**[Europe in the Twentieth Century (History 383–384)**
Not offered 1989–90.]

**[Jewish Workers in Europe and America (Industrial and Labor Relations 381)**
Not offered 1989–90.]

### Literature

**[Christianity and Judaism (Comparative Literature 326)**
Not offered 1989–90.]

**[Literature of the Old Testament (Comparative Literature 328)**
Not offered 1989–90.]

**[Old Testament Seminar (Comparative Literature 421)**
Not offered 1989–90.]

**[New Testament Seminar (Comparative Literature 426)**
Not offered 1989–90.]

**[Seminar on Biblical Law (Comparative Literature 427)**
Not offered 1989–90.]

**Readings in the New Testament (Comparative Literature 429)**

## NEPALI

See Department of Modern Languages and Linguistics.

## PHILOSOPHY

N. L. Sturgeon, chair; K. A. Appiah, R. N. Boyd, M. D. Crimmins, G. Fine, C. A. Ginet, H. Hodes, T. H. Irwin, J. Jarrett, N. Kretzmann, D. Lyons, R. W. Miller, S. Shoemaker, M. Wachsberg, A. W. Wood

The study of philosophy provides students with an opportunity to become familiar with some of the ideas and texts in the history of thought while developing analytical skills that are valuable in practical as well as academic affairs. It affords the excitement and satisfaction that come from understanding and working toward solutions of intellectual problems. The curriculum includes offerings in the history of philosophy, logic, philosophy of science, ethics, social and political philosophy, metaphysics, and theory of knowledge. Any philosophy course numbered in the 100s or 200s is suitable for beginning study in the field. Sections of Philosophy 100 are part of the freshman writing seminar program; they are taught by various members of the staff on a variety of philosophical topics, and because of their small size (seventeen students at most) they provide ample opportunity for discussion. Students who want a broad introduction to philosophy may take Philosophy 101, but many students with special interests may find that the best introduction to philosophy is a 200-level course in some particular area of philosophy; such courses have no prerequisites and are usually open to freshmen.

### The Major

Students expecting to major in philosophy should begin their study of it in their freshman or sophomore year. Admission to the major is granted by the director of undergraduate studies of the department on the basis of a student's work during the first two years. Eight philosophy courses are required for the major. They must include at least one course in ancient philosophy (Philosophy 210 or 211, or a course with a large component on Plato or Aristotle), at least one course in classical modern metaphysics and epistemology. (Philosophy 212 or a course on the empiricists, the rationalists, or Kant), and a minimum of three courses numbered above 300, at least one of which must be numbered above 400 (and be other than 490). A course in formal logic (e.g., Philosophy 231), while not required, is especially recommended for majors or prospective majors.

Philosophy majors must also complete at least 8 credits of course work in related subjects approved by their major advisers. Occasionally majors may serve as teaching or research aides, working with faculty members familiar with their work.

**Honors.** A candidate for honors in philosophy must be a philosophy major with an average of B- or better for all work in the College of Arts and Sciences and an average of B or better for all work in philosophy. In either or both terms of the senior year a candidate for honors enrolls in Philosophy 490 and undertakes research leading to the writing of an honors essay by the end of the final term. Honors students normally need to take Philosophy 490 both terms of their senior year in order to write a satisfactory honors essay. Prospective candidates should apply at the philosophy department office, 218 Goldwin Smith Hall.

### Fees

In some courses there may be a small fee for photocopying materials to be handed out to students.

### Introductory Courses

These courses have no prerequisites; all are open to freshmen.

**100 Freshman Seminar in Philosophy**
Fall and spring. 3 credits.
Fall: M W F 9:05, N. Sturgeon and staff; 10:10, 11:15, 12:20, staff; T R 10:10–11:25, R. Boyd and M. Crimmins; 11:40–12:55, C. A. Ginet; 2:55–4:10, R. Miller and staff. Spring: M W F 9:05, staff; 10:10, H. Hodes; 11:15, 12:20, staff; 1:25 J. Jarrett; T R 10:10–11:25, 11:40–12:55, 2:55–4:10, staff.

**101 Introduction to Philosophy**
Fall and spring. 3 credits. Normally offered in the six-week summer session.
Fall: M W F 9:05. A. Appiah.
The course aims to give a preliminary answer to the question "What is philosophy?" But rather than addressing this question head on, we will begin with some examples of philosophical work. We will consider key issues about seven central topics: mind, knowledge, language and logic, science, morality, politics, and law. At the end of the course we will ask what we have learned about the distinctive style of philosophical thought. Students will be better able to see how philosophy fits into our culture when they have a feel for how philosophers argue and what they argue about. Two lectures and one section per week.
Spring: M W F 11:15. S. Shoemaker.
This course will deal with a number of the central problems of philosophy, including the existence of God, our knowledge of the external world, the mind-body problem, free will and the foundations of morality. Readings will consist partly of selections from such perennially important philosophers as Descartes, Berkeley, Hume, and J. S. Mill, and partly of more recent writings. Two lectures and one section per week.

**[131 Logic: Evidence and Argument**
3 credits. Not offered 1989–90.]

**201 Philosophical Problems**
Fall. 4 credits.
M W F 9:05. C. A. Ginet.
This course will discuss the following well-known puzzles: Zeno's paradoxes of motion (the Racecourse, the Arrow, the Stadium), Zeno's paradox of plurality, the paradox of the heap, the paradox of the liar, the paradox of the surprise examination, the prisoner's dilemma, and Newcomb's problem. These puzzles present us with reasoning that is paradoxical in the sense that, although it seems clear that there must be something wrong with the reasoning, it is not easy to say what it is. Besides being an intriguing exercise in itself, studying such puzzles can show interesting and important things about some of our basic concepts, such as those of space, time, motion, truth, knowledge, rational choice, and causation.

**[210 Ancient Thought**
Fall. 4 credits. Not offered 1989–90.]

**211 Ancient Philosophy**
Fall. 4 credits.
T R 1:25–2:40. G. Fine.
An introduction to ancient Greek and Roman thought: the pre-Socratics; Socrates and Plato; Aristotle; and the Stoics, Epicureans, and Skeptics. Topics to be considered include the following: the nature of reality, the nature and limits of knowledge and of sense-perception, justice and happiness, the good man and the good life for man, the nature of the soul, the nature of divinity, and free will.

**212 Modern Philosophy**
Spring. 4 credits. Normally offered in the six-week summer session.
T R 11:40–12:55. A. Wood.
A survey of major philosophical problems in metaphysics and the theory of knowledge in seventeenth- and eighteenth-century European philosophy. Readings from Descartes, Spinoza, Locke, Leibniz, Berkeley, Hume, and Kant.

**[213 Existentialism**
Fall. 4 credits. Not offered 1989–90.]

**[214 Philosophical Issues in Christian Thought**
4 credits. Not offered 1989–90.]

**215 Medieval Philosophy**
Fall. 4 credits.
T R 10:10–11:25. N. Kretzmann.
A survey of medieval philosophy, starting with the beginning of the Christian era and ending in the fifteenth century, especially metaphysics (including philosophical theology) and epistemology. The course does not presuppose any previous work in philosophy or in medieval studies.

**231 Introduction to Formal Logic**
4 credits. Normally offered in the six-week summer session.
Fall: T R 10:10–11:25, H. Hodes; spring: M W F 9:05, C. A. Ginet.
Analysis and evaluation of deductive reasoning in terms of formalized languages. The logic of sentences, predicates, and quantifiers. (This course, rather than Philosophy 331, is the recommended introductory formal logic course.)

**241 Ethics**
Fall. 4 credits.
M W F 1:25. T. H. Irwin.
Introduction to the philosophical study of major ethical questions: Are all values relative, or are there some objective values? Can ethics be a science? Is human nature inevitably selfish? Have we ever any good reasons to care about the interests of other people? When, if ever, does the end justify the means? Why should we care about morality anyway? The course discusses these general theoretical issues and also practical moral problems, especially questions of life and death (e.g., war, abortion, euthanasia), and dilemmas about justice (e.g., equality of opportunity and reverse discrimination). Readings from classic ethical writers (e.g., Plato, Kant, Mill, Nietzsche, Sartre) and from contemporary sources.

**[242 Social and Political Theory**
4 credits. Not offered 1989–90.]

**[243 Aesthetics**
4 credits. Not offered 1989–90.]

**244 Philosophy and Literature**
Fall. 4 credits.
T R 2:55–4:10. N. Carroll.
An introduction to issues in the relations of philosophy and literary theory. Topics will include the nature of fictions, critical evaluation, the concept of structuralism, and the claims of deconstruction. Works of literature will also be read in the course.

**245 Ethics and Health Care (also Biology and Society 205 and Biological Sciences 205)**
Fall. 4 credits. Normally offered in the six-week summer session. Limited to 80 students. (40 under philosophy, 15 under Biology and Society, and 25 under Biological Sciences). Registered students not attending the first week will be dropped from the course. Open to sophomores, juniors, and seniors; permission of instructor required for graduate students.
Lecs, T R 10:10–11:25; disc, 1 hour each week to be arranged. M. Wachsberg.
Critical philosophical analysis of the conceptual frameworks in which ethical problems associated with health care can be formulated and solutions evaluated. General topics (with sample issues indicated in parentheses) include knowledge in ethics (ethical scepticism, ethical relativism); proper social allocation of resources for, and within, medicine (entitlement to health care, access to scarce medical resources, cost-benefit analysis); the proper account of basic concepts such as illness, death, autonomy, and personhood (abortion, euthanasia, procreative technologies); and the professional-patient relationship (informed consent, confidentiality, medical paternalism). Note: a more detailed description of this course is available in the philosophy department office.

**246 Ethics and the Environment (also Biology and Society 206 and Biological Sciences 206)**
Spring. 4 credits. Open to all undergraduates. Permission of instructor required for graduate students.
Lecs, T R 10:10–11:25; disc, 1 hour each week to be arranged. M. Wachsberg.
Critical philosophical analysis of the conceptual frameworks in which policies affecting the environment are formulated and judged. An introductory section of the course discusses the nature of ethics and the possibility of knowledge in ethics. The first major substantive component of the course deals with the nature and extent of individual and social obligations to spatially distant people, future generations, nonhuman animals, and nonsentient things (e.g., the ecosystem). The second major component of the course deals with the appropriate analysis of the origin of environmental problems and the range of options for their solution. Topics include individual vs. collective goods, cost-benefit analysis, and coordination problems. Note: a more detailed description of the course is available in the philosophy department office.

**247 Ethics and Public Life**
Spring. 4 credits.
T R 1:25–2:40. H. Shue.
An exploration of alternative accounts of human responsibility. What are our responsibilities now under a system of nuclear deterrence that this generation did not create and under a system of international agriculture that regularly allows malnutrition? In general, beyond obligations to intimates and friends, what are our responsibilities toward strangers, including contemporary foreigners, future generations, and endangered nonhuman species? How important should political considerations like national security and national interest be in decisions about policies toward distant places, distant times, and distant species?

**261 Knowledge and Reality**
Spring. 4 credits.
T R 11:40–12:55. M. Crimmins.
Introduction to central philosophical issues about knowledge and the world, including the nature, possibility, and sources of knowledge. Readings will be drawn from the works of well-known historical figures and contemporary writers.

**262 Philosophy of Mind**
Fall. 4 credits.
T R 11:40–12:55. S. Shoemaker.
This course will serve as an introduction to philosophy through a consideration of philosophical issues about the nature of mind. Central to the course will be the mind-body problem; here we will be concerned with the question of whether there is a mind (or soul or self) that is distinct from the body and how thought, feelings, sensations, etc., are related to states of the brain and body. Other issues will include knowledge of other minds (how do we know that other human beings are not mindless automata?), the nature of self-consciousness (how do we know about our own mental states?), the nature of mental representation (how can states of a mind be "about" things and a state of affairs outside it?), and the nature of personal identity (what makes someone existing now and someone existing a year ago one and the same person?). Written work for the course will consist of several short papers, and a final examination.

**263 Religion and Reason**
Spring. 4 credits.
T R 10:10–11:25. N. Kretzmann.
Recent and traditional literature will be taken into account in the examination of such topics as evidence for and against the existence of a god, philosophical problems associated with the attributes of God as described in the great monotheistic religions, and philosophical problems associated with the relationship of God to the physical universe and to human beings.

**286 Science and Human Nature**
Spring. 4 credits.
M W F 11:15. R. N. Boyd, N. L. Sturgeon.
An examination of attempts in the biological and social sciences to offer scientific theories of human nature and human potential and to apply such theories to explain important social and psychological phenomena. Topic for 1989–90: Darwin, social Darwinism, and sociobiology.

## Intermediate Courses

Some of these courses have prerequisites.

**[309 Plato**
4 credits. Not offered 1989–90.]

**[310 Aristotle**
4 credits. Not offered 1989–90.]

**311 Modern Rationalism**
Spring. 4 credits.
T R 1:25–2:40. G. Fine.
The focus will be on Descartes, but some attention will be paid to Spinoza and Leibniz. Topics for the course will include substance, necessity, and possibility; free will and determinism; proofs for the existence of God; innate ideas; and skepticism and the limits of knowledge.

**312 Modern Empiricism**
Fall. 4 credits.
T R 2:55–4:10. S. Shoemaker.
David Hume and Thomas Reid. Topics will include: skepticism vs. common sense; the nature of ideas, "abstract ideas," and meaning; the nature of empirical reasoning (and scepticism about it); the nature of belief, memory, and perception; our knowledge of the external world (and scepticism about it); and the nature of causality, substance, and personal identity.

**[314 Topics in Ancient Philosophy**
4 credits. Not offered 1989–90.]

**[315 Special Topics in the History of Philosophy**
4 credits. Not offered 1989–90.]

**[316 Kant**
4 credits. Not offered 1989–90.]

**[317 Hegel**
4 credits. Not offered 1989–90.]

**318 Twentieth-Century Philosophy**
Spring. 4 credits.
T R 11:40–12:55. C. A. Ginet.
Topic for 1989–90: The philosophy of Ludwig Wittgenstein.

**[319 Philosophy of Marx**
4 credits. Not offered 1989–90.]

**331 Formal Logic**
Spring. 4 credits. Prerequisite: Philosophy 231 or equivalent.
M W F 1:25. H. Hodes.
Review of derivations and other material covered in 231; basic set theory; truth in a model and the semantic definitions of consequence, validity, equivalence, and other logic concepts; and the soundness and completeness of a natural-deduction formalization of elementary logic. Further topics will be covered if time permits.

**332 Philosophy of Language**
Spring. 4 credits.
M W F 10:10. M. Crimmins.
An introduction to the philosophy of language, focusing on problems about meaning, truth, and reference in linguistic communication, and how these issues bear on the relations among mind, language, and the world. Readings will be selections from Frege, Russell, Wittgenstein, Quine, Kripke, and others.

**341 Ethical Theory**
Fall. 4 credits.
T R 1:25–2:40. M. Wachsberg.
Topic for 1989–90: Consequentialism and Its Critics.

**342 Law, Society, and Morality (also Law 666)**
Spring. 4 credits.
T R 1:25–2:40. D. Lyons.
This is an introduction to the philosophy of law. It will emphasize the nature of law and its relation to moral principle. Theories to be discussed include natural law, legal positivism, legal realism, and contemporary interpretive and critical theories of law. Other topics may include the justification of legal punishment and coercion, the idea of an obligation to obey the law, and the relevance of justice to law.

**344 History of Ethics—Ancient and Medieval**
Fall. 4 credits.
M W 2:30–3:45. T. H. Irwin.
The development of moral theory in Greek, Roman, and medieval philosophers. Socrates and his questions about morality; the different answers of Plato, Aristotle, and the Stoics; and the influence of Christian thought. Main questions: happiness, welfare, and the human good; the virtues; self-interest and the interests of others; love, friendship, and morality; theories of human nature and their relevance to ethics; comparisons and contrasts with modern moral theory. Readings mainly from Plato, Aristotle, the Stoics, St. Paul, St. Augustine, St. Thomas Aquinas. No prerequisites.

**345 History of Ethics—Modern**
Spring. 4 credits. (Philosophy 344 is not prerequisite for 345.)
M W 2:30–3:45. T. H. Irwin.
A continuation of Philosophy 344. Hobbes's challenge to Greek and Christian ethics, responses to Hobbes, self-interest and the interests of others, the place of reason and sentiment in ethics, the objectivity of ethics, different conceptions of the right and the good, utilitarianism and its critics, and radical critiques of morality. Readings mainly from Hobbes, Butler, Hume, Kant, Sidgwick, Nietzsche, Bradley, and Rawls.

**346 Modern Political Philosophy**
Fall. 4 credits.
M W 2:30–3:45. R. Miller.
A study of the leading current philosophical arguments about rights, equality, liberty, democracy, and the general welfare as they affect basic choices among institutions and political strategies. Topic for 1989–90: Liberalism and its critics—a study of liberal, conservative and socialist perspectives on the choice of basic economic and political institutions, centering on John Rawls's *A Theory of Justice*, Robert Nozick's *Anarchy, State and Utopia*, and Marxist writings.

**361 Metaphysics and Epistemology**
Fall. 4 credits.
T R 11:40–12:55. K. A. Appiah.
The course will focus on three important questions about knowledge. What is it to know something? What sorts of things can be known—in particular, is there such a thing as moral knowledge? Is what we know—either about scientific or moral questions—relative to our own personal or cultural presuppositions?

**[363 Topics in the Philosophy of Religion**
4 credits. Not offered 1989–90.]

**369 Limiting War: The Morality of Modern State Violence (also Government 469)**
Fall. 4 credits.
T R 2:55–4:10. H. Shue.
Modern states employ or threaten violence not only through conventional war but in various other forms including "low-intensity warfare," chemical and biological warfare, terrorism, and nuclear deterrence. This course critically examines the best arguments about limiting or prohibiting various contemporary means and methods of fighting one's enemies, arguments with conclusions ranging from pacificism to "realism." Have traditional doctrines about just war been overtaken by 20th-century events and technologies, or is it still possible to provide a reasonable justification for limiting war? If so, how? Special emphasis is given to moral issues about nuclear weapons. Readings include the U.S. Catholic Bishops' Pastoral Letter on nuclear deterrence, *Just and Unjust Wars*, by Walzer, and *Nuclear Deterrence, Morality and Realism*, by Finnis, Boyle, and Grisez.

**381 Philosophy of Science: Knowledge and Objectivity**
Fall. 4 credits.
W 7–9:30 p.m. R. N. Boyd.
An examination of central epistemological and metaphysical issues raised by scientific theorizing: the nature of evidence; scientific objectivity; the nature of theories, models, and paradigms; and the character of scientific revolutions. In addition to the contemporary literature in the philosophy of science, readings are also drawn from the history of science and from the works of classical modern philosophers such as Locke, Hume, and Descartes.

**[382 Philosophy and Psychology**
4 credits. Not offered 1989–90.]

**[383 Philosophy of Choice and Decision**
4 credits. Not offered 1989–90.]

**384 Philosophy of Physics**
Fall. 4 credits.
M W F 11:15. J. Jarrett.
An introduction to issues arising in a philosophical examination of modern physical science. Relevant aspects of classical statistical mechanics, relativity theory, and quantum mechanics will be considered in connection with such topics as microphysical indeterminateness, probabilistic laws, causality, the direction of time, action-at-a-distance, and scientific explanation.

**[387 Philosophy of Mathematics**
4 credits. Not offered 1989–90.]

**[388 Social Theory**
4 credits. Not offered 1989–90.]

**[389 Philosophy of Science: Evidence and Explanation**
4 credits. Not offered 1989–90.]

**390 Informal Study**
Fall or spring. Credit to be arranged.
Staff.
To be taken only in exceptional circumstances. Must be arranged by the student with his or her adviser and the faculty member who has agreed to direct the study.

## Advanced Courses and Seminars

These courses are offered primarily for majors and graduate students.

**[395 Majors Seminar**
4 credits. Not offered 1989–90.]

**410 Medieval Latin Philosophical Texts**
Variable credit. Fall or spring. Prerequisites: knowledge of Latin and permission of instructor.
Hours to be arranged. N. Kretzmann.
Reading medieval Latin philosophical texts in the original.

**411 Greek Philosophical Texts (also Classics 311)**
Variable credit. Fall or spring. Prerequisites: knowledge of Greek and permission of instructor.
Hours to be arranged. T. H. Irwin.
Reading of Greek philosophical texts in the original.

**412 Medieval Philosophy**
Fall. 4 credits.
W 4:15–6:15. N. Kretzmann.
Topic for 1989–90: The Philosophy of Duns Scotus. Scotus's metaphysics and theology as presented in his rather brief treatise *De primo principio*, and his philosophical psychology and ethics, notable for their emphasis on will over intellect in the analysis of human action and for the conception of human freedom.

**[413 Topics in Ancient Philosophy**
4 credits. Not offered 1989–90.]

**[414 German Philosophy after Kant**
4 credits. Not offered 1989–90.]

**[431 Deductive Logic**
4 credits. Not offered 1989–90.]

**[433 Philosophy of Logic**
4 credits. Not offered 1989–90.]

**[436 Intensional Logic**
4 credits. Not offered 1989–90.]

**[437 Problems in the Philosophy of Language**
4 credits. Not offered 1989–90.]

**[441 Contemporary Ethical Theory**
4 credits. Not offered 1989–90.]

**[442 Ethics and the Philosophy of Mind**
4 credits. Not offered 1989–90.]

**[443 Topics in Aesthetics**
4 credits. Not offered 1989–90.]

**444 Contemporary Legal Theory (also Law 710)**
Fall. 4 credits.
T 4:15–6:15. D. Lyons.
This seminar examines some central issues and recent developments in legal philosophy, such as problems of legal interpretation and "critical legal studies."

**[446 Topics in Social and Political Philosophy**
4 credits. Not offered 1989–90.]

**461 Metaphysics**
Spring. 4 credits.
M W F 2:30. S. Shoemaker.
The course will deal with issues about essence and modality, and will be focused mainly on David Lewis's book *On the Plurality of Worlds*.

**481 Problems in the Philosophy of Science**
Spring. 4 credits.
T R 10:10–11:25. J. Jarrett.
A study of the logical and conceptual structure of quantum mechanics. Topics to be discussed include Heisenberg's Principle, complementarity and the Copenhagen Interpretation, quantum logic, the measurement problem, the "paradoxes" (Schrödinger's cat, Wigner's friend, the EPR argument), Bell's Theorem, and the Everett-Wheeler ("many worlds") Interpretation. Some previous training in physics or mathematics is recommended, but no specialized background will be presupposed. The course will attempt to provide a philosophically responsible account of the structure of quantum mechanics in a way that fosters insight into the reasons certain aspects of the theory remain controversial.

**490 Special Studies in Philosophy**
Fall or spring. 4 credits. Open only to honors students in their senior year.
Staff.

**611 Ancient Philosophy**
Fall and spring. 4 credits.
Fall: T 4:15–6:15, G. Fine; spring: M 4:15–6:15, T. H. Irwin.
Topics for 1989–90: Fall: Plato's later dialogues; spring: Platonism from Plato to Plotinus.

**[612 Medieval Philosophy**
4 credits. Not offered 1989–90.]

**613 Modern Philosophers**
4 credits.
T 4:15–6:15. A. Wood.
Topic for 1989–90: Kant's Practical Philosophy.

**[619 History of Philosophy**
4 credits. Not offered 1989–90.]

**[631 Logic**
4 credits. Not offered 1989–90.]

**633 Philosophy of Language**
Fall. 4 credits.
M 4:15–6:15. M. Crimmins.
Topic for 1989–90: Semantics for folk-psychological expressions, including belief reports. Brief history of the debate followed by close consideration of recent proposals.

**641 Ethics and Value Theory**
Spring. 4 credits.
W 4:15–6:15. M. Wachsberg.
Topic for 1989–90: Feminist Ethical Theory.

**[661 Theory of Knowledge**
4 credits. Not offered 1989–90.]

**662 Philosophy of Mind/The Emotions**
Spring. 4 credits.
R 4:15–6:15. N. Carroll.
Recent years have witnessed an increasing interest on the part of analytic philosophers in the emotions. The purpose of this seminar is to survey a range of topics in this growing literature, including: re-assessments of historical positions about the emotions, questions about the nature and structure of the emotions in general, about the nature of particular emotions, and about the relevance of the emotions to moral and aesthetic theory. Though historical figures will be discussed, the emphasis of the course will be on contemporary debates about the emotions.

**[664 Metaphysics**
4 credits. Not offered 1989–90.]

**665 Metaphysics**
Spring. 4 credits.
W 7–9:30. R. Boyd and R. Miller.
Topic for 1989–90: Realism in the Philosophy of Science and in Metaethics.

**[681 Philosophy of Science**
4 credits. Not offered 1989–90.]

**[682 Philosophy of Social Science**
4 credits. Not offered 1989–90.]

**700 Informal Study**
Fall or spring. Credit to be arranged.
Staff.
To be taken by graduate students only in exceptional circumstances and by arrangement made by the student with his or her Special Committee and the faculty member who has agreed to direct the study.

**773 Proseminar in Cognitive Studies (also Psychology 773 and Cognitive Studies 773)**
Fall. 2 credits.
R 1:25–2:55 Staff (faculty from the Cognitive Studies program).

## Related Courses in Other Departments

**Mathematics 685 Beyond Classical First-Order Logic**
Fall.

**Theatre Arts 665 Advanced Topic in Aesthetics: Comic Theory**
Fall.

# PHYSICS

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The Department of Physics offers a full range of university-level work in physics, from general education courses for nonscientists to Ph.D.-level independent research. Major research facilities are operated by two component organizations, the Laboratory of Atomic and Solid State Physics (LASSP) and the Laboratory of Nuclear Studies (LNS). LASSP carries out extensive research efforts in condensed-matter physics and in low-temperature physics. LNS operates a major

high-energy particle physics research facility at Wilson Laboratory, the Cornell electron-positron storage ring, called CESR. Theoretical work is carried out in many fields of physics, including astrophysics. There is a full schedule of weekly research-oriented seminars and colloquia. Junior and senior students will find many opportunities for research participation and summer jobs.

Three introductory physics sequences are open to freshmen: 101–102, 112–213–214–315, and 207–208. In addition, there is a cluster of general-education courses, Physics 200 through 206. Physics 101–102, a self-paced autotutorial course, is designed for students who do not intend to take further physics courses and who do not have preparation in calculus. Physics 112 and 207 both require calculus (Mathematics 191 or 111), and additional mathematics is required for subsequent courses in sequence. Physics 101–102 or 207–208 may be taken as terminal physics courses. The three- (or four-) term sequence 112–213–214–315 or 116–217–218–315 is recommended for engineers and physics majors.

Courses beyond the introductory level that might be of interest to nonmajors include. Physics 315, Phenomena of Microphysics; Physics 330, Modern Experimental Optics; and Physics 360, Electronic Circuits.

Advanced placement and credit are offered as outlined in "Advanced Placement of Freshmen," or students may consult Professor Cotts, 522 Clark Hall. Transfer students requesting credit for physics courses taken at another college should consult the department office.

## The Major

Various options permit the student to concentrate heavily on physics or to take less physics and pursue an accompanying constellation of courses in a related area. Those desiring a physics concentration as preparation for professional or graduate work should complete Physics 112–213–214 or 116–217–218, and, if possible, 315 by the end of the sophomore year. A basic preparation for a less intensive physics program may include Physics 112–213–214 or 207–208–214. In either case, it is necessary to complete a concurrent sequence of mathematics courses.

Mathematics 191–192–293–294 are usually recommended, except for students especially interested in continuing the study of mathematics, for whom Mathematics 111–122–221–222 (or equivalent) may be preferred.

Prospective majors are urged to make an early appointment at the physics office for advice in planning their programs. Acceptance into the major is normally granted after completion of a year of physics and mathematics at Cornell with grades of B– or better. The student should propose a tentative plan for completing his or her graduation requirements as well as those for the major. The plan may change from time to time, but it must be approved by the major adviser. The major requirements have two components—a core and a concentration. Core requirements for the major include:

1) Physics 112–213–214 or 116–217–218 or 207–208–214.
2) an intermediate physics course in each of four areas: (a) mechanics—Physics 318 or 431, (b) electricity and magnetism—Physics 325 or 432, (c) modern physics—Physics 315 or 443, and (d) laboratory physics—Physics 310 (when not taken as substitute for laboratory work in 214 or 218), 330, 360, or 410.

Mathematics courses prerequisite for these physics courses are also necessary. The choice of core is influenced by the intended concentration. For a concentration in physics, Physics 116–217–218 (or 112–213–214), 315, 318, 325, and any 300-level laboratory course is appropriate, while for concentrations outside physics, part (2) of the core might consist of, for example, Physics 315, 360, 431, 432.

The concentration reflects the student's interest in some area related to physics; the array of courses must have internal coherence and be approved by the major adviser. The concentration must include at least 15 credits, with at least 8 credits in courses numbered above 300. Students have chosen to concentrate in such topics as physics, biophysics, chemical physics, astrophysics; geophysics; natural sciences; history and philosophy of science; computational physics; or physics with economics or business. A combined biology-chemistry concentration is recommended for premedical students or those who wish to prepare for work in biophysics. The concentration in natural science is particularly appropriate for teacher preparation.

The concentration in physics is recommended as preparation for professional or graduate work in physics or a closely related discipline. Twelve of the 15 concentration credits must be selected from physics courses numbered above 300 (in addition to those selected for part (2) of the core); Physics 410 must be included within those 12. The following courses are strongly recommended: Physics 341, 443; Mathematics 421, 422, and 423; and at least one of Physics 444, 454, Applied and Engineering Physics 401, 434, Astronomy 431, 432, or Geological Sciences 388.

**Foreign language requirement.** Students interested in eventual graduate work in physics are advised to meet this requirement with French, German, or Russian.

**Honors.** A student may be granted honors in physics upon the recommendation of the Physics Advisers Committee of the physics faculty.

**Double majors.** Double majors with physics are possible and not at all uncommon. However, if a student plans to complete a major in physics as well as majors in one or more other subjects, then the set of courses used to satisfy the physics major must be completely different from the set or sets used to satisfy the other major(s).

## Distribution Requirement

The requirement in physical sciences is met by any two sequential courses such as Physics 101–102 or 207–208 or 112–213 or any combination of the first term of one sequence and the second term of another. It is also met by any two general education courses from the group 200–206 or by a combination of 101 or 112 or 207 with one from the group 200–206.

## Courses with Overlapping Content

Because the department offers several courses with overlapping content, students should select courses carefully to meet the needs of their academic programs and to ensure credit for each course they take. Listed below are groups of courses with similar content. In general, students may receive credit for only one of the courses in each group.

Physics 101, 112, and 207
Physics 102 and 208
Physics 112, 116, and 207
Physics 208, 213, and 217

## Course Prerequisites

Prerequisites are specified in physics course descriptions to illustrate the materials that students should have mastered. Students who wish to plan programs different from those suggested by the prerequisite ordering are urged to discuss their preparation and background with a physics adviser or with the instructor in the course. In many cases an appropriate individual program can be worked out without exact adherence to the stated prerequisites.

## Courses

**101–102 General Physics**
101, fall; 102, spring (101–102 also normally offered in summer). 4 credits each term. Prerequisites: three years of high school mathematics, including some trigonometry. Prerequisite for Physics 102: Physics 101 or 112 or 207. Includes more modern physics and less mathematical analysis than Physics 207–208 but more mathematics than 201–206. (Students planning to major in a physical science should elect Physics 207–208 or 112–213–214.) A mostly self-paced, mastery-oriented autotutorial format; students work in a learning center at hours of their choice. Repeated tests on each unit are given until mastery is demonstrated.

One opening lecture 7:30 p.m., R Aug. 31 or M Sept. 4 (fall); M Jan. 22 (spring). D. B. Fitchen, B. Richardson.

Basic principles treated quantitatively but without calculus. Major topics for 101: kinematics; gravitational and electric forces and fields; momentum, angular momentum, energy; thermal physics, fluid mechanics; sound waves. For 102: electricity and magnetism, optics, relativity; quantum physics, particle structure of matter. Laboratory emphasizes instrumentation, measurement, and interpretation of data. Text: *Principles of Physics*, by Frank J. Blatt.

**112 Physics I: Mechanics and Heat**
Fall or spring (normally also offered in summer). 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisite: coregistration in Mathematics 192 (or 194 or 112), or substantial previous contact with introductory calculus combined with coregistration in Mathematics 191 or 111.

Lecs M W F 10:10 or 12:20; 2 recs each week; six 3-hr. labs. Evening exams: fall, Sept. 28, Oct. 31, Dec. 5; spring, Feb. 15, Mar. 15, Apr. 17. Fall, R. M. Talman; spring, D. F. Holcomb.

Mechanics of particles: kinematics, dynamics, conservation laws, central force fields, periodic motion. Mechanics of many-particle systems: center of mass, rotational mechanics of a rigid body, static equilibrium. Introduction to thermodynamics. At the level of *Fundamentals of Physics*, extended version, by Halliday and Resnick.

**116 Physics I: Mechanics and Heat**
Fall or spring. 4 credits. A more analytic version of Physics 112, intended for students who will be comfortable with a deeper, somewhat more abstract approach. (Intended mainly but not exclusively for prospective physics majors.) Prerequisites: a good secondary school physics course and familiarity with basic calculus. Corrective transfers between Physics 116 and Physics 112 (in either direction) are encouraged during the first few weeks of instruction.

Lecs, M W F 10:10; 2 recs each week; one 3-hr. lab alternate weeks. Evening exams may be scheduled. Fall, D. G. Cassel; spring, N. W. Ashcroft.

A more rigorous version of Physics 112, covering similar topics at the level of *An Introduction to Mechanics*, by Kleppner and Kolenkow.

**200 Art, Isotopes, and Analysis (also Material Science and Engineering 285)**
Spring. 3 credits.

Lec TBA. J. W. Mayer (MS&E), S. Taft (Art), D. Eddy (Univ. Libraries).

This course will be based primarily on the analysis of paintings and rare books and the physical concepts underlying modern analytical techniques. Each week a work of art will be described to include the historical and technical aspects of its creation and its modern analysis. Visual, infrared, and X-ray examination provide insight into the physical properties. Pigments are identified by the radiation emitted in electronic transitions. The ratio of isotopes can be used to identify the geographical origin of a particular pigment as well as to date the pigment. Examples will also be given of authentification and conservation.

**201 Why the Sky Is Blue: Aspects of the Physical World**
Fall. 3 credits.

Lec, T R 2:55–4:10; rec, W 3:35–4:25. A. Sadoff.

This is a descriptive physics course aimed specifically at the non–science student. There is an emphasis on the ideas of modern physics where the approach is both historical and thematic. The methodology of science and the nature of evidence is emphasized. An overriding theme is the character of physical laws as shown through the great principles of symmetry and conservation. While there are a few computational problems assigned, the purpose is to help students to understand the concepts rather than to master problem-solving techniques.

**203 The Physics of Space Exploration and of Astronomy**
Spring. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background but will use high school mathematics.

Lec, M W F 2:30; disc, W 3:35. E. E. Salpeter.

The principles of physics (plus simple mathematics) are applied to gain knowledge about planets, stars, galaxies, and the universe.

**204 Physics of Musical Sound**
Spring. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background but will use high school algebra.

Lec, M W F 2:30; disc, T 3:35. E. Cassel.

Many features of the production, propagation, and perception of musical sound may be understood in terms of important concepts in physics. Topics covered will include the mechanism of tone production in musical instruments, distinctions in tone quality, musical scales and tuning, basic principles of room acoustics and reproduction of sound, and some aspects of the mechanism of hearing. There will be hands-on demonstrations using computers where we will generate sound of our own design, and compare real instruments with computer simulations. Familiarity with computers is not expected. At the level of *Musical Acoustics*, by D. E. Hall.

**[205 Reasoning about Luck**
Fall. 3 credits. Intended for nonscientists; does not serve as a prerequisite for further science courses. Assumes no scientific background but will use high school algebra. Not offered 1989–90.

Lecs, M W F 2:30; 5. 1-hr. labs to be arranged. V. Ambegaokar.

An attempt to explain how and when natural scientists can cope rationally with chance. The first part of the course deals in a constructive way with the basic ideas of probability theory and explains why it is that in large systems likely events can become overwhelmingly likely. An introduction to mechanics and to heat as probabilistic mechanics follows. In this way, interested students are given a nontrivial understanding of the second law of thermodynamics, that putative bridge between C. P. Snow's two cultures. Another physical theory, quantum mechanics, in which chance occurs—though in a somewhat mysterious way—is touched on. Approximately five self-paced laboratory experiments will be included.]

**206 War and Peace in the Nuclear Age**
Spring. 4 credits. Intended for nonscientists; does not serve as a prerequisite to further science courses. Assumes no scientific background but will use high school mathematics.

Lecs, T R 12:20–1:35;1 rec each week. K. Gottfried.

This course is intended for any student who wishes to understand the following: the developments in 20th-century physics that culminated in the development of the "atomic" bomb; the principles, types, and effects of nuclear weapons; existing and proposed arsenals and delivery systems; the evolution and present state of the nuclear military strategy of the nuclear powers; and the history of, and current issues in, nuclear arms-control negotiations. The course will also examine important concepts involved in military strategy and arms control. Some attention will also be given to the moral and ethical questions involved. Assignments emphasize development of quantitative reasoning skills as well as knowledgeability about technical aspects of the subject matter.

**207–208 Fundamentals of Physics**
207, fall; 208, spring. 4 credits each term. Prerequisites for Physics 207: high school physics plus coregistration in Mathematics 112 or 192, or substantial previous contact with introductory calculus, combined with coregistration in a math course approved by instructor. Prerequisites for Physics 208: Physics 207 (or 112 or 101 ) and at least coregistration in Mathematics 192 or 112. Physics 207–208 is a two-semester introduction to physics intended for students majoring in a physical science, mathematics, or an analytically oriented biological science.

Lecs, M W F 9:05 or 11:15; 2 recs each week; one 3-hr. lab alternate weeks. Evening exams: fall, Oct. 17, Nov. 16; spring, Mar. 1, Apr. 12. Fall, A. Silverman; spring, R. O. Pohl.

207: mechanics, Newton's laws, conservation laws, waves, and selected topics from gravitation, thermodynamics, fluid mechanics, and acoustics.

208: electricity and magnetism, circuits, and introduction to physical and geometric optics. At the level of *Physics*, by H. C. Ohanian.

**213 Physics II: Electricity and Magnetism**
Fall or spring (also normally offered in summer). 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisites: Physics 112 and coregistration in the continuation of the mathematics sequence required for 112.

Lecs, T R 9:05 or 11:15; 2 recs each week; one 3-hr. lab alternate weeks. Evening exams: fall, Oct. 5, Oct. 31, Nov. 21; spring, Feb. 20, Mar. 15, Apr. 17. Fall, R. C. Richardson; spring, J. Orear, R. Galik; spring, J. Orear.

Electrostatics, behavior of matter in electric fields, magnetic fields, Faraday's law, Maxwell's equations, electromagnetic oscillations and waves, relativity. At the level of *Fundamentals of Physics*, extended version, by Halliday and Resnick. Laboratory covers electrical measurements, DC and AC circuits, resonance phenomena.

**214 Physics III: Optics, Waves, and Particles**
Fall or spring (also normally offered in summer). 3 or 4 credits. Primarily for students of engineering and for prospective physics majors. Prerequisites: Physics 213 and coregistration in the continuation of the mathematics sequence required for 112. (Physics 310 may be taken, with permission of the instructor, in place of the Physics 214 lab; credit for 214 is then reduced to 3 credits.)

Lecs, T R 9:05 or 11:15; 2 recs each week; one 3-hr. lab alternate weeks. Evening exams: fall, Oct. 5, Nov. 7; spring, Feb. 20, Mar. 29. Fall, G. P. Lepage; spring, R. M. Littauer.

Physics of wave phenomena, electromagnetic waves, interference and diffraction effects, optics, wave properties of particles, introduction to quantum physics. At the level of *Fundamentals of Physics*, extended version, 3rd edition, by Halliday and Resnick, or *Physics for Scientists and Engineers* (with *Modern Physics*), by D. Giancoli.

**217 Physics II: Electricity and Magnetism**
Fall or spring. 4 credits. Enrollment may be limited. Intended for students who have done very well in Physics 112 or 116 and in mathematics and who desire a more analytic treatment than that of Physics 213. Prospective physics majors are encouraged to select Physics 217. Prerequisites: approval of student's adviser and permission from the instructor. A placement quiz may be given early in the semester, permitting those students who find Physics 217 too abstract or analytical to transfer into Physics 213, which they can do without difficulty at that time. Vector calculus will be taught in this course, but previous contact, especially with the operations *grad*, *div*, and *curl*, is helpful.
Lecs, M W F 10:10, rec, F 2:30. one 3-hr. lab alternate weeks. Evening exams may be scheduled. Fall, R. M. Cotts; spring, N. W. Ashcroft.
At the level of *Electricity and Magnetism*, by Purcell (Vol. 2, Berkeley Physics Series).

**218 Physics III: Optics, Waves, and Particles**
Fall or spring. 3 or 4 credits. Enrollment may be limited. A special section of Physics 214. Conditions governing enrollment are similar to those of Physics 217.
Lecs, M W F 11:15, rec, F 2:30. one 3-hr. lab alternate weeks. (Physics 310 may be taken, with permission of the instructor, in place of the Physics 214 lab, and credit for 214 is reduced to 3 credits.) See Physics 214 or 310. Fall, R. C. Richardson; spring, D. L. Rubin.
Topics covered in recent years have included oscillators, mechanical waves, waves at interfaces, standing waves, electromagnetic waves, guided waves, scattering, interference and diffraction, geometric optics, the doppler effect, and an introduction to matter waves. Evening exams may be scheduled. A more rigorous version of Physics 214.

**310 Intermediate Experimental Physics**
Fall or spring. 3 credits. Enrollment may be limited. Prerequisite: Physics 208 or 213. May be taken concurrently with Physics 214 or 218 in place of the lab work offered in Physics 214, with permission of student's adviser.
Labs, R F 1:25–4:25. Fall, E. Cassel; spring, R. Galik.
Students select from a variety of experiments. An individual, independent approach is encouraged. Facilities of the Physics 410 lab are available for some experiments.

**315 Phenomena of Microphysics**
Fall or spring. 4 credits. Primarily for students of engineering and prospective majors in physics. Prerequisites: Physics 214 and Mathematics 294.
Lecs, M W F 9:05, R 2:30.
Fall, R. M. Littauer; spring, T-M. Yan.
Introduction to the physics of atoms, solids, nuclei, and elementary particles, emphasizing the description of phenomena using the results of elementary quantum and statistical physics. At the level of *Quantum Physics of Atoms, Molecules, Solids, Nuclei and Particles*, by Eisberg and Resnick.

**318 Analytical Mechanics**
Spring. 4 credits. Prerequisites: Physics 208 or 214 plus one of Mathematics 421, 422 or 423, or permission of instructor. Intended for physics majors concentrating in physics. Similar material is covered in Physics 431 at a less demanding analytical level. (Applied and Engineering Physics 333 is approximately equivalent to Physics 318.)
Lecs, M W F 10:10, F 2:30. R. M. Talman.
Newtonian mechanics of particles and systems of particles, including rigid bodies; oscillating systems; gravitation and planetary motion; moving coordinate systems; Euler's equations; Lagrange's equations; Hamilton's equations; normal modes and small vibrations. At the level of *Classical Mechanics*, by Goldstein.

**325 Electricity and Magnetism**
Fall. 4 credits. Prerequisites: Physics 214 plus coregistration in one of Mathematics 421, 422, or 423, or permission of instructor. Intended for physics majors concentrating in physics. Similar material is covered in Physics 432 at a less demanding analytical level.
Lecs, M W F 11:15, F 2:30.
S. A. Teukolsky.
Electrostatics: electric charge and fields, potential, multipoles, conductors, Laplace equation and formal solutions, field energy, dielectric materials, polarization. Magnetostatics: currents, magnetic fields and vector potential, dipoles, magnetic materials, field energy. Maxwell's equations. Special relativity. At the level of *Introduction to Electro-dynamics*, by Griffiths.

**326 Electromagnetic Waves and Physical Optics**
Spring. 4 credits. Prerequisite: Physics 325.
Lecs, M W F 11:15, W 2:30. L. N. Hand.
Electrodynamics: applications of Maxwell's equations, propagation in various media, radiation, relativistic electrodynamics, transmission lines and wave guides, interference and diffraction phenomena. At the level of *Classical Electromagnetic Radiation*, by Marion and Heald.

**330 Modern Experimental Optics**
Spring. 4 credits. Enrollment limited to approximately 16 students. Prerequisite: Physics 214 or equivalent.
Lec, M 2:30; lab, T R 1:25–4:15 or W F 1:25–4:15. D. M. Lee.
A practical laboratory course in basic and modern optics. Students spend two-thirds of the course experimenting with the physics of basic optical phenomena: interference, diffraction, coherence, polarization, and image formation. The last part of the course involves a choice among experiments on lasers and applications of lasers, light pulses and optical communication, and holography. The course also serves as an introduction to the use of optical equipment and techniques that are employed in current research in the fields of biology, chemistry, physics, and astronomy.

**341 Thermodynamics and Statistical Physics**
Fall. 4 credits. Prerequisites: Physics 214 and Mathematics 294.
Lecs, T R 9:05–9:55, F 10:10–11, T 2:30.
J. M. Parpia.
Statistical physics, developing both thermodynamics and statistical mechanics simultaneously. Concepts of temperature, laws of thermodynamics, entropy, thermodynamic relations, free energy. Applications to phase equilibrium, multicomponent systems, chemical reactions, and thermodynamic cycles. Application of statistical mechanics to physical systems; introduction to treatment of Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics with applications. Elementary transport theory. At the level of *Fundamentals of Statistical and Thermal Physics*, by Reif, or *Thermal Physics*, by Morse.

**360 Electronic Circuits (also Applied and Engineering Physics 363)**
Fall or spring. 4 credits. Prerequisite: Physics 208 or 213 or permission of instructor. No previous experience with electronic circuits is assumed; however, the course moves through the introductory topics (DC and AC circuits, basic circuit elements) rather quickly. Students wishing a more complete background might consider taking Electrical Engineering 210 before Physics 360. Fall term is usually less crowded.
Lec, M 2:30–4:25; labs, T R or W F 1:25–4:25. Fall, E. Kirkland; spring, B. Cooper.
An experimental survey of some devices and circuits in two general areas: analog and digital electronics. In analog circuits, the major emphasis is on operational amplifiers and bipolar transistors, and their applications. Simple filters, diodes, and field-effect transistors are covered briefly. In digital circuits, some time is spent on combinatorial logic devices. This experience is then applied to problems in programming and interfacing a simple microcomputer.

**400 Informal Advanced Laboratory**
Fall or spring; (may also be offered during summer). Variable credit. Prerequisites: two years of physics and permission of instructor.
Lab, see Physics 410.
Experiments of widely varying difficulty in one or more areas, as listed under Physics 410, may be done to fill the student's special requirements.

**410 Advanced Experimental Physics**
Fall or spring. 4 credits. Limited to seniors except by special permission. Prerequisites: Physics 214 (or 310 or 360) plus 318 and 325, or permission of instructor.
Lec, M 2:30–4:25; labs, T W 1:25–4:25. Fall, R. O. Pohl; spring, D. L. Hartill.
Selected topics in experimental concepts and techniques. About seventy different experiments are available in acoustics, optics, spectroscopy, electrical circuits, electronics and ionics, magnetic resonance, X-rays, low temperature, solid state, cosmic rays, nuclear physics. The student performs three to six diverse experiments, depending on difficulty, selected to meet individual needs and interests. Independent work is stressed.

**431–432 Introductory Theoretical Physics I and II**
431, fall; 432, spring. 4 credits each term. Prerequisites: Physics 431: Physics 207–208 or equivalent and Mathematics 294 or equivalent. Physics 432: Physics 431 or equivalent. (Mathematics 421 is recommended.) Primarily for physics majors with concentrations outside physics and for graduate students in a science other than physics (such as chemistry, engineering, biology, geology). Physics 318 and 325 cover similar material at a higher analytical level and are intended for physics majors concentrating in physics.
Lecs, M W F 10:10 and F 1:25. Fall, D. M. Lee; spring, R. M. Cotts.
431: Mechanics. Includes Newtonian mechanics, Lagrange's and Hamilton's equations, central forces, rigid-body motion, and small oscillations. At the level of *Mechanics*, by Symon. 432: Electricity and magnetism. Includes electrostatics, magnetostatics, boundary value problems, dielectric and magnetic media. Maxwell's equations and electromagnetic waves, introduction to special relativity. At the level of *Introduction to Electrodynamics*, by Griffiths.

**443 Introductory Quantum Mechanics**
Fall. 4 credits. Prerequisites: Physics 318 and 325, or 431–432; Physics 315 and Mathematics 421; or permission of instructor.
Lecs, M W F 9:05, F 2:30. Evening exams may be scheduled. A. J. Sievers.
Introduction to concepts and techniques of quantum mechanics, at the level of *Introduction to Quantum Mechanics*, by Dicke and Wittke.

**444 Nuclear and High-Energy Particle Physics**
Spring. 4 credits. Prerequisite: Physics 443 or permission of instructor.
Lecs, M W F 9:05, F 1:25. P. Drell.
Behavior of high-energy particles and radiation; elementary particles; basic properties of accelerators and detectors; general symmetries and conservation laws. At the level of *Concepts of Particle Physics*, by Gottfried and Weisskopf.

**454 Introductory Solid-State Physics**
Fall or spring. 4 credits. Prerequisite: Physics 443 or Chemistry 793, or permission of instructor.
Lecs, fall, M W F 10:10, W 3:35, V. Elser; spring, T R 10:10–11:25, R 3:35, J. Franz.
An introduction to modern solid-state physics, including lattice structure, lattice vibrations, thermal properties, electron theory of metals and semiconductors, magnetic properties, and superconductivity. At the level of *Introduction to Solid State Physics*, by Kittel (fall term), and *Solid State Physics*, by Ashcroft and Mermin (spring term).

**481–489 Special Topics Seminar**
Spring. 2 credits. Limited to senior physics majors and those who receive permission of instructor. S-U grades only.
Hours to be arranged. One selected topic of current interest is studied. Students participate in organization and presentation of material.

**490 Independent Study in Physics**
Fall or spring. 1–3 credits. Ordinarily limited to seniors. Prerequisite: permission of professor who will direct proposed work. Copy of request for independent study form must be filed with physics department course coordinator. Individual project work (reading or laboratory) in any branch of physics.

**500 Informal Graduate Laboratory**
Fall, spring, or summer. Variable credit.

**510 Advanced Experimental Physics**
Fall, spring, or summer. 3 credits.
Labs, T W 1:25–4:25.
Fall, R. H. Siemann; spring, D. L. Hartill.
About seventy different experiments are available in acoustics, optics, spectroscopy, electrical circuits, electronics and ionics, magnetic resonance, X-rays, low temperature, solid state, cosmic rays, nuclear physics. Students perform four to eight experiments selected to meet individual needs. Independent work is stressed.

**520 Projects in Experimental Physics**
Fall, spring, or summer. 1–3 credits. To be supervised by faculty member. Students must advise department course coordinator of faculty member responsible for their project. Prerequisite: Physics 510.
Projects of modern topical interest that involve some independent development work by student. Opportunity for more initiative in experimental work than is possible in Physics 510.

**525 Physics of Black Holes, White Dwarfs, and Neutron Stars (also Astronomy 511, High-Energy Astrophysics)**
Fall. 4 credits.
Lecs, T R 1:25–2:40. S. L. Shapiro.
The formation of compact objects: neutrino and gravitational radiation from supernova collapse and neutron stars. Equilibrium configurations, equations of state, stability criteria, and mass limits. The influence of rotation and magnetic fields. Pulsar phenomena. Mass flow in binary systems; spherical and disk accretion; high-temperature radiation processes. Compact X-ray sources and X-ray bursts. Emphasis will be on the application of fundamental physical principles to compact objects. Topics in diverse areas of physics will be discussed: solid-state physics, nuclear physics, relativity, fluid dynamics, high-energy physics, etc. No astronomy or general relativity prerequisites. Text: *Physics of Black Holes, White Dwarfs, and Neutron Stars*, by Shapiro and Teukolsky.

**551 Classical Mechanics**
Fall. 3 credits. Prerequisite: an undergraduate course in classical mechanics at the level of books by K. Symon or J. B. Marion.
Lecs, T R 10:10, R 2:30. E. D. Siggia.
Lagrangian and Hamiltonian formulation of classical mechanics, with modern applications in nonlinear dynamics. Foundations will be taught at the level of *Mechanics*, by Landau and Lifshitz.

**[553–554 General Relativity (also Astronomy 509–510)**
553, fall; 554, spring. 4 credits. Prerequisite: knowledge of special relativity at the level of *Classical Mechanics*, by Goldstein. Offered alternate years. Not offered 1989–90.
Lecs, T R 1:25–2:40. S. L. Shapiro.
Physics 553 is a systematic introduction to Einstein's theory, with emphasis on modern coordinate-free methods of computation. Topics include review of special relativity, modern differential geometry, foundations of general relativity, laws of physics in the presence of a gravitational field, experimental tests of gravitation theories. At the level of *Gravitation*, by Misner. Physics 554 is a continuation of 553 that emphasizes applications to astrophysics and cosmology. Topics include relativistic stars, gravitational collapse and black holes, gravitational waves, cosmology.]

**561 Classical Electrodynamics**
Fall. 3 credits.
Lecs, T R 8:30–9:55. D. R. Yennie.
Maxwell's equations, electromagnetic potentials, electrodynamics of continuous media (selected topics), special relativity, radiation theory. At the level of *Classical Electrodynamics*, by Jackson.

**562 Statistical Mechanics**
Spring. 4 credits. Primarily for graduate students. Prerequisites: a good knowledge of quantum mechanics (at the level of Merzbacher), classical mechanics (at the level of Marion), and statistical mechanics (at the level of Rief).
Lecs, T R 8:30–9:55. V. Ambegaokar.
Thermodynamic functions, equations of state; Second Law phase equilibria; thermodynamic inequalities; kinetic theory, Boltzmann's equation, transport theory. Microstates, ensembles, partition functions, and phase-space averaging. Chemical equilibria. Quantum statistical mechanics, Fermi-Dirac and Bose-Einstein distributions; application to Bose and Fermi systems. Fundamentals of statistical mechanics: density matrix, reduced distribution, Wigner function, correlation functions and fluctuations. Advanced topics include Ising model, lattice gases, and spin systems; and introduction to critical phenomena. At the level of *Statistical Mechanics*, by Huang, and *Statistical Mechanics*, by Pathria.

**572 Quantum Mechanics I**
Fall or spring. 4 credits.
Lecs, fall, M W F 9:05, T-M. Yan; spring, M W F 11:15. N. D. Mermin.
The formulation of quantum mechanics in terms of states and operators. Symmetries and the theory of angular momentum. Stationary and time-dependent perturbation theory. Fermi's golden rule and variational methods. The elements of scattering theory. At a level between *Quantum Mechanics*, by Merzbacher, and *Quantum Mechanics*, by Landau and Lifshitz. Familiarity with elementary aspects of the Schroedinger equation is assumed, including its application to simple systems such as the hydrogen atom.

**574 Quantum Mechanics II**
Fall or spring. 4 credits. Required of all Ph.D. majors in theoretical physics.
Lecs, M W F 11:15. Fall, V. Ambegaokar; spring, G. P. Lepage.
Discussion of various applications of quantum mechanics, such as collision theory, theory of spectra of atoms and molecules, theory of solids, second quantization, emission of radiation, relativistic quantum mechanics. At the level of *Lectures on Quantum Mechanics*, by Gordon Baym.

**635 Solid-State Physics I**
Fall. 3 credits. First semester of a two-semester sequence of solid-state physics for graduate students who have had the equivalent of Physics 572 and 562 and some prior exposure to solid-state physics, such as Physics 454.
Lecs, T R 11:40–12:55. C. P. Franck.
A survey of the basic *phenomenological* knowledge of condensed matter physics, mainly dealing with solids. Probable topics include equilibrium properties such as structure and phase transitions as well as transport phenomena such as electrical and thermal conductivity. Discussions at the level of *Solid State Physics*, by N. W. Ashcroft and N. D. Mermin.

**636 Solid-State Physics II**
Spring. 3 credits.
Lecs, M W F 10:10. D. Divincenzo.
Much in condensed matter physics is not covered in Ashcroft and Mermin or included in Physics 635. Topics will be chosen from: broken symmetries, elementary excitations, and topological defects; critical phenomena, the onset of chaos, and the renormalization group; first order phase transitions, nucleation, and dendritic growth; broken gauge symmetries, superconductors and superfluids, the fractional quantum Hall effect; disordered systems, spin glasses, localization, and percolation theory.

**645 High-Energy Particle Physics**
Fall. 3 credits.
Lecs, M W F 11:15. K. Gottfried.
Introduction to the physics of baryons, mesons, and leptons. Strong, electromagnetic, and weak interactions. Relevance of symmetry laws to particle physics. Introduction to the quark model. Unification of weak and electromagnetic interactions. At the level of *Introduction to High Energy Physics*, by Perkins.

**646 High-Energy Particle Physics**
Spring. 3 credits.
Lecs, T R 2:55–4:10. K. Berkelman.
Topics of current interest, such as high-energy electron and neutrino interactions, electron positron annihilation, and high-energy hadronic reactions, are surveyed. Lectures and reading material are at the level of *Introduction to High Energy Physics*, by Perkins.

*Note:* Only S-U grades will be given in courses numbered 650 or above.

**651 Advanced Quantum Mechanics**
Fall. 3 credits. S-U grades only.
Lecs, M W F 10:10. T-M. Yan.
Relativistic quantum mechanics with emphasis on perturbation techniques. Extensive applications to quantum electrodynamics. Introduction to renormalization theory. At a level somewhat above that of *Relativistic Quantum Mechanics*, by Bjorken and Drell.

**652 Quantum Field Theory**
Spring. 3 credits. S-U grades only.
Lecs, T R 10:10–11:35. H. Tye.
Canonical field theory. Analytic property of scattering amplitudes and dispersion relations. Renormalization and renormalization group. Symmetry and spontaneous symmetry breaking. Gauge theories. At the level of *Quantum Field Theory*, by Itzykson and Zuber.

**653 Statistical Physics**
Fall. 3 credits. Normally taken by graduate students in their second or later years. Prerequisites: competence in the basic principles of quantum mechanics, statistical mechanics, and thermodynamics. S-U grades only.
Lecs, M W F 9:05. C. Henley.
Survey of topics in modern statistical physics, including the theory of simple classical and quantum fluids; the theory of ordered systems such as superfluids and superconductors; kinetic theory and the Boltmann equation; phenomenological Fermi liquid theory and hydrodynamics; theories of inhomogeneous systems; scaling theories and phase transitions. The contents of the course vary with the current interests of the instructor.

**654 Theory of Many-Particle Systems**
Spring. 3 credits. Prerequisites: Physics 562, 574, 635, 636, and 653. S-U grades only.
Lecs, M W F 11:15. E. D. Siggia.
Equilibrium and transport properties of microscopic systems of many particles studied at zero and finite temperatures. Thermodynamic Green's function techniques introduced and applied to such topics as normal and superconducting. Fermi systems, superfluidity, magnetism, insulating crystals.

**661 High-Energy Phenomena**
Fall. 3 credits. Prerequisites: Physics 645, 646, and 651 (652 also desirable). S-U grades only.
Lecs, M W F 10:10. H. Tye.
Field theoretic techniques used to study the strong and electroweak interactions of elementary particles are surveyed. Among these topics are path integrals, quantization of nonabelian gauge theories, renormalization group equations, applications of perturbative QCD, lattice field theories, chiral Lagrangians, and the Standard Model of electroweak interactions. The relevance of these techniques and theories to experimental physics will be stressed.

**[665 Topics in Theoretical Astrophysics (also Astronomy 555)**
Fall. 4 credits. S-U grades only. Not offered 1989–90.
Lecs, M W F 2:30. E. E. Salpeter.
Usually concentrates on the theory of the interstellar medium. At the level of Spitzer's *The Physical Processes in the Interstellar Medium*.]

**[667 Theory of Stellar Structure and Evolution (also Astronomy 560)**
Fall. 4 credits. S-U grades only. Not offered 1989–90.
Lec, M W F 1:25. E. E. Salpeter.
Summary of observational facts on stars; dimensional analysis; nuclear reactions and energy, transport in stellar interiors; models for static and evolving stars. At the level of *Principles of Stellar Energy and Nucleosynthesis*, by Clayton.]

**680–689 Special Topics**
Offerings are announced each term. Typical topics are group theory, analyticity in particle physics, weak interactions, superfluids, stellar evolution, plasma physics, cosmic rays, general relativity, low-temperature physics, X-ray spectroscopy or diffraction, magnetic resonance, phase transitions, and the renormalization group.

**690 Independent Study in Physics**
Fall or spring. Variable credit. Students must advise department course coordinator of faculty member responsible for their project. S-U grades only. Special graduate study in some branch of physics, either theoretical or experimental, under the direction of any professional member of the staff.

# PORTUGUESE

See Modern Languages and Linguistics.

# PSYCHOLOGY

D. Bem, S. Bem, U. Bronfenbrenner, W. Collins, J. Cutting, R. Darlington, T. DeVoogd, D. Dunning, H. M. Feinstein, D. Field, B. L. Finlay, E. J. Gibson, T. D. Gilovich, B. P. Halpern, A. M. Isen, R. E. Johnston, F. Keil, K. Keil, C. Krumhansl, H. S. Kurtzman, W. W. Lambert, H. Levin, D. Levitsky, J. B. Maas, R. D. Mack, H. Porte, D. T. Regan, E. A. Regan, T. A. Ryan, E. Spelke

The major areas of psychology represented in the department are human experimental psychology, biopsychology, and personality and social psychology. These areas are very broadly defined, and the courses are quite diverse. Biopsychology includes such things as animal learning, neuropsychology, interactions between hormones, other biochemical processes, and behavior. Human experimental psychology includes such courses as cognition, perception, memory, and psycholinguistics. Personality and social psychology is represented by courses and fieldwork in psychopathology as well as courses in social psychology and personality (such as theories of personality, beliefs and attitudes, and sex roles). In addition to the three major areas mentioned above, the department also emphasizes the statistical and logical analysis of psychological data and problems.

## The Major

Prerequisites for admission to the major are:

1) any three courses in psychology (students often begin with Psychology 101 );
2) no grade below C+ in any psychology course; and
3) acceptance by the Majors and Advising Committee of the Department of Psychology.

Application forms may be obtained at the department office and should be filed two weeks before the pre–course enrollment period.

Requirements for the major are:

1) a total of 40 credits in psychology (including prerequisites), from which students majoring in psychology are expected to choose, in consultation with their advisers, a range of courses that covers the basic processes in psychology (laboratory and/or field experience is recommended); and
2) demonstration of proficiency in statistics before the beginning of the senior year. (See the section below on the statistics requirement.)

Normally it is expected that all undergraduate psychology majors will take at least one course in each of the following three areas of psychology:

1) Human experimental psychology
2) Biopsychology
3) Social, personality, and abnormal psychology

The following classification of Department of Psychology offerings is intended to help students and their advisers choose courses that will ensure that such breadth is achieved.

1) **Human experimental psychology:** Psychology 205, 209, 214, 215, 276, 305, 308, 309, 313, 314, 316, 345, 370, 412, 415, 416, 417, 418, 436, 492, 605, 609, 612, 614, 615, 616, 618, 670, 692, 709, 713, 715, 717.
2) **Biopsychology:** Psychology 123, 307, 322, 324, 326, 332, 361, 396, 422, 425, 429, 492, 607, 622, 625, 626, 629, 692, 696, 722.
3) **Social, personality, and abnormal psychology:** Psychology 265, 275, 277, 280, 325, 327, 328, 329, 379, 383, 384, 385, 389, 402, 404, 426, 450, 467, 468, 469, 481, 482, 486, 488, 489, 491, 650, 684, 689, 691, 785.

The major adviser determines to which group, if any, the following courses may be applied.

4) **Other courses:** Psychology 101, 103, 347, 350, 387, 410, 440, 465, 470, 471, 472, 473, 475, 476, 478, 479, 490.

With the permission of the adviser, courses in other departments may be accepted toward the major requirements.

**Fieldwork, independent study, and teaching.** The department requires students to observe the following limits on fieldwork, independent study, and teaching.

1) Undergraduates may not serve as teaching assistants for psychology courses if they are serving as teaching assistants for any other course during the same semester.

2) An undergraduate psychology major cannot apply more than 12 of the credits earned in independent study (including honors work) and fieldwork toward the 40 credits required by the major.

**Statistics requirement.** Proficiency in statistics can be demonstrated in any one of the several ways listed below.

1) Passing Psychology 350.

2) Passing an approved course or course sequence in statistics in some other department at Cornell. The approved list of courses and sequences may change. It has usually included Education 352 and 353, Industrial and Labor Relations 210 and 211, and Sociology 301. An up-to-date list is posted outside of 278 Uris Hall. Requests that a particular course be added to this list may be made to Professor Gilovich.

3) Passing a course or course sequence in statistics at some other college, university, or college-level summer school. The course or sequence must be equivalent to at least 6 semester credits. The description of the course from the college catalog and the title and author of the textbook used must be submitted to Professor Gilovich for approval.

4) Passing an exemption examination. This examination can be given at virtually any time during the academic year if the student gives notice at least one week before. Students who have completed a theoretical statistics course in a department of mathematics or engineering and who wish to demonstrate competence in applied statistics usually find this option the easiest. Students planning this option should discuss it in advance with Professor Gilovich. Sample examination questions are posted outside of 278 Uris Hall.

**Concentration in biopsychology.** Psychology majors interested in psychology as a biological science can elect to specialize in biopsychology. Students in this concentration must meet all of the general requirements for the major in psychology and must also demonstrate a solid background in introductory biology; the physical sciences, including at least introductory chemistry; and mathematics. Students will design with their advisers an integrated program in biopsychology built around courses on physiological, chemical, anatomical, and ecological determinants of human and nonhuman behavior offered by the Department of Psychology. Additional courses in physiology, anatomy, biochemistry, neurochemistry, neurobiology, and behavioral biology may be designated as part of the psychology major after consultation between the student and his or her biopsychology adviser.

**Concentration in personality and social psychology.** This concentration is offered in cooperation with the Department of Sociology. Psychology majors who wish to specialize in social psychology are expected to meet the general requirements set by their department, including statistics. To ensure a solid interdisciplinary grounding, students in the concentration will be permitted to include in the major courses in sociology and related fields. Advisers will assist students in the selection of a coherent set of courses from social organization, cultural anthropology, experimental psychology, social methodology, and several aspects of personality and social psychology. Seniors in the concentration may elect advanced and graduate seminars, with the permission of the instructor.

**Undergraduate honors program.** The honors program is designed for those exceptionally able students who want to pursue an intensive and independent program of research in psychology. Successful participation in this program serves as evidence of the student's facility in the two most important skills of an academic psychologist: the capacity to acquire and integrate a substantial body of theoretical and factual material and the ability to engage in creative research activity. All qualified students planning on a graduate education in psychology or other academic fields should consider the honors program seriously. The program offers most students the closest contact and consultation with faculty that they will receive during their time at Cornell.

The core of the honors program is a research project that the student carries out in close collaboration with a faculty member in the field of psychology. It is assumed that most students will do so while enrolled in Psychology 470 (Undergraduate Research in Psychology). A written report of the research is to be given to the chair of the honors committee (currently Professor Dunning) toward the end of the last semester of the student's senior year. An oral defense of the thesis is then given before a committee of three faculty members, and the student presents his or her work in a public forum. Final honors standing (summa cum laude, magna cum laude, cum laude) is indicated on the student's diploma. The T. A. Ryan Award, accompanied by a cash prize, is awarded to the student who conducts the best honors project in a given year.

A student may formally apply to the honors program at any time during the senior year provided that she or he is actively engaged in independent research. However, students must do so by the end of the fall term. Applications should be given to Professor Dunning and should be made directly by the student.

## Distribution Requirement

The distribution requirement in the social sciences is satisfied by any two courses in psychology with the exception of Psychology 123, 307, 322, 324, 326, 350, 361, 396, 422, 425, 429, 451, 471, 472, 473, 475, 476, 479, 492, 607, 622, 625, 626, 629, 696, and 722.

## Courses

**101 Introduction to Psychology: The Frontiers of Psychological Inquiry**
Fall. 3 credits. Students may not receive credit for both Psychology 101 and Education 110. Students who would like to take a discussion seminar should also enroll in Psychology 103.
M W F 10:10. J. B. Maas. Prelims: 7:30 p.m., Oct. 2, Nov. 6.
The study of human behavior. Topics include brain functioning and mind control, psychophysiology of sleep and dreaming, psychological testing, perception, learning, cognition, memory, language, motivation, personality, abnormal behavior, psychotherapy, social psychology, and other aspects of applied psychology. Emphasis is on developing skills to critically evaluate claims made about human behavior.

**103 Introductory Psychology Seminars**
Fall. 1 credit. Limited to 400 students. Prerequisite: concurrent enrollment in Psychology 101.
Hours to be arranged; 32 different time options. Staff.
A weekly seminar that may be taken in addition to Psychology 101 to provide an in-depth exploration of selected areas in the field of psychology. Involves extensive discussion and a term paper related to the seminar topic. Choice of seminar topics and meeting times will be available at the second lecture of Psychology 101.

**109 Freshman Writing Seminar: The Science of Dreaming Sleep**
Fall. 3 credits. Prerequisite: high school biology and chemistry. Limited to 17 students.
T R (Section 1) 1:25–2:40, (Section 2) 2:55–4:10. H. Porte.
Topics will include the phenomenology and neurobiology of rapid eye movement ("paradoxical") sleep; the REM sleep disorder, narcolepsy; the sense and nonsense of dreams; the problems of dream theory and dream interpretation; animals and people who act out their dreams.

**123 Introduction to Biopsychology**
Fall. 3 credits. May not be taken for credit by students who are registered in or have completed one or more courses offered by the Section of Neurobiology and Behavior of the Division of Biological Sciences or two or more biopsychology courses.
M W F 10:10. E. A. Regan.
The biology of behavior, including both evolutionary and physiological approaches to behavior. Human behavior is discussed whenever possible, but there is also extensive discussion of the behavior of nonhuman species. Specific topics include the structure, function, and development of the nervous system, stress and disease, sleep, genetic and chemical models of mental disorder, and hormones and sexual behavior; biological bases of learning, cognition, communication, and language; and the ecology and evolution of social organization and social development.

**Introductory courses in cognitive psychology.** Each of the following four courses (205, 209, 214, 215) provides an introduction to a major area of study within cognitive psychology. These courses are independent of one another, and none has any prerequisites. Students may take any one of the courses or any combination of them (including all four). Courses may be taken in any order or simultaneously.

**205 Perception**
Spring. 3 credits. Open to first-year students. Graduate students, see Psychology 605.
T R 2:55–4:10. J. Cutting.
One of four introductory courses in cognitive psychology. Basic perceptual concepts and phenomena are discussed with emphasis on stimulus variables and sensory mechanisms. All sensory modalities are considered. Visual and auditory perception are discussed in detail.

**209 Developmental Psychology**
Spring. 4 credits. Graduate students, see Psychology 609.
T R 1:25–2:40; sec to be arranged. E. Spelke.
One of four introductory courses in cognitive psychology. A comprehensive introduction to current thinking and research in developmental psychology. The course focuses on development of action, development of perception and knowledge, development of language, morality, and other aspects of human culture, and development of emotional and social relationships.

**214 Knowledge and Reasoning**
Spring. 3 credits. Graduate students, see Psychology 614.
M W F 1:25. C. Krumhansl.
One of four introductory courses in cognitive psychology. A survey of the following topics: visual and auditory memory, imagery, attention, memory for language, reasoning, decision making, and intelligence.

**215 Psycholinguistics**
Fall. 3 or 4 credits (4-credit option involves term paper). Graduate students, see Psychology 715.
M W F 11:15. H. S. Kurtzman.
One of four introductory courses in cognitive psychology. Introduction to the psychological study of language. Covers basic linguistic theory and contemporary research into language comprehension, production, and acquisition.

**265 Psychology and Law**
Fall. 3 credits. Prerequisite: Psychology 101.
M W F 1:25. D. Dunning.
This course examines the implications of psychological theory and methods for law and the criminal justice system. We concentrate on psychological research on legal topics (e.g., confession, eyewitness testimony, jury decision making, homicide, aggression, the prison system), social issues (e.g., death penalty, affirmative action), as well as on psychologists as participants in the legal system (e.g., assessing insanity and dangerousness and for expert testimony).

**275 Introduction to Personality Psychology**
Fall. 3 credits. Prerequisite: an introductory psychology course.
T R 10:10–11:25. D. Bem.
An introduction to research and theory in personality psychology, emphasizing contemporary approaches. Topics include the dynamics, structure, and assessment of personality as well as personality development and change. Biological and sociocultural influences on personality are also considered.

**[276 Motivation Theory: Contemporary Approaches and Applications**
Spring. 4 credits. Prerequisite: an introductory psychology course. Not offered 1989–90.
M W F 11:15. Staff.
Models and research in human motivation are examined and integrated. Traditional approaches are used as departure points for the study of more-current themes such as intrinsic motivation and achievement motivation. Attention is given to how pertinent various themes are to real-life behavioral settings.]

**277 Psychology of Sex Roles (also Women's Studies 277 and Sociology 277)**
Spring. 3 credits. Limited to 200 students. Prerequisite: an introductory psychology course.
T R 2:55–4:25. S. Bem.
The course addresses the question of why and how adult women and men come to differ in their overall life styles, work and family roles, personality patterns, cognitive abilities, etc. This broad question is examined from five perspectives: (a) the psychoanalytic perspective, (b) the biological perspective, (c) the historical and cultural evolutionary perspective, (d) the child development perspective, and (e) the social-psychological and contemporaneous perspective. Each of these perspectives is also brought to bear on more specialized phenomena relating to the psychology of sex roles, including psychological androgyny, women's conflict over achievement, the male sex role, equalitarian marriage relationships, gender-liberated child-rearing, female sexuality, homosexuality, and transsexualism.

**280 Introduction to Social Psychology**
Spring. 3 or 4 credits; the additional (or fourth) credit is given for the completion of a group research project and write-up. Prerequisite: an introductory psychology course.
T R 8:40–9:55. T. D. Gilovich, D. T. Regan.
An introduction to research and theory in social psychology. Topics include processing of social information; social influence, persuasion, and attitude change; social interaction and group phenomena. The application of social psychological knowledge to current events will also be discussed.

**305 Visual Perception**
Fall. 4 credits. Limited to 20 students. Prerequisite: Psychology 205 or permission of instructor.
M W F 1:25–2:15. J. Cutting.
A detailed examination of theories and processes in visual perception. Topics will include the perception of color, form, and motion; perceptual constancies; adaptation; pattern perception; and photography, television, and film.

**307 Chemosensory Perception**
Fall. 3 or 4 credits; the optional (or fourth) credit is for an independent laboratory project. Registration for the 4-credit option requires permission of the instructor; students will read, analyze, and discuss difficult original literature in the areas covered. Offered alternate years. Graduate students, see Psychology 607.
T R 9:05. B. P. Halpern.
An examination of basic theory, data, and processes for perception of the chemosensory environment. Topics include psychophysical methods for human and nonhuman studies, stimulus control, chemosensory function and development in neonates, role of chemosensory function in food choices, chemosensory communication, effects of pollution of the chemosensory environment, and possible consequences of chemosensory dysfunctions. At the level of *The Perception of Odors*, by T. Engen; *Food Taste Chemistry*, edited by J. C. Boudreau; and *Clinical Measurement of Taste and Smell*, edited by H. L. Meiselman and R. S. Rivlin.

**[308 Perceptual Learning**
Fall. 3 credits. Prerequisite: Psychology 205, 209, or 305, or permission of instructor. Not offered 1989–90.]

**309 Development of Perception**
Fall. 3 credits. Prerequisite: Psychology 205, 209, 214, or 305, or permission of instructor. Graduate students, see Psychology 609.
T R 1:25–2:40. E. Spelke.
An introduction to theories and research on the origins and development of perceptual knowledge. The course focuses on perception of the world as an arrangement in space and time, perception of the world as a unit that can be encountered through multiple sensory modes, perception of the world as a meaningful place that can be acted upon, and organization of the world into objects and events.

**[313 Perceptual and Cognitive Processes**
Spring. 4 credits. Prerequisite: Psychology 205 or 214 or permission of instructor. Not offered 1989–90. Graduate students, see Psychology 713.
R 1:25–4:25. Staff.
A critical examination of selected topics in the area of perceptual and higher mental processes. We will read, discuss, and critically analyze original experimental reports and theoretical articles.]

**314 The Social Psychology of Language**
Spring. 4 credits. Prerequisite: a course in psycholinguistics or social or personality psychology, or permission of instructor.
T R 2:55–4:10. H. Levin.
We are aware that one talks differently to children than to adults, to foreigners than to native speakers, to people we like than to those we detest, to people whose intelligence we respect compared to those we think are idiots. Speech varies by social setting; by the relationships between people; by formality, friendship, affection; and by the purposes of the communication: deception, persuasion, propaganda, etc. What are the rules of social language? How do we acquire the abilities to vary language appropriately and to understand the meanings of such variations?

**[316 Auditory Perception**
Spring. 3 or 4 credits; the 4-credit option involves a laboratory project or paper. Prerequisite: Psychology 205, 209, 214, or 215 (other psychology, linguistics, or biology courses could serve as prerequisite with permission of the instructor). Not offered 1989–90.
Lecs, T R 2:30–4:25; lab, hours to be arranged. Staff.
Basic approaches to the perception of auditory information, with special consideration of complex patterns such as speech, music, and environmental sounds.]

**322 Hormones and Behavior (also Biological Sciences 322)**
Spring. 3 or 4 credits; the 4-credit option involves a one-hour section once a week, in which students will be expected to participate in discussion and read original papers in the field. Limited to juniors and seniors; open to sophomores only by permission. Prerequisites: one year of introductory biology plus a course in psychology or Biological Sciences 221 or 222. S-U grades optional. Because the 4-credit option has very limited enrollment, students should preregister for 3 credits only. Offered alternate years. Graduate students, see Psychology 722.
T R 10:10–11:30. E. A. Regan, R. E. Johnston.
The relationship between endocrine and neuroendocrine systems and the behavior of animals, including humans. Major emphasis is on sexual, parental, and aggressive behavior.

**[324 Biopsychology Laboratory (also Biological Sciences 324)**
Fall. 4 credits. Limited to 25 juniors and seniors. Prerequisites: Psychology 123 or Biological Sciences 221 or 222, and permission of instructor. S-U grades optional. Not offered 1989–90.
T R 1:25–4:25. T. DeVoogd.
Experiments designed to provide research experience in animal behavior (including learning) and its neural and hormonal mechanisms. A variety of techniques, species, and behavior patterns are included.]

**325 Introductory Psychopathology**
Fall. 3 credits. Prerequisite: a course in introductory psychology. Students who would like to take a discussion seminar should also enroll in Psychology 329. May be taken concurrently with Psychology 327. Enrollment in Psychology 327 is limited.
T R 1:25–2:40. R. D. Mack.
A survey of the various forms of psychopathology, child and adult, as they relate to the experiences of human growth and development. Presents a description of the major syndromes, investigations, theories of etiology, and approaches to treatment.

**326 Evolution of Human Behavior**
Fall. 4 credits. Prerequisite: Psychology 123, an introductory biology course, or an introductory anthropology course. Graduate students, see Psychology 626.
T R 2:30–4. R. E. Johnston.
A broad comparative approach to the behavior of animals and humans with special emphasis on the evolution of human behavior. Topics covered will vary but will include some of the following: human evolution, evolutionary and sociobiological theory, animal communication, non-verbal communication, language, cognitive capacities, social behavior and organization, cooperation and altruism, sexual behavior, mating and marriage systems, aggression, warfare.

**327 Fieldwork in Psychopathology and the Helping Relationship**
Fall. 2 credits. Prerequisites: Psychology 325 or concurrent registration in 325 and permission of instructor. S-U grades only. Students do not enroll in advance for this course. Field placement assignments are made in Psychology 325 during the first two weeks of the semester. Students who have already taken Psychology 325 must contact the instructor during the first week of the semester. Enrollment is limited by the fieldwork placements available. Fee, $25.
T R 12:20–1:10. K. Keil.
An introductory fieldwork course for students currently enrolled in, or who have taken, Psychology 325. Fieldwork placements include the school system, psychiatric institutions, halfway houses, and other mental health-oriented facilities. In addition to fieldwork, weekly supervisory/seminar meetings are held to discuss fieldwork issues and assigned readings.

**328 Continuing Fieldwork in Psychopathology and the Helping Relationship**
Fall or spring. 2 credits each term. Prerequisites: Psychology 325, 327, and permission of instructor. S-U grades only. May not be taken more than twice. Students do not enroll in advance for this course. Students in Psychology 327 should inform their teaching assistant before the end of the semester of their desire to take Psychology 328. Students not currently in a field placement who want to take Psychology 328 should contact the instructor during the first week of the semester. Field placement assignments will be made during the first two weeks of the semester. Enrollment is limited by the fieldwork placements available. Fee, $25.
T R 12:20–1:10. K. Keil and staff.
Designed to allow students who have begun fieldwork as part of Psychology 327 to continue their field placements under supervision and for academic credit. A limited number of students may be allowed to begin their fieldwork with Psychology 328 but only with permission of the instructor.

**329 Introductory Psychopathology Seminars**
Fall. 1 credit. Limited to 90 students. Prerequisite: must be concurrently enrolled in Psychology 325. Letter grade only.
Hours to be arranged; 9 different time options. Staff.
A weekly seminar/discussion section that may be taken in addition to Psychology 325 to provide an in-depth exploration of selected areas in the field of psychopathology. Topics vary from year to year and may include such areas as depression, schizophrenia, psychotherapy, sex-roles and psychopathology, etc. Involves extensive discussion and several short papers related to the seminar topic. Choice of seminar topics and meeting times will be available at the second or third lecture of Psychology 325.

**[332 Biopsychology of Learning and Memory**
Spring. 3 credits. Prerequisites: one year of biology and either a biopsychology class or Biological Sciences 222. Not offered 1989–90.
M W F 11:15. T. DeVoogd.
This course will survey the approaches that have been or are currently being used in order to understand the biological bases for learning and memory. Topics will include invertebrate, "simple system" approaches, imprinting, avian song learning, hippocampal and cerebellar function, and human pathology. Many of the readings will be from primary literature.]

**[345 Psychological Research and Afro-Americans (also Africana Studies 345)**
Fall. 4 credits. Prerequisite: one course in introductory psychology or Africana Studies and Research Center 171. Not offered 1989–90.
T R 1:25–2:40. Staff.
In this course we will examine psychological research that has implications for Afro-Americans. The issues to be explored include (1) research methods, (2) racial attitudes within and between groups, (3) measures of group differences, (4) cognitive abilities, and (5) motivational issues. Course requirements include a preliminary exam, a midterm paper, and a final project.]

**[347 Psychology of Visual Communications**
Spring. 4 credits. Limited to 12 students. Prerequisites: Psychology 101 and permission of instructor. Not offered 1989–90.
T 10:10–12:05; lab to be arranged. J. B. Maas.
An exploration of theories of perception, attitude, and behavior change as they relate to the effectiveness of visually based communication systems. Emphasis is on an empirical examination of the factors that determine the nature and effectiveness of pictorial representations of educational messages in non-print media.]

**350 Statistics and Research Design**
Fall. 4 credits. Prerequisite: a course in the behavioral sciences.
M W F 9:05. T. D. Gilovich.
Acquaints the student with the elements of statistical description (measures of average, variation, correlation, etc.) and, more importantly, develops an understanding of statistical inference. Emphasis is placed on those statistical methods of principal relevance to psychology and related social sciences.

**[361 Biochemistry and Human Behavior (also Nutritional Sciences 361)**
Fall. 3 credits. Prerequisites: Biological Sciences 101–102, Chemistry 103–104, Psychology 123, or permission of instructor. S-U grades optional. Not offered 1989–90.
M W F 11:15. D. Levitsky.
The course is intended to survey the scientific literature on the role of the brain and body biochemical changes as determinants of human behavior. The topics covered include action and effects of psychopharmacologic agents, biochemical determinants of mental retardation, biochemical theories of psychosis, and effects of nutrition on behavior. A fundamental knowledge of human biology and chemistry is essential.]

**[370 Language and Cognition (also Linguistics 370)**
Spring. 4 credits. Prerequisites: Linguistics 101 or 264, Psychology 215, or permission of one of the instructors. Not offered 1989–90. Graduate students, see Psychology 670.
T R 1:25–2:40. J. Bowers, H. Kurtzman.
Examination of current research on selected topics in language from both linguistic and psychological perspectives. Topics include universal grammar and language acquisition, syntactic parsing, word recognition, sentence production, aphasia, and schizophrenic language.]

**[379 Social Cognition**
Spring. 4 credits. Prerequisite: one course in social or cognitive psychology or permission of instructor. Not offered 1989–90.
T R 10:10–11:25. Staff.
The focus of this course is on experimental research that applies cognitive principles to the study of social psychological phenomena. The course begins with an overview of research methodology (no prior knowledge in this area is required). Readings and discussion center around the following topics: (1) the organization and representation of social information; (2) assessing the causes of social behavior; and (3) sources of error and bias in human judgment. Course requirements include an examination, a midterm paper, and a final project.]

**[383 Social Interaction (also Sociology 383)**
Spring. 4 credits. Prerequisite: a course in social psychology. Not offered 1989–90.
M W 2:30–4:25. D. Hayes.
Fine-grain analyses of social behavior, its structure, changes, and determinants. Extensive practice in analysis of filmed and taped interactions. Student research is required throughout the course.]

**[384 Cross-Cultural Psychology**
Spring. 4 credits. Prerequisites: a course in psychology and one in either sociology or social or cultural anthropology, or permission of instructor. Not offered 1989–90. Graduate students, see Psychology 684.
M W F 11:15. Staff.
A critical survey of approaches, methods, discoveries, and applications in emerging attempts to study human nature, experience, and behavior cross-culturally. Focus on studies of cognition, values, socialization, sociolinguistics, personality, attitudes, stereotype, ideology, sociocultural development, and mental illness. Problems of how one can learn another culture will also be dealt with.]

**[385 Theories of Personality**
Spring. 4 credits. Prerequisite: Psychology 101, 214, or 275, or permission of instructor. Not offered 1989–90. Graduate students, see Psychology 785.
M W F 11:15. Staff.
An intermediate analysis of comparative features of the historically and currently important theories of personality, with an evaluation of their systematic empirical contribution to modern personality study, to psychology, and to other behavioral sciences.]

**[387 Health and Disease (also Biology and Society 327 and German Studies 327)**
Fall. 4 credits. Limited to 20 students. Not offered 1989–90.
Hours to be arranged. S. L. Gilman and faculty team.
Everyone knows what health and disease are. Or do they? This Common Learning course on health and disease will explore some of the cultural, psychological, philosophical, anthropological, medical, economic, and political dimensions of these concepts to show how various models of disease function in contexts from business to engineering, from the military to the medical profession. The course will be divided into two segments: the first will examine the general implications of concepts of health and illness; the second will study these general principles as reflected in the definition, treatment, and mythmaking surrounding one specific disease: schizophrenia. The course will draw on specialists from throughout the university.]

**389 Reading Freud: Race, Gender, and Psychoanalysis (also Comparative Literature 347, English 347, German Studies 347, HPST 347)**
Fall. 3 credits.
F 1:25–3:20. S. L. Gilman.
This course will read a series of texts from the formative works of Sigmund Freud (beginning with the *Studies in Hysteria* and concluding with Freud's reading of the Schreber autobiography). These readings will be placed within the tension existing at the turn of the century between concept of the biology of race and biology of gender. Close attention will be paid to the cultural, scientific, as well as polemical literature on the ideas of race and gender from the biological writings of the late nineteenth century. The course will also provide an introduction to the basic concepts of Freudian psychoanalytic theory. The class will consist of a one-hour lecture and a one-hour discussion group. All of the primary readings are available in English.

**396 Introduction to Sensory Systems (also Biological Sciences 396)**
Spring. 3 or 4 credits (4 credits with term paper). Registration for the 4-credit option requires permission of instructor. Prerequisites: an introductory course in biology or biopsychology, plus a second course in neurobiology or behavior or perception or cognition or biopsychology. Students will be expected to have elementary knowledge of perception, neurophysiology, behavior, and chemistry. No auditors. Offered alternate years. Graduate students, see Psychology 696.
M W F 9:05. B. P. Halpern.
The course will be taught using the Socratic method, in which the instructor asks questions of the students. Students read, analyze, and discuss in class difficult original literature dealing with both those characteristics of sensory systems that are common across living organisms and those sensory properties which represent adaptations of animals to particular habitats or environments. The principles and limitations of major methods used to examine sensory systems will be considered. General principles of sensory systems, and auditory, visual, and somesthetic systems are covered. One aspect of each system (e.g., localization of objects in space by sound, color vision, thermoreception) will be selected for special attention. At the level of *An Introduction to the Physiology of Hearing*, by J. O. Pickles; *Photoreceptors: Their Role in Vision*, by A. Fein and E. Z. Szuts; *Comparative Studies of Hearing in Vertebrates*, edited by A. N. Popper and R. R. Fay; and "Information Processing in Cutaneous Mechanoreceptors," *Fed. Proc.*, 42:1983.

**402 Current Research on Psychopathology**
Spring. 4 credits. Prerequisite: Psychology 325.
W 1:25–4. K. Keil.
Current research and theory on the nature and etiology of major psychiatric disorders. Approaches from various disciplines are considered. Minimal attention to psychotherapy and symptomatology.

**404 Psychopathology and the Family**
Fall. 4 credits. Limited to 20 students. Prerequisite: Psychology 325.
W 1:25–4. K. Keil.
This course will explore familial influences on the development of abnormal behavior. It will examine how psychological, biological, and cultural factors in a family might contribute to such disorders as anorexia nervosa, depression, sexual abuse, psychopathy, and psychosomatic illnesses. Emphasis will be placed on early childhood experiences in the family and their impact on the development of later psychopathology. The course will also discuss how the evolution of family structures in more recent times (e.g., the rise in day care and divorce) influences the individual. Family therapy approaches and techniques will also be examined.

**410 Undergraduate Seminar in Psychology**
Fall or spring. 2 credits. Written permission of section instructor required for registration. Nonmajors may be admitted, but psychology majors are given priority.
Hours to be arranged. Staff.
Information on specific sections for each term, including instructor, prerequisites, and time and place, may be obtained from the Department of Psychology office, 211 Uris Hall.

**[412 Human Experimental Psychology Laboratory**
Spring. 4 credits. Limited to 15 students. Prerequisite: permission of instructor. Recommended: knowledge of some high-level programming language, at least one course in human experimental psychology, or graduate standing in psychology. Not offered 1989–90. Graduate students, see Psychology 612.
T R 1:25–2:40; lab to be arranged. Staff.
A laboratory course in current methods of experimentation in perception and cognitive psychology that will focus on the use of microcomputers in laboratory research for both stimulus presentation and data collection. Students will hand in written laboratory reports. Projects will be selected from the areas of visual perception, pattern recognition, reading, memory, language, and concept learning.]

**415 Concepts, Categories, and Word Meanings**
Fall. 4 credits. Prerequisites: Psychology 205, 209, 214, or 215, or permission of instructor. Graduate students, see Psychology 615.
T 1:25–4. F. Keil.
Several different psychological theories about concepts, conceptual structure, and word meaning are considered. Topics will include models of concepts and categorization processes, conceptual change in development and in novice-expert transitions, relations between semantic and conceptual structure, and relations between concepts and intuitive theories of the world.

**416 Psychology of Language**
Spring. 4 credits. Prerequisite: some background in psycholinguistics or linguistics. Graduate students, see Psychology 616.
T R 1:25–2:40. H. S. Kurtzman.
Each year the course focuses on one or two major theoretical issues in current psycholinguistics. An intensive critical examination is made of the relevant literature from psychology, linguistics, and artificial intelligence. The issues are considered not only at the detailed level of specific hypotheses and evidence but also in relation to broader theoretical trends in the field.

**417 The Origins of Thought and Knowledge**
Spring. 4 credits. Prerequisites: Psychology 205, 209, 214, or 215, or permission of instructor. Graduate students, see Psychology 717.
T 1:25–4:05. F. Keil.
An in-depth analysis of current theories concerning the growth of thought and knowledge in childhood. Several controversies will be discussed in detail, including: Are mental abilities organized in local domains or modules that have their own patterns of development, or is cognitive development a more general process? Do comparative studies with other species and evolutionary models provide any useful insights into cognitive development in humans? Are there qualitative restructurings of thought and knowledge with development, or is the process more continuous in nature? What restrictions should these developmental considerations place on models of thought and knowledge in adults?

**418 Psychology of Music**
Fall. 3 or 4 credits, depending on whether student elects to do an independent project. Prerequisites: junior or senior standing with major in psychology or music and some background in both, or permission of instructor. Graduate students, see Psychology 618.
T R 1:25–2:40. C. Krumhansl.
Detailed analysis of topics in the psychology of music, including theories of consonance, perception of tonal-harmonic structure, memory for music, and effects of musical training. Emphasis given to experimental methodologies.

**422 Developmental Biopsychology**
Fall. 4 credits. Prerequisites: a course in introductory biology and a course in biopsychology or neurobiology (such as Psychology 123 or Biological Sciences 221). Graduate students, see Psychology 622.
M W F 9:05. B. L. Finlay.
We will discuss the relationship of the development and evolution of the brain to the development of behavior. Topics include normal neuroembryology; how neurons are generated, find targets, and establish connections; the emergence of reflexive and complex behavior; how experience affects the developing brain; evolutionary perspectives on the development of perception, memory, and communication systems; and abnormal development.

**[425 Brain and Behavior**
Fall. 3 or 4 credits (4-credit option includes a discussion section and requires an additional paper). Prerequisites: a course in introductory biology and a course in biopsychology or neurobiology (such as Psychology 123 or Biological Sciences 221). Not offered 1989–90. Graduate students, see Psychology 625.
M W F 9:05. B. L. Finlay.
We will study the relation between structure and function in the central nervous system. Human neuropsychology and the contribution of work in animal nervous systems to the understanding of the human nervous system will be stressed. Some topics to be discussed include visual and somatosensory perception, organization of motor activity, emotion and motivation, psychosurgery, and memory and language.]

**[426 Seminar and Practicum in Psychopathology**
Spring. 4 credits. Limited to 16 students. Prerequisite: Psychology 325; permission of instructor required in all cases. Student should apply to the course during preregistration in fall semester; acceptance will be announced before the end of the fall semester. Not offered 1989–90.
T R 2:30–4:25. R. D. Mack.
A seminar and practicum course for advanced students who have mastered the fundamental concepts of personality and psychopathology. An opportunity to explore in depth issues in personality and psychopathology, particularly as they relate to issues of development, fantasy, attachment, and sex roles. Includes an experimental component involving self-disclosure, peer counseling, and group process. The goal: an integration of education and personal growth. It is recommended that students take Psychology 328, the fieldwork course, in conjunction with this seminar.]

**[429 Olfaction and Taste: Structure and Function (also Biological Sciences 429)**
Fall. 3 or 4 credits (4-credit option requires a term paper or research project. The research project can, but does not need to, study nonhuman vertebrates). Preference given to junior and senior psychology and biology majors and graduate students. Prerequisite: one 300-level course in biopsychology or equivalent. Not offered 1989–90. Graduate students, see Psychology 629.
T R 9:05. B. P. Halpern.
The structural and functional characteristics of olfaction and taste will be explored by reading and discussing current literature in these areas. Structure will be examined at the light levels of electron microscopes as well as at the molecular level. Function will be primarily neurophysiological and biochemical aspects. The emphasis will be on vertebrates, especially air-breathing vertebrates in the case of olfaction, but there will be some coverage of invertebrate forms.]

**[436 Language Development (also Human Development and Family Studies 436 and Linguistics 436)**
Spring. 4 credits. Prerequisite: at least one course in developmental psychology, cognitive psychology, cognitive development, or linguistics. Open to undergraduates and graduate students. S-U grades optional. Offered alternate years. Not offered 1989–90. Next offered spring, 1991.
T R 11:40–12:55. B. Lust.
This course surveys basic issues, methods, and research in the study of first-language acquisition. Major theoretical positions in the field are considered in the light of experimental studies in first-language acquisition of phonology, syntax, and semantics from infancy on. The fundamental linguistic issues of universal grammar and the biological foundations for acquisition are discussed, as are the issues of relations between language and thought. The acquisition of communication systems in nonhuman species such as chimpanzees is addressed, but major emphasis is on the child.]

**440 Sleep and Dreaming**
Spring. 4 credits. Prerequisites: advanced undergraduate standing and Psychology 101 and 123.
T R 1:25–2:40. H. Porte.
The course will emphasize equally the neurobiology of sleep and the psychology of dreaming. The first half of the course will introduce the anatomy and physiology of the states and rhythms of sleep. Special topics will include sleep deprivation and the plausible functions of sleep; sleep and depression; the phylogeny and ontogeny of sleep; sleep disorders and the techniques of sleep disorders medicine. The second half of the course will look at dream data in relation to the components of REM sleep. From this perspective, students will evaluate theories of dreaming from Freud's to Francis Crick's, and will consider whether dreaming is functional or accidental, encoded or direct, wishful or confused.

**450 Seminar in the Psychology of Gender (also Women's Studies 450)**
Fall. 4 credits. Prerequisite: Psychology 277 or permission of instructor. Limited to 12 students. No preregistration. Graduate students, see Psychology 650.
W 2:30–4:30. S. Bem.
This seminar is designed primarily for juniors, seniors, and graduate students. Each time the course is offered, a particular research topic will be selected by the instructor for consideration in depth. The topic will be announced at the first meeting of the course. All interested students should attend that meeting.

**[465 Mathematical Psychology**
Spring. 4 credits. Prerequisites: one year of college mathematics (finite mathematics or calculus), a course in probability or statistics, and a course in psychology. Not offered 1989–90.
T R 10:10–11: 40. Staff.
Mathematical approaches to psychological theory are discussed. Possible topics include choice and decision, signal detectability, measurement theory, scaling, stochastic models, and computer simulation.]

**[467 Seminar: The Examined Self—A Psychohistorical View**
Spring. 4 credits. Prerequisites: 9 credits of psychology including Psychology 325 or equivalent, and permission of instructor before course enrollment. Not offered 1989–90.
T 1:25–3:25. H. M. Feinstein.
Based primarily on American autobiographies dating from the seventeenth century to the twentieth century, this seminar will explore the shifting interface between self and historical context. Students should be prepared to write and talk about their own lives as well as the historical figures selected for study.]

**468 American Madness**
Spring. 4 credits. Limited to 15 students. Prerequisites: Psychology 325 and permission of instructor.
T 1:25–3:25. H. M. Feinstein.
The seminar will be devoted to an analysis of insanity as a psychological and historical phenomenon. Selected writings by the mentally ill and their definers will be studied.

**469 Psychotherapy: Its Nature and Influence**
Spring. 4 credits. Limited to senior psychology majors. Prerequisites: Psychology 325 or equivalent and permission of instructor during preregistration.
W 7–10 p.m. R. D. Mack.
A seminar on the nature of psychotherapy. Issues related to therapeutic goals, differing views of the nature of man, ethical concerns, and research problems are also considered. Experiential and role-playing exercises in class and three hours per week of peer counseling outside of class are integral parts of the seminar experience.

**470 Undergraduate Research in Psychology**
Fall or spring. 1–4 credits. S-U grades optional. Written permission from the staff member who will supervise the work and assign the grade must be included with the course enrollment material. Students should enroll in the section listed for that staff member. A section list is available from the Department of Psychology.
Hours to be arranged. Staff.
Practice in planning, conducting, and reporting independent laboratory, field, and/or library research.

**[471 Statistical Methods in Psychology I**
Fall. 4 credits. Not offered 1989–90.
M W F 11:15. Staff.
Basic probability, descriptive and inferential statistics. Topics include parametric and nonparametric tests of significance, Bayesian inference, correlation, and simple linear regression. The level of the course is that of W. L. Hays, *Statistics for Psychologists.*]

**472 Multiple Regression**
Spring, weeks 1–7. 2 credits. Prerequisite: one solid semester of introductory statistics. Analysis of variance is helpful but not required.
M W F 10:10. R. Darlington.
Uses and pitfalls of multiple regression in causal analysis, path analysis, and prediction. Emphasis on analyzing data collected under uncontrolled conditions. Includes colinearity, indicator variables, sets, adjusted and shrunken $R^2$, suppressors, hierarchical analysis, overcontrol, experimental design. Very little hand computation; uses MYSTAT computer program.

**473 General Linear Model**
Spring, weeks 8–14. 2 credits. Prerequisite: Psychology 472 or equivalent.
M W F 10:10. R. Darlington.
Includes multicategorical variables, corrections for multiple tests, diagnostic methods, nonlinear relationships, interaction, main and simple effects, nesting, repeated measures, and MANOVA. Emphasizes MYSTAT, also discusses SYSTAT, SAS PROC REG and SAS PROC GLM.

**[475 Multivariate Analysis of Psychological Data**
Fall. 2 credits. Prerequisite: Psychology 472 or permission of instructor. Not offered 1989–90.
R 10:10–12:05. R. Darlington.
Most of the course concerns relative advantages of factor analysis and newer competing techniques for discovering hidden patterns in correlational data. Uses SYSTAT, SAS PROC FACTOR and PROC PRINCOMP. Also includes brief discussions of MANOVA, logit analysis, logistic regression, canonical correlation analysis, and multidimensional scaling.]

**[476 Representation of Structure in Data**
Fall. 3 credits. Prerequisites: one year of college mathematics (finite mathematics or calculus) and a course in the social sciences. Not offered 1989–90.
W 2:30–4:30. Staff.
Representations of preferences, dominance data, psychological distances, and similarities will be discussed. Topics include unidimensional and multidimensional scaling, unfolding, individual differences scaling, hierarchical clustering, and graph-theoretic analysis.]

**[478 Psychometric Theory**
Fall, weeks 1–10. 3 credits. Prerequisite: Psychology 472 or permission of instructor. Not offered 1989–90.
T R 10:10–12:05. R. Darlington.
Statistical methods relevant to the use, construction, and evaluation of psychological tests.]

**[479 Multisample Secondary Analysis**
Fall, weeks 11–14. 1 credit. Prerequisite: Psychology 350 or equivalent. Not offered 1989–90.
T R 10:10–12:05. R. Darlington.
Statistical methods for analyzing and integrating the results of many independent studies on related topics.]

**481 Advanced Social Psychology**
Fall. 4 credits. Limited to 20 students. Prerequisite: a course in social psychology or permission of instructor.
T R 10:10–11:25. D. T. Regan.
Selected topics in social psychology are examined in depth with an emphasis on the relationship between experimental research and the development of theory. Readings will be mostly primary sources. Among the theoretical approaches to social behavior we may discuss are social comparison theory, cognitive dissonance, attribution processes and social judgment, social exchange theory, and biological perspectives.

**482 Death and Dying**
Spring. 4 credits. Limited to 20 juniors and seniors. Prerequisites: 6 credits in sociology or psychology.
T R 2:30–4:25. W. Collins.
Issues of death and dying in modern American society are explored from the perspectives of psychology, sociology, and the health-related professions. Possible inadequacies in current practice are examined and alternatives discussed.

**[486 Interpersonal and Social Stress and Coping**
Fall. 4 credits. Limited to 25 upperclass students. Prerequisites: background in psychology and introductory statistics, or permission of instructor. Not offered 1989–90.
T 2:30–4:25. Staff.
A critical review of work in intrapersonal, interpersonal, situational, and sociocultural sources of stress and the major psychophysiological concomitants of such stress; resultant coping strategies and aids to coping. Data from laboratory, industry, and other cultures will be analyzed.]

**488 Human Development in Context (also Human Development and Family Studies 488)**
Spring. 4 credits. Open to juniors, seniors, and graduate students. Prerequisites: one course in statistics (which may be taken simultaneously) and two courses in the social sciences, or one in human biology and one in the social sciences.
T R 2:30–4:25. U. Bronfenbrenner.
The course examines highlights of what is known about human development in the actual settings in which human beings live and grow. The material presented reveals how development in its various aspects—cognitive, emotional, and social—occurs through the progressive interplay between the maturing capacities and characteristics of an active, exploring, thinking human organism and the changing situational, cultural, and historical contexts in which the person lives. Particular emphasis is given to the role of the family, peer group, school, workplace, community, and social structure and belief systems of the larger society. Course work is carried out primarily through the analysis of selected studies that shed light on critical issues in development. The main focus is not on specific findings but on key processes and principles of development to which the findings point. Students are offered guidance and experience in analyzing and evaluating research reports, with particular emphasis on the nature and intellectual excitement of the scientific process and on the implications of scientific knowledge for public policy and practice. The course is organized in terms of successive stages in the life course. At each stage the material presented will emphasize change and continuity in the two-way developmental processes taking place between a biologically maturing person and the progressively more complex environments into which the person moves through the life.

**489 Seminar: Selected Topics in Social Psychology and Personality (also Sociology 489)**
Spring. 4 credits. Prerequisites: one course in psychology and one course in sociology or permission of instructor. Graduate students, see Psychology 689.
Hours to be arranged. D. Bem.
The specific topics of discussion vary, but the general emphasis is on a critical examination of the study of individuals in social contexts.

**490 History and Systems of Psychology**
Fall. 4 credits. Intended for juniors, seniors, and graduate students, majors and nonmajors. Prerequisites: at least three courses in psychology or related fields or permission of instructor.
W 2–4:30. H. Levin.
The course aims to acquaint students with the recent history of psychology and to help them to identify important trends and underlying assumptions in contemporary writings. After a discussion of relevant nineteenth-century developments, a number of the major historical systems will be surveyed: the introspectionist, functionalist, behaviorist, and Gestalt psychologies; psychoanalysis; and cognitive psychology. Emphasis will be on the ideas that have shaped modern psychology.

**491 Research Methods in Psychology**
Spring. 4 credits. Enrollment limited to 25 students. Recommended: permission of instructor, Psychology 350, experience in upper-division psychology courses, or graduate standing. Graduate students, see Psychology 691.
T R 1:25–2:40. D. Dunning.
An intensive examination of the basic research methods used in social, personality, cognitive, and developmental psychology. The course will focus on designing and conducting experiments, i.e., how to turn vague theories into concrete and testable notions, evaluate studies, avoid common pitfalls, and, finally, remain ethical. Beyond learning methods of "correct" and rigorous experimentation, we will also discuss what makes a research study actually interesting. The course will, in addition, cover test construction, survey methods, and "quasi experiments." Students will concentrate on completing a small research project in which they conduct an experiment, interpret its data, and write up the results.

**[492 Sensory Function (also Biological Sciences 492)**
Spring. 4 credits. Prerequisite: a 300-level course in biopsychology, or Biological Sciences 222 or 311, or permission of the instructors. Students are expected to have a knowledge of elementary physics, chemistry, and behavior. S-U grades optional. Offered alternate years. Not offered 1989–90; next offered 1990–91. Graduate students, see Psychology 692.
M W F 10:10; sec, hours to be arranged. H. C. Howland, B. P. Halpern.
This course covers classical topics in sensory function such as vision, hearing, touch and balance, as well as some more modern topics like sensory coding, location of stimulus sources in space, and the development of sensory systems. Both human and nonhuman systems are discussed. In all cases the chemical, physical, and neurophysiological bases of sensory information are treated, and the processing of this information is followed into the central nervous system. At the level of *The Senses*, edited by Barlow and Mollon, and *An Introduction to the Physiology of Hearing*, by Pickles.]

## Advanced Courses and Seminars

Advanced seminars are primarily for graduate students, but with the permission of the instructor they may be taken by qualified undergraduates. The selection of seminars to be offered each term is determined by the needs of the students.

A supplement describing these advanced seminars is available at the beginning of each semester and can be obtained from the department office. The following courses may be offered either term and carry 4 credits unless otherwise indicated.

**502 Professional Writing in Psychology**

**510–511 Perception**

**512–514 Visual Perception**

**513 Learning**

**515 Motivation**

**517 Language and Thinking**

**518 Psycholinguistics**

**519–520 Cognition**

**521 Psychobiology**

**522 Topics in Perception and Cognition**

**523 Physiological Psychology**

**524 Sex Differences in Brain and Behavior (also Biological Sciences 524)**
Spring. 2 credits. Limited to 12 seniors and graduate students.
Hours to be arranged. T. DeVoogd.
A survey of the newly discovered animal models for sex differences in the brain. Topics include the role of steroids in brain development, whether hormones can modify the structure of the adult brain, and the consequences of such sex differences in anatomy for behavior.

**525 Mathematical Psychology**

**531 History of Psychology**

**535 Animal Behavior**

**541 Statistical Methods**

**543 Psychological Tests**

**544 Topics in Psychopathology and Personality**

**545 Methods in Social Psychology**

**547 Methods of Child Study**

**551 Distinguished Speakers**

**561 Human Development and Behavior**

**580 Experimental Social Psychology (also Sociology 580)**

**591 Educational Psychology**

**595 Teaching of Psychology**

**596 Improvement of College Teaching**

**600 General Research Seminar**
No credit.

**605 Perception (also Psychology 205)**
4 credits.
J. Cutting.

**607 Chemosensory Perception (also Psychology 307)**
4 credits.
B. P. Halpern.

**609 Development of Perception (also Psychology 309)**
4 credits.
E. S. Spelke.

**[612 Human Experimental Psychology Laboratory (also Psychology 412)**
4 credits. Not offered 1989–90.
Staff.]

**613 Obesity and the Regulation of Body Weight (also Nutritional Sciences 613)**
Spring. 3 credits. Limited to 30 students. Prerequisites: one course in psychology and one course in nutrition. Undergraduate students may register with permission of instructor. S-U grades optional. Offered alternate years.
T R 1:30–3. D. Levitsky.
This course is a multidisciplinary discussion of the causes, effects, and treatments of human obesity. Topics include the biopsychology of eating behavior, the genetics of obesity, the role of activity and energy metabolism, psychosocial determinants of obesity, anorexia nervosa, therapy and its effectiveness, and social discrimination.

**614 Knowledge and Reasoning (also Psychology 214)**
4 credits.
C. Krumhansl.

**615 Concepts, Categories, and Word Meaning (also Psychology 415)**
4 credits.
F. Keil.

**616 Psychology of Language (also Psychology 416)**
4 credits.
H. Kurtzman.

**618 Psychology of Music (also Psychology 418)**
4 credits.
C. Krumhansl.

**622 Developmental Biopsychology (also Psychology 422)**
4 credits.
B. L. Finlay.

**[625 Brain and Behavior (also Psychology 425)**
4 credits. Not offered 1989–90.
B. L. Finlay.]

**626 Evolution of Human Behavior (also Psychology 326)**
4 credits.
R. Johnston.

**[629 Olfaction and Taste: Structure and Function (also Psychology 429 and Biological Sciences 429)**
4 credits. Not offered 1989–90.
B. P. Halpern.]

**650 Seminar in the Psychology of Gender (also Psychology 450 and Women's Studies 450)**
4 credits.
S. Bem.

**[670 Language and Cognition (also Psychology 370 and Linguistics 370)**
4 credits. Not offered 1989–90.
J. Bowers, H. S. Kurtzman.]

**683 Seminar in Interaction (also Sociology 683)**

**[684 Cross-Cultural Psychology (also Psychology 384)**
4 credits. Not offered 1989–90.
Staff.]

**[685 Sex Differences and Sex Roles (also Sociology 685 and Women's Studies 685)**
Not offered 1989–90.
Staff.]

**689 Seminar: Selected Topics in Social Psychology and Personality (also Psychology 489 and Sociology 489)**
4 credits.
D. Bem.

**[690 Seminar on Nutrition and Behavior (also Nutritional Sciences 690)**
Spring. 3 credits. Prerequisites: a course in psychology, Nutritional Sciences 361, and permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
T R 1:30–3. D. Levitsky.
The seminar this year covers several current topics in nutrition and behavior. These topics include early nutritional insult and mental development, malnutrition and behavior, nutrition and learning, food additives and hyperkinesis, megavitamin therapy, inborn metabolic defects and mental illness, nutrition and depression, and hypoglycemia.]

**691 Research Methods in Psychology (also Psychology 491)**
4 credits.
D. Dunning.

**[692 Sensory Function (also Psychology 492 and Biological Sciences 492)**
4 credits. Not offered 1989–90; next offered 1990–91.
H. C. Howland, B. P. Halpern.]

**696 Introduction to Sensory Systems (also Psychology 396 and Biological Sciences 396)**
4 credits.
B. P. Halpern.

**700 Research in Biopsychology**

**709 Developmental Psychology (also Psychology 209)**
4 credits.
E. Spelke.

**710 Research in Human Experimental Psychology**

**[713 Perceptual and Cognitive Processes (also Psychology 313)**
4 credits. Not offered 1989–90.
Staff.]

**715 Psycholinguistics (also Psychology 215)**
4 credits.
H. S. Kurtzman.

**717 The Origins of Thought and Knowledge (also Psychology 417)**
4 credits.
F. Keil.

**720 Research in Social Psychology and Personality**

**722 Hormones and Behavior (also Psychology 322 and Biological Sciences 322)**
4 credits.
E. A. Regan, R. Johnston.

**773 Proseminar in Cognitive Studies I (also Cognitive Studies 773 and Philosophy 773)**
Fall. 2 credits.
R 1:25–2:40. Staff (taught jointly by faculty from Cornell's Cognitive Studies Program, representing fields of psychology and philosophy).
This is the first term of a year-long lecture-and-discussion course which is intended to provide graduate students with an interdisciplinary introduction to the study of knowledge, its representation, acquisition, and use. Topics for the fall semester include the psychology of perception and cognition and the philosophy of mind, language, and knowledge.

**[774 Proseminar in Cognitive Studies II (also Computer Science 774 and Linguistics 774)**
Spring. 2 credits.
R 1:25–2:40. Coordinator: Fred Landman. Taught jointly by faculty from computer science and linguistics.
This is the second half of a year-long lecture-and-discussion course that is intended to provide graduate students with an interdisciplinary introduction to the study of knowledge, its representation, its acquisition, and its use. The focus will be on the contribution of linguistics, computer science, and neuroscience to the study of cognition. Topics may include the phonology, syntax, and semantics of natural language; artificial intelligence work in natural language processing, vision, and reasoning; parallel distributed processing, and neuropsychology.]

**[785 Theories of Personality (also Psychology 385)**
4 credits. Not offered 1989–90.
Staff.]

**900 Doctoral Thesis Research in Biopsychology**

**910 Doctoral Thesis Research in Human Experimental Psychology**

**920 Doctoral Thesis Research in Social Psychology and Personality**

### Summer Session Courses

The following courses are also frequently offered in the summer session, though not necessarily by the same instructor as during the academic year. Not all of these courses will be offered in a particular summer. Information regarding these courses and additional summer session offerings in psychology is available from the department before the end of the fall semester.

**101 Introduction to Psychology: The Frontiers of Psychological Inquiry**

**123 Introduction to Biopsychology**

**128 Introduction to Psychology: Personality and Social Behavior**

**215 Psycholinguistics**

**265 Psychology and Law**

**280 Introduction to Social Psychology**

**281 Interpersonal Relations and Small Groups (also Sociology 281)**

**325 Introductory Psychopathology**

**350 Statistics and Research Design**

**380 Community Mental Health**

**469 Psychotherapy: Its Nature and Influence**

### Special Programs

The Department of Psychology, in conjunction with Human Service Studies, the Field Study Office of the College of Human Ecology, and the Tel-Aviv University School of Social Work will periodically offer an eight-week summer program in Community Health. The course will include three weeks at Cornell and five weeks in Israel. It may be taken for 10–12 credits. For further information, contact Ronald Mack in the Department of Psychology.

## ROMANCE STUDIES

The Department of Romance Studies (Mary Gaylord, chair) offers courses in French literature, Italian literature, and Spanish literature. In addition, the department's program includes courses in French and Spanish languages, French linguistics, semiotics, and courses in French, Italian, and Hispanic culture. Through its course offerings and opportunities for independent study, the department seeks to encourage study of the interactions of the Romance literatures among themselves, with other literatures, and with other fields of inquiry.

### French

J. Bëreaud (director of undergraduate studies, 265 Goldwin Smith Hall, 255-6407), A. Berger, A. M. Colby-Hall, N. Furman, D. I. Grossvogel, R. Klein, P. Lewis, J. Ngate, A. Seznec, S. Tarrow, L. R. Waugh.

#### The Major

The major in French is designed to give students proficiency in the oral and written language, to acquaint, them with French literature and culture, and to develop skills in literary and linguistic analysis.

While prospective majors should try to plan their programs as far ahead as possible, no student will be refused admission merely because of a late start. It is even possible for a student to begin French at Cornell and become a major. Students wishing to major in French literature should consult the director of undergraduate studies of the Department of Romance Studies, Professor J. Bëreaud, who will admit them to the major. After their admission students will choose an adviser from among the French faculty. Students interested in a major in French linguistics should read the description of the major under Modern Languages and Linguistics—French.

### The Core

1) All majors are expected to acquire a sound degree of competence in language. This competence is demonstrated by the successful completion of French 312 or by the passing of a special examination to be taken no later than the end of the junior year. A typical program will involve two semesters of language at the 200 level (to be taken no later than the end of the sophomore year) and two semesters of language at the 300 level (French 311–312). Students may bypass any part of the sequence through placement examinations.
2) In addition, all majors are expected to take French 201 and 202. At least one of these should be completed successfully no later than the end of the sophomore year.

### The Options

1) The successful completion of six courses in French literature or civilization at the 300 level or above. These courses will be selected in consultation with the student's major adviser and will normally include at least one course from each of the three major periods of French literature (Medieval to Renaissance, the seventeenth and eighteenth centuries, and the nineteenth and twentieth centuries).
2) The successful completion of two related courses in one of the following: (a) French literature; (b) French linguistics; (c) French history, culture, music, or history of art or architecture; (d) courses in linguistic theory, history of language, psycholinguistics, or philosophy of language.

### Study Abroad in France

French majors or other interested students may study in France for one or two semesters during their junior year. Opting for one of several study-abroad plans recognized by the departments of Romance Studies and Modern Languages and Linguistics facilitates the transfer of credit. Information about these plans is available from the director of undergraduate studies.

Students interested in studying in France are encouraged to consider the special benefits offered by EDUCO, the program in Paris cosponsored by Cornell and by Duke University. EDUCO offers advanced students a challenging course of study and the experience of total immersion in French life and culture in Paris. Participants in this program spend the year or the semester as fully matriculated students at the University of Paris and other institutions of higher learning in Paris, including the Institut d'Etudes Politiques (Sciences Po) and the Ecole du Louvre, selecting courses in many fields from the regular university course offerings. Students begin the academic year with an intensive three-week orientation into French history, society, and daily life. This three-credit orientation helps students adjust quickly to immersion in French life and is designed to fill needs for students at all levels of background on France.

EDUCO maintains a center in Paris with appropriate support staff. The resident director, chosen annually from the Cornell and Duke faculties, teaches a special seminar each semester, provides academic advice, and helps ensure the quality of the courses. The center, which includes a small library and word-processing facilities, is regularly used by students for special tutorials, seminars, and lectures, as well as informal gatherings.

**Honors.** The honors program encourages well-qualified students majoring in French literature to do independent work in French outside the structure of courses. The preparation of the senior honors essay, generally spread over two terms, provides a unique learning opportunity, since it allows for wide reading, and extensive rewriting to a degree not practically possible in the case of course papers.

No special seminars or courses are required of honors students, but they will have regular meetings with the faculty advisers who have agreed to supervise their work. They may receive course credit by enrolling in French 429–430, but these independent study courses must be taken in addition to the courses that meet the minimum requirements for the major. At the end of the senior year each honors student is examined orally on the honors essay by a jury consisting of his or her faculty adviser and two other faculty members. The awarding of honors is determined by the student's grades in the major and the quality of the honors essay.

**Fees.** Depending on the course, a small fee may be charged for copies of texts used in course work.

### Language and Linguistics

Most language courses and French linguistics courses are offered by Modern Languages and Linguistics. Further language courses (conversation and advanced level), French linguistics courses, and all literature courses are listed below.

*Note: Students placed in the 200-level courses have the option of taking language and/or literature courses; see listings under "Literature" for descriptions of the literature courses, any of which may be taken concurrently with 203–204 (offered by Modern Languages and Linguistics) or 200 described below.*

**200 Intermediate Course: Language and Literature**
Fall or spring. 3 credits. Prerequisite: qualification in French with a CPT score no higher than 629. Offered by the Department of Romance Studies. Conducted in French.
Fall: M W F 10:10, 11:15, or TR 10:10–11:25, S. Tarrow and staff; spring: M W F 9:05, 10:10, or 12:20. P. Lewis and staff.
Designed to provide an introduction to contemporary French culture and literature. Texts read and discussed are selected for their cultural and humanistic value. One-third of class time is devoted to grammar review, with emphasis on oral participation as well as improvement of language skills.

**210 Intermediate French Conversation**
Fall or spring. 2 credits. Limited to 15 students. Prerequisite: French 203 or 211 or equivalence (Q+) on the Cornell Advanced Standing Examination (CASE).
Fall: T R 8:40–9:55, 11:40–12:55, or 1:25–2:40; spring: T R 8:40–9:55 or 10:10–11:25. J. Bereaud and staff.
The course is based on audio-visual materials used in class; slides and recordings will accompany extensive discussions. A modest amount of reading each week will aim at increasing students' active vocabulary.

**310 Advanced French Conversation**
Spring. 2 credits. Limited to 15 students. Priority given to seniors. Prerequisite: French 204 or 212 or Cornell Advanced Standing Examination (CASE) placement of Q++.
T R 8:40–9:55, 11:40–12:55, or 1:25–2:40. J. Bereaud and staff.
This course is based on discussion of articles published in the French press (*L'Express* magazine). A few recordings and films will also be used.

**311 Advanced French**
Fall. 4 credits. Limited to 15 students. Prerequisite: French 204 or 212 or placement by the Cornell Advanced Standing Examination (CASE).
M W F 10:10, J. Bereaud; M W F 12:20, staff; M W F 1:25, staff.
All-skills course. Detailed study of present-day syntax. Reading and discussion of texts of cultural relevance. Weekly papers.

**312 Advanced French**
Spring. 4 credits. Limited to 15 students. Prerequisite: French 311 or placement by the Cornell Advanced Standing Examination (CASE).
M W F 10:10 or 11:15. J. Bereaud and staff.
Continuation of work done in French 311. Less emphasis will be placed on study of grammar, more on the examination of texts, on questions of style, and on oral presentation by students. Weekly papers.

**[400 Semiotics and Language (also Comparative Literature 410 and Linguistics 400)**
4 credits. Not offered 1989–90.]

**[408 Linguistic Structure of French I (also Linguistics 408)**
4 credits. Not offered 1989–90.]

**[424 Composition and Style**
4 credits. Not offered 1989–90.]

**604 Contemporary Theories of French Grammar**
Spring. 4 credits. Prerequisite: permission of instructor
To be announced. L. Waugh.
Selected readings of twentieth-century French linguistics.

### Literature

**[105 Freshman Writing Seminar: The French Novel**
Spring. 3 credits. Not offered 1989–90.]

**[107 Freshman Writing Seminar: Readings in Modern Literature**
3 credits. Not offered 1989–90.]

**109 Freshman Writing Seminar: Techniques of Interpretation: An Introduction to Semiotics (also Romance Studies 109)**
Fall or spring. 3 credits.
Fall: M W F 9:05 or T R 10:10–11:25. Spring: MWF 9:05 or 10:10. P. Lewis and staff.
In its broadest meaning semiotics is the study of signs that carry information: roadside signs, fashions, advertisements, publicity posters, literary modes. This course, which does not presuppose prior technical knowledge, will introduce the students to a critical reading of signs: the signifier (the concrete expression of the sign) and the signified (the message) and their various interactions. Exercises will be essays on how to analyze various signs taken from practical experience, such as advertisements from magazines or TV or from cultural phenomena (fashion codes, artistic modes).

**201 Introduction to French Literature**
Fall, spring, or summer. 3 credits. Prerequisite: a CPT score of 600 or higher or a 200-level language course. French 201 serves as a prerequisite for all 300-level courses in French literature and is required of all majors. The course is divided into small sections. Some are taught entirely in French; the others are taught in English. (For times of the all-French sections, see the supplemental course description available in Goldwin Smith Hall 283.) Readings for all sections are the same and all in French. Papers may be written in French or in English.
Fall: M W F 9:05, staff; M W F 10:10, staff; M W F 11:15, A. Colby-Hall; M W F 12:20, J. Ngate, staff; T R 8:40–9:55, D. Grossvogel; T R 10:10–11:25, D. Polachek. Spring: M W F 10:10, J. Bëreaud; M W F 11:15, staff; M W F 12:20, staff; T R 10:10–11:25, staff; T R 11:40–12:55, staff.
Stress is on the development of reading skills and, more generally, on cultural, sociological, and aesthetic implications of the texts. Readings will include works by major nineteenth- and twentieth-century authors in each of three principal genres: poetry, theatre, and novel.

**202 Studies in French Literature**
Fall or spring. 3 credits. Prerequisite: French 201 or a CPT achievement score of 650 or more (students who have not taken French 201 should obtain consent of instructor; those with scores in the 560–649 range should see the description of French 200 and 201). Required of all majors, but not limited to them. Conducted in French.
Fall: M W F 12:20 or T R 1:25–2:40. D. Polachek and staff. Spring: M W F 11:15 or 1:25 or T R 10:10–11:25. A. Berger and staff.
Study of the classic literature of seventeenth-century France (Corneille, Racine, Moliere, Madame de Lafayette) and its immediate forebears (Montaigne) and successors in the Enlightenment (Voltaire, Rousseau, Diderot, Beaumarchais). Special attention will be paid to the connections between classicism and humanistic trends.

**[309 Mystery and the Mystery Story (also Comparative Literature 309)**
4 credits. Not offered 1989–90.]

**[318 Music and Poetry in France: Late Middle Ages and Renaissance (also French 618 and Music 373/673)**
4 credits. Not offered 1989–90.]

**320 French Civilization**
Fall. 4 credits. Prerequisite: proficiency in French (typically taken after French 204 or 212). Conducted in French.
M W F 11:15. J. Bëreaud.
Study of contemporary France: its resources, institutions, culture, and attitudes. Students will be expected to research topics for papers and oral presentation. Audiovisual materials will be used.

**325 The Modern French Novel: A Form in Search of Itself**
Fall. 4 credits.
T R 10:10–11:25. D. Grossvogel.
Evolutions of the novelistic form through the experiments of such writers as Balzac, Stendhal, Flaubert, Zola, Gide, Proust, Colette, Robbe-Grillet, etc.

**329 Francophone Caribbean Literature**
Spring. 4 credits.
T R 11:40–12:55. J. Ngate.
A general introduction to the literature through the reading of representative poems, plays, short stories and novels by writers such as Jacques Roumain, Aimé Césaire, René Depestre, Maryse Condé, Léon Damas, Myriam Warner-Vieyra and Bertène Juminer. The course will be taught in French and with student participation in discussion of the assigned texts.

**[330 Francophone African Literature**
4 credits. Not offered 1989–90.]

**[331 Masterpieces of French Drama I: The Classical Era**
4 credits. Not offered 1989–90.]

**[332 Masterpieces of French Drama II: The Comic in the Modern Era**
4 credits. Not offered 1989–90.]

**[333 Contemporary French Thought**
Spring. 4 credits. Not offered 1989–90.]

**[334 The Novel as Masterwork**
4 credits. Not offered 1989–90.]

**335 Romance to Revolution: The French Novel before 1789**
Fall. 4 credits. Prerequisite: French 201 or permission of instructor. Conducted in French.
T R 1:25–2:40. P. Lewis.
In addition to considering formal questions relating to the development of the novel in French, this course will examine problems such as the appearance of narrative and historical consciousness, the representation of woman, and the relation between literature and society. Texts read will include those of such major writers as Rabelais, Mme de LaFayette, Prévost, Rousseau, Diderot, and Sade.

**[338 French Poetry from Its Origins to the Revolution of 1789**
4 credits. Not offered 1989–90.]

**[354 New Prose, Old Prose**
4 credits. Not offered 1989–90.]

**[358 Gustave Flaubert**
4 credits. Not offered 1989–90.]

**[362 Poems, Institutions, and Other Fictions in the Realm of Francis the First (also History 362)**
4 credits. Not offered 1989–90.]

**369 Comic Theater in the Seventeenth Century**
Spring. 4 credits.
M W F 12:20. P. Lewis
The principal focus of this course will be the comedies of Corneille and Moliere. In addition, there will be an attempt to follow the evolution of a half-century of comic theater (1625 to 1675), with attention to some interesting, if relatively minor theatrical experiments by Racan, Mairet, Scarron, and Racine. Conducted in French.

**370 Perspectives on the Age of Enlightenment: "Enlightened" Literature**
Spring. 4 credits.
M W F 1:25. A. Berger.
Through a reading of various works of the French eighteenth century (by Montesquieu, Voltaire, Diderot, Rousseau, and Sade), we will study the emergence of new literary discourses and practices aiming at a "secularisation" of the literary field, in conjunction with the ideological and epistemological changes that took place under the name of Enlightenment.

**[371 Eighteenth-Century Theater**
4 credits. Not offered 1989–90.]

**[372 Reading Order of Tragedy**
4 credits. Not offered 1989–90.]

**[375 Eighteenth-Century Novel**
4 credits. Not offered 1989–90.]

**[379 Victor Hugo—Romantic Movement**
4 credits. Not offered 1989–90.]

**[380 Introduction to French Romanticism**
4 credits. Not offered 1989–90.]

**[388 The French Lyric Romance from Symbolism to Surrealism**
4 credits. Not offered 1989–90.]

**[389 French Romanticism (also Women's Studies 493)**
4 credits. Not offered 1989–90.]

**[390 Modern French Criticism**
4 credits. Not offered 1989–90.]

**[395 Camus and His Contemporaries**
4 credits. Not offered 1989–90.]

**[396 The Contemporary French Novel: 1950 to the Present**
4 credits. Not offered 1989–90.]

**[398 Six French Poets**
4 credits. Not offered 1989–90.]

**[404 Cogito Ergo Sum: Thought and Existence from Descartes to Sartre (also Comparative Literature 404 and Romance Studies 404)**
4 credits. Not offered 1989–90.]

**419–420 Special Topics in French Literature**
419, fall; 420, spring. 2–4 credits each term.
Prerequisite: permission of instructor.
Staff.
Guided independent study of special topics.

**[422 Three Ages of Theater (also Comparative Literature 422)**
4 credits. Not offered 1989–90.]

**429–430 Honors Work in French**
429, fall; 430, spring. 4 credits each term, with permission of the adviser. Open to juniors and seniors. Consult the director of the honors program, A. Berger.

**435 Césaire et Lautréamont**
Spring. 4 credits.
R 2–4:25. J. Ngate.
Césaire et Lautreamont ont en commun de pouvoir se réclamer a la fois de la France (sur le plan de l'héritage culturel et littéraire) et du Nouveau monde (de par leur naissance). Ceci expliquerait-il qu'il y ait chez eux une forte tendance a la recherche de la démesure dans la production de leurs textes littéraires? Et peut-on vraiment parler d'une esthétique de la démesure? Quelles en seraient les données de base?

**[436 Francophone African Fiction (also French 636)**
4 credits. Not offered 1989–90.]

**438 La poésie de la Négritude (also French 638)**
Fall. 4 credits.
W 2–4:25. J. Ngate.
The course will start by looking at the poetry of a precursor (the Malagasy J.-J. Rabéarivélo), and then move on to the work of the three founders of Negritude (Aimé Césaire, Léon Damas, and Léopold S. Senghor). Two African poets of the second and third generations (the Congolese Tchicaya U Tam'si and the Ivorian J.-M. Adiaffi) will finally be read against the background of the theory and the practice of the founding "fathers."

**447–448 Medieval Literature**
447, fall; 448, spring. 4 credits each term. Prerequisite: French 201 or permission of instructor. First term not prerequisite to the second.
M W F 9:05. A. Colby-Hall.
French 447 deals with the epic and the theater; 448 deals with the romance and the lyric. Facility in reading Old French and appreciation of these four major genres are the primary goals of this course.

**[452 Theatre in Sixteenth-Century France**
4 credits. Not offered 1989–90.]

**453 Masterpieces of French Renaissance Prose**
Spring. 4 credits.
T R 1:25–2:40. D. Polachek.
This course will focus on representative works of the three major prose writers of the sixteenth century: Rabelais, Marguerite de Navarre, and Montaigne. We will first place these authors in their historical and cultural moment and see with what traditions in form each writer works and to what individual uses each writer places these traditions. Class discussions will then focus on analyses of selections from such texts as *Gargantua, l'Heptameron*, and the *Essais*. By asking how each work is structured and by concentrating upon its particular preoccupations (e.g., society and its institutions, love and sexuality, introspection and self-portraiture), we will explore the relationship between literary form and content in the Renaissance. Since each of the three authors represents a different point in the development of Renaissance thought, students will be able to compare the differing world views presented in each. Readings and discussions in French.

**[456 Diverse Poetries in Sixteenth-Century France**
4 credits. Not offered 1989–90.]

**[457 Rabelais**
4 credits. Not offered 1989–90.]

**[458 Montaigne**
4 credits. Not offered 1989–90.]

**[459 Petrarchism and the Lyric Experience in France (also French 659)**
4 credits. Not offered 1989–90.]

**[460 The Moralist Tradition (also French 660)**
4 credits. Not offered 1989–90.]

**[461 The Theater of Moliere**
4 credits. Not offered 1989–90.]

**[462 Racine (also French 662)**
4 credits. Not offered 1989–90.]

**[470 Perspectives on the Age of Enlightenment**
4 credits. Not offered 1989–90.]

**[473 Diderot and the Enlightenment**
4 credits. Not offered 1989–90.]

**479 Facing the Revolution: Chénier, Hugo, Baudelaire (also Society for Humanities 411)**
Fall. 3 credits. Limited to 17 students.
T 2:30–4:25. E. Burt.
Readings in histories of the French Revolution and in selected poems will lead to questions concerning the relationship between revolutions in the political and poetical domains. What is the rationale that leads Furet to call the revolution a "language," or De Tocqueville to speculate that the revolutionary turn came when the abusive language whereby the *ancien régime* maintained its power turned against its user? What is the likeness between the French Revolution and a text? What, on the other hand, is the significance of the borrowing by poets of revolutionary terminology to signify their innovations in poetic form? Does Hugo call his language "jacobin" by metaphor? These questions revolve around a further problem, namely, the sharper disassociation of poetry, in the wake of the revolution, from the overtly political sphere. Is this separation a "retreat" on the part of poets from an engagement in politics, as it has often been claimed? Is it, on the contrary, in order to reflect on the seductiveness of metaphors (like the metaphor comparing the order of the poem with the order of the state) that the poem effects its retreat? Readings in Michelet, Kant, De Tocqueville, Chénier, Hugo, Baudelaire.

**[485 Reading Workshop: The Short Story**
4 credits. Not offered 1989–90.]

**[487 Rimbaud and the Question of Reading**
4 credits. Not offered 1989–90.]

**[488 Baudelaire**
4 credits. Not offered 1989–90.]

**[493 French Feminisms (also Women's Studies 493)**
4 credits. Not offered 1989–90.]

**[494 Surrealism**
4 credits. Not offered 1989–90.]

**[496 The Early Twentieth-Century French Novel (also Comparative Literature 496)**
4 credits. Not offered 1989–90.]

**[497 Poetry since Baudelaire**
4 credits. Not offered 1989–90.]

**[498 Dostoevsky, Mann, and Gide (also Comparative Literature 498)**
4 credits. Not offered 1989–90.]

**499 Fiction and Film in France (also Comparative Literature 499)**
Spring. 4 credits.
T R 2:55–4:10. D. Grossvogel.
The nature of selected dramatic structures and fictional forms (especially in realism and surrealism) and their influence on the motion pictures derived from them.

**596 Colette: Can She Be a Subject of Masculine Discussion in the '80s?**
Spring. 4 credits.
W 2:30–4:25. D. Grossvogel.
From her first writings under the tutelage of her husband, Willy, to her emergence as one of the most important authors in the first half of the century. Gabrielle Colette's story is one of both emancipation and of a particular sensitivity that allowed critics to praise her as the greatest of all French women writers. Her life and writings thus raise questions about gender, narrative voice, sexual roles, and the like—questions that are very much with us today and add to the complexity of any attempt at this kind of analysis.

**[607 Proseminar: The Interpretation of Texts**
4 credits. Not offered 1989–90.]

**[608 Proseminar**
4 credits. Not offered 1989–90.]

**[618 Music and Poetry in France: Late Middle Ages and Renaissance (also French 318 and Music 373/673)**
4 credits. Not offered 1989–90.]

**[629 Historical French Phonology**
4 credits. Not offered 1989–90.]

**638 La Poésie de la Négritude (also French 438)**
Fall. 4 credits.
W 2–4:25. J. Ngate.
For description see French 438.

**639–640 Special Topics in French Literature**
639, fall; 640, spring. 4 credits each term.
Staff.
Guided independent study for graduate students.

**644 Medieval Seminar: The Old French Epic**
Spring. 4 credits.
M 2:30–4:25. A. Colby-Hall.
Topic: The epic world of Guillaume d'Orange.

**[646 Medieval Seminar: Villon**
4 credits. Not offered 1989–90.]

**[648 Medieval Seminar: *Le Roman de la Rose***
4 credits. Not offered 1989–90.]

**[659 Petrarchism and the Lyric Experience in France (also French 459)**
4 credits. Not offered 1989–90.]

**[660 The Moralist Tradition (also French 460)**
4 credits. Not offered 1989–90.]

**[661 Racine and His Critics**
4 credits. Not offered 1989–90.]

**[662 Racine (also French 462)**
4 credits. Not offered 1989–90.]

**[663 La Fontaine and Perrault: Fables, Tales, and Narrative Traps**
4 credits. Not offered 1989–90.]

**[665 The Emergence of Aesthetics**
4 credits. Not offered 1989–90.]

**[666 Seventeenth-Century Seminar: Moralities in Fiction: The Classical Moment (also Comparative Literature 666)**
4 credits. Not offered 1989–90.]

**[669 Seventeenth-Century Seminar: Illusion and Representation**
4 credits. Not offered 1989–90.]

**[679 Comedy and Philosophy in the French Enlightenment**
4 credits. Not offered 1989–90.]

**685 Stendhal, Balzac, Flaubert (also Comparative Literature 610)**
Fall. 4 credits.
R 10:10–12. J. Culler.
Study of *Le Rouge et le noir, La Chartreuse de Parme, La Peau de Chagrin, La Cousine Bette, Madame Bovary,* and *L'Education sentimentale,* with particular attention to questions of narrative structure and technique and issues of power, gender, and knowledge.

**687 Poetry and the Threat of Modernity: The Case of Rimbaud**
Fall. 4 credits.
M 2:30–4:25. A. Berger.
We will examine the ways in which Rimbaud's text stages the conflict between the idealizing and ahistorical (if not anti-historical) discourse of poetry and of history, the notion of which frames the modern experience of the world. To better locate the sources of Rimbaud's dilemma, close attention will be paid to the context of its enunciation. Readings will include selected works by Rimbaud's immediate forebearers and contemporaries (such as Hugo, Banville, Baudelaire, minor Parnassians, proto-symbolists, etc.) as well as theoretical writings on Aesthetics and the history of genres (Hegel, Nietzsche, Adorno).

**[688 Gerard de Nerval**
4 credits. Not offered 1989–90.]

**[689 Bohemians and Dandies**
4 credits. Not offered 1989–90.]

**[690 André Gide (also Comparative Literature 695)**
4 credits. Not offered 1989–90.]

**[691 Laughter**
4 credits. Not offered 1989–90.]

**[692 Sartre and Genêt**
4 credits. Not offered 1989–90.]

**[693 Nineteenth-Century Seminar**
4 credits. Not offered 1989–90.]

**[694 Surrealism**
4 credits. Not offered 1989–90.]

## Italian

A. Grossvogel (director of undergraduate studies, 261 Goldwin Smith Hall, 255-4264), M. Migiel

### The Major

Students who wish to major in Italian should choose a faculty member to serve as a major adviser; the general plan and the details of the student's course of study will be worked out in consultation with the adviser. Italian majors are encouraged to take courses in related subjects such as history, art history, music, philosophy, anthropology, classics, linguistics, and other modern languages and literatures. While a major often occupies only the junior and senior years, it is wise for students to seek faculty advice about the major as early as possible.

Students who elect to major in Italian ordinarily should have completed Italian 201 by the end of their sophomore year. Exemptions can be made on the basis of an examination. Students majoring in Italian are expected to become conversant with a fair portion of the masterworks of Italian literature, to acquaint themselves with the outlines of Italian literary history, and to develop some skill in literary analysis. To this end, students will be expected to complete successfully 32 credits of Italian literature courses at the 300 level or higher, with papers to be written in Italian or English. Required courses for the major are Italian 303, 304, and 334. Italian 402, History of the Italian Language, and 403, Linguistic Structure of Italian, may be counted toward the 32 credits required for the major (an introductory linguistics course is a prerequisite of Italian 402 and 403).

Students majoring in Italian will also be expected to acquire competence in the handling of the language. That competence may be demonstrated by passing an oral and written examination to be arranged with the adviser.

Italian majors will also be required to complete successfully two courses in related fields (for example, Italian history, Italian art history, literary theory).

Italian majors may study in Italy, generally during their junior year, under any of those study-abroad plans organized by American universities that allow the transfer of grades and credit, such as the Cornell program in Rome.

The College of Architecture, Art, and Planning maintains a program open to all qualified students attending Cornell. The program is housed in the sixteenth-century Palazzo Massimo, designed by the architect Baldassare Peruzzi, on the Corso Vittorio Emanuele, in the heart of Rome. Students may enroll for a semester in the fall or spring. Courses regularly taught at the Palazzo Massimo include Italian language (beginning and intermediate); Architecture 300, 401, 402, 500, 502, Design Studio; Architecture 338 and 399, Special Topics in Architectural History; Architecture 458, Special Projects in Design Communications; Architecture 367, Contemporary Italian Culture; Architecture 510, Thesis Introduction; Art 251, 311, 322, and 371; and History of Art 371, Renaissance and Baroque Art in Rome.

To be eligible, students must have completed the first two years of their curriculum requirements and be in good academic standing.

**Fees.** Depending on the course, a small fee may be charged for copies of texts for course work.

### Literature

Most language courses and Italian linguistic courses are offered by Modern Languages and Linguistics. Advanced language courses and all literature courses are listed below.

**109 FWS: Italian Literature Revisited**
Fall or spring. 3 credits.
Fall: T R 11:40–12:55; spring: T R 11:40–12:55. M. Migiel and staff.
The permanent presence of early Italian literature in our cultural heritage results not only from the continued popularity of the original works, but also from their recurrence in later literature and art. In this course, we will read selections from early Italian literature (especially Dante's *Divine Comedy,* Petrarch's *Canzoniere,* and Boccaccio's *Decameron)* and we will study the way in which authors and artists from the middle Ages to the present day (including Chaucer, Shakespeare, Pasolini, and Vonznesenskaya) have taken early Italian literature to be a source of inspiration for their own works. We will consider the cultural, ideological, and aesthetic implications of adaptations of literary source materials. Particular attention will be given to the ways in which an artist uses literary models to interpret contemporary social and historical reality and to define his or her place in the artistic tradition. All foreign texts will be read in English translation.

**201 Introduction to Italian Literature**
Fall. 3 credits. Prerequisite: permission of instructor. Conducted in Italian.
M W F 11:15. M. Migiel.
Exploration of the cultural, sociological, and aesthetic implications of Italian literary texts. Emphasis on the development of students' oral, written, and reading skills. Readings will include prose, poetry, and drama written by major Italian authors.

**[303 Introduction to Medieval and Renaissance Literature**
4 credits. Not offered 1989–90.]

**304 Introduction to Modern Italian Literature**
Spring. 4 credits. Prerequisite: Italian 201 or permission of instructor. Conducted in Italian.
T R 11:40–12:55. A. Grossvogel.
A reading of masterpieces of modern Italian literature with attention to the context in which they arose. Highlights of Galileo and Vico's writing. Selections of novels from romanticism to the contemporary period. The theater of Goldoni and Pirandello. Poetry from Leopardi to Montale.

**[322 Italian Civilization: Literature and Regionalism**
4 credits. Not offered 1989–90.]

**[334 Dante's Divine Comedy (also Italian 634)**
4 credits. Not offered 1989–90.]

**[340 Literature and Society in the Italian Renaissance**
4 credits. Not offered 1989–90.]

**[354 Italian Humanism (also Italian 654)**
4 credits. Not offered 1989–90.]

**[357 The Italian Renaissance Epic**
4 credits. Not offered 1989–90.]

**[370 Eighteenth-Century Thought**
4 credits. Not offered 1989–90.]

**[381 Narrative of Verga, D'Annunzio, Svevo, and Pirandello (also Italian 581)**
4 credits. Not offered 1989–90.]

**384 Early Modern Italian Autobiography (also Italian 684)**
Spring. 4 credits.
T R 2:55–4:10. J. Schiesari.
This course will focus on the development of various representations of selfhood in both narrative and poetic texts of the late Medieval through the Enlightenment periods. The emergence of autobiography as a specific genre in the eighteenth century will be studied in terms of its relation to the confessional tradition inaugurated by Augustine and elaborated in the *canzoni* of Petrarch, Bembo, della Casa, and Tasso. We will then study the ways in which this tradition is revised in the longer narrative autobiographies of Cellini, Vico, da Ponte, and Alfieri. The development of this self-interpretative writing will be organized by three different types of inquiry. First, we will consider the role of ideological and cultural conditions in determining the possibility and modes of representing personal experience. Second, we will examine how a subject of discourse, the "I" that is presupposed by any utterance, can legitimate and authorize the taking of its own past as the theme of writing. Finally, the style of each autobiographical text will be considered as a coherent system that creates the effect of personhood through metaphors, topoi, and other rhetorical strategies.

**390 Literature to Cinema**
Fall. 4 credits. Conducted in English.
T R 2:30–4:25. A. Grossvogel.
A study of the ways literary language has influenced Italian cinema. The films to be screened will be by Antonioni, Bertolucci, Bolognini, De Sica, Fellini, Pasolini, Rossellini, Scola, Taviani, Visconti, Zeffirelli, and Zurlini. The works of literature to be read in conjunction with these films will include selections from Boccaccio's *Decameron* and from the narrative works of Verga, Fogazzaro, D'Annunzio, Pirandello, and others.

**[391 The Theater of Verga, D'Annunzio, Svevo, and Pirandello (also Italian 691)**
4 credits. Not offered 1989–90.]

**[393 Narrative and Ideology in Contemporary Italian Literature (also Italian 693 and Comparative Literature 393)**
4 credits. Not offered 1989–90.]

**395 Readings in Contemporary Italian Fiction**
4 credits. Not offered 1989–90.]

**399 Cinema to Literature**
Spring. 4 credits. Conducted in English.
T R 2:30–4:25. A. Grossvogel.
The course will consist of a comparative study of selected films by Fellini, Antonioni, Visconti, and others and of works by major contemporary writers such as Montale, Ungaretti, Gadda, and Calvino. These authors' similarities and contrasts in invention, style, and techniques will be explored to illustrate the evolution of contemporary aesthetics in cinematography and poetry in Italy.

**419–420 Special Topics in Italian Literature**
419, fall; 420, spring. 2–4 credits each term.
Prerequisite: permission of instructor.
Staff.
Guided independent study of specific topics.

**[427–428 Dante: *La Divina commedia***
4 credits. Not offered 1989–90.]

**429–430 Honors in Italian Literature**
429 fall; 430, spring. 4 credits each term.
Limited to seniors. Prerequisite: permission of instructor.
A. Grossvogel.

**[437 Petrarch: *Canzoniere***
4 credits. Not offered 1989–90.]

**440 The Gendering of Melancholia**
Spring. 4 credits.
W 2:30–4:25. J. Schiesari.
The theoretical framework for the problems will be initially elaborated by an attentive reading of Freud's "Mourning and Melancholia" and of subsequent psychoanalytic commentators such as Klein, Lacan, Torok and Abraham, Irigaray, Kristeva, and Silverman. This theoretical context with its strategic positioning and eliding of gender differences will then allow us to read the Renaissance celebration of the *homo melancholicus* as it is most manifestly stated and explored in the philosophical works of Marsilio Ficino (*De Amore* and *De Vita Triplici*), and the writings of Torquato Tasso (especially *Il Messaggiero*, *La Canzone al Metauro*, and portions of the *Gerusalemme Liberata*). We will also consider the discourse of mourning in Isabella di Morra and Gaspara Stampa as a counterpoint to the appropriation of femininity in the melancholic male tradition. Attention will also be paid to the place of melancholia in the figural arts (notably Dürer) and in the medical and philosophical treatises of Weyer, Burton, and Bodin.

**445 Boccaccio (also Italian 645)**
Fall. 4 credits.
W 2:30–4:25. M. Migiel.
The course will focus mainly on the *Decameron*, with some attention to Boccaccio's Humanist production and his minor works in Italian (*Filostrato*, *Teseida*, *Corbaccio*). Particular attention will be devoted to Boccaccio's development of narrative techniques, his use of literary sources, and his commentary on the social and ideological function of literature. Conducted in Italian.

**[448 Italian Lyric Poetry, 1255–1600: The Formation of the Canon**
4 credits. Not offered 1989–90.]

**[458 Tasso**
4 credits. Not offered 1989–90.]

**[472 Eighteenth-Century Italian Theater: From Melodrama to Tragedy**
4 credits. Not offered 1989–90.]

**[474 Opera (also German 374/674 and Music 374/674)**
4 credits. Not offered 1989–90.]

**485 The Nineteenth Century: Foscolo, Manzoni, Leopardi**
Fall. 4 credits. Conducted in Italian and English.
M 2:30–4:25. A. Grossvogel.
Manzoni's novel together with Foscolo's *Ultime lettre di Jacopo Ortis* and Leopardi's *Operette morali* constitute the now-acknowledged major contribution to the renewal of literary prose in nineteenth-century Italy. A close study of the texts, their poetics, and their proximity will bring out intentions, achievements, and the unwilling reciprocity of the three major Italian writers of the century as they set out, in the brief span of a quarter of a century, to constitute modern prose.

**[488 Giacomo Leopardi and Nineteenth-Century Poetry**
4 credits. Not offered 1989–90.]

**[495 Readings in Contemporary Italian Fiction**
4 credits. Not offered 1989–90.]

**[496 Futurism in Italy and Europe**
4 credits. Not offered 1989–90.]

**[497 Modern Italian Poetry: D'Annunzio to Montale**
4 credits. Not offered 1989–90.]

**[498 Eugenio Montale and Contemporary Italian Poetry**
4 credits. Not offered 1989–90.]

**[557 The Italian Renaissance Epic**
4 credits. Not offered 1989–90.]

**[581 Narrative of Verga, D'Annunzio, Svevo, and Pirandello (also Italian 381)**
4 credits. Not offered 1989–90.]

**[634 Dante's Divine Comedy (also Italian 334)**
4 credits. Not offered 1989–90.]

**639–640 Special Topics in Italian Literature**
639, fall; 640, spring. 4 credits each term.
Staff.

**645 Boccaccio (also Italian 445)**
Fall. 4 credits.
W 2:30–4:25. M. Migiel.
For description, see Italian 445.

**[654 Italian Humanism (also Italian 354)**
4 credits. Not offered 1989–90.]

**684 Early Modern Italian Autobiography (also Italian 384)**
Spring. 4 credits.
T R 2:55–4:10. J. Schiesari.
For description, see Italian 384.

**[691 Theater of Verga, D'Annunzio, Svevo, and Pirandello**
4 credits. Not offered 1989–90.]

**[693 Narrative and Ideology (also Italian 393 and Comparative Literature 393)**
4 credits. Not offered 1989–90.]

## Romance Studies

### Literature

**109 Freshman Writing Seminar: Techniques of Interpretation: An Introduction to Semiotics (also French 109)**
Fall or spring. 3 credits.
Fall: M W F 9:05 or T R 10:10–11:25.
Spring: M W F 9:05 or 10:10. P. Lewis and staff.
In its broadest meaning, semiotics is the study of signs that carry information: roadside signs, fashions, advertisements, publicity posters, literary modes. This course, which does not presuppose prior technical knowledge, will introduce the students to a critical reading of signs: the signifier (the concrete expression of the sign) and the signified (the message) and

their various interactions. Readings will include such books as R. Barthes, *Mythologies*, and T. Hawkes, *Structuralism and Semiotics*. Exercises will be essays on how to analyze various signs taken from practical experience, such as advertisements from magazines or TV, or from cultural phenomena (fashion codes, artistic modes).

**[361 The Culture of Early Renaissance (also Comparative Literature 361 and History of Art 350)**
4 credits. Not offered 1989–90.]

**[404 Cogito Ergo Sum: Thought and Existence from Descartes to Sartre (also French 404 and Comparative Literature 404)**
4 credits. Not offered 1989–90.]

**[424 Composition and Style**
4 credits. Not offered 1989–90.]

**[431 Isms: General Concepts in Modern Cultural History (also Comparative Literature 431)**
4 credits. Not offered 1989–90.]

**[459 Being, God, Mind: Key Terms of Western Thought from Plato to Vico (also Comparative Literature 369)**
4 credits. Not offered 1989–90.]

**[460 Biology and Theology: Approaches to the Origin of Life, Evolution, Heritage and Freedom, Sexuality and Death (also Comparative Literature 460)**
4 credits. Not offered 1989–90.]

**[497 Heidegger: Short Writings (also Comparative Literature 497 and German 497)**
3 credits. Not offered 1989–90.]

## Spanish

D. Castillo, U. J. DeWinter, M. Gaylord (chair), J. W. Kronik, A. Monegal, C. Morón-Arroyo, J. Piedra, M. Stycos, J. Tittler (director of undergraduate studies [literature], 286 Goldwin Smith Hall, 255-4048)

## The Major

The major is designed to give students proficiency in the oral and written language, to acquaint them with Hispanic culture, and to develop their skill in literary and linguistic analysis. Satisfactory completion of the major should enable students to meet language and literature requirements for teaching, to continue with graduate work in Spanish or other appropriate disciplines, or to satisfy standards for acceptance into the training programs of the government, social agencies, and business concerns. A Spanish major combined with another discipline may also allow a student to undertake preprofessional training for graduate study in law or medicine. Students interested in a Spanish major are encouraged to seek faculty advice as early as possible. For acceptance into the major, students should consult the director of undergraduate studies in Spanish—Professor Tittler (286 Goldwin Smith Hall)—who will admit them to the major and choose an adviser from the Spanish faculty. Spanish majors will then work out a plan of study in consultation with their advisers. Previous training and interests as well as vocational goals will be taken into account when the student's program of courses is determined.

Spanish 201 and 204 or 212 (or equivalent) are prerequisite to entering the major in Spanish. All majors will normally include the following core courses in their programs:

1) Spanish 315–316–318
2) Spanish 311 and 312 (or equivalent)

Spanish majors have great flexibility in devising their programs of study and areas of concentration. Some typical options of the major are:

1) Spanish literature, for which the program of study normally includes at least 20 credits of Spanish literature beyond the core courses. Literature majors are strongly urged to include in their programs courses in all the major periods of Hispanic literature.
2) A combination of literature and linguistics.
3) Any of the above options with certain courses in other disciplines counted toward the major. Whichever option a student chooses, he or she is encouraged to enrich the major program by including a variety of courses from related fields or by combining Spanish with related fields such as history, philosophy, sociology, anthropology, art, music, Classics, English, comparative literature, and other foreign languages and literatures. In particular the interdepartmental programs in Latin American Studies and Hispanic American Studies sponsor relevant courses in a variety of areas.

The J. G. White Prize and Scholarships are available annually to students who achieve excellence in Spanish.

For the major in Spanish linguistics, see Modern Languages and Linguistics—Spanish.

**Study abroad in Spain.** Cornell and the University of Michigan cosponsor an academic year in Spain program. Students enrolled in this program spend the first four weeks before the fall semester begins in a residential college located on the campus of the University of Madrid, where they take a course in Spanish language and contemporary society and take advantage of special lectures and field trips to Madrid and Castile. This course carries three credits. In early October the program moves to Seville, where students enroll in as many regular classes at the University of Seville as their language competency and general education permit. Their academic work is supplemented by courses designed explicitly for the program by Seville faculty, as well as a seminar regularly offered by the resident director, who is chosen from the faculty of either Cornell or Michigan. The special courses normally include history of art and architecture, Spanish composition and syntax, and modern Spanish history. In Seville students live with selected families or in a few cases in *colegios mayores*. Cornell-Michigan also maintains a center in Seville, which is used by students for special seminars, tutorials, lectures, and informal gatherings.

Applicants are expected to have attained at least proficiency in Spanish prior to departure. Students are strongly encouraged to study abroad for the entire year rather than for one semester. Students interested in the study abroad program should consult with the Cornell Abroad office for further information.

**Honors.** Honors in Spanish may be achieved by superior students who want to undertake guided independent reading and research in an area of their choice. Students in the senior year select a member of the Spanish faculty to supervise their work and direct the writing of their honors essays (see Spanish 429–430).

**Fees.** Depending on the course, a small fee may be charged for film use or for copies of texts for course work.

### Language

Most language courses and Spanish linguistic courses are offered by Modern Languages and Linguistics. Advanced language courses and all literature courses are listed below.

*Note: Students placed in the 200-level courses have the option of taking language and/or literature courses; see listing under Spanish 201 for description of the literature course which may be taken concurrently with the 203–204 (offered by Modern Languages and Linguistics) or 211–212 language courses described below.*

**[211 Intermediate Spanish**
3 credits. Not offered 1989–90.]

**[212 Intermediate Spanish**
3 credits. Not offered 1989–90.]

**311 Advanced Composition and Conversation**
Fall. 4 credits. Prerequisite: Spanish 204 or 212 or equivalent.
M W F 11:15, A. Monegal, or M W F 12:20, M. Stycos.
Advanced language skills, developed through reading, grammar review, and intensive practice in speaking, writing, and translation. Analysis of present-day Spanish usage in a wide variety of oral and written texts.

**312 Advanced Composition and Conversation**
Spring. 4 credits. Continuation of spring 311 but may be taken separately. Required of Spanish majors.
M W F 12:20, M. Stycos, or T R 11:40–12:55, A. Monegal.
Readings and class discussion will focus on the stylistic analysis of modern texts. Increased emphasis, through weekly essays, on students' development of an effective Spanish prose style.

### Literature

**105 Freshman Seminar. Paradise Lost: Biculturalism in America (also English 168)**
Fall. 3 credits.
T R 11:40–12:55. L. Carrillo.
A dissection of the myth of the American Dream through a study of literature written by American ethnic minority authors. How expectations clash or coincide with reality and what mechanisms evolve to maintain biculturality in our predominantly white society. Representative semifictional works may include Toni Morrison's *Bluest Eye* (Afro-American), Maxine Hong Kingston's *China Men* (Asian American), Scott Momaday's *House Made of Dawn* (Native American), Piri Thomas' *Down These Mean Streets* (Hispanic American), and the movie *El Norte*.

**[106 Freshman Seminar: Searching for Self in Hispanic Fiction**
3 credits. Not offered 1989–90.]

**109 Freshman Seminar: Revolution and Literature in Latin America**
Fall or spring. 3 credits.
Fall: M W F 10:10 or 11:15. Spring: M W F 9:05. J. Tittler and staff.
Using selected works of contemporary Latin American fiction as a springboard for discussion and study, the course will consider the question of radical change from a variety of standpoints, including the historical, institutional, psychological, and literary. Readings will include Julio Cortázar's *A Manual for Manuel*, Carlos Fuentes's *The Death of Artemio Cruz*, Antonio Skármeta's *The Insurrection*, and Manual Puig's *Kiss of the Spider Woman*. Assignments will give students the opportunity to write essays of both an analytical and expressive sort. The role of biculturalism in the revolutionary process, as well as in the act of textual composition, will receive particular attention.

**[110 Freshman Writing Seminar—Invented Reality: The Media and Central America**
3 credits. Not offered 1989–90.]

**[125 Freshman Writing Seminar: The City in Hispanic Novels**
3 credits. Not offered 1989–90.]

**126 Freshman Seminar: The Complex Fate—Self-Identity in the Literature of United States Hispanic and Other Ethnic Groups**
Spring. 3 credits.
T R 11:40–12:55. L. Carrillo.
Our purpose in this seminar will be to examine representative literature written by Chicano(a)/Mexican American, Puerto Rican, and Cuban authors that traces the process of self-definition against the backdrop of American society and culture. Our discussions will center on such issues as the role of Hispanic ethnicity and its ties to language and bilingualism; the influences exerted by family, school, church, and workplace; and the impact of values presented by American feminism. Readings will include such works as Jose Antonio Villarreal's *Pocho*, Nicholasa Mohr's *Nilda*, Roberto Fernandez's *Raining Backwards*, and Sandra Cisneros's *The House on Mango Street* or Gloria Anzaldua's *Borderlands, La Frontera*. Written work will involve analytical/critical essays on the readings.

**130 Freshman Seminar: Old World, New World—The Discovery and Conquest of America in Hispanic Literature**
Fall. 3 credits.
M W F 9:05. M. Gaylord.
When Spaniards reached the "Indies," what did they see? And how did they see it and write about it? Through readings ranging from the discoverers' own letters and chronicles to contemporary Latin American fictions, this seminar explores the dramatic encounter between Old World vision and New World realities. Discussions and writing focus on the issues of ideology, morality, and perception that are raised when we attempt to understand what is radically different.

**201 Introduction to Hispanic Literature**
Fall or spring. 3 credits. Prerequisite: qualification in Spanish or permission of instructor. The course is divided into small sections and is conducted mainly in Spanish. (Fulfills both the language proficiency requirement and, followed by a 300-level Spanish literature course, the humanities distribution requirement. The literature course that normally follows Spanish 201 is either 315, 316, or 318.)
Fall: M W F 9:05, 10:10, or 11:15 or T R 8:40–9:55. Spring: M W F 9:05, 10:10, or 11:15 or T R 11:40–12:55. M. Stycos.
An intermediate reading course designed to improve reading, writing, speaking, and comprehension skills in Spanish through the reading and discussion of contemporary literary works of various genres (narrative prose, drama, poetry) from Spain and Spanish America. Emphasis is placed on the development of fluency in reading and of critical and analytical abilities. The cultural, sociological, and aesthetic implications of texts by authors such as Borges, Cortázar, Fuentes, García Márquez, García Lorca, and Cela are considered.

**[313 Spanish Civilization**
4 credits. Not offered 1989–90.]

Note: Spanish 315, 316, 317, and 318 can be taken in any order. Prerequisite: Spanish 201 or 4 years of high school Spanish or permission of instructor.

**315 Readings in Sixteenth- and Seventeenth-Century Hispanic Literature**
Spring. 4 credits. Prerequisite: Spanish 201, four years of high school Spanish, or permission of instructor. This course is not a prerequisite for Spanish 316 or 318.
T R 11:40–12:55. C. Arroyo.
Readings and discussion of representative texts of the period from both Spain and her colonies in the New World: Garcilaso de la Vega, *Lazarillo de Tormes*, San Juan de la Cruz, Cervantes, Lope de Vega, Calderón, and others.

**316 Readings in Modern Spanish Literature**
Fall. 4 credits. Prerequisite: Spanish 201 or 4 years of high school Spanish or permission of instructor. Taught in Spanish.
M W F 1:25 or 2:30 or T R 10:10–11:25. J. Kronik and staff.
Readings and discussion of representative texts from Spain from the romantic period to the present. Bécquer, Galdós, Unamuno, García Lorca, Cela, and others.

**317 Readings in Colonial Spanish-American Literature**
Fall. 4 credits.
T R 2:55–4:10. J. Piedra.
Early masterpieces of Spanish American literature from the "chronicles of discovery" to the first novels. The paradoxical relationship between the historical and literary forms, as well as the serious and the humorous contents, that characterizes writings from the journals of Columbus to those of the picaros.

**318 Readings in Spanish-American Literature**
Spring. 4 credits.
M W F 10:10, staff; T R 10:10–11:25, J. Tittler; or T R 1:25–2:40, staff.
Readings and discussion of representative texts of the nineteenth and twentieth centuries from Spanish America: Darío, Borges, Neruda, Paz, Cortázar, García Márquez, and others.

**[323 Readings in Latin American Civilization**
4 credits. Not offered 1989–90.]

Note: The prerequisite for the following courses, unless otherwise indicated, is Spanish 315, 316, or 318, or permission of instructor.

**[329 The Spanish Civil War in Literature and the Visual Arts (also Comparative Literature 329)**
4 credits. Not offered 1989–90.]

**[332 The Modern Drama in Spanish America**
4 credits. Not offered 1989–90.]

**[333 The Spanish-American Short Story**
4 credits. Not offered 1989–90.]

**345 Contemporary Spanish-American Novel**
Fall. 4 credits. Prerequisite: Spanish 317 or equivalent.
M W F 12:20. J. Tittler.
Reading and discussion of selected works of narrative fiction by today's leading authors: Cabrera Infante, Cortázar, Donoso, Fuentes, García Márquez, Puig, Vargas Llosa, and others. Two abiding concerns will be the way in which history interacts with aesthetic form and the role of the bicultural reader in actualizing the text's potential.

**[346 Hispanic Caribbean Culture and Literature**
4 credits. Not offered 1989–90.]

**[351 Spanish Drama of the Golden Age**
4 credits. Not offered 1989–90.]

**[356 Spanish Lyric Poetry of the Golden Age**
4 credits. Not offered 1989–90.]

**[368 The Birth of the Novel in Spain**
4 credits. Not offered 1989–90.]

**[375 The Picaresque Novel in European Perspective**
4 credits. Not offered 1989–90.]

**[376 The Contemporary Spanish Novel**
4 credits. Not offered 1989–90.]

**385 Studies in Spanish Realism and Naturalism**
Fall. 4 credits.
T R 1:25–2:40. U. DeWinter.
An analysis of some of the major authors and their works in the context of nineteenth-century Spanish Realism and Naturalism. We will discuss some of the works of Galdós, Pardo Bazán, Charín, Palacio Valdes, and Blasco Ibáñez, among others.

**[389 The Generation of 1898**
4 credits. Not offered 1989–90.]

**[390 Fiction of Modern Hispanic Women (also Women's Studies 390)**
4 credits. Not offered 1989–90.]

**[391 The Post-Civil War Drama in Spain**
4 credits. Not offered 1989–90.]

**[392 The Spanish Vanguard Theater: Lorca and Valle-Inclán**
4 credits. Not offered 1989–90.]

**[393 The Reader in the Novel (also Comparative Literature 369)**
4 credits. Not offered 1989–90.]

**[394 Art and Politics of Latin America**
4 credits. Not offered 1989–90.]

**395 The Novel in Spain after the Civil War**
Spring. 4 credits. prerequisite 315, 316, 318 or permission of instructor.
T R 10:105–11:25. J. Kronik.
Representative works of fiction by the major novelists from the 1940s to the 1980s will be studied thematically and structurally. Emphasis will be placed on their struggle against the existing socio-political order and on their experimentation with new forms. Works by Cela, Delibes, Sánchez Ferlosio, Martín-Santos, Goytisolo, and Martín Gaite.

**396 Modern U.S.-Hispanic Prose Fiction**
Spring. 4 credits. Taught in Spanish.
M W F 11:15. D. Castillo.
A detailed examination of representative twentieth-century fictional works (novels, short stories, plays) by Hispanic-American authors. Discussion will be centered on such issues as the social and political concerns raised by the fiction and the authors' need to struggle with a double linguistic and cultural tradition. Authors include Nicholasa Mohr, Piri Thomas, Rolando Hinojosa-Smith, Alejandro Morales, Tomás Rivera, Ron Arias, Raymond Barrio, and Luis Valdéz.

**[397 Colombian Literature**
4 credits. Not offered 1989–90.]

**[398 Postrevolutionary Mexican Novel**
4 credits. Not offered 1989–90.]

**399 Spanish Film**
Spring. 4 credits. Taught in Spanish.
T R 2:55–4:25. A. Monegal.
Examines the evolution of Spanish cinema during and after Franco's dictatorship, both from a historical and a cinematic perspective. The focus will be on film as document, taking into account its potential for the representation of reality, and on film as fiction, analyzing its narrative techniques. The problematic relation between film and literature will be addressed through the comparative study of adaptations and their sources. Special attention will be given to the encoding of political discourse under a system of censorship. Selected films include works by Buñuel, Saura, Erice, Borau, Chávarri, and Gutiérrez Aragón, among others.

**[415 The Black within: Hispanic Race and Literature**
3 credits. Not offered 1989–90.]

**419–420 Special Topics in Hispanic Literature**
419, fall; 420, spring. 2–4 credits each term. Prerequisite: permission of instructor.
Staff.
Guided independent study of specific topics. For undergraduates interested in special problems not covered in courses.

**429–430 Honors Work in Hispanic Literature**
429, fall; 430, spring. 4 credits each term. Limited to seniors. Prerequisite: permission of instructor.
J. Piedra.

**440 Medieval Spanish Literature**
Spring. 4 credits. Taught in Spanish.
T 2:30–4:25. C. Arroyo.
A reading of the most important texts in the different genres. An attempt at defining the very concept of genre and its applicability to medieval works. Exploration of concepts such as courtly love. Incorporation of Spanish texts into their philosophico-theological background. French and Italian parallels.

**[450 Literature of Conquest**
4 credits. Not offered 1989–90.]

**[455 Cervantes: *Don Quijote***
4 credits. Not offered 1989–90.]

**[466 Golden-Age Spanish Short Fiction**
4 credits. Not offered 1989–90.]

**[469 Mystics and Moralists**
4 credits. Not offered 1989–90.]

**[479 Colonial Spanish-American Literature: Voices of the Colonized**
4 credits. Not offered 1989–90.]

**[481 Eighteenth- and Nineteenth-Century Spanish Drama**
4 credits. Not offered 1989–90.]

**[485 The Nineteenth-Century Spanish Novel: Galdós and Clarín**
4 credits. Not offered 1989–90.]

**[488 The Novel in Early Twentieth-Century Spain**
4 credits. Not offered 1989–90.]

**[489 Hispanic Romanticism**
4 credits. Not offered 1989–90.]

**490 Surrealism in Spain**
Fall. 4 credits. Taught in Spanish. Reading knowledge of French helpful, but not required.
M 2:30–4:25. A. Monegal.
The course will trace the impact of French surrealism in Spain and its connections to Spanish avant-garde movements, in an attempt to answer the question of whether there was a Spanish surrealism. The objective will be to formulate a definition of surrealism applicable to the Spanish model, through the analysis of texts by Alberti, Aleixandre, Buñuel, Cernuda, Dalí, García Lorca, and Larrea, in relation to some by Breton and other French surrealists. Background readings will include relevant theoretical and critical works, as well as essays by key figures of the period, such as Gómez de la Serna, de Torre, and Ortega.

**[495 Gabriel García Márquez**
4 credits. Not offered 1989–90.]

**496 The Fiction of Manuel Puig**
Spring. 4 credits. Prerequisite: Spanish 317.
W 2:30–4:25. J. Tittler.
Often dismissed as "kitsch," "camp," or "pop" in its literary register, when not hailed as revolutionary in its use of montage and other defamiliarizing narrative devices, the fiction of Manuel Puig has attracted considerable attention among critics and general readers alike. In reading and discussing such works as *La traición de Rita Hayworth, El beso de la mujer araña,* and *Maldición eterna a quien lea estas Páginas,* among others, we shall explore the delightfully insidious role the culture industry plays in contemporary life. Puig's seductively mass-mediated novels will be shown to float on a turbulent thematic sea of uncertain personal identity, political commitment, and collective myths.

**[497 Spanish Poetry and Poetics**
4 credits. Not offered 1989–90.]

**[498 Mallarmé in Latin America**
4 credits. Not offered 1989–90.]

**[499 Borges (also Comparative Literature 499)**
4 credits. Not offered 1989–90.]

**639–640 Special Topics in Hispanic Literature**
639, fall; 640, spring. 4 credits each term.
Staff.

**667 Seminar in Golden Age Literature: Golden Age Poetry and Poetics**
Spring. 4 credits.
M 2:30–4:25. M. Gaylord.
Intensive reading of major texts of sixteenth- and seventeenth-century Spanish poetry (Garcilaso, Herrera, Lope de Vega, Góngora, Quevedo). The seminar will seek to situate these works in the context of a contemporary critical and theoretical dialogue that grew out of poetry and in turn contributed to it. We will examine golden age concepts of genre, rhetoric, imitation, and reading, attending both to theories of poetic language and to the language of these theories.

**[686 Seminar in Nineteenth-Century Spanish Literature: Galdós**
4 credits. Not offered 1989–90.]

**[690 Hispanic Feminisms (also Women's Studies 692)**
4 credits. Not offered 1989–90.]

**691 Native Revenge (also Comparative Literature 691)**
Fall. 4 credits.
W 2:30–4:25. J. Piedra.
This course deals with the "anthropological" intrusion of French writers and literary theorists into the life and texts of Latin American "natives," as well as their strategies of revenge. Among the intruding explorers we have: Montaigne on New World cannibals, Todorov on Columbus, Lévi-Strauss and Derrida on the Nambikwara, Foucault on Borges, and Barthes on Sarduy. Among the avenging natives we have: the voices and writings of those intruded upon and their defenders, including Carpentier, Pax, Vargas Llosa, Fuentes, Lispector, Andrade, and the Campos brothers. The course will explore the "conciliatory" solutions already advanced by the anthropological theories on "the scene of arrival," as well as the "drastic" solutions considered by ethnopoetic films such as: "Macunaima" and "How Tasty Was My Little Frenchman." Taught and readings in English.

**[694 Seminar in Modern Spanish Literature**
4 credits. Not offered 1989–90.]

## RUMANIAN

See Department of Modern Languages and Linguistics.

# RUSSIAN

L. H. Babby, E. W. Browne, P. Carden (director of undergraduate studies [literature], 235 Goldwin Smith Hall, 255-8348), G. Gibian, R. L. Leed (director of undergraduate studies [language and linguistics], 302 Morrill Hall, 255-2322), N. Pollak, M. Scammell, S. Senderovich, G. Shapiro

## The Russian Major

Russian majors study Russian language, literature, and linguistics, emphasizing their specific interests. It is desirable, although not necessary, for prospective majors to complete Russian 101–102, 201–202, and 203–204 as freshmen and sophomores, since these courses are prerequisites to most of the junior and senior courses that count toward the major. Students may be admitted to the major upon satisfactory completion of Russian 102 or the equivalent. Students who elect to major in Russian should consult both Professor Carden and Professor Leed as soon as possible. For a major in Russian, students will be required to complete (1) Russian 301–302 or 303–304 or the equivalent, and (2) 18 credits from 300- and 400-level literature and linguistics courses, of which 12 credits must be in literature in the original Russian.

Certain courses may, with the permission of the instructor, be taken for one additional hour's credit. Such courses will involve a one-hour section each week with work in the Russian language. These courses count one hour each of credit toward the 12 courses of Russian literature in the original language required for the major.

## Study Abroad

Cornell is an affiliated institution in the program for Russian language study at Leningrad State University. Opportunities are available for study during the summer, a single semester, or the full year. Further information is available from Professor Wayles Browne.

**Honors.** Students taking honors in Russian undertake individual reading and research and write an honors essay.

**Fees.** Depending on the course, a small fee may be charged for photocopied texts for course work.

**Freshman writing seminar requirement.** The following courses will satisfy the freshman writing seminar requirement: Russian 103, 104, 105, 107, and 108.

## Russian and Soviet Studies Major

See "Special Programs and Interdisciplinary Studies," which follows the department listings.

## Russian Literature

P. Carden (director of undergraduate studies, 235 Goldwin Smith Hall, 255-8348), G. Gibian, N. Pollak, M. Scammell (chair), S. Senderovich, G.Shapiro.

The Department of Russian Literature offers a variety of courses: some with readings in English translation, others in the original Russian, or both. The connection between Russian history, society, and literature is particularly close, so instruction and discussion in class often include a variety of topics, such as culture and intellectual history, as well as literature. Several courses are interdisciplinary, cosponsored with the departments of History, Economics, Government, Comparative Literature, etc. Students interested in majoring in Russian are strongly urged to take Russian 101–102 as soon as possible, preferably in their first year, or by their second at the latest. Russian 203–204, offered by the Department of Modern Languages and Linguistics, and Russian 201–202, offered by the Department of Russian Literature, complete basic language instruction and introduce students to literature. A further sequence of literature courses in Russian follows Russian 202.

For further information about courses and majors, see Modern Languages and Linguistics.

**103 Freshman Writing Seminar: Classics of Russian Thought and Literature**
Fall or spring. 3 credits.
M W F 9:05 or 11:15. Staff.
Russian society has always seen its literature as having a mission important to the development of the nation. In this course we will examine Russian literature as it participates in the debate, whither Russia? We will look in particular at the conflict between the Slavophiles, those who thought Russia had its own unique destiny, and the Westernizers, those who thought Russia should look to the West for a model in its development. We will be reading such Russian authors as Turgenev, Dostoevsky, Herzen, and Solzhenitsyn in English translation. The course will examine the rhetorical means each author uses to make his argument. All reading is in English traslation.

**104 Freshman Writing Seminar: Nineteenth-Century Russian Literary Masterpieces**
Fall or spring. 3 credits.
M W F 9:05 or 10:10. Fall: N. Pollak and staff. Spring: P. Carden and staff.
This course will introduce students to a broad selection of the major works of the Russian literary tradition. Our emphasis will be on what makes each work interesting as writing, what themes have been particularly interesting to Russians, and how we recognize the distinctive voice of each of the writers we are studying. Among the authors read are Pushkin, Gogol, Turgenev, Dostoevsky, Tolstoy, and Chekhov. All reading is in English translation.

**105 Freshman Writing Seminar: Twentieth-Century Russian Literary Masterpieces**
Fall or spring. 3 credits.
Fall: T R 8:40–9:55. Spring: M W F 11:15 or T R 8:40–9:55. Staff.
Russian literature in the twentieth century has endured many ups and downs. At times it has produced great masterpieces of modern art. At times it has been forced into the dry mode of "socialist realism," in which it had to voice the ideas forced upon it by a totalitarian government. Russian authors have been glorified as the voice of the nation, and they have also perished in concentration camps in the far north of Siberia. In this course we will read a representative selection of these authors, including those who took the path of art, those who bent to the "social command," and those who assumed a politically dissident stance. Among the authors read will be Babel, Pasternak, Olesha, and Solzhenitsyn. All reading in English translation.

**[107 Freshman Writing Seminar: Writers on Writing**
Fall or spring. 3 credits. Not offered 1989–90.
T R 10:10–11:25. Staff.
Why do we write or read? The centrality of reading and writing in our lives evidences our dependence on language. Both processes paradoxically mirror and create reality. We will examine how writers of nineteenth- and twentieth-century Russian literature from Gogol to Olesha portray reading or writing processes in their works and, with the help of selections from Schiller, Poulet, Sartre, and others, we will analyze how and why we read and write.]

**[108 Freshman Writing Seminar: 100 Years of Russian Fiction (1830–1930)**
Fall. 3 credits. Not offered 1989–909.
M W F 10:10. N. Pollak.
What is the "truth" of the work of fiction? Native responses to Russian literature in the nineteenth and twentieth centuries have included two apparently antithetical—and passionately proclaimed—responses to this question. According to one view, that truth lies in the ideal content of the work, its fidelity to "objective" reality, and its social relevance. According to the other view, which arose in part as a response and counterweight to the first, the truth is inseparable from the stylistic aspects of the work. In reading short fiction by such writers as Pushkin, Gogol, Tolstoy, Chekhov, and Babel, we will attempt to examine the ways each of them asserts his conception of the truth—and the ways these approaches must overlap in the determination of the complex truth that is the work of art.]

**201–202 Readings in Russian Literature**
201, fall; 202, spring. 3 credits each term.
Prerequisite: qualification in Russian. Open to freshmen.
M W F 10:10 or 1:25. G. Shapiro or N. Pollak.
These courses are designed as the initial courses students take after qualification in Russian and are conducted mainly in Russian. Considerable guidance is provided, however, and there is no presumption of fluency. The goals of the courses are to introduce students to Russian literature in the original, to sample differing literary styles, and to accomplish both with minimal recourse to English in class. Several short papers in Russian and English will be assigned. Readings from nineteenth- and twentieth-century masters of prose and verse such as Pushkin, Lermontov, Tiutchev, Tolstoy, Chekhov, Babel, and Zoshchenko.

**307 Themes from Russian Culture**
Fall. 4 credits.
M W 9:05. G. Shapiro.
This course is based on lectures, discussions, and audio-visual presentations (slides, tapes, films). It includes within its scope various aspects of Russian culture such as literature, art, music, religion, philosophy, and social thought from its very beginnings through the eighteenth century. The course is designed to give undergraduates a broad familiarity with the cultural traditions of the country which plays a major role in the world today. Russian culture will be presented as part of Western civilization with attention given to its distinctive character. The basic texts are literary works of moderate length in English translation.

**[308 Themes from Russian Culture II**
Spring. 4 credits. Not offered 1989–90.
M W F 1:25. G. Shapiro.
This course is based on lectures, discussions, and audiovisual presentations (slides, tapes, films). It includes various aspects of Russian culture such as literature, art, music, religion, philosophy, and social thought over the last two hundred years. The course is designed to give undergraduates a broad familiarity with the cultural traditions of the country that plays a major role in the world today. Russian culture will be presented as part of Western civilization with attention given to its distinctive character. The basic texts are literary works of moderate length in English translation.]

**[314 Intellectual Background of Russian Literature, 1825–1930**
Not offered 1989–90.]

**[329 Eastern Europe Today: Economics, Government, Culture (also Economics 329 and Government 326)**
Fall. 4 credits. Not offered 1989–90.
T R 2:55–4:10. G. Gibian, M. Rush, G. Staller.
Introductory interdisciplinary survey of Poland, Hungary, Czechoslovakia, and Yugoslavia since World War II, with emphasis on contemporary developments. The goals of the course are to examine differences among East European countries as well as common elements.]

**330 The Soviet Union: Politics, Economics, and Culture (also Economics 330 and Government 330)**
Spring. 4 credits.
T R 2:55–4:10. G. Gibian, M. Rush, G. Staller.
Interdisciplinary survey of the U.S.S.R. since the Revolution, with emphasis on contemporary developments.

**331 Introduction to Russian Poetry**
Fall. 4 credits. Prerequisites: Russian 202 or equivalent and permission of instructor. This course may be counted toward the 12 credits of Russian literature in the original language for the Russian major. Also open to graduate students.
T R 11:40–12:55. S. Senderovich.
A survey of Russian poetry with primary emphasis on the analysis of individual poems by major poets.

**[332 Russian Theatre and Drama**
Not offered 1989–90.]

**333 Twentieth-Century Poetry**
Spring. 4 credits.
T R 11:40–12:55. N. Pollak.
Close readings of lyrics by major twentieth-century poets. All reading is in Russian. Geared towards undergraduates.

**334 The Russian Short Story**
Spring. 4 credits. Prerequisites: Russian 202 or equivalent and permission of instructor. This course may be counted toward the 12 credits of Russian literature in the original language for the Russian major. Also open to graduate students.
T R 11:40–12:55. S. Senderovich.
A survey of two centuries of Russian story telling. Emphasis on the analysis of individual stories by major writers, on narrative structure, and on related landmarks of Russian literary criticism.

**[335 Gogol**
Spring. 4 credits. There may be a special section for students who read Russian; if they are Russian majors, they may count this course as one in the original language. Also open to graduate students. Not offered 1989–90.
M W 2:30–3:45. Staff.
Selected works of Gogol read closely and viewed in relation to his life and to the literature of his time. Readings in English translation.]

**[350 Education and the Western Literary Tradition (also Comparative Literature 350 and College Scholar 350)**
Spring. 4 credits. Not offered 1989–90.
M W F 10:10. P. Carden.
A major philosophical tradition has conceived of education as encompassing the whole of our lives. What we should do or be is seen as the result of every choice we make. The whole of our human contacts is understood as a school in which we form ourselves. This all-encompassing vision of education has been embodied in the works of the great philosopher-fantasts who use the forms of fiction to explore fundamental issues of education. In this course we will examine several key philosophical fantasies, among them Plato's *Republic*, Rousseau's *Emile*, and Tolstoy's *War and Peace*. Our aim will be to understand how the discourse on education became a central part of our Western tradition.]

**367 The Russian Novel (also Comparative Literature 367)**
Fall. 4 credits. Also open to graduate students. Special discussion section for students who read Russian.
T R 9:05 plus 1 hour to be arranged. G. Gibian.
Realism and modernism. The prosaics of Russian writers of the nineteenth and twentieth centuries. Novels and short stories by Gogol, Turgenev, Tolstoy, Dostoevsky, Chekhov, Solzhenitsyn, and others. Readings in English translation.

**368 Soviet Literature from Revolutionary Times to "Glasnost"**
4 credits. Also open to graduate students. There will be a special section for students who read Russian.
T R 1:25–2:40. M. Scammell.
An introductory survey of Soviet literature, beginning with the revolutionary fervor of the twenties, continuing through the dark days of the thirties and the war years of the forties, and ending with an account of Khrushchev's "thaw," the rise of the dissident movement and the introduction of "glasnost." Writers and movements to be discussed include Mayakovsky and the Futurists; Zamyatin, Platonov and anti-utopian fiction; Gorky and Socialist Realism; Gulag literature; Pasternak; Solzhenitsyn and the dissidents; the meaning of "glasnost."

**[369 Dostoevsky (also Comparative Literature 383)**
Fall. 4 credits. Not offered 1989–90.]

**[371 Literature of the Third Wave**
Spring. 4 credits. Not offered 1989–90.
M W 11:15 plus 1 hour to be arranged. M. Scammell.
The literature of the "third emigration." A survey of recent Russian literature by writers who have voluntarily or involuntarily left the Soviet Union during the past fifteen years. Among the authors discussed will be Solzhenitsyn, Sinyavsky, Brodsky, Zinoviev, Sokolov, Aksyonov, Vionovich, Limonov, Vladimov, Maximov, Aleshkovsky, Dovlatov, and Gorbanevskaya. Some consideration will be given to the influences of émigré publishing houses and literary magazines on the development of contemporary Russian literature and literary and political issues being debated by émigré literary circles.]

**[373 Chekhov**
Fall. 4 credits. Not offered 1989–90. A special section is offered for students who read Russian.
T R 11:40–12:55. S. Senderovich.
Reading and discussion of Chekhov's works, with emphasis on the short story. The course is designed for non-specialists as well as literature majors. A variety of approaches will be employed; informal lectures and discussions.]

**[375 Literature of the Soviet Period, 1917–1945**
Fall. 4 credits. Prerequisite: permission of instructor. Also open to graduate students. Russian majors may do part or all of the reading in Russian by prior agreement with the instructor. Not offered 1989–90.
T R 11:40–12:55. M. Scammell.
A survey of the development of Russian literature during the second quarter of the twentieth century, with the emphasis on attempts to create a purely Soviet literature but also taking into account the achievements of non-Soviet writers, including émigrés and the so-called fellow travelers.]

**[376 Literature of the Soviet Period, 1945–1985**
Spring. 4 credits. Prerequisite: permission of instructor. Also open to graduate students. Russian majors may do part or all of the reading in Russian by prior agreement with the instructor. Not offered 1989–90.
T R 11:40–12:55. M. Scammell.
A survey of the development of Soviet literature after World War II, including the thaw, the literature of the Gulag, the rise of the dissident movement, and the creation of the "third emigration."]

**379 The Russian Connection (also Comparative Literature 379)**
Spring. 4 credits.
T R 2:55–4:10. P. Carden.
We will examine the development of a Russian psychological literature of the interior self in its interrelationship with European literature. Using early examples of psychological prose such as Rousseau's *Confessions* and Benjamin Constant's *Adolphe*, we will examine the connection to Russian prose of the romantic period in Pushkin's *Queen of Spades* and Lermontov's *Hero of Our Time*. We will compare Hoffmann's and Gogol's employment of the fantastic to probe the more obscure sides of the psyche. After reading Stendhal's *Charterhouse of Parma*, we will turn to two of the most significant psychological novels of the Russian tradition, Tolstoy's *War and Peace* and Dostoevsky's *The Idiot*. All reading is in English translation.

**[380 Soviet Dissident Literature**
Fall. 4 credits. Not offered 1989–90.
T R 1:25–2:40. M. Scammell.
Study of the dissident movement. Defining the meaning of the term; political dissidence and cultural and literary dissidence; and the religious dissident movement. The writings of Siniavsky-Tertz, Pasternak's *Doctor Zhivago*, and other figures of the past two generations. This course is intended for students of government and society in general, not only for students of Russian literature.]

**[387 Teaching and Learning: Ideas of Education in the Western Tradition (also Comparative Literature 387)**
Spring. 4 credits. Not offered 1989–90.
M 2:30–4:30, plus 1 hour to be arranged.
P. Carden and guest lecturers.
Education is a central theme in our cultural tradition. What makes a person educated? Should a child be shaped to benefit society or to benefit some notion of his own good? What makes a good teacher? Should we have schools and, if so, what kind? What role should the state play in determining what to teach and how it should be taught? These questions are fundamental to our philosophical discourse from Plato to Rousseau. Fiction takes school and learning as primary subjects, and narrative has developed under the influence of the pedagogical discourse; public policy is shaped by the debate over teaching and learning. Writing shapes education, both as a vehicle of pedagogical discourse and as a necessary practice at every level of education. These topics will be the focus of our discussion as we look at a number of texts from the philosophical, literary, and public policy discourse.]

**[388 Ideas and Form in Novels of Social Inquiry (also Comparative Literature 388)**
Spring. 4 credits. Not offered 1989–90.
M W F 9:05. G. Gibian.
From the French Revolution to the present. Problems of relations between politics and the writer. Literary representations of conflict between political ideologies (ideas of revolution, justice, nationalism) and private needs (art, nature, love, order). Marx, Flaubert, Dostoevsky, Conrad, Trotsky, Lenin, V. S. Naipaul, Richard Wright, Solzhenitsyn, Kundera, and others. Some poetry will also be included.]

**389 Modern Literature in Poland, Czechoslovakia, Hungary, and Yugoslavia (also Comparative Literature 389)**
Spring. 4 credits.
9:05 plus 1 hour to be arranged.
G. Gibian
The course will focus on novels and short stories, but some consideration will also be given to drama and poetry. No knowledge of Eastern European languages is required; the reading will be done in English translation. Primary emphasis will be on the texts as literary works of art, but attention will also be given to historical and political background.

**[390 The Power of Nationalism: Expressions of National Feelings in Politics, Literature, History, and the Arts (also Comparative Literature 390)**
Fall. 4 credits. Not offered 1989–90.
T R 2:55–4:10. G. Gibian and others.
The course will deal with various aspects of the general subject of national identity and feeling. In addition to studying the political phenomenon of nationalism, we will also study the roles played by national awareness in the perception of one's identity, the self-images of national character, stereotypes of national and ethnic qualities, and the relation between a sense of belonging to a nation and various other groups. Case studies of several nations and ethnic groups. There will be guest lecturers.]

**393 Honors Essay Tutorial**
Fall or spring. 4 credits.
Hours to be arranged. Staff.

**[400 Reading the Great Tradition**
Fall. 4 credits. Prerequisite: Russian 202 or equivalent. Recommended: a course at the 300 or 400 level in which reading has been done in Russian. This course may be counted toward the 12 credits of Russian literature in the original language required for the Russian major. Not offered 1989–90.
T R 2:55–4:10. Staff.
The course is designed to improve the reading facility of advanced undergraduates and beginning graduate students by reading selected works of Russian literature in the original and paying close attention to their stylistic qualities. Works of contemporary Russian authors, both those officially approved and dissidents, those in the Soviet Union and those in emigration, will be read.]

**[409 Russian Stylistics**
Fall. 4 credits. Not offered 1989–90. Also open to graduate students. Prerequisite: three years of Russian.
T R 1:25–2:40. S. Senderovich.
A few steps beyond normative grammar. Introduction to the subtleties of idiomatic Russian on the levels of morphology, syntax, vocabulary, and phraseology. Introduction to the genres of live colloquial and written language. Development of writing skills through short assignments and their analyses. First notions of literary stylistics and their practical application.]

**[415 Postsymbolist Russian Poetry**
Spring. 4 credits. Open to graduate students. Prerequisite: permission of instructor. Not offered 1989–90.
M W 2:30–4. N. Pollak.
We will examine works by three poets in the first quarter of this century: Innokentij Annenskij, the Symbolist whom the Acmeists considered their mentor; Osip Mandelstam, a founding Acmeist; and Boris Pasternak, associated, at least for a time, with the Futurists. Through close readings of their verse, and also critical prose and manifestos, we will attempt to determine some of the general features that link poets of such diverse orientations in the years following the crisis of Symbolism. We will also outline the features that distinguish them as representative of their respective movements.]

**[418 Pedagogy and the Nineteenth-Century Novel (also Comparative Literature 418)**
Fall. 4 credits. Not offered 1989–90.
M 2:30–4:30, plus 1 hour to be arranged.
P. Carden.
Platonic thought affiliates basic philosophical questions to pedagogy. How do we know? How do we learn? What education will produce worthy citizens and rulers? Rousseau in his *Émile* took up the high philosophical tradition of pedagogy and recast it as a myth and as an incipient novel. In so doing, he opened the way to what we can call the great pedagogical novels of the nineteenth century. In this seminar we will examine the principles of a pedagogy designed to encompass the whole of life, as it is set forth in such works of Plato as *Meno*, *Phaedo*, *Symposium*, and *Republic* and as it is reintroduced into the mainstream of philosophical thought by Rousseau's *Émile* and Schiller's *Letters on Aesthetic Education*. Then we will turn to several novels of the nineteenth century, among them Tolstoy's *War and Peace*, Dostoevsky's *Notes from Underground*, and Flaubert's *A Sentimental Education*, to see how the presumptions of a philosophical pedagogy rooted in Platonic thought were tested by authors who found in the novel a vehicle for philosophical and pedagogical myths or for their debunking.]

**[431 Contemporary Russian Prose**
Fall. 4 credits. Not offered 1989–90. Prerequisites: Russian 202 or equivalent and permission of instructor. This course may be counted toward the 12 credits of Russian literature in the original language for the Russian major. Also open to graduate students.
T R 2:55–4:10. M. Scammell.
Aksyonov, Erofeyev, Siniavsky-Tertz, Sokolov, Solzhenitsyn, and other Soviet and émigré writers of the last two decades, approached through the style and structure of their short fiction.]

**[432 Pushkin**
Spring. 4 credits. Not offered 1989–90. Prerequisites: Russian 202 or equivalent, and permission of instructor. This course may be counted towards the 12 credits of Russian literature in the original language for the Russian major. Also open to graduate students.
T R 1:25–2:40. S. Senderovich.
Reading in the original language and discussion of selected works by Pushkin: lyrics, narrative poems, and *Eugene Onegin*.]

**491 Reading Course: Russian Literature in the Original Language**
Fall or spring. 1 credit each term. Prerequisite: permission of instructor.
Hours to be arranged. Staff.
This course is to be taken in conjunction with any Russian literature course in English translation. Students will receive one credit for reading and discussing works in Russian in addition to their normal course work.

**492 Supervised Reading in Russian Literature**
Fall or spring. 1–4 credits each term.
Hours to be arranged. Staff.

**[493 Tolstoy's *War and Peace* and *Children's Stories*: Thematic Invariance and Plot Structure**
Not offered 1989–90.]

**498 Russian Symbolism (also 698)**
Fall. 4 credits.
M 2:30–4:30 and W 2:30–3:20.
P. Carden.
Around 1886 the trends in French culture represented by Baudelaire and Mallarme crystallized into a new cultural movement, called in some of its aspects the Decadence and in others Symbolism. The new sentiments about the nature of art spread throughout Europe, drawing in England, the Scandinavian countries, Germany, and Russia. The first stirrings of Symbolism were in the ascendant in Russian cultural life and it remained the dominant force until 1910. Our task will be to study the phenomenon of Symbolism as it touched the arts in Russia, including not only literature, but dance, theater, and the visual arts. Since Symbolism was a movement that cut across national boundaries, we will study the seminal works of European art that created the climate in which Russian Symbolism was conceived and came to maturity.

**499 Russian Modernism (also 699)**
Spring. 4 credits.
M 2:30–4:30 and W 2:30–3:20.
P. Carden.
We will be investigating the rich and innovative period of the avant-garde in Russia from 1910 to 1925. In addition to examining outstanding works in a variety of forms, we will look at the movements, social context, and ties to the European avant-garde. Among the writers whose works we will examine are Blok, Bely, Mayakovsky, Khlebnikov, Pilnyak and Babel. We will examine theater through the Futurist performance piece, "Victory Over the Sun," through Meyerhold's productions of Mayakovsky's plays and other experimental pieces, and through mass spectacles. We will discuss the film theories of Eisenstein and Dziga Vertov and see several of their films. In the visual arts we will be examining the experiments of Larionov and Goncharova, Malevich, Kandinsky, and Tatlin. We will also look at the photomontage of Rodchenko.

### Graduate Seminars

**[600 Proseminar: Research Methodology in Russian Literature**
Fall. 4 credits. Not offered 1989–90.
W 3:45–5:45. P. Carden.
This course is intended for graduate students beyond the first-year level who want a more advanced training in research methodology. Among the topics to be covered are the research library, its resources and obstacles; bibliography of Russian literature and culture; Russian archives, what they contain and how to use them; finding and evaluating information; reading criticism analytically; evaluating different editions of an author's works; editing and revising a paper to meet professional standards of cogency and format. Each student should be working concurrently on a paper, which might be an upgrading of a seminar paper, a draft of the master's essay, or a chapter of the dissertation.]

**611 Supervised Reading and Research**
Fall or spring. 2–4 credits. Prerequisite: permission of the department.
Hours to be arranged. Staff.

**[615 Postsymbolist Russian Poetry**
Not offered 1989–90.
For description see Russian 415.]

**[617–618 Russian Stylistics I and II**
Not offered 1989–90.]

**[619 Seventeenth-Century Russian Literature**
Fall. 4 credits. Not offered 1989–90.
F 2:30–4:30. G. Shapiro.
Seventeenth-century Russian literature is often studied together with Medieval literature. Is such an arrangement justified, or does seventeenth-century literature have its own problematic that makes it worth studying separately? In the scholarship the seventeenth century is referred to as the Age of Baroque. Did Muscovite Russia experience its own Baroque, and, if so, what are its unique features? These and other important issues will be addressed in the seminar. In the course of the seminar a variety of concepts, genres, and themes characteristic for the epoch will be discussed. We will read the works of such authors as Simeon Polotsky, Silvester Medvedev, Karion Istomin, and the archpriest Avvakum.]

**[620 Twentieth-Century Russian Poetry**
Spring. 4 credits. Not offered 1989–90. Open to advanced undergraduates with permission of instructor.
W 3:35–5:35. N. Pollak.
An in-depth study of the writings of selected twentieth-century poets. Authors may include Blok, Mandelstam, Pasternak, Tsvetayeva, and Khlebnikov.]

**[621 Old Russian Literature**
Spring. 4 credits. Not offered 1989–90.
T 4–6. S. Senderovich.
A survey.]

**622 Eighteenth-Century Literature**
Spring. 4 credits.
T 4–6. S. Senderovich.
Introduction to the first century of modern Russian literature. Cultural identity of the age: Baroque, Neo-Classicism, Enlightenment, Sentimentalism. Reading of representative texts of the major writers of the century: Trediakovsky, Lomonosov, Sumarokov, Novikov, Karamzin, etc. Main connections with nineteenth-century literature: roots, evolution, intertextuality.

**[623 Early Nineteenth-Century Literature**
Not offered 1989–90.]

**[624 Russian Romanticism**
Fall. 4 credits. Taught in Russian. Not offered 1989–90.
T 4:15–6:15. S. Senderovich.
A survey of concepts, themes, genres, and main individual contributions in Russian literature of the Age of Romanticism. The Age of Romanticism encompasses the first four decades of the nineteenth century. Zhukovsky, Batiushkov, Pushkin, Baratynsky, Gogol, and Lermontov are the major representatives of this style and the most important period of Russian literature. The emphasis is on poetry, its historical and theoretical problems. It was, above all, the golden age of Russian poetry, which prepared and deeply influenced the following age of great Russian prose. Turgenev, Tolstoy, Dostoevsky, and Chekhov are full of allusions to the texts of the golden age and cannot be properly understood without it.]

**[625 Russian Realism**
Spring. 4 credits. Not offered 1989–90. Also open to advanced undergraduates with permission of instructor.
R 3:35–5:35. P. Carden.
A study of the development of psychological realism in Russian prose of the nineteenth century, with some attention to the poetic tradition. In addition to reading representative works, we will pay attention to the historical background of the period. We will approach the works through the critical writings of several important theorists, in particular those of Lydia Ginzburg.]

**630 Gogol**
Spring. 4 credits. Taught in Russian.
W 4:15–6:15. G. Shapiro.
Gogol's artistic career from his "Ukrainian" cycles to *Dead Souls*. We will examine representative works from each of the major divisions of Gogol's early work, in particular from his cycles *Evenings on a Farm near Dikanka* and *Mirgorod*, and will trace the writer's development toward his magnum opus, *Dead Souls*. Although some of the readings will be done in English to enable the class to cover a significant amount of material, the class work will be focused on close analysis of the Russian text.

**[669 Seminar: Dostoevsky**
Fall. 4 credits. Not offered 1989–90. Also open to advanced undergraduates.
R 4:15–6:15. G. Gibian.
Study of representative works from various periods of Dostoevsky's life, from *Poor Folk* and *The Double* to *The Brothers Karamazov*, including some articles, speeches, and parts of *The Diary of a Writer* against the context of nineteenth-century Western European and Russian literature. A variety of critical and scholarly approaches (from Russian formalists to 1980s Western scholars) will be sampled and evaluated.]

**671 Seminar in Nineteenth-Century Russian Literature**
Fall. 4 credits.
T 4:15–6:15. S. Senderovich.
Topic: Chekhov. Prosaic and dramatic works. Close reading. Problems of Chekhov's poetics. Poetics and meaning in Chekhov. Chekhov in the history of Russian culture. Orientation in the field of Chekhov criticism. Readings in Russian. Work on a research project.

**[672 Seminar in Twentieth-Century Russian Literature**
Spring. 4 credits. Open to advanced undergraduates. Not offered 1989–90.]

**673 The Russian Nabokov**
Fall. 4 credits. Also open to advanced undergraduates.
R 4:15–6:15. M. Scammell.
Vladimir Nabokov wrote much verse, several plays, numerous short stories, and nine novels in Russian before switching to English. He is a major Russian writer of the twentieth century. This seminar will examine his work in the context of modern Russian literature, concentrating in particular on the novels. Knowledge of Russian is highly desirable, but all the works discussed also exist in English translation.

**[674 Solzhenitsyn**
Fall. 4 credits. Not offered 1989–90.
R 4:15. M. Scammell.]

**675 Literature of the Soviet Period, 1917–1945**
Fall. 4 credits.
W 4–6. G. Gibian.
Study of the main works as well as the chronological development of all literary genres. Twofold approach: as it looked at the time; and how it looks from the perspective of hindsight: rehabilitations and revisionisms of the "glasnost" period. From Babel and Mayakovsky to Bulgakov, Sholokov, and Zoshchenko; from Futurism through Emigration and Writing for the Drawer to Socialistic Realism.

**[676 Literature of the Soviet Period, 1945–1985**
Not offered 1988–89.]

**698 Russian Symbolism**
Fall. 4 credits.
M 2:30–4:30, W 2:30–3:20. P. Carden.
For course description, see 498.

**699 Russian Modernism**
Spring. 4 credits.
M 2:30–4:30, W 2:30–3:20. P. Carden.
For course description, see 499.

**[701 Proseminar: Methods in Research and Criticism**
Not offered 1989–90.]

**[702 Graduate Seminar: Neglected Masterpieces of Short Russian Prose**
Spring. 4 credits. Not offered 1989–90.
R 3:35–5:35. G. Gibian.
Nineteenth- and twentieth-century works chosen according to the needs of the students enrolled. Stress on skills useful in teaching Russian literature.]

# SANSKRIT

See Department of Modern Languages and Linguistics.

# SERBO-CROATIAN

See Department of Modern Languages and Linguistics.

# SINHALA

See Department of Modern Languages and Linguistics.

# SOCIOLOGY

R. L. Breiger, chair; M. Abolafia, S. Caldwell, J. Freeman, M. Hannan, D. P. Hayes, R. McGinnis, M. McPherson, L. Meltzer, P. Moen, V. Nee, D. Nelkin, S. Olzak, B. C. Rosen, B. Rubin, L. Smith-Lovin, R. Stern, J. M. Stycos, P. Tolbert, D. Weakliem, R. M. Williams, Jr.

The subject matter of sociology is human social organization and institutions. The Department of Sociology offers courses in social organization that include (among other issues) examination of inequality on the basis of race, ethnicity, income, and occupation; political behavior and public policy; relations and affect in small groups; and contemporary social movements for change. Courses that analyze institutions include the family, politics and policy issues such as welfare and poverty, the analysis of voluntary organizations, and the study of networks of political and organizational action.

The Department of Sociology offers the opportunity to develop fundamental theoretical insight and advanced research skills appropriate for the study of social behavior and institutions. Graduates of the Department take up careers in university, government, and business settings and in law, management, architecture, and other professions seeking men and women who demonstrate a disciplined understanding of society and social issues.

## Sociology Courses for Non-Majors

The social sciences provide students with particularly effective ways to understand the complexities of modern life. For many students, the undergraduate years are a last opportunity to gain the insights these fields have to offer. The Sociology Department is continuing to design an array of beginning and advanced courses that convey a broad understanding of the methods and insights of sociological analysis—courses that will be of particular interest to undergraduates who may not major in Sociology. First- and second-year students should note that the introductory courses (101, 103, 104, 106) provide substantial focus on the sociological analysis of major issues of public life. A wide selection of general education courses is available at the 200 level. Advanced undergraduates who are majors in other fields should also see, in particular, the descriptions of Sociology 365 (fall) and Sociology 335 (spring), for which there are no prerequisites other than junior or senior status.

## Related Courses in Other Departments

Students interested in sociology should consult the course lists of the other social science departments in the College of Arts and Sciences and of these other departments: Organizational Behavior (College of Industrial and Labor Relations), Human Development and Family Studies (College of Human Ecology), and Rural Sociology (College of Agriculture and Life Sciences).

## The Major

Requirements for general sociology: (1) 101 and any other 100-level course (excluding Freshman Writing Seminar) with a 2.5 minimum grade-point average; (2) no later than the junior year, the 301 and 303 methods courses; (3) one course in the department at the 400 level or higher (491 is recommended); and (4) 20 additional credits in sociology, of which 9 may be taken in related departments if approved by the student's adviser.

**Requirements for social relations:** This major is offered jointly by the departments of Anthropology and Sociology. See page 323 for a description and a list of requirements.

**Requirements for honors:** Potential honor students are encouraged to begin taking the methods and statistics courses during their sophomore year and to take at least 2 credits of Sociology 491, Independent Study, during their junior year. Honors students take Sociology 495–496 during their senior year. Graduation with honors requires a cumulative average of at least B+ in all sociology courses and the successful completion of an oral defense of the honors thesis. Interested students should consult the director of undergraduate studies no later than the second semester of their junior year.

**Cornell-in-Washington program.** Qualified sociology majors may include a semester in the Cornell-in-Washington program, in which students take courses and undertake a closely supervised internship. For further information, see p. 15.

**Supervised research.** Qualified sociology majors are invited to participate with faculty members in conducting research. Such projects are usually initiated in one of two ways: the student may offer to assist the faculty member in an ongoing project, or the student may request that the faculty member supervise the execution of a project conceived by the student. In either case the student should enroll in Sociology 491. Interested students may direct inquiries to any faculty member.

### Society and Economy Concentration

Sociology majors or students in other disciplines who wish to prepare for graduate study (in any of the social sciences) or a profession (business, management, or law) may elect to acquire a concentration in society and economy. This program is designed to provide training in economic sociology, formal organizations, and social science methods. The requirements for the concentration in society and economy are: (1) three of the following courses in economic sociology and formal organizations: 245, 324, 350, 365, 375, 443; and (2) two of the following courses in methods: 241, 301, 302, 460. For further information, consult Professor Victor Nee, 330 Uris Hall.

## Introductory Courses

**101 Introduction to Sociology**
Fall or spring. 3 credits.
M W 11:15–12:05 plus one sec.
Fall: S. Caldwell; spring: M. Hannan.
With a focus on public issues that might in any semester include collective violence, markets and organizations, and social policies aimed at lowering the rate of poverty, this course provides an introduction to theory and research in sociology and demonstrates how the insights and methods of sociological analysis can be brought to bear in understanding major issues of public life. The goal is to convey a sense of the interrelations between the formulation of theories about social behavior and the collection and analysis of data in order to evaluate those theories. Instead of simply describing research, this course provides "hands-on" experience in analyzing sociological problems. Students undertake guided research exercises that involve using computers to analyze actual data. No prior background is presumed; necessary skills are covered in class and section meetings.

**103 Introduction to Sociology: Microsociology**
Fall. 3 credits.
M W F 9:05–9:55. D. P. Hayes.
An introduction to microsociology, focusing on concepts and theory of social processes within small groups, including the family. Emphasis is on leadership, conformity, social influence, cooperation and competition, distributive justice, and micro analyses of interaction.

**104 Class, Race, and Ethnicity**
Spring. 3 credits.
T R 10:10–11:25. S. Olzak.
What is the relationship between race and social class? To what extent does discrimination produce barriers to achievement and attainment for African Americans, Hispanics, Asians, and other immigrants in American society? Why are some groups more likely to be the targets of ethnic and racial hostility than others? This course uses sociological analyses to answer these questions about the nature of race, ethnic, and social class in our society and others. This course is designed as an introduction to the sociology of inequality, and is primarily for freshmen and sophomores.

**106 Family and Work**
Spring. 3 credits.
T R 10:10–11:25. L. Smith-Lovin.
The events of the past 30 years have profoundly transformed arrangements governing love, work, and their routinization in households and employment. In this course, students will look at data from census and time use studies showing what has changed and what has remained relatively stable. Sociological theories that explain these trends will be examined. Students will have the opportunity to test their own ideas with analyses of data from a national survey. The impact of sociological ideas for public issues like child care, welfare policy, sex discrimination statutes, and comparable worth will be discussed. This course is primarily for freshmen and sophomores.

**121 Sociology of Deviance**
Summer. 3 credits.
3-week session: M-F 2:30–5.
L. Zimmer.
Nonconformist behavior—its causes, its consequences, and the social reaction to it. Analysis of social structure, social change, and social control. Topics may include prostitution, teenage pregnancy, drunk driving, homosexuality, drug use, mental illness, crime, and forms of elite deviance.

## General Education Courses

**202 Writing in the Social Sciences (also Writing 202)**
Fall or spring. 3 credits. Limited to 17 students. Prerequisite: at least one social science course.
Fall: T R 11:40–12:55; spring: M W F 11:15–12:05. K. Hjortshoj.
This course offers students the opportunity to strengthen their writing, become more aware of the diverse writing styles and strategies used in the social sciences, and experiment with new approaches to composition and revision. Students will benefit from detailed written comments on their work and from extensive discussion of student writing in class. Initial writing and reading assignments will explore styles of description, the ways in which writers adapt their work to different audiences, the differences between academic and popular writing in a particular field, and methods of revision. Subsequent assignments will include the interpretation of primary data, the review of a documentary film, and writing based on research literature in a field of the student's choice. The instructor will hold frequent individual conferences with students to discuss finished essays and work in progress. During the semester students will write, and often revise, 8 to 10 papers—about 40 pages of finished work.

**205 Population Dynamics (also Rural Sociology 201)**
Spring. 3 credits.
T R 1:25–2:40. J. M. Stycos.
An introduction to population studies, which includes the determinants and consequences of population change. The primary focus is on the influences of demographic dynamics on society and the economy, with emphasis on marriage, family formation, mortality, crime and deviance, migration, and marketing behavior.

**240 Personality and Social Change**
Spring. 3 credits.
T R 1:25–2:40. B. C. Rosen.
An analysis of social and psychological factors that affect and reflect social change. Topics to be examined will include models of man and society, national character, modern melancholy, feminism, family and sex roles, industrialism, economic development, and psychocultural conflict.

**243 Family**
Fall. 3 credits.
T R 10:10–11, plus one sec. B. C. Rosen.
A social and historical analysis of the family both in the West and cross-culturally. Specific areas examined include sex roles, socialization, mate selection, sex and sexual controls, internal familial processes, divorce, disorganization, and social change.

**245 Inequality in America**
Fall. 4 credits.
T R 10:10–11:25. S. Olzak.
This course deals with sociological explanations for various forms of social and economic inequality, particularly inequalities associated with class and work. We will describe systems of inequality, analyze various theoretical explanations for those systems, and examine the various structures designed to reduce or eliminate inequality.

**[248 Politics in Society**
Spring. 3 credits. Not offered 1989–90.
M W F 1:25–2:15. B. Rubin.
An examination of the relationships between economic, social, and political structures in industrial societies with particular emphasis on the United States. Topics include democratic forms of participation in society at large, social movements, the structure of power and its legitimation, the emergence of the welfare state, and the tensions between political and economic structures.]

**264 Minorities in America**
Summer. 3 credits.
3-week session: M-F 12–2:30. C. Elliott.
The dynamics of race and ethnic relations in the United States. Lectures and discussions focus on the current and historical experiences of Native Americans, Afro-Americans, Asian Americans, and Hispanic Americans. Immigrant assimilation, prejudice, discrimination, and women as a minority group.

**265 Hispanic Americans**
Spring. 3 credits (4-credit option available).
T R 2:55–4:10. H. Velez.
Analysis of the present-day Hispanic experience in the United States. An examination of sociohistorical backgrounds as well as the economic, psychological, and political factors that converge to shape and influence a Hispanic group-identity in the United States. Perspectives are developed for understanding the diverse Hispanic migrations, the plight of Hispanics in urban and rural areas, and the unique problems faced by the different Hispanic groups. Groups studied include Dominicans, Chicanos, Cubans, and Puerto Ricans.

**277 Psychology of Sex Roles (also Psychology 277 and Women's Studies 277)**
Spring. 3 credits. Limited to 200 students. Prerequisite: an introductory psychology course.
T R 2:55–4:25. S. Bem.
This course addresses the question of why and how adult women and men come to differ in their overall life styles, work and family roles, personality patterns, cognitive abilities, etc. This broad question is examined from five perspectives: (a) the psychoanalytic perspective, (b) the biological perspective, (c) the historical and cultural evolutionary perspective, (d) the child development perspective, and (e) the social-psychological and contemporaneous perspective. Each of these perspectives is also brought to bear on more specialized phenomena relating to the psychology of sex roles, including psychological androgyny, women's conflict over achievement, the male sex role, equalitarian marriage relationships, gender-liberated child-rearing, female sexuality, homosexuality, and transsexualism.

**283 Groups and Relationships**
Fall or spring, and summer. 3 credits. Enrollment limited to ten men and ten women in each section. Not open to freshmen.
Fall and spring: M or W 7:30–10 p.m.; 6-week summer session: M and W 7–10 p.m. L. Meltzer.
The processes and societal functions of small groups (such as teams, committees, and fraternities) and dyadic relationships (such as engaged couples, parent and child, and friends). Involvement in self-study as individuals and as group participants is an integral part of the course. The goal is increased sensitivity to group processes, heightened awareness of the effects we have on others, and an understanding of how these phenomena relate to larger societal phenomena.

## Methods and Statistics Courses

**301 Evaluating Statistical Evidence**
Fall. 4 credits.
M W F 10:10–11. R. L. Breiger.
A first course in statistical evidence in the social sciences, with emphasis on statistical inference and multiple regression models. Theory is supplemented with numerous applications.

**[302 Sociological Differences in Contemporary America**
Fall. 4 credits. Not offered 1989–90.
M W F 10:10. S. Caldwell.
A course providing training in analysis of socioeconomic data using introductory statistics. The course is organized around the analysis of data sets reflecting major areas of social science research. Emphasis is placed upon involving students in the use of computers in understanding contemporary society and social issues.]

**303 Design and Measurement**
Spring. 4 credits. Prerequisite: a course in sociology.
T R 2:30–4:25. D. P. Hayes.
Foundations of sociological analysis; issues arising from using humans as data sources; the quality of our primary data; methods of its collection; research designs in wide use and their limitations; pragmatic considerations in doing research on humans, organizations, communities, and nations.

## Intermediate Courses

**310 Sociology of War and Peace**
Fall. 4 credits. Prerequisite: a course in sociology or government.
T R 1:25–2:40. R. M. Williams, Jr.
Every human group, community, or society presents many examples of altruism, helping, cooperation, agreement, and social harmony. Each grouping or society also manifests numerous examples of competition, rivalry, opposition, disagreement, conflict, and violence. Both conflict and cooperation are permanent and common aspects of the human condition. Collective conflicts, especially wars and revolutions, are frequent and dramatic events. But "peace" and "war" are equally active social processes, not passive happenings. This course describes various commonly accepted but erroneous notions of the causes and consequences of war and deterrence. It deals with the major theories concerning the sources of war in international and intranational social systems. The last half of the course analyzes the modes, techniques, and outcomes of efforts to restrict, regulate, and resolve international conflicts.

**[324 Organizations and Associations**
Fall. 3 credits. Prerequisite: two courses in sociology. Not offered 1989–90.
T R 11:40–12:55. M. McPherson.
This course provides an overview of the literature on social organization as it bears on the formation, maintenance, and dissolution of formal organizations. These organizations are extremely diverse, ranging from large multinational firms to neighborhood improvement groups. Throughout the course we will seek to discover the theoretical similarities among these diverse forms. We will be reading from the literature on firms, unions, voluntary associations, churches, political groups, and other types of organizations. We will study how these organizations relate to one another, how individuals come to join them, and the process by which they grow and decline.]

**[328 Sociology of Work**
Spring. 4 credits. Not offered 1989–90.
M W F 11:15–12:05. B. Rubin.
With the exception of those too rich, too ill, too young, or too old, most people in the United States will spend the majority of their waking lives working. Some will spend that time engaged in activity they enjoy. Others will be trapped in jobs that deaden the senses, cramp creativity, and provide only a paycheck as a reward. Nevertheless, the centrality of work in most of our lives is taken for granted; so too are the ways in which work is organized, rewards are distributed, and (though perhaps less so) workers recruited. The purpose of this course, then, is to explore, and thereby increase our understanding of, the underlying causes and consequences of the organization of work in capitalist America.]

**335 Industrial and Post–Industrial Society**
Spring. 4 credits. Open to juniors and seniors in any department. No prerequisites.
T R 1:25–2:40. D. Weakliem.
Service and information–based industries are steadily growing in all modern societies. Many people claim that this development fundamentally changes social structure, social conflict, politics, and culture. Others say that post–industrial society is just a continuation of industrial society. This course will explore issues concerning post–industrial society: for example, are traditional social categories such as class or religion giving way to new divisions? It will explore theories of post–industrial society and allow students to test them with data on recent changes in social conditions.

**[348 Sociology of Law**
Fall. 4 credits. Not offered 1989–90.
M W F 1:25. C. Bohmer.
Legal decisions and legal practices viewed within the context of society's institutions and customs. Topics vary from semester to semester but deal with issues such as civil rights versus society's rights, variations in permissible sexual practices in different cultures, the social organization of police departments and its effects on justice and equity, changing divorce laws in relation to changes in the status of women, the role of psychiatry in the legal process, and judicial attitudes toward rape victims.]

**[350 Organizations, Individuals, and Social Structure**
Spring. 4 credits. Prerequisite: one course in sociology. Not offered 1989–90.
T R 10:10–11:25. D. Weakliem.
Organizations are composed of people, but at the same time they can be regarded as actors in their own right, distinct from their members. This course introduces recent sociological theory and research on the relations among organizations and between organizations and individuals. Topics include the reasons for organization, effects on social conflict, stratification among organizations, and the extent to which organizations represent their members' interests. Examples will be taken from firms, labor unions, and political organizations.]

**355 Social and Political Studies of Science (also City and Regional Planning 442 and Biology and Society 442)**
Spring. 3 credits.
T R 10:10–11:25. D. Nelkin.
A view of science, less as an autonomous activity than as a social and political institution. We will discuss such issues as secrecy in science, ethical and value disputes, and the limits to scientific inquiry in the context of the changing relationships between science and the public.

**363 Remaking Socialism (also Society for the Humanities 425)**
Fall. 3 credits.
R 12:20–2:30. D. Stark.
This course examines the problems and prospects of restructuring the socialist economies of Eastern Europe. It addresses obstacles to creating markets administratively from above and explores recent efforts from below. On the basis of recent ethnographic studies, it analyzes conceptions of work, worth, and honor where diverse processes of evaluation and justification compete and coexist.

**[364 Race and Ethnicity**
Spring. 4 credits. Not offered 1989–90.
T R 1:25–2:40. S. Olzak.
This course examines the sociology of race and ethnic relations in the United States, Western Europe, South Africa, and other settings. The topics covered include the role of immigration and competition, the dynamics of upward mobility for some (but not all) ethnic-racial groups in the United States, the sociology and politics of ethnic-racial caste systems such as apartheid in South Africa, and the dynamics of ethnic boundaries in developing countries compared to those in underdeveloped countries.]

**365 Comparative Perspectives on Socialist Societies and Economies**
Fall. 3 credits. Open to juniors and seniors in any department. No prerequisites.
W 2:30–4:25. V. Nee.
This course focuses on analyzing the relationship between state, economy, and society in socialist societies. Particular attention is given to the tensions between planning and market, equality and equity, center and locality, bureaucratic domination and individual choice, and ideology and dissent. What are the problems in state-socialist societies and what are the dynamics and limits of reform movements? What are the areas of difference and convergence in the patterns of state, market, and household relations in capitalist and socialist societies? Readings will draw primarily on case studies of the Chinese, Eastern European, and Soviet experiences.

**[369 Contemporary Chinese Society**
Spring. 4 credits. Not offered 1989–90.
T R 2:55–4:10. V. Nee.
This course provides an introduction to Chinese society, its social organization, and its institutions. Since 1949 the various development models China has pursued have had differing consequences for society. What effects have they had on societal change—on stratification, community development, politics, the economy, work, schooling, family life, the position of women, personal relationships, and the meaning of life and values? What lessons can we draw from the Chinese experiences in implementing state-directed social change? How do we assess their accomplishments and failures? Recent field research on China will be cited.]

**[372 Sex Discrimination: Law and Social Policy (also Women's Studies 372 and Government 306)**
Spring. 4 credits. Not offered 1989–90.
M W F 10:10. C. Bohmer.
This course will cover the legal and social trends in the area of sex discrimination. It will examine the relationship between feminist consciousness and developments in gender-related constitutional law. We will discuss the meaning of sex discrimination in the context of various areas of importance and examine the role of the law in redressing or perpetuating social and legal inequities.]

**385 Personality and Social Systems**
Spring. 3 credits. Prerequisite: one course in any social science. Enrollment limited to 20 students.
T 10:10–12:05. B. Rosen.
A discussion seminar. Perspectives will be developed for understanding personality and behavior in a cultural context. A number of theories and conceptual approaches that have been used to understand the relationship between personality and social systems will be critically examined. Some themes in contemporary American culture will be discussed.

## Advanced Courses

The following courses are intended for advanced undergraduates with substantial preparation as well as for graduate students in sociology and related disciplines. The normal prerequisite for all 400-level courses is one introductory course plus 301 (or an equivalent statistics course). Students who are not sure whether their background is sufficient for a particular course should consult the professor in charge.

**[405 Sociology of Emotions**
Fall. 3 credits. Prerequisite: at least one of Sociology 101,103, or 205. Not offered 1989–90.
M W F 1:25. L. Smith-Lovin.
The seminar examines (1) theories that explain emotional response as a function of social interaction and (2) the impact of emotional displays on social processes such as attribution, labeling, and identity maintenance. Sociological approaches to emotion are compared with psychological and biological views. Readings include classic works as well as current theory and research. Student research is an integral part of the course.]

**[420 Mathematics for Social Scientists**
Fall. 2–4 credits. Not offered 1989–90.
M W 1–3; lab, F 1–3. R. McGinnis.
Elementary matrix algebra, probability theory, and calculus.]

**[426 Policy Research**
Spring. 3 credits (4-credit option available). Prerequisite: a course in multivariate methods. Not offered 1989–90.
R 9–11. S. Caldwell.
Examines the distinctive character of that social research which is sponsored and carried out explicitly for the purpose of informing policy. Intended especially for students considering nonacademic careers. Draws frequently from case studies to probe the methodological requirements, substantive flavor, and partisan context of applied research and also to identify the institutional actors involved in its sponsorship, production, and use.]

**[444 Contemporary Research in Social Stratification**
Fall. 4 credits. Not offered 1989–90.
R. L. Breiger.
Stratification and mobility as paired concepts requiring mutual articulation. The interplay of structure (occupational groups, labor markets, organizational demographics, social classes) and process (tracking, career trajectories, socioeconomic attainment).]

**460 Field Research in Sociology**
Spring. 3 credits.
M 3:35–5:30. V. Nee.
This course will deal with the organization and execution of studies of social life in naturally occurring settings—through participant observation and various forms of interviewing, as well as through the analysis of personal and historical documents. After a brief discussion of selected issues in the methodology and social research, attention will center on a critical examination of five published studies—to ascertain in each case just what the investigator was trying to do and the extent to which he or she succeeded. During the semester each student will be expected to develop a detailed study design and to do whatever preliminary tasks that are necessary. This may be a doctoral dissertation, an M.A. research project, or some other inquiry on a problem of personal interest.

**463 Political Sociology**
Fall. 4 credits. Prerequisite: Sociology 248 or equivalent or any three courses in sociology and government.
T R 11:40–12:55. D. Weakliem.
Analyzes the relation between politics and social structure, focusing on contemporary capitalist democracies. Considers classical and contemporary views on social class and politics. Topics include ideology, voting behavior, and recent changes in class structure.

**[468 Women and Achievement**
Fall. 3 credits. Not offered 1989–90.
T 1:30–3:30. B. C. Rosen.
An analysis of social and psychological factors affecting female achievement. Topics will include women in the labor force, sex differences in children's achievement, the impact of sex roles on the socialization of competence and achievement among women, and the impact of marriage and the family on career choice and occupational achievement.]

**[485 Social Structure and Personality**
Fall. 3 credits. Not offered 1989–90.
T 1:25–3:25. B. C. Rosen.
An analysis of the ways in which social and psychological factors interact to affect the development of personality, the rates of individual and group behavior, and the functioning of social systems.]

**491 Independent Study**
Fall or spring. 1–4 credits. For undergraduates who wish to obtain research experience or to do extensive reading on a special topic. Interested students must submit a petition, available at the departmental offices, 314–318 Uris Hall. Permission to enroll for independent study will be granted only to students who present an acceptable prospectus and secure agreement of a faculty member to serve as supervisor for the project throughout the term. Graduate students should enroll in 891–892.

**495 Honors Research**
Fall or spring. 4 credits. Limited to sociology majors in their senior year. Prerequisite: permission of instructor.
Hours to be arranged. Staff.

**496 Honors Thesis: Senior Year**
Fall or spring. 4 credits. Prerequisite: Sociology 495.
Hours to be arranged. Staff.

**497 Social Relations Seminar (also Anthropology 495)**
Spring. 4 credits. Limited to seniors majoring in social relations.
Hours to be arranged. T. Kirsch.

## Graduate Core Courses

These courses are primarily for graduate students in sociology but may be taken by other graduate students with permission of the instructor. Graduate students in sociology will normally take each of the five courses listed below, but with the concurrence of their special committees other arrangements may be made.

**501 Basic Problems in Sociology I**
Fall. 4 credits.
R 2:55–4:55. V. Nee.
Analysis of theory shaping current sociological research. Examination of several central problems in sociological inquiry provides an occasion for understanding tensions and continuities between classical and contemporary approaches, for indicating the prospects for unifying microsociological and macrosociological orientations, and for developing a critical appreciation of efforts to integrate theory and research.

**502 Basic Problems in Sociology II**
Spring. 4 credits.
W 10:10–12:05. S. Olzak.
Analysis of theoretical perspectives shaping current sociological research. A continuation of Sociology 501.

**505 Research Methods I: Logic of Social Inference**
Fall. 4 credits. Prerequisite: a first course in statistics and probability.
M W 2:30–4:25 plus a weekly lab.
S. Caldwell.
The stages and logic of social inquiry, using the formal language of multivariate regression, with emphasis on applications. Threats to inference—and techniques for meeting such threats—are examined within each stage of inquiry: conceptualization; measurement; design; specifying, exploring, testing and evaluating models; dissemination and influence of results. Scope includes survey, comparative-historical, and experimental styles. Work load includes weekly lab exercises with data, attention to subject-matter, articles, and a research proposal. The first course in a three-course methods sequence (505–507).

**506 Research Methods in Sociology II**
Spring. 4 credits. Prerequisite: Sociology 420 or 505 or equivalent.
M W 1:25–3:20. M. McPherson.
A survey of methods for analyzing sociological data, including measurement error models, confirmatory factor analysis, panel models, and general structural equation methods. Readings from the sociological research literature will illustrate various methods. Periodic assignments on micro and mainframe computers will integrate theory, method, and data.

**507 Research Methods in Sociology III**
Fall. 4 credits. Prerequisite: Sociology 505.
W 2:30–5. D. Weakliem.
The statistical analysis of temporal change. Major topics are time-series and event-history (survival) analysis, with some discussion of panel data.

## Graduate Seminars

These seminars are primarily for graduate students but may be taken by qualified advanced undergraduates who have permission of the instructor. Which seminars are to be offered any term is determined in part by the interests of the students, but it is unlikely that any seminar will be offered more frequently than every other year. The list below indicates seminars that are likely to be offered in 1989–90, but others may be added and some may be deleted. Students should check with the department before each term.

**[509 Seminar on Sociology of Organizations (also Management NRE 509)**
Fall. 4 credits. Not offered 1989–90.
Hours to be arranged. J. Freeman.
This course explores current research on organizations. The current literature can be broken up into four subareas: (1) population ecology of organizations (the class will read Hannan and Freeman, *Organizational Ecology*); (2) institutional theory; (3) organizations as mechanisms of social stratification (including work on occupational mobility and internal labor markets); and (4) economics of organization (including such topics as agency theory, transaction costs, and economic approaches to collective action). These areas will be explored in depth reflecting student interest. For each, stress will be placed on the opportunities for empirical research and limitations of operationalization.]

**513 Social Networks and Social Structure**
Spring. 4 credits.
T 10:10–12:05. R. L. Breiger.
A critical survey of theories and techniques of structural analysis in sociology, centering on the usefulness of social network analysis in providing integration of studies at different levels of generality. Applications in the areas of the sociology of organizations, community studies, social stratification, and dependence relations among nations. Emphasis on the mutual relevance of theories and operation research procedures.

**515 The Politics of Technical Decisions I (also City and Regional Planning 541, Management NBA 686, Biology and Society 415, and Government 628)**
Fall. 4 credits.
M 2:30–4:25. Staff.
Political aspects of decision making in technical areas. Drawing from recent risk disputes, we will examine the origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system.

**516 The Politics of Technical Decisions II (also City and Regional Planning 542, Management NBA 687, Biology and Society 416, and Government 629)**
Spring. 4 credits. Prerequisite: The Politics of Technical Decisions I.
Hours to be arranged. D. Nelkin.
Continuation of the Politics of Technical Decisions I. Political aspects of decision making in technical areas. Drawing from recent risk disputes, we will examine the origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system.

**517 The Sociology and Demography of Science and Technology**
Spring. 4 credits.
F 1:25–3:20. R. McGinnis.

**[551 Seminar in Collective Action**
Spring. 4 credits. Not offered 1989–90.
R 3–5. S. Olzak.
Examination of current research and theory in collective action, including neo-Marxist, resource mobilization, breakdown, and competition perspectives of the rise and fall of collective action and social movements. Comparison of different methods of data collection and analysis, including examination of recent event-history methods applied to collective-action research.]

**[563 Contemporary Research in Political Sociology**
Spring. 4 credits. Not offered 1989–90.
W 3:15–5:45. D. Weakliem.
Considers research from several theoretical perspectives in political sociology. The main focus will be on contemporary society, but some historical work may be included. Topics may include state economy relations, class structure and politics, and political ideology, among others.]

**[565 Seminar on Voluntary Associations**
Spring. 4 credits. Not offered 1989–90.
M 3–5:30. M. McPherson.
This is a study of the literature on voluntary associations, which can be described as groups that are not business, government, or family. The literature reflects the extreme diversity of the subject: there are thousands of references in sociology, political science, anthropology, psychology, economics, and related areas. The course will draw on readings from a broad selection of these sources, beginning with some of the earliest references and finishing with some modern empirical and theoretical work.]

**[582 Models of Social Action**
Spring. 4 credits. Not offered 1989–90.
T 9:30–12. L. Smith-Lovin.
This course introduces students to models that link meaning, knowledge, and social behavior. Three types of models will be explored: (1) models that relate social structure to shared knowledge; (2) production system approaches, which view knowledge as a role program; and (3) cybernetic models, which suggest that meaning and behavior can be described as a negative feedback system. Related work on knowledge representation in psychology, linguistics, and artificial intelligence will be reviewed.]

**591 Special Seminars in Sociology**
Fall and spring. 2–4 credits.
Hours to be arranged. Staff.
These graduate seminars will be offered irregularly. Topics, credit, and instructors will vary from semester to semester. Students should look at the sociology department bulletin board at the beginning of each semester for possible offerings.

**606–607 Sociology Colloquium**
Fall and spring. No credit. Required of all graduate students. Juniors and seniors are encouraged to attend.
F 3:35–5. Staff.
A series of talks representative of current research interests in sociology, given by distinguished visitors and faculty members.

**608 Proseminar in Sociology**
Fall. One credit. Required of all first-semester graduate students.
T 11:40–12:55. Staff.
Discussions on the state of sociology and on the interests of the members of the field, given by members of the field.

**[620 Processes in Small Groups**
Spring. 4 credits. Not offered 1989–90.
T 2–4:30. L. Smith-Lovin.
Analysis of processes in small groups, including communication, cohesiveness, norm development, group culture, conformity, deviance, status differentiation, leadership, power, and productivity. The seminar will cover both theory and research methods in the investigation of groups in face-to-face interaction.]

**625 Seminar on Organization Ecology**
Fall. 4 credits. Prerequisite: coregistration in Sociology 507 or permission of instructor.
M 12:20–2:15. M. Hannan.
Considers theory and research on the ecology of organizations with an emphasis on contemporary developments. Issues treated include evolution of organizational forms, interactions of competitive and institutional processes, density dependence in vital rates, niche width dynamics, and the evolution of size distributions.

**627 Models of Error**
Spring. 4 credits.
T 2:55–5:30. M. McPherson.
This is a methods seminar that focuses on solutions to the classical problems of estimation in linear models: measurement error in the independent variables, specification error, reciprocal effects, multiple indicators, unmeasured variables, correlated errors, and the like. The goal of the course will be to gain facility in the use of now-standard solutions to these problems, such as the LISREL model, the EOS approach, and such variants as LINCS. Both mainframe- and micro-based applications will be explored. We will integrate both theory and practice by studying the underlying statistical models and applying them to standard datasets. The standard core methods sequence will be ample preparation for this course.

**681 Special Topics in Social Psychology**
Fall. 4 credits.
T 1:25–4:10. L. Smith-Lovin.
This course will treat current research issues on the interrelationship of identity, behavior, and emotion. We will focus particularly on applying theories of interaction to small group contexts. Theoretical work that attempts to relate task and socio-emotional behavior in groups will be critiqued. The seminar will emphasize students' own theoretical work and research design.

**683 Social Interaction (also Psychology 683)**
Spring. 4 credits.
M 2:30–5. D. P. Hayes.
Seminar: topic to be announced.

**[685 Sex Differences and Sex Roles (also Psychology 685 and Women's Studies 685)**
Fall. 4 credits. Not offered 1989–90.
Hours to be arranged. S. Bem.]

**891–892 Graduate Research**
891, fall; 892, spring. Up to 4 credits each term, to be arranged. Prerequisite: graduate status and permission of a faculty member willing to supervise the project.

**895–896 Thesis Research**
895, fall; 896, spring. Up to 6 credits each term, to be arranged. Prerequisite: permission of thesis director.

### Related Courses in Other Departments

**Advanced Macro–organizational Behavior (ILR 722)**
Fall. 3 credits.
W 7–10 p.m. P. Tolbert.

**Contemporary Family Theory and Research (Human Development and Family Studies 650)**
Fall. 3 credits.
T 9:30–12. P. Moen.

**[Families and Social Policy (Human Development and Family Studies 456)**
Fall. 3–4 credits. Prerequisite: one course in the area of the family or in sociology. S-U grades optional. On campus and in Washington. Not offered 1989–90.
F 10–12. P. Moen.]

**Organizational Theory and Behavior (Management NCC 504)**
Fall. 3 credits.
Hours to be arranged. M. Abolafia.

**[Population Policy (Rural Sociology 418)**
Fall. 3 credits. Not offered 1989–90.
R 1:25–4:30. J. M. Stycos.]

**Strategy Implementation: Process and Politics (Management NBA 660)**
Fall. 3 credits.
Hours to be arranged. M. Abolafia.

**The Professions: Organization and Control (ILR 427)**
Fall. 4 credits.
M W 2:30. P. Tolbert.

## SPANISH LANGUAGE

See Department of Modern Languages and Linguistics.

## SPANISH LITERATURE

See Department of Romance Studies

## SWAHILI

See Africana Studies and Research Center.

## SWEDISH

See Department of Modern Languages and Linguistics.

## TAGALOG

See Department of Modern Languages and Linguistics.

## TAMIL

See Department of Modern Languages and Linguistics.

## THAI

See Department of Modern Languages and Linguistics.

## THEATRE ARTS

### Theatre, Film, and Dance

B. Levitt, Chairman; R. Archer, S. Banes, D. Bathrick, S. Brookhouse, N. Carroll, D. Feldshuh, D. Fredericksen, E. Gainor, P. Gill, P. Guion, D. Hall, M. Hays, J. Johnson, J. Moon, J. Morgenroth, M. Rivchin, P. Saul, and A. Van Dyke.

Through its courses and production laboratories, the department provides students with a wide range of opportunities in theatre, dance, and film. It offers a theatre arts major with concentration in theatre or film and a major in dance. These majors educate students in accordance with the general liberal arts ethic of the college. The programs in dance and film and the advanced undergraduate training program in theatre give some measure of professional preparation in those arts as well. The department encourages academic and studio participation by students from all disciplines and also provides the Cornell community with an opportunity to take part in its productions on an extracurricular basis.

### Theatre Arts Major

#### Theatre Concentration

The theatre concentration offers studies in the history of theatre, dramatic theory and criticism, playwriting, acting, directing, design/technology, and stage management.

**Course requirements for theatre concentration:** **Credits**

1) **TA 240** and **TA 241** (two-semester introduction to theatre) 8
**TA 250** Introduction to Theatre Design and Technology 4
**TA 280** Introduction to Acting 3

2) Four laboratory courses distributed as follows: **Credits**
**TA 151** Production Lab I 1-3
**TA 153**, **TA 253**, or **TA 353** Stage Management Lab I, II, or III 1-3
**TA 155** Rehearsal and Performance or **TA 151** in a different area 1-3
**TA 251** or **TA 351** Production Lab II or III 1-4

3) Four courses in the area of Theatre Studies chosen in the following manner:
Two courses selected from TA 331 through 399 8
Two courses selected from TA 400 or above 8

4) Three courses (at least 9 credits) in other Theatre Arts courses chosen in consultation with the faculty advisor. Course taken to qualify for admission to the Advanced Undergraduate Training Program (described below) may also be used to fulfill this requirement.

5) Courses in which a student receives a grade below "C" cannot be used to fulfill the requirements for a Theatre Arts major.

### The Advanced Undergraduate Training Program

The department offers advanced training in acting, directing, playwriting, design/technology, and stage management to students who qualify on the basis of outstanding achievement in coursework. Criteria for admission to the AUTP is by the completion of the appropriate "track" of courses and invitation of the faculty. The program provides students with intensive study in theatre as well as the opportunity to collaborate with professional faculty and guest artists. Department productions will be chosen to offer a unique experience to the individual student selected for the program. (For specific requirements please see listing of courses at end of department listings.)

### Film

The study of film began in this department in the 1930s and continues to be based here. However, in the interim years it has also spread into a significant number of other departments in the college: Africana studies, anthropology, Asian studies, comparative literature, English, German studies, history, psychology, and romance studies. This proliferation of courses has been accompanied by a comparable proliferation of perspectives and faculty concerns, e.g., the relationship of national cinemas to national literatures and specific cultures, film to myth and ideology, the use of film as historical evidence, film's efficacy as a rhetorical medium, and film's contribution to perennial issues in aesthetics, the history of the arts, and studies in cognition.

This richness of courses and perspectives is matched by the ways in which students may make film the focus of their undergraduate studies. The four currently being used are as follows: 1) concentrating on film within a Theatre Arts major; 2) constructing an individually tailored Independent Major in film (including the possibility of placing film in tandem with another medium or discipline); 3) focusing on film as a College Scholar; and 4) concentrating in Visual Studies. Students interested in option 4 should consult Marilyn Rivchin (Theatre Arts) and/or Robert Ascher (Anthropology). Students interested in options 2 or 3 should consult Don Fredericksen (Theatre Arts) and Lynne Abel (director, College Scholar and Independent Major programs). Students interested in the first option should consult Alison Van Dyke (director, Undergraduate Studies, Theatre Arts) and one of the department's film faculty (Don Fredericksen, Marilyn Rivchin, Noel Carroll, and David Bathrick).

*Please note:* the requirements for film concentration within a Theatre Arts major have been changed significantly for students in the class of 1991 and beyond. For students in the class of 1990, the requirements in place when they initially declared their film concentration remain effective. Both sets of requirements are listed below.

**Film Concentration Requirements for Class of 1991 and beyond:** **Credits**

The department's revised film concentration requires a total of 50 credits in film, theatre, and related courses. *Introduction to Film Analysis* will now be the primary prerequisite for the concentrator, rather than three theatre courses.

1. **TA 274** Introduction to Film Analysis 4
2. *One* of the following theatre courses:
   **TA 250** Fundamentals of Theatre Design/Technology 4
   **TA 280** Introduction to Acting 3
   **TA 398** Directing I (prerequisite TA 280) 4
3. A core of *three* film courses:
   **TA 375** History of Commercial Narrative Film 4
   **TA 376** History of Documentary and Experimental Film 4
   **TA 377** Fundamentals of 16mm Filmmaking 4
4. *Four* courses (16 credits) in film offered by Theatre Arts as below, each 4 credits, or by other departments (with adviser):
   **TA 378** Russian Film of 20s and French Film of 60s 4
   **TA 379** International Documentary from 1945 to present 4
   **TA 396** German Film 4
   **TA 413** Film and Performance 4
   **TA 475** Seminar in the Cinema I 4
   **TA 476** Seminar in the Cinema II 4
   **TA 477** Intermediate Film Projects 4
   **TA 478** Seminar in the Theory of Motion Pictures 4
   **TA 494** Advanced Film Production 4
   **TA 654** Special Topics in the Theory of Motion Pictures 4
   **TA 676** New German Cinema 4
5) *15 credits* of related coursework in or outside of Theatre Arts
6) With a grade of less than C, a course cannot be used toward the concentration

**Film Concentration for Class of 1990**

Requirements:

1) Theatre Arts 230 or 240, 250 and 280 (230 is no longer offered)
2) Theatre Arts 374 with a grade of C+ or better. (TA 274, 1991 and beyond)
3) 16 credits in film that should include:
   a) two courses chosen from Theatre Arts 375, 376, 378, and 379;
   b) Theatre Arts 377;
   c) Theatre Arts 475 or 477.
4) 8 credits in other theatre arts courses.
5) 12 additional credits of related work outside the department.
6) An average of C+ or better in all theatre arts courses.

## Film Study Abroad

The College of Arts and Sciences, through this department and in consort with seventeen other colleges and universities, offers up to a full year's study at the Inter-University Center for Film and Critical Studies in Paris, France. The center's program is theoretical, critical, and historical. It is most useful to students pursuing a major in film studies and serves as an intensive supplement to their Cornell film courses. Fluency in French is required, and Theatre Arts 274, 375, and 376 are prerequisites. Inquiries should be addressed to Professor Fredericksen, Cornell's liaison with the center.

## The Dance Program

The dance program offers courses in dance technique, improvisation, composition, performance, anatomical analysis of movement, and the history, theory, and criticism of dance. Technique courses include modern dance at four levels and ballet at three levels. Other dance forms, such as tap, historical dances, Japanese Noh, Indian, Javanese, and African dance are offered on a rotating basis. Courses in ballroom dance taken through the Physical Education program supplement these offerings. Technique classes develop strength, flexibility, coordination, and the ability to perceive and reproduce phrases of dance movement with clarity of rhythm, body design, and expression. The more advanced courses require the ability to perform complex phrases in various styles. Students may earn up to four academic credits (one each semester) in level III and IV technique only (see TA 304, 306, and 308). Students may also satisfy the physical education requirement by taking dance technique classes in the dance program. The schedule for all dance technique classes is available in the main office of the Center for Theatre Arts. Registration for technique classes takes place in Teagle Hall. Students taking technique for academic credit must also register through their own colleges.

The faculty offer rehearsal and performance workshops in which they choreograph and rehearse original dances, performed in public concert. Admission to rehearsal and performance classes is by audition. Students may receive one academic credit (S-U grades only) when performing in student-faculty concerts by registering for TA 155.

### The Dance Major

To be admitted to the major, students must have completed two technique courses in modern dance or ballet (at level II or above for the performance/composition concentration) and TA 201 (dance improvisation). It is also recommended that TA 250 and Music 105, both requirements for the major, be taken before the junior year. The dance major offers two options for concentration: 1) composition and performance (studio); 2) history, theory, and criticism (academic). The following requirements are expected of majors in both concentrations.

**Prerequisites for the major:**

Two technique courses in modern dance or ballet (at level II or above for the performance/composition concentration)

**TA 201** Dance Improvisation

**Requirements for the major:** **Credits**

**Music 105** (or substitute at the appropriate level) 3
One course in historical, tap, jazz, ballroom, or non-Western dance 0–3
**TA 210** Beginning Dance Composition and Music Resources 3
**TA 250** Fundamentals of Design and Technology 4
**TA 314–315** Western Dance History 8
**TA 418** or other 400-level academic dance course 4
**TA 155** Rehearsal and Performance 1

**Additional requirements for the studio concentration:** **Credits**

Two semesters each of ballet and modern dance technique (in addition to the prerequisite) 0–4
**TA 310–311** Intermediate Projects in Dance Composition 6
**TA 312** Physical Analysis of Movement 3
**TA 410–411** Advanced Dance Composition 6

Students concentrating in the studio option will be expected to perform in at least two concerts and to present at least two of their own dances, in addition to the senior project.

**Additional requirements for the academic concentration:** **Credits**

A total of at least two semesters each of ballet and modern dance techniques (including prerequisite) 0–2
Dance history, theory, criticism, and aesthetics courses 8
**TA 490** (senior paper) 4

For both options, additional credits, for a total of 45, should be selected in consultation with the advisor. Of the 45 credits, at least 32 must be at the 300 level or higher.

## Department Courses

### Theatre Courses

**240 Introduction to Western Theatre I**
Fall. 4 credits.
T R 10:10-11:25. E. Gainor.
A survey of the major developments in the theatre—playwriting, acting, staging, architecture, and dramaturgy—in Classical Greece and Rome, medieval and Renaissance Europe. Representative plays will be read and discussed in their theatrical context.

**241 Introduction to Western Theatre II**
Spring. 4 credits.
T R 10:10-11:25. E. Gainor.
A survey of the major developments in the theatre–playwriting, acting, staging, architecture, and dramaturgy–since 1642. Among the areas considered will be French Neoclassicism, the English Restoration, the eighteenth and nineteenth centuries in England, France, and Germany and the modern international stage. Representative plays will be read and discussed in their theatrical context.

### Theatre Studies Courses

**130 American Myth in Drama**
Fall or spring. 3 credits.
M W 11:15-12:05. Staff.
This course examines the images of America presented on the twentieth-century stage. How do Americans view themselves? How are they seen by foreign dramatists? To what ends do dramatists use the American myth?

**140 From Script to Stage: Writing about the Theatrical Process**
Fall or spring. 3 credits.
M W F 12:20–1:10. Staff.
In this course students will explore and write about the process through which drama becomes theatre: how the methods of playwright, actor, director, and designer dovetail to create the theatrical piece. Students will be asked to apply the rhetorical strategies of theatre to their own essay writing. Texts will include Theatre Cornell productions.

**160 Vietnam and the American Theatre**
Fall. 3 credits Limited enrollment.
T R 1:25–2:40. B. Wright.
The Vietnam War has spawned a diverse range of dramatic texts and events. This course will investigate some central questions regarding this dramaturgy, such as: What types of theatrical events developed from the Vietnam War? How did this dramaturgy reflect attitudes about the war? How did it change over time? Where did it go in the 1970s and early 1980s? Why has there been a recent resurgence of theatrical interest in this topic? The class will investigate plays by David Rabe, Megan Terry, The Living Theatre, The Bread and Puppet Theatre, and others, in addition to various Happenings and events. Students will read and discuss the dramaturgy as the basis for their critical assignments.

**[325 Classic and Renaissance Drama (also Comparative Literature 352)**
Spring. 4 credits.
A. Caputi. Not offered 1989–90.
A study of the major traditions in Western drama from the beginnings among the Greeks to the Renaissance in England and Spain. The work will consist of both lectures and discussions, focusing primarily on a close reading of the plays. But we shall also give attention to the physical conditions of production and to social and political contexts. Among the authors to be read will be Aeschylus, Sophocles, Euripides, Aristophanes, Marlowe, Shakespeare, and Lope de Vega.]

**326 European Drama, 1660 to 1900 (also Comparative Literature 353)**
Spring. 4 credits.
M W F 9:05–9:55. A. Caputi.
Readings from major dramatists from Corneille to Chekhov, including such authors as Moliere, Congreve, Marivaux, Goldoni, Gozzi, Schiller, Kieist, Gogol, Ostrovski, and Ibsen.

**[327 Modern Drama (also Comparative Literature 354)**
Fall. 4 credits.
T R 12:10–1:25. E. Gainor. Not offered 1989–90.
Readings in European drama from Ibsen to the present.]

**[331 The Classical Theatre**
Fall. 4 credits. Prerequisite: Theatre Arts 230 (will be 240 after 1989–90) or permission of instructor. Not offered 1989–90.
An examination of major developments in the theatre—acting, staging, dramaturgy—and the historical background to these developments in Greek and Roman society. Representative plays will be read and discussed in their theatrical text.]

**[332 Medieval and Renaissance Theatre**
Spring. 4 credits. Prerequisite: Theatre Arts 230 (will be 240 after 1989–90) or permission of instructor. Not offered 1989–90.
A study of theatrical styles and production modes. Topics include the medieval liturgical and secular stages, the Renaissance court and public stages on the Continent and in England and the professionalization of the theatre. Representative plays will be read and discussed in their theatrical context.]

**333 From the Neo-classical Theatre to the Well-Made Play**
Fall. 4 credits. Prerequisite: Theatre Arts 240 or 241.
M W 2:30–4:00. M. Hays.
A study of theatrical styles and production modes. Topics include the English Restoration and French Neoclassical theatres, the European court theatre, romanticism in the theatre, and the rise of standing commercial theatre companies. Representative plays will be read and discussed in their theatrical context.

**335 The Modern and Contemporary Theatre**
Fall. 4 credits. Prerequisites: Theatre Arts 230 (will be 240 after 1989–90) or permission of instructor.
T R 12:10–1:25. E. Gainor.
A study of theatrical styles and production modes. Examination of advances in acting, directing, design, and dramaturgy in theory and in practice from the late nineteenth century through the present day. Representative plays will be read and discussed in their theatrical context.

**[336 American Drama and Theatre**
Fall. 4 credits. Prerequisite: Theatre Arts 230 (will be TA 240 after 1989–90) or permission of instructor. Not offered 1989–90.
T R 12:20–1:25. E. Gainor.
A study of the American theatre and representative American plays, with emphasis on drama from O'Neill to the present.]

**[338 Japanese Theatre (also Asian Studies 338)**
Fall. 3 credits. Not offered 1989–90.
W 2:30–4. K. Brazell.
A study of traditional forms of Japanese theatre. Topics will include ritual and theatre, noh and kyogen, kabuki and the puppet theatres, and contemporary theatrical use of traditional forms. Special emphasis will be placed on dramaturgy, acting styles, performance aesthetics, and theories of performer training.]

**[400 Dance, Theatre, and Film of the 1960s**
Fall. 4 credits. Not offered 1989–90.
W 2–4:25. S. Banes.
This course will be concerned with the burgeoning avant-garde arts scene in New York City in the early 1960s. Postwar American economic expansion and the shift of cultural as well as political power from Europe to the United States gave an impetus to new movements ranging from postmodern dance to Off-Off Broadway to underground film to new intermedia genres like happenings, and to new modes of criticism in the arts. A survey of the other arts will provide additional context. We will trace themes of community, freedom, the body, and the "other" in these avant-garde works as sites where cultural themes of the sixties were both reflected and produced.]

**[431 Theory of the Theatre and Drama I**
Fall. 4 credits. Prerequisite: some theatre history and dramatic literature work at the 300 level or permission of instructor. Not offered 1989–90.
M 2:30–4:25. M. Hays.
A study of various theories of dramatic form and theatrical presentation from Aristotle and Horace to Goethe and Schiller.]

**432 Theory of the Theatre and Drama II**
Spring. 4 credits. Prerequisites: Course work in theatre history or dramatic literature at the 300 level or permission of instructor.
M 2:30–4:25. M. Hays.
An examination of dramatic theory and its performance context from Schiller to the present.

**433 Dramaturgy: Play and Period. Topic for 1989–90: The Female Dramatic Tradition**
Spring. 4 credits.
T 12:20–2:15. E. Gainor.
Is there a "female dramaturgy"? What is the female tradition in the theatre? The course will explore these questions through an investigation of texts by women dramatists, including Hrotsvitha, Aphra Behn, and Caryl Churchill, as well as theory by such critics as Sue Ellen Case and Jill Dolan.

**[434 Theatre and Society**
Spring. 4 credits. Prerequisite: permission of instructor or some work in theatre history or dramatic literature at the 300 level. Not offered 1989–90.
M 2:30–4:25. M. Hays.
An exploration of the ways in which the theatre serves to formulate cultural and aesthetic norms.]

**[435 Special Topics**
Not offered 1989–90.]

**[438 East and West German Drama**
Fall. 4 credits. Not offered 1989–90.
W 1:25–3:25. D. Bathrick.
This course will cover the major historical and textual developments in German theatre from the end of World War II to the present. Leading dramatists from West and East Germany, Switzerland, and Austria (Brecht, Frisch, Durrenmatt, Weiiss, Hochhuth, Muller, Braun, Kroetz, Handke, and others) will be treated in the light of the political events and aesthetic-dramaturgical traditions from which they emerge and with which they are taking issue.]

**455 Topics in Aesthetics/Horror**
Spring.
W 4:15–6:15. N. Carroll.
This course focuses on the genre of horror and seeks to explore its nature, its characteristic effects and structures, its imagery and its narrative forms, its social implications and the nature of the pleasures it affords audiences. The primary text for the course will be *Paradoxes of the Heart: The Philosophy of Horror* by Noel Carroll, along with selected readings by Burke, Lovecraft, King, Twitchell, Heller, and Waller. Philosophical articles on the topics of how it is possible to fear fictions and on how one can derive pleasure from what is distressing will also be examined. Plays, films, novels, and short stories will also be discussed on a weekly basis in class in terms of the ways in which they shed light on the genre as a whole.

**456 Race and Theatre in America (also English 656)**
4 credits. Spring.
T 3:30–5:30. B. Jeyifo.
The course will explore the representation(s) of race in selected periods and movements of dramatic writing and theatrical performance in America. Drawing both on conventional dramatic theories of "types" and "masks" and poststructuralism theories of "otherness" and "difference," the course will study important dramatic texts and performance forms which have made race such a historically crucial dimension of the American theatre. One major area of our exploration will be the changing patterns of the politics of representations of race in the American theatre. Class discussion will draw on supplementary materials such as films, video, and slides.

**[494 Four Directors: Stanislavsky, Meyerhold, Brecht, Brook**
Spring. 4 credits.
S. Banes. Not offered 1989–90.
Of all the arts in the theatrical ensemble, the art of the director, while currently the most influential, is by far the youngest. These four directors, whose work spans the twentieth century, have been instrumental in refining the art of the metteur-en-scene with a unified vision. We will study their theories of directing in the context of specific products. We will look as well through Stanislavsky to American method directors (such as Kazan); through Meyerhold at the other experimental Russian directors of the 1920s; through Brecht at Piscator and more recent political theatre; through Brook at Artaud's theories, on the one hand, and at the other Artaud-influenced directors of the last twenty-five years (including Grotowski and the Living Theatre), on the other.]

**[633 Seminar in Theatre History**
Spring. 4 credits.
W 2:30–5. E. Gainor. Not offered 1989–90.
Advanced work in a specific area of theatre history.]

**636 Seminar in Dramatic Criticism**
Fall. 4 credits. Prerequisite: Permission of instructor.
T 2:30–4. M. Hays.
Critical approaches to the drama.

**637 Seminar in Dramatic Theory**
Spring. 4 credits. Prerequisite: Permission of instructor.
T 2:30–4. M. Hays.
Expectation and alienation: hermeneutic and dialogic approaches to the drama.

**[648 East and West German Drama: Post 1945 (also German Studies 438)**
Fall. 3 credits. Not offered 1989–90.
W 1:25–3:25. D. Bathrick.
This course will cover the major historical and textual developments in German theatre from the end of World War II to the present. Leading dramatists from West and East Germany, Switzerland, and Austria (Brecht, Frisch, Durrenmatt, Weiiss, Hochhuth, Muller, Braun, Kroetz, Handke, and others) will be treated in the light of the political events and aesthetic-dramaturgical traditions from which they emerge and with which they are taking issue. (Not offered 1989–90)]

**655 Advanced Topics in Aesthetics/ Comic Theory**
Fall. 4 credits.
W 4:15–6:15. N. Carroll.
This seminar will examine traditional and contemporary theories of laughter and humor, including writings by Plato, Aristotle, Cicero, Hazlitt, Spencer, Freud, Bergson, Roger Scruton, Stanley Cavell, Ronald deSousa, Ted Cohen, and John Morreall, among others. The course will attempt to isolate the nature and structure of jokes, puns, riddles, farces, parodies, satires, caricatures, sight gags, cartoons, and a gamut of comic forms, including stand-up monologues and informal badinage. Selected films, plays, club recordings, novels, short stories, cartoons, and videos will be studied to ground our theorizing empirically. The ethical, social, and political ramifications of humor will also be a concern of the course.

**656 Race and Theatre in America (also English 656)**
Spring. 4 credits.
T 3:30–5:30. B. Jeyifo.
The course will explore the representation(s) of race in selected periods and movements of dramatic writing and theatrical performance in America. Drawing both on conventional dramatic theories of "types" and "masks" and poststructuralism theories of "otherness" and "difference," the course will study important dramatic texts and performance forms which have made race such a historically crucial dimension of the American theatre. One major area of our exploration will be the changing patterns of the politics of representations of race in the American theatre. Class discussion will draw on supplementary materials such as films, video, and slides.

**[678 Theory and Practice of Modern Drama**
Spring. 4 credits.
W 3:35. D. Bathrick Not offered 1989–90.
The course will explore different theories of modern drama (Szondi, Brecht, Artaud, etc.) and discuss these on the basis of a number of representative works of modern drama. The point will be to trace the interchange between theory formation and dramatic practice.]

**688 Theodore W. Adorno: Mass Culture and the Avant-Garde (also German Studies and Comparative Literature 688)**
Fall. 4 credits.
T 1:25–3:20. P. Hohendahl.
In this country Adorno is primarily known for his philosophical writings and his music criticism. His literary criticism and his contributions to aesthetic theory, on the other hand, remain to be discovered. The seminar will explore Adorno's importance for contemporary criticism; it will focus on Adorno's theory of art as well as his literary and music criticism, especially those parts concerned with the Avant-garde and its role in the age of modern mass culture. The readings will be taken from Adorno's essays as well as *Minima Moralia, Dialectic of Enlightenment, Philosophy of Modern Music, Prisms,* and *Aesthetic Theory.*

**695 Brecht and Artaud (also Comparative Literature 695 and German Studies 695)**
Fall. 4 credits.
W 12:20–2:15. D. Bathrick.
This course will explore in depth the writings and practices of two major twentieth century theatrical artists, Bertolt Brecht and Antonin Artaud, in order to a) map out differences and similarities between the two as representatives of avant-garde theatre; b) situate their respective work in the political and cultural contexts out of which they emerged; and c) explore their impact upon succeeding movements and artists of modern drama and cinema. A central focus of the course will be to explore the differing and changing notions of "avant-garde theatre" as demonstrated in the work and reception of Brecht and Artaud. The face off between the two will serve methodologically both to delineate and interrogate critically what have become two discrete "models" of avant-garde theatre as well as to consider ways to which these two models have been and could be synthesized.

**698 Performing the Sixties**
Fall. 4 credits.
T 4:15–6:15. S. Banes.
During the 1960s, the roots of postmodernism in the arts were planted as artists and critics posed fundamental questions about the relationship between "high" and "low" culture; about the interdisciplinarity of art forms; and about the relationship between art and community. Performance itself became the key site of artistic investigation for artists in various media. This seminar will examine performance practice in the 1960s, focusing on the avant-garde in the early part of the decade as a harbinger of the cultural explosion later in the decade. We will look at Happenings and Fluxus, as new genres of performance generated by the cultural milieu of this era; at the beginnings of postmodern dance and the Off-Off Broadway movement; at underground film; at new genres, later in the decade, of the spectacle of anti-war protest and guerrilla theatre; and at the broader context of popular culture and its appropriations by the avant-garde. An in-class presentation of an original research project will be required, as will some outside film screenings (times to be arranged).

### Acting

**155 Rehearsal and Performance**
Fall or spring. 1–2 credits. 1 credit per production experience per term up to 2 credits per term. Students must register for the course in the term in which credit is earned; requests for retroactive credit will not be honored. Limited to students who are assigned roles after tryouts at the department's scheduled auditions or who are assigned assistant director positions after obtaining director's approval. Students should add this course only after they have been assigned roles. S-U grades only.
Staff.
The study, development, and performance of roles in departmental theatre or dance productions or the study and practice of directing as experienced in assisting faculty and guest directors.

**280 Introduction to Acting**
Fall or spring. 3 credits.
An introduction to an actor's technique and performance skills, exploring the elements necessary to begin training as an actor, i.e., observation, concentration, and imagination. Focus will be on physical and vocal exercises, improvisation, and text and character. There is required play reading, play attendance, and some scene study.

**281 Acting I**
Fall or spring. 3 credits. Prerequisite: TA 280 and audition.
A continuation of the study of technique and performance skills with greater concentration on scene work. Special consideration will be given to modern naturalistic plays with further text and character analysis, physical exploration, and some improvisation.

**282 Introduction to Voice and Speech for Performance**
Fall or spring. 2 credits.
TR 10:10–12:05. Staff.
Study and practice in the development of the speaking voice with emphasis on tone quality, breathing, articulation, and practice of standard American English pronunciation. Some oral interpretation of poetic, narrative, and dramatic text.

**283 Voice and Speech for Performance**
Spring. 2 credits. Limited to 12 students. Primarily for department majors. Prerequisites: TA 282.
Registration only through department roster in the main office of the Center for Theatre Arts. Development of the speaking voice with additional emphasis on dramatic interpretation.

**284 Speech and Dialects for Performance**
Fall. 3 credits. Limited to 12 students. Primarily for department majors or advance undergraduate training program candidates. Prerequisites: TA 280, 281.
Registration only through department roster in the main office of the Center for Theatre Arts. Development of speech and dialects in dramatic text.

**287 Summer Acting Workshop**
Summer. 3 credits. Limited to 16 students in a section. Fee for theatre admissions, $10.
An introduction to the processes of acting. Practice in training techniques, rehearsal procedures, and methodology. Productions of the Hangar Theatre company attended and used as performance examples. Includes visits by guest artists and Hangar Theatre company members.

**380 Acting II**
Fall. 3 credits. Prerequisite: TA 280, 281 and audition.
T R 12:20–2:15. Staff.
A continuation of Acting I. Special consideration will be given to verse and drama and plays in transition.

**381 Acting III**
Spring. 3 credits. Prerequisite: TA 280, 281, 380, and audition.
A continuation of Acting II. Special consideration will be given to scene study which presents particularly difficult physical and vocal challenges to the actor, as well as dramatic texts in which language and style are key elements.

### Directing

**155 Rehearsal and Performance**
Fall or spring. 1–2 credits. 1 credit per production experience per term up to 2 credits per term. Students must register for the course in the term in which credit is earned; requests for retroactive credit will not be honored. Limited to students who are assigned roles after tryouts at the department's scheduled auditions or who are assigned assistant director positions after obtaining director's approval. Students should add this course only after they have been assigned roles. S-U grades only.
Staff.
The study, development, and performance of roles in departmental theatre or dance productions or the study and practice of directing as experienced in assisting faculty and guest directors.

**398 Fundamentals of Directing I**
Fall. 3 credits. Limited to 12 students. Prerequisite: Theatre Arts 280 and permission of instructor.
M W 12:20–2:15. D. Feldshuh.
Focused, practical exercises to teach the student the fundamental staging techniques that bring a written text to theatrical life. A core objective of the course is to increase the student's awareness of why and how certain stage events communicate effectively to an audience. Each student will direct a number of exercises as well as a short scene.

**498 Fundamentals of Directing II**
Spring. 4 credits. Enrollment strictly limited. Prerequisite: Theatre Arts 280 and 398, and permission of instructor.
M W 12:20–2:15 plus lab time to be arranged. D. Feldshuh.
The course builds on the staging techniques learned in Fundamentals of Directing I. In this course each student will direct a series of projects and public presentations focusing on specific directoral challenges. The student will develop an increased ability to articulate and defend directoral choices and learn to work with actors on a diverse range of material. The course is open to graduate and undergraduate students. Directors will cast from a company of actors to be auditioned early in the semester. Each actor in the company will earn two credits as part of Theatre Arts 155.

**499 Seminar in Directing**
Fall or spring. 1–4 credits. Prerequisites: Theatre Arts 240, 250, 280, 398, 498, and permission of instructor.
Hours to be arranged. D. Feldshuh.
This seminar will give the student the opportunity to direct a full evening of theatre. It may also involve an internship with a prominent director on campus and a final paper focusing on a specific aspect of directing.

### Playwriting

**348 Playwriting**
Fall. 4 credits. Prerequisite: permission of instructor.
T R 2:30–3:45. J. O'Neal.
A laboratory for the discussion of student plays. Following exercises in dramatic structure and technique, students will be expected to write two or three one-act plays.

**349 Advanced Playwriting**
Spring. 4 credits. Prerequisite: Theatre Arts 348.
T R 2:30–3:45. Staff.
A continuation of Theatre Arts 348, culminating in the composition of a full-length play.

**497 Seminar in Playwriting**
Fall. 1–4 credits. Prerequisite: Theatre Arts 348 and 349 or permission of instructor.
To be announced. W. Soyinka.
This seminar will provide the student with the opportunity to collaborate with faculty directors, designers, and actors in the production of his/her own work. The course will include a final paper and faculty critique of the manuscript and the production process.

## Design, Technology and Stage Management

### Design

**120 The Unfashionable Human Body**
Fall. 3 credits.
T R 2:55–4:10. J. Johnson.
At an early age we learn the magic power of dress. There are many theories about why we wear clothes: protection from the elements, love of ornamentation, sexual attraction, and modesty, to name a few. Whatever the reason(s), our dissatisfaction with the human body expresses itself in all cultures, and that expression is endlessly changing.

Students will explore the various theories, look at examples from decoration to distortion (i.e., masks, corsets, tattoos, and fads) and write about how society addresses (or undresses) "the unfashionable human body."

**250 Fundamentals of Theatre Design and Technology**
Fall and spring. 4 credits. Not open to first term freshman. Limited to 20 students. A minimum of one credit of Production Lab (TA 151 or 251) is strongly recommended concurrently.
M W F 12:20–2:15. R. Archer, J. Johnson, J. Moon, P. Gill, D. Hall.
An introduction to design and technology in the theatre. Lectures, discussion, and project work introduce the visual principles of designing scenery, costumes, lighting and sound, and the technical process of realizing designs on stage.

**362 Lighting Design Studio I**
Fall. 4 credits. Students are required to purchase materials which the instructor will specify (approximate cost $25.00). Prerequisite: TA 252 and 340 or permission of instructor.
T R 12:20–2:15. P. Gill.
An examination of the fundamental theories of color and the physical characteristics of light. Through discussion and a series of projects in the light lab this course examines the role of light as a flexible, expressive art medium; its visual nature and dramatic impact, the conceptual and intuitive nature of the successful approach to stage lighting and the influence of professional practices on the application of lighting design to many areas including architecture and theatre.

**364 Scenic Design Studio I**
Fall. 4 credits. Students are required to purchase materials which the instructor will specify (approximate cost: $50.00). Prerequisite: TA 340 and 354 or permission of instructor.
M W 10:10–12:05. J. Moon.
An exploration of the process of designing scenery for the stage: analysis of the dramatic text, use of research and imagery, theatre architecture, communication techniques, and materials for building the scenic model. Four required design projects will use the major stage forms and involve the design and construction of full color scale models. Each project will represent a formative period in the history of dramatic literature and theatre architecture.

**366 Costume Design Studio I**
Fall. 4 credits. Students are required to purchase materials which the instructor will specify (approximate cost: $50.00). Prerequisite: TA 356 or permission of instructor.
T R 10:10–12:05. J. Johnson.
Design of costumes for the theatre, concentrating on script and character analysis, period research, design elements, figure drawing and rendering skills, and understanding production style.

**368 Sound Design Studio**
Spring. 4 credits. Limited enrollment to 6 students. Prerequisite: TA 252 or permission of instructor. Students are required to purchase supplies (approximate cost $30.00).
T R 10:10–12:05. D. Hall.
The use of sound as a medium of design for the theatre; research and creation of sound score, recording and engineering techniques, live effects and projects in live and studio sound production.

**462 Lighting Design Studio II**
Spring. 4 credits. Prerequisite: TA 362 or permission of instructor.
T R 12:20–2:15. P. Gill.
An in-depth study of selected topics in the history of lighting design, contemporary design style, and the aesthetics of lighting the dramatic text. In addition to advanced projects and research, this course can also provide a tutorial for all student lighting designers in the advanced undergraduate training program.

**464 Scenic Design Studio II**
Spring. 4 credits. Students are required to purchase materials which the instructor will specify (approximate cost $50.00). Prerequisite: TA 364 or permission of instructor.
M W 10:10–12:05. J. Moon.
A continuation of the course of study begun in TA 364, specifically, the analysis and design of two major theatrical works, one operatic, and one dramatic. Two full color scale models and formal design presentations will be the culmination of the class.

**466 Costume Design Studio II**
Spring. 4 credits. J. Johnson. May be repeated for credit. Prerequisite: Theatre Arts 364 and permission of instructor.
T R 10:10–12:05. J. Johnson.
This course builds on the Costume Design I topics (script analysis, period research, the use of the elements of design, developing figure drawing and painting, and understanding the theatrical process) by stressing the practical production situations that influence design and the relationship between designer, director, and the scenography team. Theatrical styles and actual production work are explored in more depth. Extensive project work includes both the rendering of design projects and actual costume construction.

### Technology

**252 Technical Production Studio I**
Fall. 2 credits. A minimum of one credit of production laboratory (TA 151 or 251) is required concurrently. Prerequisite: TA 250 or permission of instructor.
T R 10:10–12:05. C. Hatcher, C. Watts.
*Stage Lighting Technology:* The practical aspects of lighting technology: stage electrics, equipment, organization, techniques, and paperwork will be explored through projects, lecture, and class discussion. *Stage Sound Technology:* The practical aspects of sound technology: equipment set-up, organization, recording techniques and paperwork will be explored through projects, lecture, and class discussion.

**254 Theatrical Make-up Studio**
Spring. 3 credits. Students are required to purchase make-up kits which the instructor will provide (approximate cost $30.00). Prerequisite: permission of instructor.
T R F 2:30–4:25. J. Johnson.
Basic techniques of make-up for the stage including corrective, old age, and fantasy; use of prosthetics, wigs, hair and hairpieces.

**256 Technical Production Studio II**
Spring. 2 credits. A minimum of one credit of production laboratory (TA 151 or 251) is required concurrently. Limited to 6 students. Students are required to purchase materials which the instructor will specify (approximate cost $25.00). Prerequisite: TA 250 or permission of instructor.
T R 10:10–12:05. B. Johnson, G. Bakke.
*Scene Painting:* Techniques of paint and set decoration for the stage including large format layout, grid systems, transfer methods, color mixing and matching, dye painting, airbrush and spray systems are a traditional approach to scenic art. *Stage Properties:* The design and construction of scenic, hand and costume props, concentrating on period research and accuracy of detail, use of various materials, crafts and construction techniques, and painting and finishing.

**340 Theatrical Drafting and Technical Drawing Studio**
Fall. 3 credits. Limited to 10 students. Prerequisite: Theatre Arts 250 or permission of instructor.
M W F 9:05–9:55. S. Brookhouse, P. Gill.
Implementation of the fundamentals of drafting and technical drawing. Introduction of the concept of an individual style in the approach to drafting for the theatre. A series of projects to familiarize students with the convention and process of drafting in all areas of theatrical production and design.

**354 Stagecraft Studio**
Spring. 3 credits. A minimum of one credit of production laboratory (TA 151 or 251) is strongly recommended concurrently. Prerequisite: TA 250 or permission of instructor.
M W 10:10–12:05. R. Archer.
An exploration of the techniques and practice of theatre operation, scenic construction, stage mechanics, rigging, painting, and model building.

**356 Costume Construction Studio**
Fall. 3 credits. A minimum of one credit of production laboratory (TA 151 or 251) is strongly recommended concurrently. Prerequisite: TA 250 or permission of instructor
M W 10:10–12:05. J. Johnson.
A project/lecture/discussion class in costume research, patterning, cutting, construction, and fitting.

### Stage Management

**153 Stage Management Production Laboratory I**
Fall and spring. 1–3 credits. May be repeated for credit. Orientation meeting in the scene shop in the Center for Theatre Arts at 7:30 p.m. on the first Tuesday of classes.
P. Guion.
Practical production experience in theatrical production as an assistant stage manager for a smaller scale production under the supervision of the faculty production stage manager. Theatre Arts 370 complements this course.

**253 Stage Management Laboratory II**
Fall and spring. 1–3 credits. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the scene shop.
P. Guion.
Practical experience in theatrical production as assistant stage manager for a large scale production under the supervision of the faculty production stage manager. TA 370 complements this course.

**353 Stage Management Laboratory III**
Fall and spring. 1–3 credits. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the scene shop.
P. Guion.
Practical experience in theatrical production as stage manager for a small scale production under the supervision of the faculty production stage manager. TA 370 complements this course.

**370 Stage Management Studio**
Fall and spring. 1 credit. Prerequisite: TA 250 or 280. T 2:30–4:25
P. Guion.
Introduction to the concepts and techniques of stage management as they relate to specific areas of production. Development of relevant communication skills and an understanding of the production process as experienced by a working stage manager or assistant stage manager. TA 153, 253, and 353 complement this course.

**453 Stage Management Laboratory IV**
Fall and spring. 1–3 credits. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the scene shop. Prerequisite: permission of instructor.
P. Guion.
Practical experience in theatrical production as stage manager for a large-scale production under the supervision of the faculty production stage manager.

### Production Laboratories

**151 Production Laboratory I**
Fall and spring. 1–3 credits. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the scene shop.
J. Johnson, G. Bakke, S. Brookhouse, P. Guion, C. Hatcher, C. Watts.
Practical experience in theatrical production. Students register for sections by areas of interest. 01 Scenery, 02 Costumes, 03 Properties, 04 Lighting, 05 Sound, 06 Stage Crew. No prerequisites or experience required.

**251 Production Laboratory II**
Fall and spring. 1–3 credits.
J. Johnson, G. Bakke, S. Brookhouse, P. Guion, C. Hatcher, C. Watts.
Practical experience in theatrical production, in a position of major responsibilities on the production staff. Prerequisite: TA 151 or permission of instructor. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the scene shop. Students register for sections by areas of interest: 01 Scenery, 02 Costumes, 03 Properties, 04 Lighting, 05 Sound.

**351 Production Laboratory III**
Fall and spring. 1–3 credits. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the scene shop. Students register for sections by areas of interest: 01 Scenery, 02 Costumes, 03 Properties, 04 Lighting, 05 Sound. Prerequisite: Permission of instructor.
R. Archer, D. Hall, G. Bakke, P. Gill, J. Johnson, J. Moon.
Practical experience in theatrical production, in a position of major responsibility on the production staff or as assistant to a faculty or guest designer.

**451 Production Laboratory IV**
Fall and spring. 1–3 credits. May be repeated for credit. Orientation meeting on the first Tuesday of classes each semester at 7:30 p.m. in the scene shop. Students register for sections by areas of interest: 01 Scenery, 02 Costumes, 03 Properties, 04 Lighting, 05 Sound. Prerequisite: permission of instructor.
R. Archer, D. Hall, G. Bakke, P. Gill, J. Johnson, J. Moon.
Practical experience in theatrical production, in the position of designer or in another position of major responsibility on the production staff.

## Internships

**485 Undergraduate Internship**
Summer. 1–6 credits. Prerequisite: permission of AUTP faculty.
Program of supervised experience with a noted professional company or individual either in the United States or abroad chosen in consultation with the faculty advisor.

### FILM

**274 Introduction to Film Analysis: Meaning and Value**
Fall or summer. 4 credits.
T R 10:10–12:05. D. Bathrick (fall 1989); D. Fredericksen (fall 1990).
Consideration of the ways films generate meaning and of the ways we attribute meaning and value to films. Discussion ranges over commercial narrative, documentary, and personal film modes. Emphasis may vary with instructor.

**[375 History and Theory of the Commercial Narrative Film**
Fall. 4 credits. Fee for screening expenses, $10 (paid in class). Not offered 1989–90; next offered 1990–91.
T R 1:25–4:25. D. Fredericksen.
Consideration of the broad patterns of narration in the history of the commercial narrative film, viewed as an artistic medium and as a system requiring the massive consumption of artifacts. Emphasis placed upon the early articulation of a cinematic means of narration, realism as an artistic style, the nature and functions of popular film, and the modes of modernist narration. Major figures discussed include Griffith, Eisenstein, Murnau, Von Stroheim, Dreyer, Chaplin, Renoir, Ford, Hitchcock, Welles, Antonioni, Fellini, Bergman, Bunuel, Resnais, Godard, and Herzog. Students majoring in film should have taken Theatre Arts 374 previously or concurrently.]

**376 History and Theory of Documentary and Experimental Film.**
Fall. 4 credits. Fee for screening expenses, $10 (paid in class). Prerequisite: Theatre Arts 374 is strongly recommended, but not required.
T R 1:25–4:25. D. Fredericksen.
The history and theory of documentary form up to the end of World War II. Major figures covered include Vertov, Flaherty, Ivens, Grierson, Lorentz, Riefenstahl, Capra, Hurwitz, and Jennings. Within the history and theory of the experimental and personal film form, emphases are: the avant-garde of the twenties in Germany, France, U.S.S.R., and the U.S., the movement toward documentary practice in the thirties, and American experimental and personal film from the forties to the present. Major figures covered include Deren, Brakhage, Baillie, Belson, the Whitneys, Hill, and Mekas.

**377 Fundamentals of 16mm Filmmaking**
Fall or spring. 4 credits. Limited to 12 students. Intended for juniors and seniors (who may need to sign up a year or more in advance). Prerequisite: Theatre Arts 374 and permission of instructor. Fee for maintenance costs, $50 (paid in class). The average cost to each student for materials and processing is $300.
M W F 2–4:25. M. Rivchin.
A hands-on course in the basics of 16mm filmmaking techniques, requiring no prior experience. Each student will complete a number of short film projects to explore narrative, experimental, documentary, animation, and abstract genres. A longer, final sound film project will be screened publicly.

**[378 Russian Film of the 1920s and French Film of the 1960s**
Spring. 4 credits.
Fee for screening expenses, $10 (paid in class). Prerequisite: Theatre Arts 375 is strongly recommended, but not required. Not offered 1989–90; next offered 1990–91.
T R 1:25–4:25. D. Fredericksen.
An intensive treatment of two distinct periods of innovation in film theory and history. Emphasis on working relationship between theory and practice. Major figures include Eisenstein, Pudovkin, Vertov, Dovzhenko, Room, Godard, Truffaut, Resnais, Eustache, Rivette, and Bresson.]

**379 International Documentary Film from 1945 to present**
Spring. 4 credits. Prerequisite: Theatre Arts 376. Fee for screening expenses, $10 (this fee is paid in class).
T R 1:25–4:25. D. Fredericksen.
Emphasis on the contemporary documentary film as a sociopolitical force, as an ethnographic tool within and without a filmmaker's own culture, and as an artistic form with a distinct history and set of theatrical questions. Major figures, structures, and movements covered include Jennings, Rouquier, Leacock, Maile, Rouch, Solanas, national film boards, Challenge for Change, direct cinema, cinema verite, and revolutionary documentary of the Third World.

**413 Film and Performance**
Fall. 4 credits. Prerequisite: permission of both instructors. Previous work in at least one appropriate medium.
T R 2:30–4:25. M. Rivchin and staff.
This course is designed to encourage interdisciplinary connections among the students of the theatre, dance, and film programs in the Department. The course will focus on one program (dance, acting, or directing) and how it relates to film and video media. Students will work collaboratively to produce new work in both performance and recorded modes.

Topic for 1989: **Interactive Theatre and Video Documentation**. Students will be involved in script development, acting, directing, video shooting and editing to produce two projects in conjunction with the Theatre Outreach program. Readings on theatre and education, special guest lectures, and screening of films and videos will complement production work. M. Rivchin, D. Feldshuh, and Outreach staff.

**474 Advanced Film Projects**
Summer. 4 credits. Limited to 12 students. Prerequisite: TA 280, 281, or 377 or equivalent and permission of instructor. Maintenance fee, $50.
M. Rivchin.
Students work in small crews to produce a short dramatic film and/or short documentary film, using synchronous sound filming and editing equipment. Equipment is provided, but students must pay for film and processing (average cost, $250).

**475 Seminar in the Cinema I (also College Scholar Seminar)**
Spring. 4 credits.
T R 10:10–12:05. D. Fredericksen.
Topics for 1990: Jung, film, and the process of self-knowledge. "Know thyself": this has been called our culture's most enduring psychological need, and it has been frequently offered as the *raison d'etre* for liberal studies. C. G. Jung's answer to how one might "know oneself" is based on his claim that "image is psyche" and his informing metaphor is depth. The seminar will trace the elaborations of his position in Jung, James Hillman, Russell Lockhart, and Murray Stein. It will also test the critical capacities of this position with respect to film images given us by Bergman, Fellini, Brakhage, Gunvor Nelson, Suzan Pitt, Larry Jordan, Bruce Baille, and others. The manner in which Jung's claim might provide an archetypal and imaginal alternative to current approaches to liberal studies will be asked throughout the seminar; the nature of education will thereby become a central theme of the semester's work.

**476 Seminar in the Cinema II**
Fall. 4 credits.
T R 9:05–12:05. D. Fredericksen.
Topic for 1989: the films of Ingmar Bergman. Close stylistic and thematic study of approximately twelve of Bergman's films, using biographical, formal, cultural, and psychological approaches.

**477 Intermediate Film Projects**
Spring. 4 credits. Limited to 8 students. Prerequisite: Theatre Arts 377 or equivalent, and permission of instructor. Fee for maintenance costs, $50 (this fee is paid in class). The minimum cost to each student for materials and processing is $300. Students retain ownership of their films.
MW 10:10–12:05. M. Rivchin.
The development and completion of individual projects, with emphasis on personal and documentary modes. Includes preparation of an original script or storyboard, direction, cinematography, synchronous-sound recording, editing, and follow-through to a composite print.

**[478 Philosophical Problems of Classical Film**
Spring. 4 credits.
T R 11:40–12:55; screening time T 7–9 p.m. Not offered 1989–90.
This course explores the development of film theory from the silent era to the advent of semiotics. Questions to be addressed concern the nature of cinema, the nature of cinematic representation and expression, the objectivity of film criticism, and so on. Readings include works by Munsterberg, Arnheim, Benjamin, Eisenstein, Pudovkin, Panofsky, Sontag, Bazin, Kracauer, Perkins, Cavell, and others.]

**650 Culture in the Weimar Period (also German Studies 650)**
Spring. 4 credits.
T 3:35–5:35. D. Bathrick.
This survey course will treat major developments in the area of German culture (literature, cinema, painting) between 1900 and 1933. Individual representative texts will be studied and discussed in their relation to the cultural, political, and social contexts out of which they emerge. Lectures and discussions will focus *both* on detailed interpretation of individual works as well as the general historical background and developments of the period.

**653 Myth onto Film (also Anthropology 653)**
Fall and spring. 4 credits. Open to undergraduate and graduate students with permission of instructor. Enrollment limited by available studio space and equipment. Prerequisite: some knowledge of any one of the following: anthropology, filmmaking, mythology, graphics, drawing, and painting.
T 2–4:25. R. Ascher.
In myths, whales fly, pebbles throw themselves across streams, and trees are transformed into women. Toward the end of visualizing myths—in particular the myths of other people—we explore the possibilities of animated film. The technique used is cameraless animation; that is, we draw and paint, frame by frame, directly onto motion picture film. The intellectual problem is to visualize the myths of others so that they are comprehensible to us but are not thought to be of us. Reading includes introductory works on both myth and animation, and there is background reading on the particular myth that is committed to film.

**[654 Topics in Recent Film Theory (also Comparative Literature 654)**
Fall. 4 credits.
W 2:30–4:25. N. Carroll. Not offered 1989–90.
This course is an examination of the broad range of options in film theory today. The first part of the course will explore the reigning film theory of the cinema studies' establishment This theory is an amalgam of Althusserian Marxism and Lacanian psychoanalysis. Some of the followers, whose writings we will study, include Metz, Heath, and Baudry. We will also discuss the influence of this theory on feminism. In ensuing sections of the course we will review alternatives to the established film theory as found in the writings of Bordwell, Wilson, Brannigan, and Jarvie.]

**699 German Film Theory (also German Studies 699 and Comparative Literature 699)**
Spring. 4 credits.
R 1:25–3:20. D. Bathrick.
This course will examine critically the writings of major German film theories from the Weimar period to the present. Works by Bela Balazs, Rudolf Arnhelm, Siegfried Kracauer, Walter Benjamin, Theodor Adorno, Max Horkheimer, Alexander Kluge, H. J. Syberberg, Gertrud Koch, Thomas Elsaesser, and others will be read and discussed in light of the following considerations: What are the cultural and political contexts out of which these ideas emerge and how are these theories addressing these contexts? How do these theories relate to the work coming out of other national traditions at the same time or to current debates in feminist, formalist, postmodern, or poststructuralist film theory. There will be film showings.

## DANCE

**123 Ballet I (also Physical Education 423)**
Fall and spring. 0 credit.
Theatre Arts and Physical Education registration at Teagle Hall only. Fall: M W 3:10–4:40; Spring: T R 3:10–4:40.
P. Saul.
The fundamentals of classical ballet technique. Material covered includes all of the exercises at the barre, and elementary work in the areas of port de bras, adage and allegro. Satisfies the PE requirement.

**124 Modern Dance I (also Physical Education 424)**
Fall and spring. 0 credit. Theatre Arts and Physical Educaction registration at Teagle Hall only.
Sec. 13 M W 11:20–12:35. Staff ; Sec. 27 T R 3:10–4:25. Staff.
The fundamentals of modern dance technique. Elementary dance movement phrases, with attention to rhythm, placement, and vitality of performance. Satisfies the PE requirement.

**150 Writing About Dance**
Spring. 3 credits.
T R 10:10–11:25. S. Banes.
In this freshman writing seminar, dance is analyzed as a system of nonverbal communication. We will explore methods of categorizing and describing human behavior such as kinesics, proxemics, and choreometrics; examine the function of dance in society; and study specific dance styles. Although in class we will work from film or video recordings, attending live dance performances will be an integral part of the course.

**155 Rehearsal and Performance**
Fall and/or spring. 1–2 credits. 1 credit per production experience per term up to 2 credits per term. Students must register for the course in the term in which credit is earned; requests for retroactive credit will not be honored. Limited to students who are assigned roles after tryouts at the department's scheduled auditions or who are assigned assistant director positions after obtaining director's approval. Students should add this course only after they have been assigned roles. S-U grades only.
Staff.
The study, development, and performance of roles in departmental theatre or dance productions or the study and practice of directing as experienced in assisting faculty and guest directors.

**200 Introduction to Dance**
Spring and summer. 3 credits.
T R 1:25–2:40. J. Morgenroth
Introduction to aesthetics and theoretical issues in Western theatrical dancing, with emphasis on the twentieth century. Viewing of films and videotapes and discussion of readings. Two papers.

**201 Dance Improvisation**
Fall. 3 credits. Limited to 12 students. Concurrent enrollment in a dance technique class at the appropriate level is required. Registration only through department roster in the main office of the Center for Theatre Arts.
T R 4:50–6:20. J. Morgenroth
Exploration of movement invention and group composition through structured dance improvisation. Live musical accompaniment.

**206 Making Dances to Music**
Fall. 3 credits. Limited to 10 students. Concurrent enrollment in a dance technique class at the appropriate level is required. Students are expected to attend campus dance activities for class discussion. Registration only through department roster in the main office of the Center for Theatre Arts.
M W 4:50–6:20. P. Saul.
An introduction to the world of expression through movement to music (no previous experience required). Experiments choreographing to various music styles. In-class improvisation will lead to composition

assignments using a variety of music. Studies will be performed at an end-of-semester informal studio showing. Films and videotapes will be viewed.

**209 Introduction to African Dance (also AS&RC 209)**
Fall. 3 credits.
T R 10:10–11:25. F. Ajayi.
An introduction to ancient African dance forms, origins, socio-economic and political significance; the state of the dances, changes and continuing relevance in contemporary times. This course will look at the evolution and significance of contemporary dance forms.

**210 Beginning Dance Composition and Music Resources**
Spring. 3 credits. Concurrent enrollment in a dance technique class at the appropriate level is required. Registration only through the department roster in the main office of the Center for Theatre Arts.
MW 6:30–8:00. Staff.
Weekly assignments are designed to introduce students to basic elements of dance traditionally and currently used in the choreographic process. Problems are defined and explored through class improvisation as a way to encourage fresh, individual solutions. Students compose and present a series of short studies that are discussed and reworked before being performed at informal studio showings and outreach events. One additional hour per week will be arranged for music-related activities. The music resource faculty will introduce a new composer each week and orient the class regarding problems and possibilities with sound collaborations. Students are expected to attend campus dance activities for class discussion.

**231 Ballet II (also Physical Education 431)**
Fall and spring. 0 credit. Theatre Arts and Physical Education registration at Teagle Hall only. Prerequisite: Theatre Arts 123 (Ballet I) or permission of instructor.
Fall: T R 3:10–4:40; Spring: M W 3:10–4:40. P. Saul.
A continuation of Ballet I for students with at least a year of dance training. In addition to more advanced forms of port de bras, adage and allegro, work is done on the pirouette. Satisfies the PE requirement.

**232 Modern Dance II (also Physical Education 432)**
Fall and spring. 0 credit. Theatre Arts and Physical Education registration at Teagle Hall only. Prerequisite: Modern Dance I or permission of instructor.
Sec. 25: T R 1:30–3:00. J. Morgenroth; Sec. 19: M W 6:30–8:00. Staff.
A continuation of Modern Dance I, for students with at least a year of dance training. Practice of longer dance phrases, with attention to clarity of design, rhythm, and expression.

**272 Music and the Dance (also Music 272)**
Spring. 3 or 4 credits. Prerequisite: permission of instructor.
T R 11:15–12:30. R. Harris-Warrick.
This course will explore selected topics in the interrelations between music and dance in the Western tradition. Some of the areas to be examined include the influence of dance movement on musical composition, composer-choreographer relationships, and a comparison of music composed for dancing with dance music composed for listening. Examples will be drawn from the Renaissance, the baroque period, and a modern era. Students will be asked to pursue an independent project.

**[304 Ballet III (also Physical Education 434)**
Fall and spring. 0 or 1 credit. May be repeated for up to 4 credits. Prerequisite: Ballet II or permission of instructor.
M W F 3:10–4:40. P. Saul. Not offered 1989–90.
Study and practice of traditional training exercises and the classical ballet vocabulary; work is done on strengthening the body and using it as an expressive instrument.]

**306 Modern Dance III (also Physical Education 436)**
Fall and spring. 0 or 1 credit. May be repeated for up to 4 credits. Prerequisite: Modern Dance II or permission of instructor.
Fall: Sec. 17 M W F 3:10–4:40. J. Morgenroth; Sec. 18 M W F 4:50–6:20. Staff.
Advanced work with rhythm, placement, and phrasing for students who are prepared to refine technical skills of dancing. Students will be physically and mentally challenged by lengthy, complex phrases and will be expected to bring the instructor's material to life.

**[307 Asian Dance and Dance Drama (also Asian Studies 307)**
Fall. 3 credits. May be repeated for credit. Section 1: Indian Dance, Section 2: Japanese Noh Theatre, Section 3: Indonesian Dance Theatre.
Hours to be arranged. Staff. Not offered 1989–90.
Readings, lectures, and practice sessions. On Fridays there will be lectures, demonstrations, and discussions. Videotapes and films will be shown. The Monday and Wednesday classes will consist of learning basic movement vocabulary and dances. No previous experience in dance is necessary.]

**308 Modern Dance IV (also Physical Education 438)**
Fall and spring. 0 or 1 credit. May be repeated for up to 4 credits. Prerequisite: Modern Dance III or permission of instructor.
T R F 4:50–6:20. Staff.
A continuation of, and supplement to, Theatre Arts 306/Physical Education 436.

**309 African Dance Aesthetics (also AS&RC 309)**
Spring. 3 credits. Prerequisite: TA and AS&RC209 or permission of instructor.
T R 10:10–11:25. F. Ajayi.
An examination of African dance styles and forms within the cultural perspective of African peoples. Practical classes will consist of learning basic movement vocabulary, techniques, and dances, with lectures on the cultural world view of the people. Practical sessions will explore the dynamics of African dances as nonverbal artistic forms communicating a world view, with an end of semester studio showing. The course will concentrate particularly on West and East Africa.

**310 Intermediate Projects in Dance Composition I**
Fall and Spring. 3 credits. Prerequisite: Theatre Arts 210.
Hours to be arranged. Staff.
Biweekly meetings for students working on intermediate choreographic projects to be presented in various performance situations. Work in progress will be critiqued by faculty and peers. Design problems in costuming and lighting will be approached, and students with particular interests in collaboration will have a forum in which to develop their ideas.

**311 Intermediate Projects in Dance Composition II**
Fall and spring. 3 credits. Prerequisite: Theatre Arts 310.
Hours to be arranged. Staff.
A continuation of Theatre Arts 310.

**[312 Physical Analysis of Movement**
Fall. 3 credits.
T R 1:25–2:40. J. Morgenroth. Not offered 1989–90.
This course is an examination of human movement with particular attention to dance movement. Readings in Sweigard's *Human Movement Potential.* Guest lectures by experts in anatomy and health areas. Practical and laboratory work. Demonstration of dissection.]

**[314 Western Dance History I**
Fall. 4 credits.
T R 11:15–12:30. S. Banes. Not offered 1989–90.
A survey of the history of dance from the Renaissance to the end of the nineteenth century with emphasis on the development of theatrical forms in Western culture.]

**[315 Western Dance History II**
Spring. 4 credits.
T R 11:15–12:30. S. Banes. Not offered 1989–90.
A survey of the history of Western theatrical dance in the twentieth century.]

**[318 Historical Dances**
Spring. 2 credits. Prerequisite: Ballet II or Modern Dance II.
Staff. Not offered 1989–90.
A sampling of the social dances from the Renaissance to the present, with emphasis on pinpointing basic differences in movement styles and customs in the various periods. A major part of class time will be spent learning and performing the dances.]

**410 Advanced Dance Composition I.**
Fall and spring. 3 credits. Prerequisite: Theatre Arts 310 and 311.
Hours to be arranged. Staff.
Students work on advanced choreographic problems, to be presented in performance. Work in progress will be critiqued by faculty biweekly.

**411 Advanced Dance Composition II**
Fall and spring.
Hours to be arranged. Staff.
A continuation of Theatre Arts 410.

**418 Seminar in History of Dance**
Spring. 4 credits. Prerequisite: Theatre Arts 315 or permission of instructor.
R 2:30–4:25. S. Banes.
Postmodern dance, from the 1960s to the present.

**490 Senior Paper in Dance**
Spring. 4 credits. Prerequisite: Theatre Arts 418, senior standing.
Under faculty direction, the student will write a senior paper in dance history, criticism, or theory.

### Tracks toward selection into the advanced undergraduate training program

**Design, Technology, and Stage Management**

Required for **ALL** individuals interested in a **Design**, **Technology**, or **Stage Management** track:
**TA 151** and **251** Production Lab I and II (at least 2 combined credits)
**TA 250** Fundamentals of Design and Technology

Required for Scenic Design emphasis:
**TA 340** Theatrical Drafting and Technical Drawing Studio
**TA 351** Production Lab III (at least 1 credit)
**TA 354** Stagecraft Studio
**TA 364** Scene Design Studio I

Required for Costume Design emphasis:
**TA 351** Production Lab III (at least 1 credit)
**TA 356** Costume Construction Studio
**TA 358** Theatrical Make-up Studio
**TA 366** Costume Design Studio I

Required for Lighting Design emphasis:
**TA 252** Technical Production Studio I
**TA 340** Theatrical Drafting and Technical Drawing Studio
**TA 351** Production Lab III (at least 1 credit)
**TA 362** Lighting Design Studio I

Required for Sound Design emphasis:
**TA 252** Technical Production Studio I
**TA 351** Production Lab III (at least 1 credit)
**TA 354** Stagecraft Studio
**TA 368** Sound Design Studio

Required for Technical Direction emphasis:
**TA 252** Technical Production Studio I
**TA 340** Theatrical Drafting and Technical Drawing Studio
**TA 351** Production Lab III (at least 1 credit)
**TA 354** Stagecraft Studio

Required for Stage Management emphasis:
**TA 253** and TA 353 Stage Management Lab II and III
**TA 280** Introduction to Acting
**TA 370** Stage Management Studio
**TA 398** Fundamentals of Directing I

**Acting**

Required for ALL individuals interested in an acting track:
**TA 151 and TA 251** Production Lab I and II (at least 2 combined credits)
**TA 240/241** Introduction to Western Theatre (1 Semester ONLY)
**TA 250** Fundamentals of Design and Technology
**TA 280** Introduction to Acting

Required for Acting emphasis:
**TA 281** Acting I
**TA 282** Introduction to Voice and Speech for Performance
or
**TA 284** Speech and Dialects for Performance
**TA 380** Acting II
Be accepted into TA 381 Acting III

**Directing**

Required for ALL individuals interested in a directing track:
**TA 151 and TA 251** Production Lab I and II (at least 2 combined credits)
**TA 240/TA 241** Introduction to Western Theatre (1 Semester ONLY)
**TA 250** Fundamentals of Design and Technology
**TA 280** Introduction to Acting

Required for Directing emphasis:
**TA 398** Directing I
**TA 498** Directing II

**Playwriting**

Required for ALL individuals interested in a playwriting track:
**TA 240/TA 241** Introduction to Western Theatre (1 Semester ONLY)
**TA 250** Fundamentals of Design and Technology
**TA 280** Introduction to Acting

Required for Playwriting emphasis:
**TA 348** Playwriting
**TA 349** Advanced Playwriting

Students in the advanced undergraduate training program may also elect to take TA 485 (Undergraduate Internship) in addition to or in place of one production assignment.

## TURKISH

See Department of Near Eastern Studies.

## UKRAINIAN

See Department of Modern Languages and Linguistics.

## VIETNAMESE

See Department of Modern Languages and Linguistics.

## WRITING PROGRAM

See John S. Knight Writing Program, p. 21 and p. 319.

## YIDDISH

See Department of Near Eastern Studies.

## YORUBA

See Department of Modern Languages and Linguistics.

# SPECIAL PROGRAMS AND INTERDISCIPLINARY STUDIES

### Africana Studies and Research Center

R. Harris, director (255-5218); A. Adams, F. Ajayi, A. Appiah, W. Branch, W. Cross, L. Edmondson, G. Fraser, H. Gates, A. Nanji, D. Ohadike, W. Soyinka, J. Turner, M. Williams. Offices: 310 Triphammer Road, 255-4625 or 255-4626.

The Africana Studies and Research Center is concerned with the examination of the history, culture, intellectual development, and social organization of Black people and cultures in the Americas, Africa, and the Caribbean. Its program is structured from an interdisciplinary and comparative perspective and presents a variety of subjects in focal areas of history, literature, social sciences, and Swahili language and literature.

The center offers a unique and specialized program of study that leads to an undergraduate degree through the College of Arts and Sciences and a graduate degree, the Master of Professional Studies (African and Afro-American), through the university's Graduate School.

A student may major in Africana studies; however, another attractive alternative is the center's joint major program. This program enables the student to complete a major in any of the other disciplines represented in the college while at the same time fulfilling requirements for a major in Africana Studies. This requires only a few more credits than is usually the case when one completes a single major course of study. Courses offered by the center are open to both majors and nonmajors and may be used to meet a number of college distribution requirements, such as freshman writing seminars, language (Swahili), expressive arts, humanities, social sciences, and history.

The center also brings distinguished visitors to the campus, sponsors a lecture series, and houses its own library.

#### The Africana Major

The undergraduate major offers interdisciplinary study of the fundamental dimensions of the Afro-American and African experiences. Because of the comprehensive nature of the program, it is to the students' advantage to declare themselves Africana majors as early as possible. The following are prerequisites for admission to the major.

Students should submit:

1) a statement of why they want to be an Africana studies major;
2) a tentative outline of the area of study they are considering (African or Afro-American) for the undergraduate concentration; and
3) a full transcript of courses taken and grades received.

The center's undergraduate faculty representative will review the applications and notify students within two weeks of the status of their request.

After acceptance as a major in the Africana Center, a student must maintain a C+ cumulative average in the center's courses while completing the major program. The Africana major must complete 36 credits in courses offered by the center, to include the following four core courses: AS&RC 231, 290, 360, and 431. Beyond the core courses, the student must take 8 credits of center courses numbered 200 or above and 15 credits numbered 300 or above. Within this selection the student must take at least one of the following AS&RC courses: 203, 204, 283, or 301. The program of an undergraduate major may have a specifically Afro-American focus or a specifically African focus.

### Joint Majors

The center encourages joint majors in the College of Arts and Sciences and in other colleges. Joint majors are individualized programs that must be worked out between the departments concerned. The center's undergraduate faculty representative, Professor Adams, will assist students in the design and coordination of joint major programs. However, in any joint major program, the center will require at least 16 credits be taken in Africana studies courses, including AS&RC 290.

### Double Majors

In the case of double majors (as distinct from joint majors) students undertake to carry the full load of stipulated requirements for a major in each of the two departments they have selected.

**Honors.** The honors program offers students the opportunity to complete a library research thesis, a field project in conjunction with a report on the field experience, or a project or experiment designed by the student. The requirements for admission to the honors program for all students—regular majors, joint majors, and double majors—are a B- cumulative average in all courses and a B+ cumulative average in the center's courses. Each student accepted into the honors program will have an honors faculty committee consisting of the student's adviser and one additional faculty member, which is responsible for final evaluation of the student's work. The honors committee must approve the thesis or project before May 1 of the student's junior year. The completed thesis or project should be filed with the student's faculty committee by May 10 of the senior year.

## Distribution Requirement

Two Africana Studies and Research Center courses from the appropriate group may be used in fulfillment of the following distribution requirements:

Social sciences: AS&RC 171, 172, 190, 191, 208, 231, 280, 290, 301, 302, 344, 345, 346, 351, 352, 400, 410, 420, 460, 481, 484, 485, 495, 550, 551, 571.

History: AS&RC 203, 204, 208, 231, 283, 344, 350, 360, 361, 370, 381, 405, 460, 475, 483, 490, 510.

Humanities: AS&RC 211, 219, 422, 431, 432, 425, 455.

Expressive arts: AS&RC 285, 303, 425.

Freshman writing seminars: AS&RC 100.

## Language Requirement

Swahili fulfills the College of Arts and Sciences language requirement. Successful completion of AS&RC 131, 132, 133, and 134 provides qualification in Swahili. Successful completion of AS&RC 202 gives proficiency in Swahili. Africana majors are not required to take Swahili, but the center recommends the study of Swahili to complete the language requirement.

## Courses

**131 Swahili**
Fall. 4 credits.
W R 10:10–12:05; lab to be arranged. A. Nanji.
Beginner's Swahili. Part 1—Grammar. Requires no knowledge of language.

**132 Swahili**
Spring. 4 credits. Prerequisite: Swahili 131.
W R 10:10–12:05. A. Nanji.
Continued study of the basic grammatical formation of the language and the introduction of reading material ranging from songs to short stories. A great many drills help develop the student's comprehension. Swahili tapes are highly used.

**133 Swahili**
Fall. 4 credits. Prerequisites: Swahili 131 and 132.
W R 12:20–2:15; language lab to be arranged. A. Nanji.
Advanced study in reading and composition.

**134 Swahili**
Spring. 4 credits. Prerequisite: Swahili 133.
W R, hours to be arranged. A. Nanji.
In this course of the sequence more emphasis is placed on the development of reading ability and the acquisition of writing skills. Students are expected to read and comprehend selected Swahili stories and write compositions on chosen topics. Ample consideration is given to oral practice in the classroom.

**171 Black Families and the Socialization of Black Children**
Fall. 4 credits.
T R 2:55–4:10. W. Cross.
Survey of key psychological dimensions of the Black experience, covering such issues as (1) race and intelligence; (2) Black identity; (3) Black family structure; (4) Black English; (5) Black middle class; and (6) nature of Black psychology.

**172 The Education of Black Americans: Historical and Contemporary Issues**
Spring. 4 credits.
T R 2:55–4:10. W. Cross.
This is a course designed for freshmen and sophomores that will be devoted to the history of Black education and contemporary issues in Black education, such as the struggle for Black studies, the development of independent Black schools, and problems of public schools in Black communities.

**190 Introduction to Modern African Political Systems**
Fall. 4 credits.
M W 3:35–5. L. Edmondson. Offered alternate years.
This course directs attention to the salient characteristics of Africa's political systems and assesses the way in which continental and global factors impinge on development efforts. It is especially concerned with the impact of colonialism and the ongoing efforts by Africans to overcome its political and socioeconomic legacies. Among the specific issues to be discussed are problems of ethnic fragmentation, boundary problems, levels of political institutionalization, challenges of continental unity, neocolonialism and dependency, and Africa within the Third World and in the world system.

**191 Africa: The Continent and Its People**
Spring. 3 credits.
T R 11:40–12:55. L. Edmondson.
An introductory interdisciplinary course focusing on Africa's geographical, ecological, and demographic characteristics; indigenous institutions and values; the triple cultural heritage of Africanity, Islam, and Western civilization; main historical developments and transitions; contemporary political, economic, social, and cultural change. Africa's ties with the United States (from trans-Atlantic slavery to the present), its impact on the emerging world order, and its contribution to world civilization will also be explored.

**202 Swahili Literature**
Fall. 4 credits. Prerequisite: Swahili 134. Offered on demand.
A. Nanji.
Students gain mastery over spoken Swahili and are introduced to the predominant Swahili literary forms.

**203 History and Politics of Racism and Segregation**
Fall. 4 credits.
M W 1:25–3:20. Staff.
A cross-cultural study in the historical context of the evolution of racist thought and practice in southern Africa and North America.

**204 History and Politics of Racism and Segregation**
Spring. 4 credits.
M W 1:25–3:20. Staff.
The course will deal with the historical patterns of racism and segregation using southern Africa and North America as case histories. The study will be undertaken within a theoretical framework that broadly defines racism and segregation and their implication.

**208 Gender, Race, and Medical "Science"**
Fall. 3 credits.
T R 11:40–12:55. G. Fraser.
The course will examine the social construction of race and gender in the medical sciences from the turn of the century to the present. Beginning with readings that propose a new view of scientific medicine as a system of signs and symbols and as culturally embedded, we will proceed to an examination of some of the following topics: racism and experimentation; the treatment of venereal disease and tuberculosis; the demise of social childbirth; the body as a medical product; menstruation as pathology; the monitored mind; women and psychiatry; the political economy of health care; medical authority; the training of medical students; political anatomy of the body; sites of resistance; alternative systems; and cross-cultural case studies.

**209 Introduction to African Dance (also Theatre Arts 209)**
Fall. 3 credits.
T R 10:10–11:25. F. Ajayi.
An introduction to ancient African dance forms, origins, socio-economic, and political significance; the state of the dances, changes, and continuing relevance in contemporary times. The course will also look at the evolution and significance of contemporary dance forms.

**211 West Indian Literature from Abroad**
Fall. 3 credits.
T R 10:10–11:25. A. Adams.
"Writing home": writing by West Indians who have emigrated to North America, Europe, or Africa, but whose cultural, social, psychological, spiritual center of gravity remains the Caribbean (or its transplanted manifestation in the new domicile). Whether experienced as "exile," as with Lamming, "loneliness," as with Selvon, or as a search for the diasporic connection with the continent of ancestry, as with Conde, the West Indian literary artist abroad is, in some form, "writing home."

**219 Issues in Black Literature**
Fall. 4 credits. Offered alternate years. An examination of literature written for Black children, including an analysis of the literature as it pertains to Black life from 1960 to the present. Students write a pamphlet containing their essays, fiction, and poetry and compile a bibliography of literature for Black children.

**231 Black Political Thought**
Fall. 3 credits.
T R 11:40–12:55. J. Turner. Offered in alternate years.
This is an introductory course that will review and analyze the major theoretical and ideological formulations developed and espoused by African-Americans in the struggle for liberation. This semester we will focus specifically on the political philosophy and historical significance of Malcolm X, and the work and movement of Marcus Garvey, as the prime movers of nationalism and pan-Africanism among Black people in this century. Such themes as slave resistance, nationalism, pan-Africanism, emigration, anti-imperialism, socialism and internal colonialism, and the political and social views of Black women will be discussed. Black political thought will be viewed in its development as responses to concrete conditions of oppression and expression.

**280 Racism in American Society**
Fall. 3 credits.
W 7:30–10 p.m. D. Barr and J. Turner.
This course will be a topical treatment of the history and theory of racism in the United States. The course will begin with an examination of basic concepts and theories of racism. From there we will examine the history of racial groups in America—African Americans, Native Americans, Asian Americans, and the Hispanic groups. Particular attention will be paid to the political economy of racism and the sociological and the psychological aspects of race relations in America, with specific reference to the differences and intersections of race, class, gender, and ethnicity.

**283 Black Resistance: South Africa and North America**
Fall. 4 credits. Offered alternate years.
Staff.
A study of Black political movements in South Africa and North America and their responses to the situations of race relations that formed the contexts of their operations.

**285 Black Theater and Dramatic Literature**
Fall. 3 credits.
T R 4:30–5:50. W. Branch.
This course is an introduction to the history of literature of Black drama. It also provides an opportunity for students to cultivate an interest in individual and group presentation of Black dramatic materials. Students who successfully complete this course will be granted preference for the limited enrollment in AS&RC 425 (Advanced Seminar in Black Theatre and Dramatic Literature), which produces a public performance in the spring.

**290 The Sociology of the Black Experience**
Fall. 3 credits.
T R 1:25–2:40. J. Turner.
An introductory course to the sociology of the Black experience and to the field of Afro-American studies. Required for all undergraduate students majoring at the Africana Center. The course surveys the early culture and development of Black people and their role in world civilization and concentrates on the cultural heritage and social experience of Black people in the United States in particular.

**301 Oppression and the Psychology of the Black Social Movement**
Spring. 4 credits.
R 10:10–12:05. W. Cross.
The focus of the course will be conversion experiences within the context of social movement. The development of political groups (for example, the Black Panther Party) and outstanding activist-intellectuals (such as Malcolm X) are used as reference points for discussion of social movement theory.

**302 Social and Psychological Effects of Colonialization and Racism**
Spring. 4 credits.
Offered alternate years. Staff.

**303 Blacks in Communication Media**
Spring. 3 credits.
W 2:30–5. W. Branch.
The focus is on the general theory of communications, the function of media in an industrialized society, and the social, racial, and class values implied in the communication process. There is a term paper and screenings of significant American and Third World films.

**309 African Dance Aesthetics: Practice and Theory**
Spring. 3 credits.
M W F 10:10–11:25. F. Ajayi.
An examination of the aesthetics of African dance styles and forms within the cultural perspectives of African peoples. Monday and Wednesday classes will consist of learning basic movement vocabulary and dances, with lectures and discussions on Fridays. Practical sessions will explore the dynamics of African dances as non-verbal artistic forms communicating a world view, with an end of semester studio showing. The course will concentrate particularly on West and East Africa.

**344 Neocolonialism and Government in Africa (The Politics of Public Administration)**
Fall. 4 credits. Offered alternate years.
T R 1:25–2:15.
The course is designed to explain why Africa's public administrations in the postcolonial era have generally failed to move from the colonialist ethos to becoming primary instruments for initiating and guiding the processes of development. The reality of colonialism was bureaucratic centralism—the closest approximation to the ideal type of a pure administrative state specializing in law and order. Colonial administrations resembled armies in their paramilitary formation and ethos and were, indeed in a number of cases, the instruments of military men. Much attention focuses on the internal characteristics of bureaucratic organizations in Africa and their relationship to their social and political environments

**345 Afro-American Perspectives in Experimental Psychology (also Psychology 345)**
Spring. 3 or 4 credits. Prerequisite: an introductory course in psychology or AS&RC 171. Offered alternate years.

**346 African Socialism and Nation Building**
Spring. 4 credits.
An exploration and critical analysis of the various theories of African socialism as propounded by theorists and practitioners. Those ideas, extending from Nyerere's Ujamaa (for example, traditional social and economic patterns of African society) to Nkrumah's scientific socialism (such as the desirability and practicality of the Marxian type of socialism in Africa) are compared.

**350 The Black Woman: Social and Political History**
Spring. 3 credits. Offered alternate years.
Hours to be arranged.
This course will address the social organizations, political protests, and political ideologies written by or about Black women in the United States, from the time of slavery to the 1980s. Topics will include the special role of Black women in slavery, the political-protest thought of Black women writers in the nineteenth and twentieth centuries (e.g., Ida B. Wells, Mary Church Terrell, Ella Baker, Mary McLeod Bethune, Eleanor Holmes Norton, Angela Davis), the emergence of Black feminism, and the various social-political controversies surrounding the relationship of Black women to both the civil rights and Black power movements.

**352 Pan-Africanism and Contemporary Black Ideologies**
Spring. 4 credits. Offered alternate years.
A historical study of pan-Africanism that reviews and analyzes the literature and activities of early Black pan-African theorists and movements.

**360 Ancient African Nations and Civilizations**
Fall. 3 credits. Offered alternate years.
M W F 1:25–3:20. Staff.
An introduction to African history beginning with early civilizations in pre-colonial Africa.

**361 Introduction to Afro-American History (from African Background to the Twentieth Century)**
Fall. 3 credits. Offered alternate years.
M W F 10:10–11. R. Harris.
Surveys the transition of Africans to America through the process of enslavement and their transformation into Afro-Americans. Explores the transition from slavery to freedom through the process of emancipation and the transformation of Afro-Americans from chattel slaves into rural peasants. Its purpose is to understand the internal dynamics of the Black experience from African origins to the age of segregation.

**370 Afro-American History: The Twentieth Century**
Spring. 3 credits. Offered alternate years.
M W F 12:20–1:10. R. Harris.
Examines the transition of Afro-Americans from countryside to city through the process of migration and urbanization and their transformation into industrial laborers. Probes the transition from segregation to civil rights through the process of protest and the transformation of Afro-Americans from second-class into first-class citizens. The purpose is to understand historical antecedents for the current socioeconomic, political, and cultural status of Afro-Americans.

**381 Contemporary African History**
Spring. 3 credits. Offered alternate years.
M W 12:20–1:25. Staff.
A survey of the current problems on the African continent as they have appeared from 1500 to the present time. Important topics include the impact of the Atlantic slave trade, the European scramble of 1884, various forms of African resistance to colonial occupation in 1914, and the prospects of protracted social unrest in Africa south of the Zambezi River.

**382 Comparative Slave Trade of Africans in the Americas**
Fall. 3 credits. Offered alternate years.
T R 1:25–2:30.
The focus is on eighteenth- and nineteenth-century slave societies in Virginia and South Carolina and the eighteenth-century slave societies in San Domingue or Haiti and to some extent in Jamaica. The slave society in Cuba during the latter part of the nineteenth century is studied.

**400 Political Economy of Ideology and Development in Africa**
Spring. 4 credits. Offered alternate years.
T R 11:15–12:40. L. Edmondson.
An exploration of the processes of African underdevelopment, ranging from historical foundations to contemporary international dynamics. Rival theories of underdevelopment, contending models of development, and competing ideologies will be explored. Common African postures as manifested in the "Lagos Plan of Action for the Economic Development of Africa, 1980–2000" and in the north-south dialogue will also be assessed.

**405 Political History of the Age of Booker T. Washington and W. E. B. DuBois**
Spring. 4 credits. Offered alternate years.
A review of the intellectual and political history of the Black experience in the United States from 1890 to the eve of World War II. Although the course concentrates on two of the outstanding Black historical figures of the period, Booker T. Washington and W. E. B. DuBois, other personalities and leaders within Black social and political history will be examined—including Marcus Garvey, T. Thomas Fortune, A. Philip Randolph, Charles S. Johnson, William Monroe Trotter, and James Weldon Johnson. Major Black issues, such as the intellectual debates between DuBois and Washington, and DuBois versus Garvey, will constitute a critical part of the discussion.

**410 Black Politics and the American Political System**
Fall. 4 credits.
W 2:30–4:25. J. Turner.
The central thesis of African American politics has been its movements for political change and democratic access and human rights. This development since the seventeenth century is a complex political legacy. This course will conduct a close study of African American political practice and theoretical analysis of the American political system. Implications of the political systems for prospects and limitations to participation by Black people will be analyzed. Critical historical stages in the process of Black politics will be examined. The development of electoral offices in federal and statewide politics, and the significant urban political power bases giving rise to African American mayorality politics in critical industrial centers, as well as rural hamlets will center the course. Presidential politics—the Jesse Jackson campaigns—and new political formations including Black Republicans/conservatives will constitute the emphasis on contemporary events. The course will review the development of the literature in African American politics.

**420 Social Policy and the Black Community:**
Spring. 4 credits.
W 2:30–4:30. J. Turner.
The socioeconomic conditions of the Black urban community will be the central focus of the course. Community development models will be explored in relationship to the social needs of the Black populations. The changing configuration of internal organization of the Black community nationally will be examined.

**422 African Literature**
Fall. 4 credits.
M 2:30–4:25. A. Adams.
Women writers of Africa will be the focus of attention in this course. Questions of gender as well as complementary issues of equal importance in the artistic vision and expression of the woman writer in Africa will be considered in the works of Mariama Ba, Ama Ata Aldoo, Buchi Emecheta, Aminata Sow Fall, Bessie Head, as well as some "newer" writers. All works will be read in English.

**425 Advanced Seminar in Black Theater and Dramatic Literature**
Spring. 4 credits. Enrollment limited.
T R 4:30–5:50. W. Branch.
This course will be devoted to the study, rehearsal, production, and public performance of a play or plays drawn from the annals of Black American dramatic literature. Students will participate in all the various phases and categories of theatrical production, from acting to production crews to theater group management. A field trip to a Black theater attraction in New York City will also be arranged if possible. Students who have successfully completed AS&RC 285 (Black Theater and Dramatic Literature) will be granted preference for the limited enrollment in this course.

**431 History of Afro-American Literature**
Fall. 4 credits. Offered alternate years.
An extensive examination of the impact that Afro-American literature has had on describing, explaining, and projecting the Afro-American experience from 1619 to the present.

**432 Modern Afro-American Literature**
Spring. 4 credits. Offered alternate years.
A study of fiction by Black writers, focusing on the political and sociological component that influenced the development and growth of Black writing in relationship to literary themes and attitudes current in specific periods and movements from post–World War I to the present.

**450 Body Aesthetics or Body Politics: Images of the Woman in West African Art Forms**
Fall. 3 credits.
W 12:20–2:15.
Examines the body image of the woman as represented in various West African art forms to determine the extent to which the art forms become mediums for: validating the prescribed status of the women in society, suppressing the actual perception of the woman, and re-evaluating the archetypal woman and presenting the woman from a different perspective.

**451 Politics and Social Change in the Caribbean**
Fall. 4 credits.
M W 10:10–12:05. L. Edmondson.
Offered alternate years.
A study of the historical, geostrategic, political, economic, and social (including racial and cultural) forces bearing on the domestic and international experiences of Caribbean societies. Special attention will be given to conflicting definitions and perceptions of the Caribbean; contending theories of Caribbean social structure and models of development; the continuing salience of struggles for change and transformation; prospects of regional integration; and Caribbean challenges to the global system, especially with regard to the region's relations with the United States in the context of the East-West conflict and its position in the Third World in the context of the North-South cleavage.

**455 Modern Caribbean Literature**
Spring. 4 credits.
M 2:30–4:30. A. Adams.
This course will examine the prose literature of the Caribbean islands. Through the reading of several novels and short stories from the various languages and cultural strains that comprise the Caribbean societies, students will study the points of commonality and the diversity within this body of literature. The recurrence of certain historical, social, and cultural issues that have formed the multi-ethnic Caribbean peoples will be analyzed in their varying manifestations across the linguistic and other boundaries to uncover the underlying shared experience.

**460 African Philosophy and the Origins of Major Western Religions**
Fall or spring. 4 credits.
M 3:35–6. Not offered in 1989–90.
The overall objective of this course is to develop in the student an understanding of the origins of the philosophical, theosophical, and magic-religious teachings that were responsible for producing what is today called Judaism, Christianity, and Islam. From this juncture the most basic works and teachings from the Nile Valley and the Great Africans Lakes, and African religions will be compared to the adoptions in Hebrew, Christian, and Moslem religions, as well as in what is today called Greek philosophy.

**475 Black Leaders and Movements in Afro-American History**
Spring. 4 credits.
T R 2:55–4:10. R. Harris.
Analyzes the personalities, ideas, and activities central to the struggle for Afro-American liberation from the eighteenth-century to the present. Examines theories of leadership and the structure of protest movements with the goal of understanding current leadership needs and trends among Afro-Americans.

**483 Themes in African History**
Fall. 4 credits.
M W 1:25–3:20, plus one hour to be arranged. Staff.
Designed to expose the student to what has been referred to as the particular aspects of African history. The survey approach will be adopted in the treatment of selected themes, and use will be made, when necessary, of the work done in auxiliary disciplines. The study will be along the following lines: (a) selected African heroines; (b) women in traditional African societies; and (c) African women in the twentieth-century industrial societies.

**484 Politics, Conflict, and Social Change in Southern Africa**
Fall or spring. 4 credits.
T 10:10–12:05. L. Edmondson.
The focus is on escalating conflicts and ongoing transformations in South Africa and the increasingly salient issue of U.S. relations with the *apartheid* regime. Topical emphases include the heightening contradictions of *apartheid*; the rising tide of Black resistance; women under and against *apartheid*; South Africa's relations with its neighbors; geopolitical, economic, and racial dimensions of the American connection; the disinvestment-divestment debate; and the Reagan administration's "constructive engagement" policy under challenge. Instructor's lectures will be supplemented by films, class discussion, and guest lectures.

**485 Racism, Social Structure, and Social Analysis Seminar**
Spring. 4 credits.
W 2–4:25. J. Turner.
An examination of the social structure of American society and the relationship of racial and class categories to social stratification. An analysis of power structures and the social salience of socioeconomic connections of government decision makers and the corporate structure is developed.

**490 Advanced Reading and Research Seminar in Black History**
Spring. 4 credits.
M W 1:25–2:15. Staff.
The seminar is designed to help students acquaint themselves with the available sources of information and materials in Black history, as well as make the maximum use of their own inclinations and interests in unearthing the material and creating a body of comprehensive conclusions and generalizations out of them.

**495 Political Economy of Black America**
Spring. 4 credits.
M W 10:30–12:05.
An examination of the role that Black labor has played in the historical development of U.S. monopoly, capitalism, and imperialism. Emphasis is on the theory and method of political economy and a concrete analysis of the exploitation of Black people as slave labor, agricultural labor, and proletarian labor.

**498–499 Independent Study**
498, fall; 499, spring.
Hours to be arranged. Africana Center faculty.
For students working on special topics, with selected reading, research projects, etc., under the supervision of a member of the Africana Studies and Research Center faculty.

**500 Political Theory, Planning, and Development in Africa**
Spring. 4 credits. Offered alternate years.
T R 11:15–12:45.
The course explores the processes of underdevelopment of Africa from the epoch of slavery through colonial and neocolonial phases of domination, drawing on the assumptions of "underdevelopment" theory à la G. Frank, Walter Rodney, and others. It then takes up the differential content and emphasis on socialistic and capitalistic strategies by highlighting the interaction of political and economic forces. Case studies are drawn from Ghana, Kenya, and Tanzania.

**505 Workshop in Teaching about Africa**
4 credits. Prerequisites: AS&RC 203 and 204 or AS&RC 360 and 361 or permission of instructor. Offered alternate years.

**[510 Historiography and Sources: The Development of Afro-American History**
Fall. 4 credits. Prerequisite: upperclass or graduate standing or permission of instructor. Not offered 1989–90.
T 9:30–12:05. R. Harris.
Studies the way Black historians in particular have explained the Afro-American past. Examines the development of writing on Afro-American history from the earliest writers to the present. Seeks to determine the principles for interpreting Afro-American history. Acquaints participants with the methodologies and sources central to understanding the Afro-American experience.]

**515 Comparative Political History of the African Diaspora**
4 credits. Prerequisite: upperclass or graduate standing or two of the following courses: AS&RC 203, 204, 283, 360, 361, 475, 484, 490. Offered alternate years.

**520 Historical Method, Sources, and Interpretation**
Fall. 4 credits. Prerequisite: upperclass or graduate standing or two of the following courses: AS&RC 203, 204, 361, 475, 484, 490. Offered alternate years.
J. C. Mbata.

**550 Transnational Corporations in Africa and Other Developing Countries**
Spring. 4 credits. Prerequisite: upperclass or graduate standing or permission of instructor. Offered alternate years.
Examines the role of transnational enterprises as an economic and political factor in the Third World, their relations with the host government, and their interaction with both the private and public sectors of the economy of the host country. Special emphasis on Africa and Latin America.

**571 Graduate Seminar in Black Psychology**
Fall. 4 credits. Prerequisite: permission of instructor.
R 9:05–12:05. W. Cross.
This is an upper-level undergraduate and graduate seminar devoted to psychological issues in the Afro-American experience. This seminar will examine the theoretical and empirical literature of Black family–kinship systems and Black self-concept.

**598–599 Independent Study**
598, fall; 599, spring. Variable credit. For all graduate students.

**698–699 Thesis**
698, fall; 699, spring. Limited to Africana Studies and Research Center graduate students. Africana Center faculty.

## Agriculture, Food, and Society Concentration

F. H. Buttel, A. G. Power, coordinators; G. Altschuler, M. M. Devine, M. J. Esman, J. Fessenden-Raden, C. C. Geisler, A. Gillespie, B. Ginsberg, C J. Greenhouse, D. J. Greenwood, S. L. Kaplan, D. R. Lee, T. J. Lowi, T. F. Lynch, T. A. Lyson, P. L. Marcus, V. Nee, D. I. Owen, D. Pimentel, N. T. Uphoff, D. Usher, M. W. Wachsberg. Office: 275 Clark Hall, 255-6042.

Agriculture, food, and society is an interdisciplinary concentration that is designed to introduce students to the study of agricultural and food issues from diverse perspectives within the liberal arts. The concentration seeks to make available to students a coherent program of study in which the role of agriculture in modern or prehistorical-historical and developed or developing societies can be understood in biological, social, scientific, and humanistic perspective. The concentration draws on courses in several colleges—in particular the Colleges of Arts and Sciences, Agriculture and Life Sciences, and Human Ecology.

Members of the concentration committee, which consists of faculty from each of the major colleges from which courses in the concentration are drawn, serve as advisers in the program. The committee is administered through the Biology and Society Major (office: 275 Clark Hall, 255-6042).

### Basic Requirements

The requirements for the agriculture, food, and society concentration are designed to ensure a broad background in the biological, socioeconomic, and humanistic dimensions of agricultural and food issues. These requirements include foundation courses in biology plus a minimum of six courses and 18 credits of electives.

Students enrolling in the concentration should take the following foundation courses in biology to prepare themselves for course work in agricultural science: a two-semester introductory biology sequence selected from Biological Sciences 109–110, 105–106, or 101–102 plus 102–104. (Advanced placement in biology with a score of 4 or 5, or Biological Sciences 100, offered during the six-week Cornell summer session for 7 credits, also satisfies the biological sciences requirement). These courses may be used to meet group 1 (physical or biological sciences) distribution sequence requirements in the College of Arts and Sciences.

It is recommended (but not required) that students in the agriculture, food, and society concentration elect one or more freshman writing seminars with agriculturally related content to meet basic college requirements for graduation. A list of agriculturally related freshman writing seminars to be offered in 1988–89 is available from the Biology and Society office.

For further information and a complete list of courses that can be used to fulfill the concentration requirements, students should contact the Biology and Society office, 275 Clark Hall, 255-6042.

## American Indian Program

R. LaFrance, acting director (300 Caldwell Hall, 255-6587)

The American Indian Program (AIP) is a multidisciplinary, intercollege program consisting of academic, student support, research, extension, and publications–public relations components.

**Academic component.** The AIP offers courses that increase all students' awareness of the unique heritage of American Indians. Students are challenged by such topics as the sovereign rights of Indian nations and the contemporary relevance of Indian attitudes

toward the environment. The program's instructional core consists of courses focusing on American Indian life with an emphasis on the Iroquois and other Indians of the Northeast. Core courses are supplemented by a variety of offerings from several departments.

The student support staff help Indian students complete an enriched Cornell education by coordinating academic tutoring, financial aid, personal counseling, and other student services.

**Research.** Research priorities include education, social and economic development, agriculture, wildlife management, and cultural preservation.

**Extension.** The AIP's cooperative extension unit seeks to develop solutions to problems identified by Indian people. In this way the AIP can stimulate the application of institutional expertise and resources to community needs.

**Publications and public relations.** AIP publishes its own multidisciplinary journal, *Northeast Indian Quarterly* and sponsors conferences, guest lectures, and forums on important national and local Indian issues, past and present. AIP also contributes articles and information to the national Indian press, including *Daybreak*.

### American Indian Studies Concentration

American Indian studies offers an interdisciplinary approach to the study of American Indian life. Course work in various colleges and departments of the university provides a broad base for understanding the past, present, and future of Indian people. Students selecting a concentration in American Indian studies must take five or more courses from those listed below. At least one course must be selected from each group. All course work must be approved by an adviser from the program.

For full descriptions of the following courses, consult the listings under individual departments.

#### The Indian Traditions

**ALS 100 American Indian Studies: An Introduction**

**ALS 318 An Ethnohistory of the Haudenosaunee: The Six Nations Iroquois Confederacy**

**Anthropology 230 Cultures of Native North America**

**Anthropology 242 American Indian Philosophies I: Power and World Views (also Rural Sociology 242)**

**Anthropology 354 The Peopling of America**

**Music 223 Music of the American Indian**

#### Indians in Transition

**Anthropology 318 Ethnohistory of the Iroquois**

**History 209 Political History of Indians in the United States**

**History 219 Freshman Writing Seminar: History of North American Indians**

**History 323–324 Native American History**

**History 381–382 Content and Form of Iroquois Diplomacy**

**Rural Sociology 442: North American Indian Philosophies**

**History 429 American Indians in Eastern North America**

**History 624 Graduate Seminar in American Indian History**

#### Contemporary Issues

**Anthropology 243 American Indian Philosophies II: Native Voices (also Rural Sociology 243)**

**Anthropology 442 American Indian Philosophies: Selected Topics**

**Rural Sociology 175: North American Indians From 1890 to the Present**

**Rural Sociology 440 Social Impact of Rapid Resource Development**

#### Independent Study

Independent study courses in departments; students must have approval of an American Indian studies faculty member.

## Center for Applied Mathematics

The Center for Applied Mathematics administers a broadly based interdepartmental graduate program that provides opportunities for study and research over a wide range of the mathematical sciences. This program is based on a solid foundation in analysis, algebra, and methods of applied mathematics. The remainder of the graduate student's program is designed by the student and his or her Special Committee. For detailed information on opportunities for graduate study in applied mathematics, students should contact the director of the Center for Applied Mathematics, Sage Hall.

There is no special undergraduate degree program in applied mathematics. Undergraduate students interested in an application-oriented program in mathematics may select an appropriate program in the Department of Mathematics, the Department of Computer Science, or some department of the College of Engineering.

A listing of selected graduate courses in applied mathematics can be found in the description of the center on pages 17–18.

## Asian American Studies Program

The Asian American Studies Program is a university-wide program within the College of Arts and Sciences. Its aim is to promote teaching, research, and cultural activities related to Americans of Asian heritage. The program functions as a teaching and resource center to serve the educational needs of the general Cornell community as well as those of the Asian American community. It is intercollegiate in nature with links to all the schools and colleges of the university. The teaching program offers a number of broad basic courses dealing with the Asian American experience that are offered in any of the participating colleges, depending on content and faculty affiliation. It encourages the incorporation of more specific Asian American content into the mainstream curriculum of the university by providing financial resources and substantive support to faculty members interested in developing new courses and adding pertinent materials to existing courses. The Course Development Grants Program has been established for this purpose. The staff in the program will work toward establishing one or more academic concentrations in the future.

#### Research

The research program encourages and stimulates research on Asian American topics by functioning as a resource and activity center for its affiliated members as well as the general Cornell community. It sponsors activities designed to facilitate dialogue and interchange among faculty from a variety of disciplines and strives to promote collaborative research among its members. To this end the Research Grants Program has been instituted to provide seed money to faculty and students for research on Asian American topics.

#### Art and Culture

The third dimension of the program is to foster and promote Asian American culture and art. The program functions as a resource center and a place for social interaction among Asian American students and members of the Cornell community. In this capacity the program sponsors events aimed not simply at enhancing Asian American students' sense of identity but also at developing an appreciation for the creative aspects of the heritage of Asian Americans among all members of the Cornell community.

#### Affiliated Faculty

Lee C. Lee, director (Human Development and Family Studies); R. Barker (Agricultural Economics, M. L. Barnett (Rural Sociology and Asian Studies), T. Chaloemtiarana (Southeast Asia Program), P. Chi (Consumer Economics and Housing), M. C. Chou (Asian Studies), B. de Bary (Asian Studies), D. Gold (Asian Studies), J. C. T. Huang (Modern Languages and Linguistics), K. A. R. Kennedy (Ecology and Systematics), J. V. Koschmann (History), L. C. Lee (Human Development and Family Studies), D. R. McCann (Asian Studies), K. March (Anthropology and Women's Studies), T. L. Mei (Asian Studies), V. Nee (Sociology), R. E. Ripple (Education), N. Sakai (Asian Studies), P. S. Sangren (Anthropology), C. L. Shih (Modern Languages and Linguistics), R. J. Smith (Anthropology), M. W. Young (History of Art)

#### Courses

**110 Introduction to Asian American Studies**

Fall. 3 credits.
T R 2:55–4:10. Staff.

This introductory course examines the historical roots of Asians in America—the causes and sources of Asian immigration to the United States, the experiences of these pioneers, and their major role in the development of the western states. It also examines the U.S. response to these Asian immigrants, and analyzes contemporary issues such as self-worth, identity, and the influences of mass media.

**262 Asian American Literature**
Spring. 3 credits.
Staff.
This course explores the diverse worlds of past and present Asian America through critical reading of selected works by Asian American writers. Emphasis is on helping students locate and develop their own points of view with regard to America as a pluralistic society with a diverse and evolving literary heritage. Topics covered include the oral tradition; the creative process for Asian American writers; incarceration and resistance; generation, gender, and community; and diversity and evolution. Students will keep a reading journal with entries focusing on connections among what is read, class discussion, and perceptions of life.

**435 Asian American Images and Stereotypes in Film**
Fall. 3 credits. Prerequisite: AAS 110 or permission of instructor.
Staff.
This course examines images of Asian Americans in domestically produced film and television and analyzes these images with a historical and socio-cultural framework. Within this context, film and media theory are used to assess the impact of these images on viewers. Students' projects will include the creation of a video or a paper using images that more realistically reflect Asian American life and issues.

**610 Asian Americans, Civil Rights, and the Law**
Spring. 3 credits. Prerequisite: Seniors may enroll with permission of instructor.
R. J. Chin.
This course examines major immigration and civil rights laws and Supreme Court cases which have impacted Asians in America. Topics include America's immigration policy; alien land laws and Asian American community development; Japanese American internment; the failure of the Constitution and the redress and reparation movement; Asian women and the law; Asian labor; voting rights and Asian empowerment; anti-Asian violence and the criminal justice system; equal education opportunity and contemporary legal issues in Asian American communities (from the "English only" initiative to new immigration bills). American laws and Supreme Court cases will be analyzed, and the treatment of Asian Americans and other minority groups within the American system will be contrasted.

## Biology and Society

F. H. Buttel, chair, biology and society (275 Clark Hall, 255-6042); R. Battistella, B. Bedford, A. Boehm, R. Boyd, U. Bronfenbrenner, emeritus, S. M. Brown Jr., emeritus, S. Ceci, C. C. Chu, J. Fessenden MacDonald, J. Ford, J. Fortune, C. Geisler, M. Gilliland, S. Gilman, D. Greenwood, J. Haas, M. A. Harwell, R. Howarth, H. C. Howland, S. Jasanoff, K. Kennedy, B. Knuth, A. Lemley, M. Lenzenweger, S. A. Levin, B. A. Lewis, K. S. March, C. McClintock, D. Nelkin, L. Palmer, A. Parrot, D. Pimentel, D. L. Poston, Jr., A. G. Power, W. Provine, H. Ricciuti, emeritus, S. Robertson, R. Root, M. Small, H. Stinson, N. Sturgeon, J. M. Stycos, V. Utermohlen, M. W. Wachsberg, S. White-Means

The biology and society major is offered to students enrolled in the College of Arts and Sciences and the College of Human Ecology. Undergraduates in the College of Agriculture and Life Sciences can develop an approved sequence of courses from the biology and society curriculum under general studies. The major is coordinated for students in all colleges through the biology and society office. Students can get information, specific course requirements, and application procedures for the major from the office in 275 Clark Hall.

Because the major is multidisciplinary, students must attain a basic understanding of each of the several disciplines it comprises. These include introductory courses in the fields of ethics, history or philosophy, biochemistry, ecology, genetics, evolutionary biology, and statistics. In addition, majors are required to take a core course and must develop a theme: a coherent and meaningful grouping of six courses representative of their special interest in biology and society. Students should develop the theme and select the courses in consultation with a member of the biology and society faculty.

There are student advisers and faculty available (according to posted office hours or by appointment) in the biology and society office, 275 Clark Hall or 278 Clark Hall (advising office), to answer questions and to provide assistance.

### Admission to the Major

#### Arts and Sciences and Agriculture and Life Sciences

Students should have completed a year of college-level biology and submit an application during their sophomore year. Juniors are considered on a case-by-case basis. Upper division applicants should realize the difficulties of completing the major requirements in fewer than two years. The application includes (1) a one- to two-page statement explaining the student's intellectual interests in the biology and society major and why the major is consistent with the student's academic goals and interests; (2) a selected theme in the major; (3) a tentative plan of courses fulfilling biology and society requirements, including courses taken and those the student plans to take; and (4) a transcript of work taken at Cornell University and elsewhere if applicable, current as of the date of application.

Acceptance into the major requires completion of the course sequence in introductory biology. Sophomores in the process of completing this prerequisite may be admitted to the major on a *provisional* basis. It is the student's responsibility to assure that final acceptance is granted on satisfactory completion of the introductory biology sequence. Although only introductory biological science is a prerequisite for acceptance, students will find it useful to have completed some of the other requirements (listed below) by the end of their sophomore year, preferably in the first semester.

#### Human Ecology

Human Ecology students should consult the current *Human Ecology Guide* and meet with the college advising coordinator, Virginia Utermohlen, N206a Martha Van Rensselaer Hall, 255-2136.

#### Major Requirements

1) Basic courses
   A. Biological sciences 101–104 or 105–106 or 107–108
   B. College calculus (one course): Math 106, 108, or 111 or any higher-level calculus course
   C. General chemistry (one-year sequence): Chem 103–104, 207–208, or 215–216.
2) Foundation courses (should be completed by the end of the junior year): one course in *each* subject area
   A. Ethics: Bio&Soc 205 (also Bio Sci 205 and Phil 245) or Bio&Soc 206 (also Bio Sci 206 and Phil 246)
   B. History *or* philosophy: Phil 381 or 389, or Bio&Soc 288 (also Hist 288 and Bio Sci 202), or Bio Sci 207 (also Hist 287), or Hist 282
   C. Biochemistry: Bio Sci 231, or 330, or 331
   D. Ecology: Bio Sci 261
   E. Genetics: Bio Sci 281 or 282 or Pl Br 225
   F. Evolutionary Biology: Bio Sci 378
   G. Statistics: Stat 200, ILR 210, Ag Ec 310, Ed 353, Soc 301, Psych 350, Math 372, Econ 319, OR&IE 370, or Stat 601
3) Core course
   A. Phil 286: Science and Human Nature
4) Themes (six courses above the 100 level)
   A. Biology issues (one course) and elective (one course)
   Note: Two biology electives are required for the class of 1990.
   B. Social sciences issues (one course) and elective (one course)
   C. Humanities issues or elective, or additional social sciences elective (one course)
   D. Senior seminar (one course in the senior year). Courses change yearly.

#### Themes in the Major

Students are encouraged to develop their own themes in a concentration area. Examples include biology, behavior, and society; biology and public policy; environment and society; food, agriculture, and society; and health and society. Sample theme areas are available in the biology and society office.

#### Independent Study

Projects under the direction of a biology and society faculty member are encouraged as part of the program of study in the student's theme area. Applications for research projects are accepted by individual faculty members. Students may enroll for 1–4 credits in Biology and Society 375 (Independent Study) with written permission of the faculty supervisor and may elect either the letter grade or the S-U option. Students from the colleges of Arts and Sciences and Agriculture and Life Sciences may elect to do an independent study project as an alternative to, or in advance of, an honors project. Applications and information on faculty research, scholarly activities, and undergraduate opportunities are available in the biology and society office, 275 Clark Hall. Independent study credits may not be used in completion of the major requirements.

#### Honors Program

The honors program is available to biology and society majors from the colleges of Arts and Sciences and Agriculture and Life Sciences and is designed to challenge the academically talented undergraduate student. Students who enroll in the honors program are given the opportunity to do independent study and to

develop the ability to evaluate research dealing with issues in biology and society. Students participating in the program should find the experience intellectually stimulating and rewarding.

**Selection of Students:** During the first three weeks of the fall semester, senior biology and society majors are considered for entry into the honors program by the Honors Program Committee. Applications for the honors program are available at the biology and society office, 275 Clark Hall. To qualify for the honors program, students must explain how the honors work will fit into their overall program, must have an overall Cornell cumulative grade-point average of at least 3.00 and at least a 3.30 cumulative grade-point average in all courses used to meet the major requirements. Students in the College of Agriculture and Life Sciences must also meet the requirements of that college and be selected by one of the existing college committees.

If, after admission to the honors program, a student fails to maintain a high scholastic average, or if for any other reason(s) he or she is considered unsuited for honors work, the student reverts to candidacy for the regular bachelor's degree. The student who does not continue in the honors program receives credit for any work passed in the program but is not eligible for a degree with honors.

**Project Requirements:** The satisfactory completion of a special project and the writing and oral defense of an honors thesis are required. The project must include substantial research, and the completed work should be of wider scope and higher quality than the work normally required for an advanced course.

Initiative for formulation of ideas, developing the proposal, carrying out the study, and preparation of a suitable thesis all lie with the student. Honors projects will be under the direction of two advisers. Candidates must first find a biology and society faculty member willing to serve as the adviser and, together with the adviser, find a second adviser among the faculty at large. The purpose of the second adviser is to guarantee expertise in the subject matter covered by the thesis. Students in the College of Agriculture and Life Sciences must select this adviser from the area in which their thesis will be reviewed.

Students must enroll in Biology and Society 499 for one or both terms of their senior year after consultation with the biology and society thesis adviser. They take from 3 to 5 credits per term with up to a maximum of 8 credits in Biology and Society 499. Students are encouraged to enroll for both terms to give them time to develop a project properly for the thesis. If registering for a two-semester honors project, students must register for the total credits desired for the whole project each term (e.g., 8 credits for the fall term and 8 credits for the spring term). Students should note, however, that Biology and Society 499, because it is a special honors course, is to be taken in addition to those courses that meet the regular major requirements. Honors projects cannot be used to fulfill the senior seminar requirement.

**Honors Thesis:** Students and their advisers should meet regularly during the period of research and writing for the honors thesis. The responsibility for scheduling these meetings, and for carrying out the research agreed on, rests with the student. Advisers are expected to make themselves available for discussion at the scheduled times and to offer advice on the plan of research, as well as provide critical and constructive comments on the written work as it is completed. They are not expected, however, to have to pursue students either to arrange meetings or to ensure that the research and writing are being done on schedule.

There is no prescribed length for a thesis, since different topics may require longer or shorter treatment, but it should normally be no longer than seventy double-spaced, typed pages. When a thesis has been completed in a form satisfactory for purposes of evaluation, the candidate must meet with the thesis advisers and one member of the Honors Program Committee and formally defend the thesis. This should be no later than the last day of classes. Any student would be well advised, however, to provide reviewers with a polished draft at least four weeks prior to the last day of classes and defend his or her thesis well in advance of the end of classes to allow time for revisions. A public presentation of the honors work to faculty and students will be scheduled at the end of the student's last semester.

**Evaluation and Recommendation:** Two copies of the completed and defended thesis (suitably bound in a plastic or hard-backed cover), together with the advisers' recommendations, must be submitted to the Honors Program Committee by the first day of study period of the student's final term.

Following the formal defense of the thesis, the thesis advisers will each submit to the Honors Program Committee a recommendation that includes (1) an evaluation of the honors work and the thesis, (2) an evaluation of the student's academic record in the biology and society major, and (3) a recommendation for or against awarding honors. (For College of Arts and Sciences students, a justification for the level of honors proposed must be included.)

Copies of the thesis and recommendations will be circulated to the Honors Program Committee. As the committee may have little knowledge of the subject area of the thesis, letters of recommendation should be carefully prepared to help the committee ensure consistency in the honors program. Unless there is serious disagreement, the recommendation of the advisers should stand. If there is disagreement, the Honors Program Committee will make the decision after consultation with the interested parties.

## Freshman Writing Seminars

**103 In the Company of Animals**
Spring. 3 credits.
A. Boehm.

**[104 Ecosystems and Ego Systems**
Spring. 3 credits.
M. Gilliland.]

**108 Living on the Land**
Fall. 3 credits.
A. Boehm.

**[109 Women and Nature (also English 106.5)**
Spring. 3 credits.
A. Boehm.]

**[113 Writing as a Naturalist (also English 113)**
Fall. 3 credits.
M. Gilliland.]

**115 The American Way: Addiction and Consumption**
Spring. 3 credits.
M. Gilliland.
For up-to-date information consult the John S. Knight Writing Program brochure.

## Foundation Courses

**A. Ethics** (select one)

**205 Ethics and Healthcare (also Philosophy 245 and Biological Sciences 205)**
Fall. 4 credits. Limited to 80 students. Registered students not attending the first week will be dropped from the course. Open to sophomores, juniors, and seniors; permission of instructor required for graduate students.
Lecs, T R 10:10–11:25, disc, 1 hour each week to be arranged. M. Wachsberg.
Critical *philosophical* analysis of the conceptual frameworks in which ethical problems associated with healthcare can be formulated and solutions evaluated. General topics (with sample issues in parentheses) include knowledge in ethics (ethical skepticism, ethical relativism); proper social allocation of resources for, and within, medicine (entitlement to health care, access to scarce medical resources, cost-benefit analysis); the proper account of basic concepts such as illness, death, autonomy, and personhood (abortion, euthanasia, procreative technologies); and the professional-patient relationship (informed consent, confidentiality, medical paternalism). *Note:* A more detailed description of this course is available in the biology and society office, 275 Clark Hall.

**206 Ethics and the Environment (also Philosophy 246 and Biological Sciences 206)**
Spring. 4 credits. Open to all undergraduates; permission of instructor required for graduate students.
Lecs, T R 10:10–11:25, disc, 1 hour each week to be arranged. M. Wachsberg.
Critical *philosophical* analysis of the conceptual frameworks in which policies affecting the environment are formulated and judged. An introductory section of the course discusses the nature of ethics and the possibility of knowledge in ethics. The first major substantive component of the course deals with the nature and extent of individual and social obligations to spatially distant people, future generations, nonhuman animals, and nonsentient things (e.g., the ecosystem). The second major component of the course deals with the appropriate analysis of the origin of environmental problems and the range of options for their solution. Topics include individual vs. collective goods, cost benefit analysis, and coordination problems. *Note:* A more detailed description of this course is available in the biology and society office, 275 Clark Hall.

**B. History or Philosophy** (select one)

**288 History of Biology (also History 288 and Biological Sciences 202)**
Spring. 3 credits. Prerequisite: one year of introductory biology.
Lecs, T R 10:10–11:30. W. Provine.
An examination of the history of biology, emphasizing the interaction of biology and culture. Original writings of biologists constitute the bulk of reading assignments. This course covers the period from classical antiquity to the present, but primary emphasis is on twentieth-century biology.

**History 282 Science in Western Civilization**
Spring. 3 credits.
P. Dear.

**History 287 Evolution (also Biological Sciences 207)**
Fall. 3 credits. (May not be taken for credit after Biological Sciences 378, Evolutionary Biology.)
W. Provine.

**Philosophy 381 Philosophy of Science: Knowledge and Objectivity**
Fall. 4 credits.
R. Boyd.

**[Philosophy 389 Philosophy of Science: Evidence and Explanation**
Spring. 4 credits.
R. Miller.]

**C. Biochemistry** (select one)

**Biological Sciences 231 General Biochemistry**
Fall. 3 credits.
J. M. Griffiths.

**Biological Sciences 330 Principles of Biochemistry, Individual Instruction**
Fall and spring. 4 credits.
M. Ferger.

**Biological Sciences 331 Principles of Biochemistry, Lectures**
Fall. 4 credits.
J. K. Moffat.

**D. Ecology**

**Biological Sciences 261 Principles of Ecology**
Fall. 4 credits.
R. Howarth, P. Marks, and D. Winkler.

**E. Genetics** (select one)

**Biological Sciences 281 Genetics**
Fall and spring. 5 credits.
T. Fox and M. L. Goldberg.

**Biological Sciences 282 Human Genetics**
Spring. 3 credits.
R. Calvo.

**Plant Breeding 225 Plant Genetics**
Spring. 4 credits.
M. A. Mutschler.

**F. Evolutionary Biology**

**Biological Sciences 378 Evolutionary Biology**
Spring. 4 credits. (2 credits if taken after History 287/Biological Sciences 207.)
R. G. Harrison.

**G. Statistics** (select one)

**Agricultural Economics 310 Introductory Statistics**
Spring. 4 credits.

**Economics 319 Introduction to Statistics and Probability**
Fall. 4 credits.
J. Park.

**Education 353 Introduction to Educational Statistics**
Spring. 3 credits.
J. Millman.

**Industrial and Labor Relations 210 Statistics: Statistical Reasoning**
Fall and spring. 4 credits.

**Mathematics 372 Elementary Statistics**
Fall. 4 credits.

**Operations Research and Industrial Engineering 370**
Fall and spring. 4 credits.

**Psychology 350 Statistics and Research Design**
Fall. 4 credits.
T. Gilovich.

**Sociology 301 Evaluating Statistical Evidence**
Fall. 4 credits.
R. Breiger.

**Statistics 200 Statistics and the World We Live In**
Spring. 3 credits.

**Statistics 601 Statistical Methods I**
Fall. 4 credits.
C. E. McCulloch.

## Core Course

**Philosophy 286 Science and Human Nature**
Spring. 4 credits.
Lecs, M W F 11:15, disc, to be announced. R. Boyd and N. Sturgeon.
An examination of attempts in the biological and social sciences to offer scientific theories of human nature and human potential and to apply such theories to explain important social and psychological phenomena. Topics vary, and may include issues in psychology, such as behaviorism, Freudianism, and artificial intelligence, or issues in the foundations of historical theory, such as methodological individualism and economic determinism, as well as relevant issues in the biological sciences.

## Themes

**A. Issues - Natural Sciences**

**232 Recombinant DNA Technology and Its Applications (also Biological Sciences 232)**
Spring. 3 credits. Disc limited to 20 students. Prerequisite: one year of introductory biology. There is a possible fee for course reading material.
Lecs and discs, M W F 11:15. J. Calvo, J. Fessenden MacDonald, F. H. Buttel.
An introduction to molecular approaches to biology. Basic concepts underlying recombinant DNA technology together with strategies for cloning genes are discussed. Much of the course deals with applications of recombinant DNA technology to basic research and to biotechnology. Applications to be discussed include screening for genetic diseases, plant improvement, and production of insulin, interferon, blood-clotting factors, growth hormones, vaccines, and feedstock chemicals. Scientific, historical, regulatory, social, and ethical issues form the basis of the discussions. Recommended especially for sophomores desiring a firm background in recombinant DNA technology in preparation for taking genetics and biochemistry. Also appropriate for an intelligent layperson who wants to understand some new research discoveries and applications stemming from them.

**347 Human Growth and Development: Biological and Social Psychological Considerations (also Human Development and Family Studies 347 and Nutritional Sciences 347)**
Spring. 3 credits. Prerequisites: Biological Sciences 101 or 109 or equivalent, and Human Development and Family Studies 115 or Psychology 101. Offered alternate years.
Lecs M W F 1:25–2:15. J. Haas and S. Roberston.
A review of major patterns of physical growth from the fetal period through adolescence, with consideration of biological and socio-environmental determinants of growth as well as physical and psychological consequences of variations in growth patterns. An examination of normal patterns of growth is followed by an analysis of major sources of variations in growth (normal and atypical).

**469 Food, Agriculture, and Society (also Biological Sciences 469)**
Spring. 3 credits. Prerequisite: an introductory ecology course or permission of instructor. There is a possible fee for course reading material.
Lecs, T R 1:25–2:40 plus disc to be arranged. A. G. Power.
A multidisciplinary course that deals with the social and environmental impact of food production in the United States and developing countries. Agroecosystems of various kinds are analyzed from biological, economic, and social perspectives. The impacts of traditional, conventional, and alternative agricultural technologies are critically examined in the context of developed and developing economies. Specific topics include pest management, soil conservation, farm labor, land reform, biotechnology, and international food policy.

**Biological Sciences 246 Plants and Civilization**
Spring. 3 credits.
D. Bates.

**Biological Sciences 275 Human Biology and Evolution (also Anthropology 275)**
Fall. 4 credits.
J. Haas and K. Kennedy.

**Natural Resources 201 Environmental Conservation**
Spring. 3 credits.
T. Fahey.

**[Nutritional Sciences 361 Biochemistry and Human Behavior (also Psychology 361)**
Fall. 3 credits.]

**Nutritional Sciences 650 Clinical and Public Health Nutrition**
Spring. 3 credits.
D. Roe.

**B. Issues - Social Sciences**

**[301 Biology and Society: The Biocultural Perspective (also Anthropology 301 and Biological Sciences 301)**
Fall. 3 or 4 credits (3 credits by arrangement with instructor). Biology and society majors are required to take the course for 4 credits. Prerequisite: one year of introductory biology.
Lecs, TBA, disc, TBA Not offered 1989–90.
In modern evolutionary theory, human biology, behavior, and institutions are understood as the ongoing products of interactions between human biological evolution and cultural change. Nevertheless, numerous attempts to examine the evolutionary processes in humans violate key tenets of evolutionary theory, unwittingly reproducing elements of pre-Darwinian views of human nature. After reviewing the pre-Darwinian context and reading *The Origin of Species*, the course explores attempted applications of evolutionary analysis to humans and develops a cultural explanation of the persistence of pre-Darwinian elements in many of them.]

**407 Law, Science, and Public Values (also Government 407)**
Spring. 4 credits.
Lec, M 2:30–4:30; disc, W 1:25 or 3:35.
S. Jasanoff.
This course explores the varied interactions between science and the legal process that have developed in recent years as a result of attempts to bring greater public accountability to the use of science and technology. It examines the activities of both legislatures and courts in controlling science and analyzes the values underlying these initiatives. Three major types of science-law interactions form the focus of the course: regulation of new technologies, judicial review of risk-management decisions, and legal control of professional standards in science and technology. Specific topics include the regulation of toxic chemicals and nuclear power, controversies about biotechnology, reproductive technologies and biomedical research, and science fraud.

**[426 Medicine and the Law**
Fall. 4 credits. Letter grades only. There is a possible fee for copying charges. Not offered 1989–90.
Lecs, M T W 2–2:50. L. Palmer.
The role of law in modern medicine (and the related biomedical sciences) will be examined from the perspective of the social functions of law and medicine. A number of policy and ethical issues will be considered, including the role of hospitals and other health organizations in doctor-patient interactions, the social aspects of physician-patient interactions, the effect of medical malpractice on health-care delivery, legal issues in the care of the newborn and health-care decisions for incompetents and terminally ill patients.]

**City and Regional Planning 480 Environmental Politics**
Spring. 3 credits.
R. Booth.

**City and Regional Planning 656 Land Resources Protection Law**
Fall. 3 credits.
R. Booth.

**[Civil and Environmental Engineering 525 Environmental Law I (also Toxicology 625)**
Fall. 4 credits.]

**[Consumer Economics and Housing 450 Economics of Health, Health-care Expenditures, and Health Policy**
Fall. 3 credits.
S. White-Means.]

**History 233 Agricultural Sciences in America: From Squanto to Biotechnology**
Spring. 4 credits.
M. Rossiter.

**Human Development and Family Studies 258 The Historical Development of Women as Professionals, 1800 to the Present (also Women's Studies 238)**
Spring. 3 credits.
J. Brumberg.

**Human Development and Family Studies 372 Typical and Atypical Intellectual Development**
Spring. 4 credits.
S. Ceci.

**Human Development and Family Studies 488 Development in Context (also Psychology 488)**
Spring. 4 credits.
U. Bronfenbrenner.

**Human Service Studies 315 Human Sexuality**
Spring. 3 credits.
A. Parrot.

**Human Service Studies 325 Health Care Services and the Consumer**
Fall. 3 credits.
A. Parrot.

**[Human Service Studies 330 Ecology and Epidemiology of Health**
Fall. 3 credits.
A. Parrot.]

**Human Service Studies 634 Health Services Organization and Financing**
Fall. 3 credits.
R. Buchanan.

**Human Service Studies 688 Alternative Health and Social Services Delivery Systems: Long-Term Care and the Aged**
Spring. 3 credits.
R. Battistella.

**Natural Resources 400 International Environmental Issues**
Fall. 3 credits.
R. McNeil.

**Nutritional Sciences 325 Sociocultural Aspects of Food and Nutrition**
Fall. 3 credits.
D. Sanjur.

**Nutritional Sciences 445 Community Nutrition and Health**
Spring. 3 credits.
C. Olson.

**Nutritional Sciences 457 National and International Food Economics**
Spring. 3 credits.
E. Thorbecke.

**Psychology 326 Evolution of Human Behavior**
Fall. 4 credits.
R. Johnson.

**Rural Sociology 205 Rural Sociology and International Development**
Spring. 3 credits.
P. McMichael.

**Rural Sociology 324 Environment and Society**
Fall. 3 credits.
F. Buttel.

**C. Issues - Humanities**

**322 Medicine and Civilization**
Spring. 4 credits. Offered alternate years.
Lecs T R 1:25–2:40. S. Gilman.
What is sickness? What is health? Who is the physician? Is a physical illness different from mental illness? Where is medicine practiced? Is being a patient or a doctor different from culture to culture and from age to age? This course will introduce the undergraduate student to the historical and cultural context of medicine. Our sources will range from the texts of ancient Greek medicine to contemporary films and novels dealing with medicine. We will examine the historical and social context of mental illness as well as physical illness from the standpoint of patient, physician, and "society." The class will consist of lecture and discussion. All of the primary readings are available in English.

**Natural Resources 407 Religion, Ethics, and the Environment**
Spring. 3 credits.
R. Baer.

**Philosophy 241 Ethics**
Fall. 4 credits.
T. H. Irwin.

**D. Senior Seminars**

**[401 The History of Biology (also History 447)**
Fall. 4 credits. Limited to 20 students. A Common Learning course. Not offered 1989–90.
Sec, T 2:30–4:30. W. Provine.]

**[402 The History of Biology (also History 448)**
Spring. 4 credits. Not offered 1989–90.
Sec, T 2:30–4:30. W. Provine.]

**404 Human Fertility in Developing Nations (also Rural Sociology 408)**
Fall. 3 credits. Prerequisite: a population course or permission of instructor. Offered alternate years.
Lecs, R 3–5:30. J. M. Stycos.
A review of the major literature dealing with the social causation of variation in human fertility. Emphasis will be on international comparisons and on the methodology of field research.

**406 Biotechnology and Law**
Fall. 4 credits. Limited to 20 students. Recommended: a course in genetics or rDNA, a course in American government or law, or permission of instructor. Fee for course reading materials.
Lec, R 2:30–4:25. S. Jasanoff.
Biotechnology, with its myriad applications in areas such as medicine and agriculture, is developing more rapidly than the social institutions that are capable of controlling it. This course explores the use and potential abuse of biotechnology in areas such as genetic screening and counseling, reproductive technologies, intentional release of genetically engineered organisms, patents, and ownership of human tissue. Particular attention will be given to evolving legal and management strategies for regulating the applications of biotechnology. Readings are from science, medicine, law, and public policy. A research paper is required.

**[414 Population Policies (also Rural Sociology 418)**
Fall. 3 credits. Prerequisite: a population course or permission of instructor. Offered alternate years. Next offered 1990–91.
Lecs, R 1:25–4:30. J. M. Stycos.
The ways in which societies try to affect demographic trends. Special focus is on government policies and programs to influence fertility.]

**415 The Politics of Technical Decisions I (also Sociology 515, City and Regional Planning 541, Government 628)**
Fall. 4 credits.
Lecs, TBA.
Political aspects of decision-making in technical areas. Drawing from recent risk disputes, we will examine the origins and characteristics of "technical politics," the role of experts in government, and the problem of expertise in a democratic system.

**428 Medical Service Issues in Health Administration (also Human Service Studies 628)**
Spring. 3 credits.
Sec, M W F 2:30–3:20. V. Utermohlen.
A survey of the issues that affect interactions between the health-care consumer and the health-care team, including disease processes (how disease occurs and progresses), the health-care team and illness, third-party payment and illness, and resource allocation.

**434 Biotechnology: Lab to Market (also Biological Sciences 434)**
Spring. 3 credits. Offered alternate years.
Sem, W 1:25–4:25.
J. Fessenden MacDonald.
Study of select cases of biotechnology transfer from scientific discoveries to medical products or processes. An examination of the scientific regulatory and social aspects of biotechnology transfer. Background is provided on the molecular biology and applied science aspects of the biotechnology under consideration. Possible topics include human growth hormone, tPA (tissue plasmenogen activator), gene probes, and gene therapy. Readings from various disciplines including scientific papers, government reports, and industrial and legal reports will provide background for class discussions. A research paper and oral prsentations are required.

**442 Social and Political Studies of Science (also Sociology 355 and City and Regional Planning 442)**
Spring. 3 credits.
Lecs, TBA.
A view of science less as an autonomous activity than as a social and political institution. We will discuss such issues as secrecy in science, ethical and value disputes, and the limits to scientific inquiry in the context of the changing relationships between science and the public.

**451 AIDS and Society**
Fall. 3 credits. Limited to 20 students who have been approved by Professor A. van Tienhoven, 102 Rice Hall. A Common Learning course.
W 2:30–4:30. A. van Tienhoven and others.
Discussions of the impact of acquired immune deficiency syndrome (AIDS) on society will consist of faculty seminars on the biology of the virus, the epidemiology of the disease, the legal aspects of controlling the spread of the disease, and the impact of the disease on the performing arts, especially theater. Students will be required to contribute their own seminar presentations.

**[459 Risk Management of Toxic Chemicals**
Fall. 3 credits. Limited to 12 students. Prerequisite: a course in biochemistry or toxicology or permission of instructor. Offered alternate years. Not offered 1989–90.
Sec, T 2:30–4:25.
J. Fessenden MacDonald.
Select cases of chemical-risk communication and risk management by government agencies, communities, industries, and individuals will be reviewed. Potential topics to be included are toxic wastes, groundwater contamination, chemical accidents, and community right-to-know. The roles of social, economic, political, legal, and ethical factors in decision making will be discussed. Readings from the various disciplines, including scientific papers and reports, will provide background for class discussions. A research paper and class presentation are required.]

**461 Environmental Policy (also Biological Sciences 661)**
Fall and spring. 6 credits. Prerequisite: permission of instructor. This is a two-semester course.
Sec, R 2:30–4:30. D. Pimentel.
This course uses an interdisciplinary approach to focus on complex environmental and energy problems. Ten to twelve students, representing several disciplines, investigate significant environmental problems. The research team spends two semesters preparing a scientific report for publication in *Science* or *BioScience*.

**[485 Human Development in Postindustrialized Societies (also Human Development and Family Studies 485)**
Spring. 4 credits. A Common Learning course. Not offered 1989–90.
T R 2:30–4:25. U. Bronfenbrenner.
The course analyzes the implications for human development of the profound economic, technical, and social changes that have been taking place in modern societies, with a special focus on the United States. Particular emphasis is placed on the consequences for human effectiveness of the powerful interplay between changes in family life, on the one hand, and the major institutions of society such as schools, communities, business and industry, and government on the other. The relations between these domains will be examined as they influence, and are influenced by, processes of biological and psychological development throughout the life course. The topic will be treated from the perspective of several relevant disciplines, including human biology, developmental psychology, sociology, anthropology, Japanese studies, economics, American history, and European history.]

### Other Courses

**[300 Biology and Society: Preparation for Research**
Fall. 1 credit. Prerequisite: Philosophy 286 or concurrent enrollment. S-U grades only.
Staff.
For all biology and society majors interested in doing independent study or honors work. Faculty presentations on their current research and the methodologies used in their individual areas. Preparation of project outlines and literature review. Recommended for biology and society juniors.]

**375 Independent Study**
Fall or spring. 1–4 credits. Prerequisite: written permission of faculty supervisor.
Staff.
Projects under the direction of a Biology and Society faculty member are encouraged as part of the program of study within the student's concentration area. Applications for research projects are accepted by individual faculty members. Students may enroll for 1–4 credits in Biology and Society 375 (Independent Study) with written permission of the faculty supervisor and may elect either the letter grade or the S-U option. Students may elect to do an independent study project as an alternative to, or in advance of, an Honors Project. Applications and information on faculty research, scholarly activities, and undergraduate opportunities are available in the Biology and Society office, 275 Clark Hall. Independent study credits may not be used in completion of the major requirements.

**400 Undergraduate Seminar**
Fall or spring. Variable credit. May be repeated for credit.
Staff.
From time to time different seminars on topics of interest to undergraduates are offered. Topics and instructors are listed in the biology and society supplement issued at the beginning of each semester.

**499 Honors Project**
Fall or spring; two-semester projects are acceptable. 3–5 credits each term with a maximum of 8 credits for the entire project. Open only to biology and society honors students in their senior year.
Staff.
Students enrolled in Biology and Society 499 will receive a letter grade at the end of their final term, whether or not they complete a thesis and whether or not they are recommended for honors. Students enrolled for the whole year in 499 may receive either a letter grade for both terms or a grade of "R" for the first term with a letter grade for both terms submitted at the end of the second term. When a student is enrolled for two terms, the student and the thesis adviser must reach a clear agreement at the outset as to which grade will be assigned for the first term and on the basis of what sort of work. Minimally an honors thesis outline and bibliography should be completed during the first term. Applications and information are available in the Biology and Society office, 275 Clark Hall.

## Cognitive Studies Program

F. Keil (psychology), S. McConnell-Ginet (linguistics), codirectors. G. Bilardi, K. Birman, R. Constable, B. Donald, D. Huttenlocher, D. McAllester, P. Panangaden, G. Salton, A. Segre, D. Subramanian, (computer science); J. Condry, B. Koslowski, B. Lust, M. Potts, G. Suci (human development and family studies); L. Babby, J. Bowers, G. Chierchia, G. N. Clements, J. Gair, W. Harbert, J. Huang, J. Kingston, A. Landman, S. McConnell-Ginet, C. Rosen, C. Shih, M. Suñer, L. Waugh, J. Whitman (linguistics); A. Nerode, R. Platek, R. Shore (mathematics); A. Appiah, R. Boyd, C. Ginet, H. Hodes, S. Shoemaker (philosophy); J. Cutting, B. Finlay, E. Gibson, B. Halpern, F. Keil, C. Krumhansl, H. Kurtzman, H. Levin, E. Spelke (psychology)

Cognitive studies is comprised of a number of disciplines that are linked by a major concern with such fundamental capacities of the mind as perception, memory, reasoning, language, and motor control. In the College of Arts and Sciences these disciplines are represented in the departments of Computer Science, Linguistics, Mathematics, Philosophy, and Psychology. Elsewhere in the university they are represented in the Department of Human Development and Family Studies (College of Human Ecology), the Section of Neurobiology and Behavior (Division of Biological Sciences), and the Department of Education (College of Agriculture and Life Sciences).

The issues addressed in cognitive studies arise at several levels. At the broadest level are problems of characterizing such basic notions as "mind," "knowledge," "information," and "meaning." At a more specific level are questions regarding the abstract operating principles of individual components of the mind, such as the components underlying visual perception, language ability, and understanding of concepts. These principles concern the organization and behavior of the components and also how the components develop and change. And at the most specific level are questions about the properties of the elementary computational structures and processes that constitute these components.

Important insights into issues of these kinds have been achieved in recent years as a result of the various cognitive studies disciplines converging in their theoretical and methodological approaches. It is this convergence, in fact, that warrants grouping the disciplines together under the single term "cognitive studies." Even greater progress can be expected in the future as a consequence of increasing cooperation among the disciplines.

### Undergraduate Concentration

Professor H. Kurtzman (psychology), director of undergraduate studies (224 Uris Hall, 255-3835).

The undergraduate concentration in cognitive studies provides a framework for the design of structured, individualized programs of study in this growing interdisciplinary field. Such programs of study are intended to serve as complements to intensive course work in a single discipline as represented in an individual department. It is considered crucial that students gain a strong background in an individual department, independent of their work in the concentration. This background provides both a foundation and a focus for the concentration work.

In light of the importance of a strong background in an individual department, it is required that a student seeking admission to the concentration have completed or plan to complete three courses in one department from among the list of courses below. (Such a student will typically be a major in the department, but being a major is not necessary. The Section of Neurobiology and Behavior counts as a department here.) These three courses are, however, the only requirement for admission. To enter the concentration formally, the student should consult with the concentration director, who will assign the student a concentration adviser (from among the faculty listed above) who has expertise in the student's main areas of interest.

The concentration requires that the student take five courses from departments other than the one from which the student takes the three courses needed for admission to the concentration. These five courses may not all be taken from a single department. The student must gain approval for the selection of five courses from the concentration adviser. The five courses will generally be chosen from among the list below, but other courses (including independent study) are permissible in individual cases.

In addition to assisting in and approving the student's selection of courses, the concentration adviser serves as a general source of information about the field of cognitive studies, relevant resources around the university, and job and graduate school opportunities.

### Graduate Minor

For information, consult the program office (225 Uris Hall, 255-6431).

### Courses

#### Computer Science

**211 Computers and Programming**
Fall or spring. 3 credits.

**212 Modes of Algorithmic Expression**
Fall. 4 credits.

**280 Discrete Structures**
Fall or spring. 4 credits.

**381 (or 481) Introduction to Theory of Computing**
Fall. 4 credits.

**410 Data Structures**
Fall or spring. 4 credits.

**411 Programming Languages and Logics**
Fall or spring. 4 credits.

**472 Introduction to Artificial Intelligence**
Fall. 4 credits.

**482 Introduction to Analysis of Algorithms**
Spring. 4 credits.

**486 Applied Logic (also Mathematics 486)**
Fall. 4 credits.

#### Education (College of Agriculture and Life Sciences)

**210 Introduction to Applied Psychology: Learning and Memory**
Fall. 3 credits.
J. A. Dunn.

#### Human Development and Family Studies (College of Human Ecology)

**333 Cognitive Processes in Development**
Fall. 3 credits.
Staff.

**431 Learning in Children**
Fall. 3 credits.
M. Potts.

**432 Cognitive Development and Education**
Spring. 3 credits.
M. Potts.

**434 The Growth of the Mind: A View from Piaget's Theory**
Spring. 4 credits.
B. Lust.

**436 Language Development (also Psychology 436 and Linguistics 436)**
Spring. 4 credits.
B. Lust.

**438 Thinking and Reasoning**
Fall. 3 credits.
B. Koslowski.

#### Linguistics

**101–102 Theory and Practice of Linguistics**
Fall and spring. 4 credits each term.
Staff.

**264 Language, Mind, and Brain**
Fall. 4 credits.
J. Bowers.

**301–302 Phonology I, II**
Fall and spring. 4 credits each term.
G. N. Clements.

**303–304 Syntax I, II**
Fall and spring. 4 credits each term.
J. Bowers.

**309–310 Morphology I, II**
Fall and spring. 4 credits each term.
Staff.

**316 Introduction to Mathematical Linguistics**
Spring. 4 credits.
F. Landman.

**319–320 Phonetics I, II**
Fall and spring. 3 credits each term.
J. Kingston.

**325 Pragmatics**
Fall. 4 credits.
S. McConnell-Ginet.

**370 Language and Cognition (also Psychology 370)**
Spring. 4 credits.
J. Bowers, H. Kurtzman.

**400 Semiotics and Language**
Spring. 4 credits.
L. Waugh.

**401 Language Typology**
Fall. 4 credits.
C. Rosen.

**412 Process and Knowledge in Speech Perception and Word Recognition**
Spring. 4 credits.
J. Kingston.

**418 Nonlinear Phonology**
Spring. 4 credits.
J. Kingston.

**420 Fundamentals of Speech Acoustics**
Spring. 4 credits.
J. Kingston.

**421–422 Semantics I, II**
Fall and spring. 4 credits each term.
G. Chierchia.

**436 Language Development (also Psychology 436 and HDFS 436)**
Spring. 4 credits.
B. Lust.

### Mathematics

**481 Mathematical Logic**
Spring. 4 credits.

**486 Applied Logic (also Computer Science 486)**
Fall. 4 credits.

**487 Applied Logic II**
Spring. 4 credits.

### Neurobiology and Behavior (Division of Biological Sciences)

**221 Neurobiology and Behavior I: Introduction to Behavior**
Fall. 3 or 4 credits.
T. Eisner and staff.

**222 Neurobiology and Behavior II: Introduction to Neurobiology**
Spring. 3 or 4 credits.
R. Harris-Warrick and staff.

**326 The Visual System**
Spring. 4 credits.
H. Howland.

**396 Introduction to Sensory Systems (also Psychology 396)**
Spring. 3 or 4 credits.
B. Halpern.

**424 Neuroethology**
Fall. 3 credits.
Staff.

**492 Sensory Function (also Psychology 492)**
Spring. 4 credits.
H. Howland, B. Halpern.

### Philosophy

**231 Introduction to Formal Logic**
Fall or spring. 4 credits.
Staff.

**261 Knowledge and Reality**
Fall. 4 credits.

**262 Philosophy of Mind**
Fall. 4 credits.
S. Shoemaker.

**318 Twentieth-Century Philosophy**
Spring. 4 credits.
C. Ginet.

**331 Formal Logic**
Spring. 4 credits.
H. Hodes.

**332 Philosophy of Language**
Spring. 4 credits.
M. Crimmins.

**361 Metaphysics and Epistemology**
Fall. 4 credits.
A. Appiah.

**381 Philosophy of Science: Knowledge and Objectivity**
Fall. 4 credits.
R. Boyd.

**382 Philosophy and Psychology**
4 credits.

**383 Philosophy of Choice and Decision**
4 credits.

**389 Philosophy of Science: Evidence and Explanation**
4 credits.

**431 Deductive Logic**
4 credits.

**433 Philosophy of Logic**
4 credits.

**436 Intensional Logic**
4 credits.

**437 Problems in the Philosophy of Language**
4 credits.

**461 Metaphysics**
Spring. 4 credits.
S. Shoemaker.

### Psychology

**205 Perception**
Spring. 3 credits.
J. Cutting.

**209 Development**
Spring. 4 credits.
Staff.

**214 Knowledge and Reasoning**
Spring. 3 credits.
C. Krumhansl.

**215 Psycholinguistics**
Fall. 3 or 4 credits.
H. Kurtzman.

**305 Visual Perception**
Fall. 4 credits.
J. Cutting.

**308 Perceptual Learning**
Fall. 3 credits.
Staff.

**309 Development of Perception**
Fall. 3 credits.
E. Spelke.

**313 Perceptual and Cognitive Processes**
Fall. 4 credits.
Staff.

**314 The Social Psychology of Language**
Spring. 4 credits.
H. Levin.

**316 Auditory Perception**
Spring. 3 or 4 credits.
Staff.

**332 Biopsychology of Learning and Memory**
Spring. 3 credits.
T. DeVoogd.

**370 Language and Cognition (also Linguistics 370)**
Spring. 4 credits.
J. Bowers, H. Kurtzman.

**396 Introduction to Sensory Systems (also Biological Sciences 396)**
Spring. 3 or 4 credits.
B. Halpern.

**412 Human Experimental Psychology Laboratory**
Spring. 4 credits.
Staff.

**415 Concepts, Categories, and Word Meanings**
Fall. 4 credits.
F. Keil.

**416 Psychology of Language**
Spring. 4 credits.
H. Kurtzman.

**417 The Origins of Thought and Knowledge**
Spring. 4 credits.
F. Keil.

**418 Psychology of Music**
Fall. 3 or 4 credits.
C. Krumhansl.

**425 Brain and Behavior**
Fall. 3 or 4 credits.
B. Finlay.

**436 Language Development (also Linguistics 436 and HDFS 436)**
Spring. 4 credits.
B. Lust.

**465 Mathematical Psychology**
Spring. 4 credits.

**490 History and Systems of Psychology**
Fall. 4 credits.
H. Levin.

**492 Sensory Function (also Biological Sciences 492)**
Spring. 4 credits.
H. Howland, B. Halpern.

### Graduate Courses and Seminars

The following courses and seminars are generally for graduate students only. However, some may be appropriate for advanced undergraduates. The director of the concentration must approve an undergraduate's use of any of these for satisfying the concentration requirements.

**Cog St 773 (also Philosophy 773 and Psychology 773) Proseminar in Cognitive Studies I**
Fall. 2 credits.

**Cog St 774 (also Computer Science 774 and Linguistics 774) Proseminar in Cognitive Studies II**
Spring. 2 credits.

**Cog St 600/700 Graduate Seminars**

**HDFS 600/700 Graduate Seminars**

**Ling 600/700 Graduate Seminars**

**Math 581 Logic**

**Math 655 Mathematical Foundations of Computer Modeling and Simulation**

**Math 684 Recursion Theory**

**Math 688 Automated Theorem Proving**

**Phil 700 Graduate Seminars**

**Psych 500–700 Graduate Seminars**

## College Scholar Program

Dean Lynne Abel, director, 55 Goldwin Smith Hall, 255-3386.

The College Scholar program is described in the introductory section, p. 137.

**397 Independent Study**
Fall or spring. 1–4 credits. Prerequisite: permission of program office.

**499 Honors Research**
Fall or spring. 1–8 credits; a maximum of 8 credits may be earned for honors research. Prerequisite: permission of program director. Each participant must submit a brief proposal approved by the honors committee.

## East Asia Program

140 Uris Hall

K. W. Brazell, director; R. Barker, M. G. Bernal, M. C. Chou, S. G. Cochran, T. Cullen, B. de Bary, E. M. Gunn, C. T. J. Huang, J. V. Koschmann, L. C. Lee, T. P. Lyons, D. R. McCann, J. R. McRae, T. L. Mei, V. Nee, T. J. Pempel, C. A. Peterson, J. R. Piggot, D. L. Poston, N. Sakai, P. S. Sangren, C. L. Shih, T. Shiraishi, V. B. Shue, R. J. Smith, R. J. Sukle, J. M. Swanberg, J. K. Wheatley, J. Whitman, M. W. Young, J. Zeitlin

East Asian studies at Cornell is led by thirty-two faculty members from six colleges, who participate in a program of research and teaching on the civilizations and cultures of East Asia. Courses are offered in most of the humanities and social science disciplines, as well as in the fields of business, city and regional planning, and hotel administration. Comprehensive language courses in Mandarin, Cantonese, and Japanese are taught, in addition to the Full-year Asian Language Concentration (FALCON) in Japanese and Mandarin. A new program has also been developed in Korean language instruction, which offers first- and second-year Korean. Undergraduates major in the Department of Asian Studies and concentrate on the language and culture of one East Asian country, while graduate students may work toward an M.A. in East Asian studies, a dual M.B.A./M.A. degree, or an M.A./Ph.D. degree in a discipline such as agricultural economics, anthropology, city and regional planning, government, history, history of art, linguistics, literature, rural sociology, or sociology. Several fellowships, travel grants, awards, and assistantships are available for graduate students in East Asian studies.

The formal program of study is enriched by a variety of extracurricular activities, including a Chinese language house, various film series, career workshops, art exhibits, and numerous lectures and performances related to East Asia. The Wason Collection in Olin Library is a comprehensive collection of books on East Asia in Western languages, Japanese, and Chinese. The Mary Rockwell Galleries of the Herbert F. Johnson Museum of Art have an excellent collection of East Asian art.

## Freshman Writing Seminars

For information about the requirements for freshman writing seminars, see p. 22. For descriptions of seminar offerings, see John S. Knight Writing Program, p. 319, and consult the John S. Knight Writing Program brochure, available from college registrars in August for the fall term and in November for the spring term.

## Program in History and Philosophy of Science and Technology

The Program in History and Philosophy of Science and Technology (HPST) is an interdisciplinary program that provides a broadly based perspective on science and its place in modern society. The faculty is drawn from numerous science and humanities departments and includes specialists in philosophy, history, and communications. A considerable number of courses is offered each year at the undergraduate level, ranging from historical surveys of physical and biological sciences to the philosophy of science. The cultural and intellectual history of science and technology in particular periods and in both American and European settings, courses in science writing, and the philosophy of quantum physics all contribute to the establishment of a richly structured field of opportunity for those undergraduates who wish to supplement their majors with an integrated yet wide-ranging series of studies that will further their understanding of a powerful social and cultural force.

### The Concentration

The undergraduate concentration in HPST is an interdisciplinary offering granting recognition to students, regardless of major, who have successfully completed before graduation a sequence of courses selected from among a substantial number of offerings. Credit for the concentration is awarded for the completion of at least one course in each of four categories. Among the courses offered for 1989–90 under each category are the following (this listing is not exhaustive; furthermore, certain courses from previous years may also qualify retrospectively):

**History of Science**
- ** Hist. 281 or 282. Science in Western Civilization. Fall and spring. 281, fall; 282, spring. History 281 is not a prerequisite for 282.
- ** Hist. 288 (also Biological Sciences 202 and Biology and Society 288). History of Biology. Spring.

**History of Technology and Applied Science**
- ** EE 250. History of Technology and Engineering. Fall.
- ** EE 292. History of Electrotechnology. Spring.

**Philosophy of Science**
- ** Phil. 286. Science and Human Nature. Fall.
- ** Phil. 381. Philosophy of Science: Knowledge and Objectivity. Fall.
- ** Phil. 384. Philosophy of Physics. Spring.
- ** Phil. 681. Philosophy of Science (open to undergraduates with instructor's permission). Fall.

**Social Dimensions of Science**
- ** Comm. 352. Science Writing for the Mass Media. Fall.
- ** Government 407. Law, Science, and Public Values. Spring.
- ** Hist. 380. Social History of Western Technology. Fall.
- ** Hist. 444 (also Women's Studies 444). Historical Issues of Gender and Science. Spring.
- ** Comm. 666. Perspectives on Science Writing in America (open to undergraduates with instructor's permission). Spring.

Interested students should contact Pat Dean, Program in HPST, 425 Caldwell Hall (tel. 5-6234), for a full listing of courses and for information on available program advisers.

## Human Biology Program

J. Haas (nutritional sciences), director, N206 Martha Van Rensselaer Hall, 255-8001; R. Dyson-Hudson (anthropology), B. Finlay (psychology), J. Fortune (physiology/women's studies), R. Johnston (psychology), K.A.R. Kennedy (ecology and systematics/anthropology), M. LaVelle (ecology and systematics), D. Levitsky (nutrional sciences), D. McClearn (ecology and systematics), D. L. Pelletier (nutritional sciences), W. Provine (ecology and systematics/history), R. Robertshaw (physiology), S. Robertson (human development and family studies), R. Savin-Williams (human development and family studies), M. Small (anthropology)

Human biology integrates the methods and theories of many disciplines, such as biological anthropology, nutrition, neurobiology, physiology, psychology, demography, ecology, genetics, and paleontology, into a comprehensive study of biological diversity in *Homo sapiens.* A central focus of this interdisciplinary approach to the study of the human organism is an understanding of evolutionary processes that explain our biological variation through space and time. The program of study seeks to educate future biological scientists to address the concerns of a society that is becoming more demanding of the scientific community to place its specialized biological knowledge in a broad context. The human biology curriculum is of particular relevance to undergraduate students in premedical and predentistry programs, biological anthropology, nutrition, human development, ecology and systematics, psychology, physiology, genetics, and the health-related sciences. It serves to bring together students with a common interest in humankind as defined from these diverse fields and to provide a forum for student-faculty interaction on various topics relating to human evolution and biological diversity. Human biology is not a major but a curriculum of study that provides majors in various departments with a program for selecting elective courses that deal with the biology of the human species. Students in their junior year may develop a program of study in human biology while majoring in a number of different departmental fields.

### Basic Requirements

The requirements for a program of study in human biology are designed to ensure sufficient background in physical sciences and mathematics to enable the student to pursue a wide range of interests in the fields of modern biological sciences, anthropology, and fields related to the evolution and physical diversity of the human species. Adjustments may be made in these requirements, depending upon the student's academic background and affiliation with colleges and schools within the university.

The basic requirements are one year of introductory biology (Biological Sciences 101–103 plus 102–104 or 105–106 or Biological Sciences 100 offered during the six-week Cornell Summer Session); one year of general chemistry (Chemistry 103–104 or 207–208 or 215–216); one year of college mathematics, including at least one semester of calculus (Mathematics 111–112 or 105–106 or 111–105); at least one semester of organic chemistry lectures (Chemistry 253 or 357–358 or 359–360); one course in genetics (Biological Sciences 281 or 282); one course in biochemistry (Biological Sciences 330 or 331); two semesters of physics (Physics 207–208 or 112–213–214 or 101–102). It is recommended that students planning graduate careers in biological anthropology, psychology, and related fields in the medical and nutritional sciences take a course in statistics. Students should consult their faculty adviser in human biology for help in selecting appropriate courses.

Elective courses should be taken that will enable the student to acquire breadth in the subject matter of human biology outside of their departmental major. Therefore only 6 of the 15 human biology elective credits may also fulfill requirements for the major. Courses should be selected that also provide sufficient exposure to the integration of basic anatomical and physiological sciences with the behavior of individuals and groups within the context of evolutionary theory and ecology. The courses listed below are representative of the offerings in human biology and are included to assist the student in organizing a curriculum of study. They are organized into three groups that reflect the three levels of integration noted above: (1) human anatomy and physiology, (2) human behavior, and (3) human evolution and ecology. Students should choose at least one course from each of these areas of integration. It is anticipated that the student will include in a program of study at least one of the laboratory courses offered. It is expected that a student will take a minimum of 15 credits from among these courses or others that are listed in the brochure available to students upon request.

There is no foreign language requirement for human biology beyond what is dictated by specific departments and colleges. The requirements for the human biology curriculum are set alongside requirements of the undergraduate majors as these are defined by different departments. Students with independent majors may design their own programs of study under the guidelines provided by their college. Although a student may indicate an interest in human biology in the freshman year and be able to obtain early guidance from a faculty adviser representing the curriculum of study, it is more usual for students to establish their course programs in the first semester of the junior year. The student may request one of the faculty advisers in human biology to be the principal adviser, or he or she may have an adviser in the department of the major and seek the advice of a human biology faculty adviser in matters pertaining to satisfaction of the requirements. In certain cases a faculty adviser may represent both the major and the curriculum of study in human biology.

## Courses

### Human Anatomy and Physiology

**Bio S 214 The Biological Basis of Sex Differences (also Women's Studies 214)**
Spring. 3 credits.

**Bio S 274 The Vertebrates**
Spring. 5 credits.

**Bio S 311 Introductory Animal Physiology, Lectures (also Veterinary Medicine 346)**
Fall. 3 credits.

**Bio S 319 Introductory Animal Physiology Laboratory (also Veterinary Medicine 378)**
Fall. 3 credits.

**Bio S 414 Vertebrate Morphology (also Veterinary Medicine 700)**
Spring. 3 credits.

**Bio S 458 Mammalian Physiology**
Spring. 3 credits.

**Bio S 474 Laboratory and Field Methods in Human Biology (also Anthropology 474)**
Spring. 4 credits.

**NS 115 Ecology of Human Nutrition and Food**
Fall or spring. 3 credits.

**NS 222 Maternal and Child Nutrition**
Spring. 3 credits.

**NS 331 Physiological and Biochemical Basis of Human Nutrition**
Spring. 3 credits.

**NS 361 Biochemistry and Human Behavior (also Psychology 361)**
Fall. 3 credits.

**NS 441 Nutrition and Disease**
Fall. 4 credits.

**Psych 322 Hormones and Behavior (also Biological Sciences 322)**
Spring. 3 or 4 credits.

**Psych 425 Brain and Behavior**
Fall. 3 or 4 credits.

**Vet M 331 Medical Parasitology**
Fall. 2 credits.

### Human Behavior

**Anthr 285 Monkeys, Apes, and People: The Comparative Behavior of Primates**
Spring. 3 credits.

**Anthr 476 Human Nature: An Evolutionary Perspective**
Fall. 4 credits.

**Bio S 301 Biology and Society I: The Biocultural Perspective (also Anthropology 301 and Biology and Society 301)**
Fall. 3 or 4 credits.

**Bio S 427 Vertebrate Social Behavior**
Fall. 3 credits.

**B&Soc 404 Human Fertility in Developing Nations (also Sociology 404)**
Fall. 4 credits.

**HDFS 344 Infant Behavior and Development**
Fall. 3 credits.

**HDFS 464 Developmental Theory and Research on Homosexuality**
Fall. 4 credits.

**HDFS 645 Seminar in Infancy: Newborn Behavioral Organization**
Spring. 3 credits.

**HSS 315 Human Sexuality: A Biosocial Perspective**
Fall, spring, or summer. 3 credits.

**NS 325 Sociocultural Aspects of Food and Nutrition**
Fall. 2 credits.

**NS 347 Human Growth and Development: Biological and Social Psychological Considerations (also Human Development and Family Studies 347)**
Spring. 3 credits.

**NS 445 Community Nutrition and Health**
Spring. 3 credits.

**Psych 326 Evolution of Human Behavior**
Fall. 4 credits.

**Psych 425 Brain and Behavior**
Fall. 3 or 4 credits.

**Soc 430 Social Demography**
Spring. 4 credits.

### Human Evolution and Ecology

**Anthr 101 Introduction to Physical Anthropology**
Fall. 3 credits.

**Anthr 203 Early People: The Archaeological and Fossil Record (also Archaeology 203)**
Fall. 3 credits.

**Anthr 214 Humankind: The Biological Background**
Spring. 3 credits.

**Anthr 290 Primate Behavior and Ecology**
Spring. 4 credits.

**Anthr 490 Primates and Evolution**
Spring. 4 credits.

**Bio S 207 Evolution**
Fall. 3 credits.

**Bio S 261 General Ecology**
Fall or spring. 3 credits.

**Bio S 262 Ecology, Environment, and Society**
Spring. 3 credits.

**Bio S 275 Human Biology and Evolution (also Anthropology 275)**
Fall. 3 credits.

**Bio S 301 Biology and Society I: The Biocultural Perspective**
Fall. 3 or 4 credits.

**Bio S 371 Human Paleontology (also Anthropology 371)**
Spring 4 credits.

**Bio S 378 Evolutionary Biology**
Spring. 4 credits.

**Bio S 468 Systems Ecology**
Fall. 4 credits.

**Bio S 481 Population Genetics**
Spring. 4 credits.

**Bio S 482 Genetics and Society**
Spring. 2 credits.

**Bio S 673 Human Evolution: Concepts, History and Theory (also Anthropology 673)**
Fall. 3 credits.

**B&Soc 404 Energy and Ecological Systems**
Fall. 3 credits.

**B&Soc 447 (also History 447) History of Biology–Evolution**
Fall. 4 credits.

**HSS 330 Ecology and Epidemiology of Health**
Fall. 3 credits.

**Psych 326 Evolution of Human Behavior**
Fall. 4 credits.

**Soc 430 Social Demography**
Spring. 4 credits.

**Soc 431 Techniques of Demographic Analysis**
Fall. 4 credits.

**Vet M 331 Medical Parasitology**
Fall. 2 credits.

**Vet M 664 Introduction to Epidemiology**
Fall. 3 credits.

## Independent Major Program

Dean Lynne Abel, director, 55 Goldwin Smith Hall, 255-3386.

The Independent Major Program is described in the introductory section, p. 137.

**351 Independent Study**
Fall or spring. 1–4 credits. Prerequisite: permission of the program office.

**499 Honors Research**
Fall or spring. 4–8 credits; a maximum of 8 credits may be earned for honors research. Prerequisite: permission of program director. Each participant must submit a brief proposal approved by the honors committee.

## Intensive English Program

E. J. Beukenkamp, director

This full-time, noncredit, nondegree program is designed to meet the requirements of foreign students who need to acquire proficiency in English to pursue university-level studies in the United States, as well as for visitors, businessmen, and others seeking competence in the language.

The intensive nature of the program leads to a command of the language in all its aspects—listening, speaking, reading, and writing—in the shortest possible time.

Integrated courses are offered both fall and spring semesters at three levels: beginning (Test of English as a Foreign Language [TOEFL] score below 370), intermediate (TOEFL score below 450), and advanced.

Students who have gained full admission to, or who already are registered in, degree-granting programs at Cornell should consult the section, Modern Languages and Linguistics, for information regarding courses in English as a second language.

The Intensive English Program is administered by the Department of Modern Languages and Linguistics, Cornell University, Morrill Hall, Ithaca, New York 14853-4701, U.S.A. Application materials and information are available directly from the program or by calling 607/ 255-4863.

## International Relations Concentration

Peter Katzenstein, faculty coordinator

Undergraduates interested in an international relations concentration should see Professor Katzenstein (160 Uris Hall).

One of the university's strongest, most diverse fields is international relations. Cornell offers dozens of courses, in many departments and several colleges, that provide a strong education in the field, including courses in government, economics, history, anthropology, rural sociology, nutrition, modern languages and literatures, international comparative labor relations, and many others too numerous to list and keep current.

The purpose of a concentration is to provide a structure for students who have a general interest in the field or who plan to specialize in careers in international law, economics, agriculture, foreign trade, international banking, government service, international organizations, or another cultural or scholarly activity. Some students will major in one of the traditional departments: history, government, economics, foreign literature, and so on. Others will design an independent major. Still others will major in a different discipline, perhaps altogether unrelated, but would like to have a basic understanding of international problems.

For students in any of these categories, the requirements for a *concentration in international relations* are the following six courses or options:

1) Government 181, Introduction to International Relations
2) One appropriate 300-level government course, either in international relations or in the foreign policy of a particular nation
*3) Economics 361, International Trade Theory
*4) Economics 362, International Monetary Theory
5) History 314, History of American Foreign Policy II
6) Any history course dealing with a modern nation, particularly History 379, War and Society: the Origins of the First World War, 1870–1919

*Numbers 3 and 4 can be replaced by choosing two courses from the following:

a) Economics 371, Public Policy and Economic Development
b) Economics 372, Applied Economic Development
c) Economics 373, International Specialization and Economic Development
d) Economics 374, National and International Food Economics

The typical choices among the sequences listed above would be to study European history and government with Economics 361–362 or Third World history and government with Economics 371–374. Reasonable substitutions can also be arranged.

Students are also urged as strongly as possible to acquire full proficiency in, not merely a passing acquaintance with, a modern foreign language. At least a semester of study abroad is advised.

## Center for International Studies

See Interdisciplinary Centers and Programs, p. 17.

## Program of Jewish Studies

S. L. Gilman, acting director and undergraduate adviser (Yiddish literature, German-Jewish history and literature), S. Bacharach (industrial and labor relations, sociology, Jewish thought and social theory), R. Brann (Hebrew and Arabic literatures), W. J. Dannhauser (Jews and Germans, contemporary Jewish thought, Gershom Scholem), S. T. Katz (Jewish history and religion), G. Korman (Holocaust studies, Jewish labor history), A. S. Lieberman (ecology of man and landscape in Israel and the Middle East), D. I. Owen (Near Eastern and ancient Jewish history), D. S. Powers (history of Jews in Islamic lands), G. Rendsburg (biblical studies), E. Rosenberg (Jews in modern European and Anglo-American literature), N. Scharf (Hebrew language), N. Sher (jurisprudence), M. Zamir (Dayan Visiting Professor)

The Program of Jewish Studies is an outgrowth of the Department of Near Eastern Studies. The program has grown out of the conviction that Judaic civilization merits its own comprehensive and thorough treatment and that proper understanding of any culture is inconceivable without adequate knowledge of the language, literature, and history of the people that created it. Accordingly, the offerings in the areas of Hebrew language and literature have been considerably expanded, and courses in ancient, medieval, and modern Jewish history have been added to the program.

Although further expansion of the program is anticipated, it presently enables students to obtain basic instruction and specialization in the fields of Semitic languages; the Hebrew Bible; the apocryphal and Tannaitic literatures; medieval Hebrew literature; modern Jewish thought; modern Hebrew literature; ancient, medieval, and modern Jewish history; and Yiddish language and literature. In some of these fields students may take courses both on graduate and undergraduate levels. Faculty throughout the university provide breadth to the program by offering courses in related areas of study.

### Courses Offered

**Elementary Modern Hebrew I and II (Near Eastern Studies 101–102)**
Fall and spring.

**Elementary Modern Hebrew (Near Eastern Studies 103)**
Summer.

**Introduction to Near Eastern Civilization (Near Eastern Studies 198)**
Spring.

**Intermediate Modern Hebrew (Near Eastern Studies 201–202)**

**Exodus and Conquest (Near Eastern Studies 226)**
Spring.

**Genesis (Near Eastern Studies 228 and 628)**
Fall.

**Jurisprudence and the Holocaust (Near Eastern Studies 244)**
Fall.

**Seminar in Jewish Mysticism: From the Zohar to Hasidism (Near Eastern Studies 246)**
Spring.

**Introduction to Classical Jewish History (Near Eastern Studies 248)**
Fall.

**Introduction to Modern Jewish History (Near Eastern Studies 249)**
Spring.

**Agriculture and Society in the Ancient Near East (Near Eastern Studies 264)**
Spring.

**Modern History of the Middle East: Changing Politics, Society, and Ideas (Near Eastern Studies 294 and Government 358)**
Fall.

**Advanced Modern Hebrew I (Near Eastern Studies 301)**
Fall.

**Akkadian (Near Eastern Studies 333–334)**
Fall and spring.

**Ugaritic (Near Eastern Studies 337–338)**
Fall and spring.

**Introduction to Field Archaeology in Israel (Near Eastern Studies 364)**
Summer.

**Jews of Arab Lands (Near Eastern Studies 346)**
Fall.

**Anti-Semitism in Germany and the Jewish Response (also German Studies 349) (Near Eastern Studies 349)**
Fall.

**The History and Archaeology of Ancient Egypt (Near Eastern Studies 367)**
Fall.

**Topics in the Middle East: (Government 352 and Near Eastern Studies 397)**
Fall.

**Independent Study, Undergraduate Level (Near Eastern Studies 491–492)**

**Independent Study Honors Seminar (Near Eastern Studies 499)**

**Genesis (Near Eastern Studies 628 and 228)**

**Independent Study, Graduate Level (Near Eastern Studies 691–692)**

**Courses Not Offered 1989–90.**

**Elementary Classical Hebrew (Near Eastern Studies 121–122)**

**Modern Hebrew Literature in Translation (Near Eastern Studies 207)**

**Readings in Classical Hebrew Literature: The Art of Biblical Narrative (Near Eastern Studies 221)**

**Readings in Classical Hebrew Literature: The Art of Biblical Poetry (Near Eastern Studies 222)**

**Introduction to the Bible (Near Eastern Studies 223)**

**Judaic Literature in Late Antiquity (Near Eastern Studies 225)**

**Introduction to the Prophets (Near Eastern Studies 227)**

**Classics of Hebrew Literature, a Survey: The Hebrew Literary Tradition (Near Eastern Studies 231 and Comparative Literature 231)**
Fall.

**The Lyrics of Love and Death: Medieval Hebrew Poetry in Translation (Near Eastern Studies 233, Medieval Studies 233, and Comparative Literature 333)**
Spring.

**Muslim Spain: Literature and Society (Near Eastern Studies 234 and Comparative Literature 234)**
Spring.

**Aramaic (Near Eastern Studies 238)**

**The Holocaust: European Jewry, 1933–1945 (Near Eastern Studies 241)**
Spring.

**Israel: History and Geography (Near Eastern Studies 242)**
Summer.

**The History and Archaeology of Ancient Israel to 450 B.C.E. (Near Eastern Studies 243)**
Spring.

**The Emergence of the Modern Jew: 1648–1948 (Near Eastern Studies 245)**

**History of Jewish Textual Interpretation (Near Eastern Studies 247)**

**Ancient Seafaring (Near Eastern Studies 261 and Archaeology 275)**

**Introduction to Biblical Archaeology (Near Eastern Studies 263)**

**Agriculture and Society in the Ancient Near East (Near Eastern Studies 264)**

**Women in Jewish Literature: Tradition and the Literary Imagination (Near Eastern Studies 291 and Comparative Literature 291)**

**Women in the Hebrew Bible (Near Eastern Studies 292 and Women's Studies 292)**

**Judaism and Islam in Comparative Perspective (Near Eastern Studies and Medieval Studies 293)**

**Advanced Modern Hebrew II (Near Eastern Studies 302)**

**Seminar in Modern Hebrew Literature: The Short Story (Near Eastern Studies 303)**

**Seminar in Modern Hebrew Literature: The Novel (Near Eastern Studies 304)**

**The History and Archaeology of the Ancient Near East (Near Eastern Studies 366 and Archaeology 310)**

**Undergraduate Seminar in Biblical Literature: Prophecy in Ancient Israel (Near Eastern Studies 322)**

**Ancient Near Eastern Literature (Near Eastern Studies 332)**

**Readings in Akkadian Texts (Near Eastern Studies 335–336)**

**Special Topics in Near Eastern Studies (Near Eastern Studies 341–342)**

**The Jewish Community throughout History (Near Eastern Studies 343)**

**Age of the Patriarchs (Near Eastern Studies 344)**

**Anti-Semitism in Germany and the Jewish Response (Near Eastern Studies 349 and German Studies 349)**

**Yiddish Literature in Translation (Near Eastern Studies 373 and German Studies 350)**

**Interconnections in the Eastern Mediterranean World in Antiquity (Near Eastern Studies 361)**

**The History and Archaeology of Ebla (Near Eastern Studies 362)**

**The History and Culture of Ancient Mesopotamia (Near Eastern Studies 363)**

**The Divided Monarchy (Near Eastern Studies 365)**
Spring.

**The History and Archaeology of the Ancient Near East (Near Eastern Studies 366 and Archaeology 310)**

**The Shtetl in Modern Yiddish Fiction in English Translation (German Studies 375 and Near Eastern Studies 375)**

**The Yiddish Novel in English Translation (German Studies 377 and Near Eastern Studies 377)**

**Jewish Workers in Europe and America 1789–1948 (Industrial and Labor Relations 381 and Near Eastern Studies 381)**

**Advanced Hebrew (Near Eastern Studies 402)**

**The Double Identity Crisis: German Jewish Women from Rahal Varnhagen to Hannah Arendt (Near Eastern Studies 409, German Studies 409, Society for the Humanities 409, and Women's Studies 409)**

**Readings in Judeo-Arabic: Medieval Judeo-Arabic and Hebrew Poetics (Near Eastern Studies 432)**
Spring.

**The Holocaust Survivor as Author (Near Eastern Studies and German Studies 444/644) Seminar in Jewish Mysticism (Near Eastern Studies 693)**

## John S. Knight Writing Program

S. Davis, M. Gilliland, K. Gottschalk, K. Hjortshoj, N. Kaplan, B. LeGendre, J. Martin, J. Pierpont, S. Siskin, D. Williams

### Freshman Writing Seminar

**137–138 Workshops in English Composition**

137, fall; 138, spring. 3 credits each term. Each section limited to 12 students. S-U grades only.

Hours to be arranged. J. Martin and staff. An intensive writing experience, this course is designed for those whose composition skills need extra attention. In class discussion, students respond to each other's work and analyze brief additional readings. The average weekly syllabus includes small classes, a tutorial with the instructor, and a paper plus revision. Each section of this course is individually shaped to respond to the needs of students in that particular class.

### Advanced Writing Seminars

**201 Writing in the Humanities (also English 286)**

Fall or spring. 3 credits. Limited to 17 students. Registrants must have completed freshman writing requirements. S-U grades with permission of instructor. Carries distribution credit as English 286.

Fall: M W F 11:15–12:05.

Spring: T R 11:40–12:55. S. Davis.

Writing 201 helps students strengthen reading and writing skills valuable in all disciplines and particularly appropriate to the humanities. It also encourages them to reflect on what they do when they interpret and write about works of literature, philosophy, and visual art. Just what happens when we "read" such works—and what do we mean when we claim to understand them? What is interpretation, and how is it best presented in writing to an informed audience? How are conflicts of interpretation resolved? How do historical knowledge and theory affect our interpretations? What kinds of knowledge and self-awareness does study in the humanities yield? Works studied in the course challenge our understanding by their strangeness or their uncanny familiarity. They show Western reason in conflict with its real or supposed opposites—alien humanity, artistic inspiration, illusion, madness, the divine, and the will to power. Readings and viewings may include paintings by da Vinci and Velasquez; novels by Nabokov, Coetzee, and Achebe; Plato's *Gorgias* or *Protagoras*; Nietzsche's Birth of *Tragedy*; Euripides' *The Bacchae*; and Peter Weiss's *Marat/Sade*, the play and the film.

Students in the course write (and often rewrite) 30 pages of papers and confer frequently with the instructor.

**202 Writing in the Social Sciences (also Sociology 202)**

Fall or spring. 3 credits. Limited to 17 students. Prerequisite: at least one social-science course. Carries distribution credit as Sociology 202.

Fall: T R 11:40–12:55. Spring: M W F 11:15–12:05. K. Hjortshoj.

This course offers students the opportunity to strengthen their writing, become more aware of the diverse writing styles and strategies used in the social sciences, and experiment with new approaches to composition and revision. Students will benefit from detailed written comments on their work and from extensive discussion of student writing in class. Initial writing and reading assignments will explore styles of description, the ways in which writers adapt their work to different audiences, the differences between academic and popular writing in a particular field, and methods of revision. Subsequent assignments will include the interpretation of primary data, the review of a documentary film, and writing based on research literature in a field of the student's choice. The instructor will hold frequent individual conferences with students to discuss finished essays and work in progress. During the semester students will write, and often revise, 8 to 10 papers—about 40 pages of finished work.

**203 Writing for Readers/Reading for Writers (also English 283)**

Spring. 3 credits. Limited to 17 students. Prerequisite: permission of the instructor.

T R 10:10–11:25. J. Martin.

This course will develop students' writing abilities by teaching them to become skilled readers of their own work as well as that of others. By studying our own preconceptions about writing and through readings on language and rhetoric, we will work to develop a critical vocabulary for evaluating writing, focusing on such issues as the role of audience, patterns of organization, the varieties of language, and the recognition and manipulation of styles. The class will focus on how writers can respond to the work of others through informed evaluations and criticisms and on how writers can learn from the evaluations of their readers. In considering how a reader can help direct and influence subsequent drafts of an essay, the writer learns to strengthen writing skills by rewriting in response to the reader's critical evaluation. In classes, in editing groups, and in written responses, students will evaluate their own work and that of others to develop effective writing and revising strategies. Students will write and revise at least eight essays during the semester. Qualified students may have the opportunity to continue the practice of reading and responding by becoming tutors in the Writing Workshop's Walk-In Service.

## Latin American Studies

B. J. Isbell, director; L. Benería, R. Blake, D. Block, D. Castillo, T. Davis, G. Fields, M. Gaylord, W. Goldsmith, C. Greenhouse, J. Haas, J. Henderson, T. Holloway, S. Jackson, T. Jordan, E. Kenworthy, S. Kyle, T. Lynch, O. Mitchell, C. Morris, J. Piëdra, T. Poleman, A. Power, B. Rosen, D. Sanjur, D. Solá, J. M. Stycos, M. Suñer, H. D. Thurston, J. Tittler, A. VanWambeke, K. Vernon, L. Williams, F. Young

The Latin American Studies Program encourages and coordinates faculty and student interests in Latin America. A variety of special lectures, films, and seminars supplement the regular course offerings. Undergraduate students may arrange an independent major in Latin American studies, and graduate students may pursue a minor in Latin American studies while majoring in the graduate field of their choice. The College of Arts and Sciences offers Latin American studies courses in anthropology, economics, government, history, and sociology. In addition, there is a varied language, literature, and linguistics curriculum in Spanish, Portuguese, and Quechua. The student may also pursue Latin American studies in the College of Agriculture and Life Sciences; the College of Architecture, Art, and Planning; the College of Human Ecology; and the School of Industrial and Labor Relations.

For further information and a current course listing, students should contact the program office, 190 Uris Hall.

## Law and Society

D. Dunning, director, 240 Uris Hall, 255-6391, C. Bohmer (sociology), C. Carmichael (comparative literature), D. A. Dunning (psychology), C. Greenhouse (anthropology), G. Hay (economics), C. Holmes (history), S. Jasanoff (science, technology, and society), M. Katzenstein (government), D. B. Lyons (philosophy), R. Miller (philosophy), M. B. Norton (history), R. Polenberg (history), D. Powers (Near Eastern studies), J. Rabkin (government), L. Scheinman (government)

The Law and Society Program offers an interdisciplinary concentration for undergraduates who are interested in the law from the perspectives of the social sciences and the humanities: anthropology, comparative literature, economics, government, history, philosophy, psychology, science, technology and society, and sociology. In addition, undergraduates in the College of Arts and Sciences can major in law and society through the Independent Major Program. Students who wish to graduate with a concentration in law and society should consult the director of the program or one of the advisers listed above to plan a coherent program of study. Such a program should ordinarily include at least four courses from the following list. Other courses may be substituted with the approval of the adviser.

**Anthropology 328 Law and Culture**

**Anthropology 329 Power and Culture**

**Anthropology 627 Legal Anthropology**

**Comparative Literature 326 Christianity and Judaism**

**Comparative Literature 427 Seminar on Biblical Law**

**Economics 304 Economics and the Law**

**Economics 354 Economics of Regulation**

**Government 313 The Nature, Functions, and Limits of Law**

**Government 323 The "Fourth" Branch**

**Government 327 Civil Liberties in the United States**

**Government 328 Constitutional Politics: The United States Supreme Court**

**Government 364 Liberty, Equality, and the Social Order**

**Government 389 International Law**

**Government 407 Law, Science, and Public Values**

**Government 414 The Administrative State**

**Government 428–429 Government and Public Policy: An Introduction to Analysis and Criticism**

**Government 457 Comparative Public Law: Legal Controls on Government in Europe and America**

**Government 489 International Law and Regime Development**

**History 275 Crime and Punishment: From the Puritans to Mickey Spillane**

**History 318 American Constitutional Development**

**History 367 Church and State during the Middle Ages**

**History 421 Constitutionalism as a Cultural Problem in America**

**History 430 Law and Authority in American Life**

**Near Eastern Studies 357 Islamic Law and Society**

**Philosophy 319 Philosophy of Marx**

**Philosophy 342 Law, Society, and Morality (also Law 666)**

**Philosophy 446 Topics in Social and Political Philosophy**

**Psychology 265 Psychology and Law**

**Sociology 207 Ideology and Social Concerns**

**Sociology 310 Sociology of War and Peace**

**Sociology 348 Sociology of Law**

**Sociology 372 Sex Discrimination: Law and Social Policy (also Government 306)**

**Sociology 409 Interpretation, Authority, and the Law (also Government 409)**

**Biology and Society 406 Biotechnology, Society, and Law**

**Biology and Society 426 The Social Functions of Law and Medicine**

**City and Regional Planning 480 Environmental Politics**

**City and Regional Planning 656 Land Resources Protection Law**

**Civil and Environmental Engineering 524 Contemporary Issues in Environmental Law and Policy**

**Civil and Environmental Engineering 525 Environmental Law I**

**Consumer Economics and Housing 465 Consumers and the Law**

**Industrial and Labor Relations 607 Arbitration and Public Policy**

**Industrial and Labor Relations 680 Problems in Union Democracy**

## Medieval Studies

Winthrop Wetherbee, director; B. B. Adams, F. M. Ahl, R. Brann, E. W. Browne, R. G. Calkins, A. M. Colby-Hall, R. T. Farrell, A. B. Groos, T. D. Hill, J. H. Jasanoff, J. J. John, R. E. Kaske, W. J. Kennedy, N. Kretzmann, S. Mehrez, G. M. Messing, M. Migiel, C. Morón-Arroyo, J. M. Najemy, J. Noblitt, D. S. Powers, D. M. Randel, S. Senderovich, B. Tierney, W. Wetherbee

Undergraduates interested in Medieval Studies have an opportunity to take courses in the following areas of instruction: medieval Hebrew, Arabic, and Latin; Old English, Middle English, and medieval Irish and Welsh; Old Provençal and medieval French; medieval Spanish and Italian; Old Saxon, Old High German, Middle High German, Gothic, Old Norse (Old Icelandic); Old Russian; comparative literature; medieval art and architecture; medieval history; Latin paleography; medieval philosophy; musicology; comparative Slavic linguistics, comparative Romance linguistics, and comparative Germanic linguistics.

Undergraduates who want to undertake an independent major or a concentration in Medieval Studies should consult the director of the program, 259 Goldwin Smith Hall.

Information for prospective graduate students is contained in the catalog of the Graduate School and in a brochure on Medieval Studies, which can be obtained from the director.

### Freshman Writing Seminars

**101 Aspects of Medieval Culture**
Fall or spring. 3 credits.
Staff.
Under this very general heading a variety of courses are offered each year. A course may center on a particular kind of writing (e.g., biography, narratives of crusades or pilgrimages) or on a particular theme (e.g., the status of the individual, women in medieval society, encounters with other cultures and with the supernatural). In most cases, in addition to exploring the distinctive features of the medieval world view, the course will compare medieval treatments of these forms or themes with the work of modern writers.

**102 The Literature of Chivalry**
Fall, spring, or summer. 3 credits.
Staff.
Romances of chivalry, especially those devoted to King Arthur and the knights of the Round Table, were not only the most popular literature of medieval Europe, but a vehicle for examination of social ideals. This course explores the development of chivalric culture in such works as the *Lais* of Marie de France, the romances of Chrétien de Troyes, French and German stories of Tristan and Perceval, *Sir Gawain and the Green Knight*, Malory's *Morte d'Arthur*, and modern works on related themes. Discussion will investigate fundamental problems raised by these works: the individual in society, the development of the hero, the nature of love, and the conflict of religious and secular ideals.

**103 Legend, Fantasy, and Vision**
Fall or spring. 3 credits.
Staff.
Re-creation of the legendary past, imaginary voyages to other worlds, and the invention of ideal societies are among the ways in which medieval writers attained a perspective on social, scientific, and religious questions. This course will survey examples of such writing from various medieval cultures (e.g., Icelandic sagas, the Irish *Voyage of St. Brendan*, the Anglo-Saxon epic *Beowulf*, French and German romances of King Arthur and his knights, Dante's *Divine Comedy*), and we will consider the continuity of these writings with selected works of modern fiction.

### Graduate Seminars

Courses in various aspects of medieval studies are offered each year in numerous cooperating departments, including Classics, Comparative Literature, English, History, History of Art, Modern Languages and Linguistics, German Literature, Romance Studies, Russian Literature, Music, Near Eastern Studies, and Philosophy, and by the Society for the Humanities. An up-to-date listing of the courses offered in each term will be made available at the Medieval Studies office as soon as the *Course and Time Roster* is published.

## Modern European Studies Concentration

Susan Tarrow, coordinator

Students from any college may choose an undergraduate concentration in modern European studies to complement any major in any college. The purpose of the concentration is to provide a coherent structure for students with an interest in interdisciplinary study in the field of European studies.

The concentration has two tracks:

**European culture** comprises courses in English and European literatures, comparative literature, semiotics, fine arts, music, architecture, film and theater arts, and women's studies.

**European society** comprises courses in European and comparative politics, social and political history, anthropology, sociology, philosophy, women's studies, and related courses in the School of Hotel Administration, the College of Agriculture and Life Sciences, and the School of Industrial and Labor Relations.

The requirements for completion of the concentration are

1) Completion of the European studies interdisciplinary core course (History 283/ Government 343/German 285)
2) Three additional courses in European studies with at least *one* from each of the two tracks. (No more than one of these courses may be used to satisfy requirements for the student's major.)
3) Competence in at least one modern Western European language (i.e., completion of a 300-level course or equivalent with a grade of at least B- or demonstration of an advanced level of competence in an oral proficiency interview test where available).

Students who want to take honors in the concentration must choose a senior seminar in the field and complete an honors essay. All concentrators are encouraged to spend a semester or more in a program of study in Europe and to participate in the Language House Program.

Undergraduates in the College of Arts and Sciences can major in European studies through the Independent Major or College Scholar programs.

For a list of relevant courses and seminars, departmental advisers, and any further information, contact Susan Tarrow, coordinator of the Modern European studies concentration, at the Western Societies Program, 130 Uris Hall (telephone: 255-7592).

## Religious Studies

N. Kretzmann, chairman; C. M. Arroyo, R. Baer, J. P. Bishop, J. Boon, R. Brann, R. Calkins, C. M. Carmichael, K. Clinton, D. Gold, J. Henderson, J. John, S. Katz, T. Kirsch, R. L. Moore, S. O'Connor, D. Owen, D. Powers, D. Randel, G. Rendsburg, H. D. Smith, C. Strout, B. Tierney, A. Wood.

Religious Studies is an interdisciplinary program reflecting a wide variety of academic interests and disciplines. The intention of the program is to provide a formal structure for the study of religions at the undergraduate level. A student may fulfill the requirement for a concentration in religious studies by completing a minimum of four courses that have been approved by an adviser in the area of concentration.

The program is administered by a committee. The chairman is Professor Kretzmann, 320 Goldwin Smith Hall.

Courses in religious studies currently offered include the following:

**Anthropology 343 Religion, Family and Community in China**
Fall. 4 credits.
P.S. Sangren.

**Anthropology 424 Myth, Ritual and Sign**
Fall. 4 credits.
J. T. Siegel.

**Anthropology 619 Anthropological Approaches to the Study of Buddhisms in Asia**
Fall. 4 credits.
A. T. Kirsch.

**Asian Studies 148 Myths, East and West**
Spring. 3 credits.

**Asian Studies 250 Introduction to Asian Religions**
Fall. 3 credits.

**Asian Studies 349 Myth and Literature in India**
Spring. 4 credits.
D. Gold, H. D. Smith.

**Asian Studies 351 The Religious Traditions of India**
Fall. 4 credits.
D. Gold.

**Asian Studies 355 Japanese Religions**
Spring. 4 credits.
Staff.

**Asian Studies 357 Chinese Religions**
Fall. 4 credits.
Staff.

**Asian Studies 440 Meditation Schools of East Asian Buddhism**
Spring. 4 credits.

**Asian Studies 460 Indian Meditation Texts**
Spring. 4 credits.
D. Gold.

**Asian Studies 650 Seminar on Asian Religions**
Spring. 2–4 credits.
Staff.

**Comparative Literature 359 Being, God, Mind: Humanistic Revolutions**
Spring. 4 credits.
C. Arroyo.

**History 346 Religion and Cultural Life of 19th Century Americans**
Spring. 4 credits.
R. L. Moore.

**History 427 Religion, Gender, and Family**
Spring. 4 credits.
M. B. Norton.

**History 438 Francis of Assisi and Franciscans**
Fall. 4 credits.
B. Tierney.

**History 442 Religion and Politics in the United States**
Fall. 4 credits.
R. L. Moore.

**Natural Resources 407 Religion, Ethics, and the Environment**
Spring. 3 credits.
R. Baer.

**Near Eastern Studies 226 Exodus and Conquest**
Spring. 3 credits.
G. Rendsburg.

**Near Eastern Studies 228 Genesis**
Fall. 3 credits.
G. Rendsburg.

**Near Eastern Studies 229 Introduction to the New Testament**
Fall. 3 credits.
P. Perkins.

**Near Eastern Studies 324 The History of the Early Church**
Spring. 4 credits.
P. Perkins.

**Near Eastern Studies 346 Jews of Arab Lands**
Fall. 4 credits.
D. S. Powers.

**Near Eastern Studies 351 Introduction to Islamic Law**
Spring. 4 credits.
D. S. Powers.

**Near Eastern Studies 352 Islam and the West**
Spring. 3 credits.

**Philosophy 263 Reason and Religion**
Spring. 4 credits.
N. Kretzmann.

**Religious Studies 101 Introduction to the Study of Religion**
Spring. 3 credits.
D. Gold and others.

## Russian and Soviet Studies Major

M. G. Clark (emeritus), G. J. Staller, J. Vanek (economics); M. Rush (government); W. M. Pintner (history); W. W. Austin (music); U. Bronfenbrenner (emeritus, psychology); P. Carden, G. Gibian, N. Pollak, M. Scammell, S. Senderovich, G. Shapiro (Russian literature); L. H. Babby, W. Browne, R. L. Leed (Slavic linguistics)

The major in Russian and Soviet studies has the following requirements:

1) Qualification in Russian.

2) At least one course relating to Russia, at the 200 level or above, in each of the following departments: Government, Economics, History, and Russian Literature. (A course in another department may be substituted for one of the above with the consent of the major adviser.)

3) At least three additional courses, at the 250 level or above, in one of the following departments: Government, History, Economics, or Russian Literature. These courses are selected in consultation with the student's adviser and are to be approved as appropriate for a major in Russian and Soviet studies.

Professor Pintner will serve as adviser for all majors, but each student should also designate an additional adviser in the department in which his or her work is concentrated.

### Courses

**[Economics 329 Eastern Europe Today: Economics, Government, Culture (also Government 326 and Russian Literature 329)**
Fall. 4 credits. Not offered 1988–89.
G. Staller, M. Rush, G. Gibian.]

**Economics 367/567 Comparative Economic Systems**
Fall. 4 credits.
G. Staller.

**Economics 381 Economics of Participation and Worker Management**
Fall. 4 credits.
J. Vanek.

**Economics 382 The Practice and Implementation of Self-Management**
Spring. 4 credits.
J. Vanek.

**Economics 681 Self-Management**
Fall. 4 credits.
J. Vanek.

**Economics 682 Seminar on Economics of Participation and Labor-Managed Systems**
Spring. 4 credits.
J. Vanek.

**[German Studies 376 Contemporary Soviet Latvian Literature**
Fall. 4 credits. Taught in Latvian. Not offered 1989–90.
I. Ezergailis.]

**Government 333 Government and Politics of the Soviet Union**
Fall. 4 credits.
M. Rush.

**[Government 446 Comparative Communism**
Fall. 4 credits. Not offered 1989–90.
M. Rush.]

**[Government 481 Foreign Policy of the U.S.S.R.**
Spring. 4 credits. Not offered 1989–90.
M. Rush.]

**History 252 Russian History to 1800**
Fall.
Staff.

**[History 253 Russian History since 1800**
Spring. 4 credits. Not offered 1989–90.
W. M. Pintner.]

**[History 471 Russian Social History**
Spring. 4 credits. Not offered 1989–90.
W. M. Pintner.]

**[History 486 The Formation of the Russian Intelligentsia, 1700–1850**
Fall. 4 credits. Not offered 1989–90.
W. M. Pintner.]

**[History 677 Seminar in Russian History**
Fall or spring. 4 credits. Not offered 1989–90.
W. M. Pintner.]

**Human Development and Family Studies 488 (also Psychology 488) Development in Context**
Spring. 4 credits.
U. Bronfenbrenner.

**[Music 668 Shostakovich**
Spring. 4 credits. Not offered 1989–90.
W. W. Austin.]

**[Polish 131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Not offered 1989–90.
W. Browne.]

**Polish 133–134 Intermediate Course**
133, fall; 134, spring. 3 credits each term.
W. Browne.

**[Russian 101–102 Elementary Course**
101, fall; 102, spring. 6 credits each term. Not offered 1989–90.
R. L. Leed and staff.]

**Russian 103 Freshman Writing Seminar: Classics of Russian Thought and Literature**
Fall or spring. 3 credits.
Staff.

**Russian 104 Freshman Writing Seminar: Nineteenth-Century Russian Literary Masterpieces**
Fall or spring. 3 credits.
Staff.

**Russian 105 Freshman Writing Seminar: Twentieth-Century Russian Literary Masterpieces**
Fall or spring. 3 credits.
Staff.

**[Russian 107 Freshman Writing Seminar: Writers on Writing**
Fall or spring. 3 credits. Not offered 1989–90.
Staff.]

**Russian 121–122 Elementary Course**
121, fall; 122, spring. 4 credits each term.
R. L. Leed and staff.

**Russian 123 Continuing Russian**
Fall or summer. 4 credits.
Staff.

**Russian 201–202 Readings in Russian Literature**
201, fall; 202, spring. 3 credits each term.
N. Pollak or G. Shapiro.

**Russian 203–204 Intermediate Composition and Conversation**
203, fall or spring; 204, spring. 3 credits each term.
L. Paperno and S. Paperno.

**Russian 205–206 Russian for Scientists**
205, fall; 206, spring. 2 credits each term.
S. Paperno, R. L. Leed.

**Russian 301–302 Advanced Russian Grammar and Reading**
L. H. Babby

**Russian 303–304 Advanced Composition and Conversation**
303, fall; 304, spring. 4 credits each term.
L. Paperno and S. Paperno.

**Russian 305–306 Directed Individual Study**
305, fall; 306, spring. 2 credits.
Staff.

**Russian 307 Themes from Russian Culture I**
Fall. 4 credits.
M W F 9:05. G. Shapiro.

**[Russian 308 Themes from Russian Culture II**
Spring. 4 credits. Not offered 1989–90.
G. Shapiro.]

**[Russian 329 Eastern Europe Today: Economics, Government, Culture (also Economics 329 and Government 326)**
Fall. 4 credits. Not offered 1989–90.
G. Gibian, M. Rush, G. Staller.]

**Russian 330 The Soviet Union: Politics, Economics, and Culture (also Economics 330 and Government 330)**
Spring. 4 credits.
T R 2:55–4:10. G. Gibian, M. Rush, G. Staller.

**Russian 331 Introduction to Russian Poetry**
Fall. 4 credits.
N. Pollak.

**Russian 333 Twentieth-Century Poetry**
Spring. 4 credits.
T R 11:40–12:55. N. Pollak.

**Russian 334 The Russian Short Story**
Spring. 4 credits.
S. Senderovich.

**[Russian 335 Gogol**
Spring. 4 credits. Not offered 1989–90.
Staff.]

**[Russian 350 Education and the Western Literary Tradition (also Comparative Literature 350 and College Scholar 350)**
Spring. 4 credits. Not offered 1989–90.
P. Carden.]

**Russian 367 The Russian Novel (also Comparative Literature 367)**
Fall. 4 credits.
T R 9:05 and one hour to be arranged.
G. Gibian.

**[Russian 371 Literature of the Third Wave**
Spring. 4 credits. Not offered 1989–90.
M. Scammell.]

**[Russian 373 Chekhov**
Fall. 4 credits. Not offered 1989–90.
S. Senderovich.]

**[Russian 375 Literature of the Soviet Period 1917–1945**
Fall. 4 credits. Not offered 1989–90.
M. Scammell.]

**[Russian 376 Literature of the Soviet Period 1945–1985**
Spring. 4 credits. Not offered 1989–90.
M. Scammell.]

**[Russian 380 Soviet Dissident Literature**
Fall. 4 credits. Not offered 1989–90.
M. Scammell.]

**[Russian 387 Teaching and Learning: Ideas of Education in the Western Tradition (also Comparative Literature 387)**
Spring. 4 credits. Not offered 1989–90.
P. Carden and guest lecturers.]

**[Russian 388 Ideas and Form in Novels of Social Inquiry (also Comparative Literature 388)**
Spring. 4 credits. Not offered 1989–90.
G. Gibian.]

**[Russian 390 The Power of Nationalism: Expressions of National Feelings in Politics, Literature, History, and the Arts (also Comparative Literature 390)**
Fall. 4 credits. Not offered 1989–90.
G. Gibian and others.]

**Russian 393 Honors Essay Tutorial**
Fall or spring. 4 credits each term.
Staff.

**[Russian 400 Reading the Great Tradition**
Fall. 4 credits. Prerequisite: Russian 202 or equivalent. Recommended: a course at the 300 or 400 level in which reading has been done in Russian. This course may be counted toward the 12 credits of Russian literature in the original language required for the Russian major. Not offered 1989–90.
T R 2:55–4:10. Staff.]

**[Russian 401–402 History of the Russian Language**
401, fall; 402, spring. 4 credits each term. Not offered 1989–90.
L. H. Babby.]

**[Russian 403–404 Linguistic Structure of Russian**
403, fall; 404, spring. 4 credits. Not offered 1989–90.
L. H. Babby.]

**[Russian 409 Russian Stylistics**
Fall. 4 credits. Not offered 1989–90.
S. Senderovich.]

**Russian 413–414 Advanced Conversation and Stylistics**
413, fall; 414, spring. 4 credits each term.
L. Paperno and S. Paperno.

**[Russian 418 Pedagogy and the Nineteenth Century Novel (also Comparative Literature 418)**
Fall. 4 credits. Not offered 1989–90.
P. Carden.]

**[Russian 431 Contemporary Russian Prose**
Fall. 4 credits. Not offered 1989–90.
M. Scammell.]

**[Russian 432 Pushkin**
Spring. 4 credits. Not offered 1989–90.
S. Senderovich.]

**Russian 491 Reading Course: Russian Literature in the Original Language**
Fall or spring. 1 credit.
Staff.

**Russian 492 Supervised Reading in Russian Literature**
Fall or spring. 1–4 credits each term.
Hours to be arranged. Staff.

**[Russian 600 Proseminar: Research Methodology in Russian Literature**
Fall. 4 credits. Not offered 1989–90.
P. Carden.]

**Russian 601 Old Church Slavic**
Fall. 4 credits.
E. W. Browne.

**Russian 602 Old Russian**
Fall. 4 credits.
L. H. Babby.

**Russian 611 Supervised Reading and Research**
Fall or spring. 2–4 credits.
Staff.

**[Russian 619 Seventeenth-Century Russian Literature**
Fall. 4 credits. Not offered 1989–90.
G. Shapiro.]

**[Russian 620 Twentieth-Century Russian Poetry**
Spring. 4 credits. Not offered 1989–90.
N. Pollak.]

**[Russian 621 Old Russian Literature**
Spring. 4 credits. Not offered 1989–90.
S. Senderovich.]

**[Russian 624 Russian Romanticism**
Fall. 4 credits. Not offered 1989–90.
S. Senderovich.]

**[Russian 625 Russian Realism**
Spring. 4 credits. Not offered 1989–90. Also open to advanced undergraduates with permission of instructor.
P. Carden.]

**Russian 633–634 Russian for Graduate Specialists**
633, fall; 634, spring. 4 credits each term.
L. Paperno and S. Paperno.

**Russian 651–652 Comparative Slavic Linguistics**
651, fall; 652, spring. 4 credits each term.
E. W. Browne.

**[Russian 669 Seminar: Dostoevsky**
Fall. 4 credits. Not offered 1989–90.
G. Gibian.]

**Russian 671 Seminar in Nineteenth-Century Russian Literature**
Fall. 4 credits.
T 4:15. S. Senderovich.

**[Russian 672 Seminar in Twentieth-Century Russian Literature**
Spring. 4 credits. Not offered 1989–90.
P. Carden.]

**Russian 673 The Russian Nabokov**
Fall. 4 credits. Also open to advanced undergraduates.
R 4:15–6:15. M. Scammell.

**[Russian 674 Solzhenitsyn**
Fall. 4 credits. Not offered 1989–90.
M. Scammell.]

**[Russian 702 Graduate Seminar: Neglected Masterpieces of Short Russian Prose**
Spring. 4 credits. Not offered 1989–90.
G. Gibian.]

**[Serbo-Croatian 131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Not offered 1989–90.
W. Browne.]

**Serbo-Croatian 133–134 Intermediate Course**
133, fall; 134, spring. 3 credits each term.
W. Browne.

**[Ukrainian 131–132 Elementary Course**
131, fall; 132, spring. 3 credits each term. Not offered 1989–90.
W. Browne.]

## Concentration in Science, Technology and Society

The undergraduate concentration in Science, Technology and Society (STS) is designed for students who wish to engage in a systematic, interdisciplinary exploration of the role of science and technology in modern societies. The concentration is intended for students with varied academic interests and career goals. It offers majors in the natural sciences and engineering an opportunity to explore the social, political, and ethical implications of their selected fields of specialization. At the same time it offers students majoring in the humanities and social sciences a chance to study the processes, products, and impacts of science and technology from varied disciplinary perspectives. Drawing on course offerings in several departments, programs, and colleges, the STS concentration permits students to develop an individualized program of study closely related to their major field. STS courses are organized under four major headings: social relations of science and technology; science, technology, and public policy; ethics and values in science and technology; and biology, medicine, and society.

To satisfy the requirements for the STS concentration, students must complete a minimum of four courses selected from the following list. At least one course should be chosen from the list of core courses. The remaining three course should be chosen in consultation with an STS faculty adviser and must be drawn from at least two of the areas described below.

Interested students may obtain further information about advisers and courses by contacting the STS main office, 632 Clark Hall, 255-3810. (This concentration is awaiting approval by the College of Arts and Sciences in fall 1989.)

**STS Core Courses**
Govt 407 Law, Science, and Public Values (also Bio & Soc 407)
Hist 281–282 Science in Western Civilization
Hist 380 Social History of Western Technology
Soc 355 Social and Political Studies of Science (also Soc 355, CRP 442)
Soc 515 The Politics of Technical Decisions (also CRP 541, Mgmt NBA 686, Bio & Soc 415, Govt 628)

**Social Relations of Science and Technology**
BioSci 202 History of Biology (also Hist 288, Bio & Soc 288)
Comm 360 Science Writing for Public Information
Comm 626 Impact of Communication Technologies
Engr 101 The Computer Age (also CS 101)
Engr 250 Technology in Western Society (also EE 250)
Engr 292 The Electrical and Electronic Revolutions (also EE 292)
Hist 287 Evolution (also BioSci 207)
Hist 686 Historiography of Science and Technology
Hist 481 History of Modern Physics (also Physics 481)
ILR 626 Science and Innovation in Industry
Nat Res 331 Beyond the Year 2000 (also Govt 331)
Physics 206 War and Peace in a Nuclear Age
Psyc 277 Psychology of Sex Roles (also Wms Stds 277, Soc 277)
Rur Soc 208 Appropriate Social Technologies
Rur Soc 324 Environment and Society

**Science, Technology, and Public Policy**
Bio&Soc 406 Biotechnology and Law
Bio&Soc 426 Medicine and the Law
CEE 598 Decision Making in Engineering Systems
Econ 302 The Impact and Control of Technological Change (also Govt 302, CRP 440)
Engr 400 Science, Risk, and Public Policy (also T&Am 400, Econ 358)
Govt 381 The Politics of Defense Spending
ILR 374 Technology and the Worker

**Ethics and Values in Science and Technology**
BioSci 205 Ethics and Medicine (also Phil 245, Bio&Soc 205)
BioSci 206 Environmental Ethics (also Phil 246, Bio&Soc 206)
Engr 360 Ethical Issues in Engineering
HSS 600.7 Professional Ethics and Public Policy
NatRes 407 Religion, Ethics and the Environment
Phil 381 Philosophy of Science: Knowledge and Objectivity

**Biology, Medicine, and Society**
Bio&Soc 232 Recombinant DNA Technology and Its Applications
Bio&Soc 322 Medicine and Civilization
BioSci 301 Biology and Society: The Biocultural Perspective
BioSci 469 Food, Agriculture, and Society
Bio&Sci 482 Human Genetics and Society
Entomol 370 Pesticides and the Environment
NatRes 401 Environmental and Natural Resources Policies
Psych 387 Health and Disease

## Social Relations Major

A. T. Kirsch, director of undergraduate studies, 200 McGraw Hall, 255-3505; C. Greenhouse, D. Hayes, B. J. Isbell, W. W. Lambert, V. Nee, L. Smith-Lovin, R. Williams

The major in social relations is offered jointly by the Department of Anthropology and the Department of Sociology. It provides the student with basic competence in cultural anthropology, social psychology, and sociology and gives particular emphasis to the common methods of research in these disciplines. The student is expected to obtain a grasp of the common interests and unique insights of the three disciplines, and in the senior Social Relations Seminar is expected to integrate aspects of their theory and data.

Students seeking admission to the program should have completed the following prerequisites: (a) Sociology 101 or Anthropology 212; (b) Psychology 101 or 280 or Sociology 280; and (c) Sociology 301 or Psychology 350 or an equivalent course in statistics.

The major calls for a minimum of 36 credits of course work as follows:

1) two related courses to be selected in consultation with the major adviser, in each of the three following disciplines: anthropology, social psychology, and sociology. Ordinarily these courses should be at the 300 level or above, but in special circumstances the adviser may approve one or two courses at the 200 level.
2) at least one course in methods, to be selected from the following: anthropological methods, techniques of experimentation (psychology), methods in sociology, philosophy of science or of social science, or advanced statistics
3) at least one course in theory related to social relations
4) the senior seminar in social relations (Sociology 497 or Anthropology 495)

A list of the courses that may be used to satisfy the requirements for a major in social relations is available from any of the major advisers.

## Society for the Humanities

Jonathan Culler, director

**Fellows for 1989–90**

**Ian Balfour** (York University)

**Fredric Bogel** (Cornell University)

**Ellen Burt** (University of California-Irvine)

**Geraldine Friedman** (Purdue University)

**Lynn Hunt** (University of Pennsylvania)

**Steven Kaplan** (Cornell University)

**Colin Lucas** (Oxford University)

**Ilja Luciak** (Virginia Polytechnic Institute)

**Maurice Meissner** (University of Wisconsin-Madison)

**Chantal Mouffe** (College Internationale de Philosophie)

**Mary Beth Norton** (Cornell University)

**Reeve Parker** (Cornell University)

**Andrew Ross** (Princeton University)

**David Stark** (University of Wisconsin-Madison)

**John Weiss** (Cornell University)

The Society annually awards fellowships for research in the humanities. The Fellows offer, in line with their research, informal seminars intended to be exploratory or interdisciplinary.

These seminars are open to graduate students, suitably qualified undergraduates, and interested auditors. Students who want credit for a seminar should formally register in their own college. Persons other than those officially enrolled may attend as visitors with permission of the Fellow.

The Society's theme during 1989–90 will be **Producing, Inventing, and Remembering Revolution**.

**409 Discontinuity, Revolution, and Satire, 1640–1790 (also English 433)**
Fall. 3 credits. Limited to 17 students.
T 12:20–2:15. F. Bogel.
How are accounts of revolutionary activity shaped by prevailing models of discontinuity and continuity, and how does revolutionary activity affect these models? Moving between the English and French Revolutions, this course explores such topics as: theories of causality, consciousness, and personal identity; models of historical development; theories of the sublime, the grotesque, and the fragmentary; and ideas of motion, force, and inertia in cosmological theory. Authors include Milton, Dryden, Hobbes, Locke, Leibniz, Newton, Swift, Hume, Bolingbroke, and Burke.

**410 Language, History, Criticism: The Writings of Walter Benjamin**
Spring. 3 credits. Limited to 17 students.
M 12:20–2:15. I. Balfour.
This course will address critical, philosophical, and autobiographical texts by Benjamin with special attention to theory of language, practical criticism, history, and their interrelation. The critical texts will include historical understanding as well as historical action. The seminar will take Benjamin texts as points of departure for a theory and practice of criticism generally. Seminar and written work may address other relevant authors and issues arising from the reading of Benjamin. Knowledge of German not required.

**411 Facing the Revolution: Chénier, Hugo, Baudelaire (also Romance Studies 479)**
Fall. 3 credits. Limited to 17 students.
T 2:30–4:25. E. Burt.
Readings in histories of the French Revolution and in selected poems will lead to questions concerning the relationship between revolutions in the political and poetical domains. Readings in Michelet, Kant, De Toccqueville, Chénier, Hugo, Baudelaire.

**412 Mechanism, Replication, Revolution, and Satire, 1640–1790 (also English 436)**
Spring. 3 credits. Limited to 17 students.
F 12:20–2:15. F. Bogel.
The late seventeenth and early eighteenth centuries in England were marked by a profound exploration of the phenomena of mechanism and replication. What forms does the imagination of revolutionary possibility—in politics, in literature, in philosophy, and elsewhere—take in such a context? We will ask such questions while investigating the fields of political theory; printing technology; acting and mimicry; literary imitation; forgery and counterfeiting; literary satire, parody, and mock-forms; and aesthetic theories of original and unmechanizable production. Authors include Descartes, Hobbes, Dryden, Newton, Swift, Pope, Diderot, Young, La Mettrie, Boswell, and Burke.

**413 The People of the French Revolution (also History 406)**
Fall. 4 credits.
T R 1:25–3:20. S. Kaplan, C. Lucas.
The Revolution was nothing if not a mass event. Mass action played a critical part in shaping its course. The "re-invention" of France affected the population down to each village and demanded decisions from virtually every adult. This course will focus on the people as actors: their collective memory, their ideologies, their repertoire of intervention, the formation of a popular political culture. It will examine the encounters between the people (in their multiple incarnations) and the revolutionary elites who sought to articulate and appropriate the Revolution. A major theme will be the tension between the ambitions to achieve liberty and equality.

**416 Romanticism and Revolution: The (Gender) Politics of Aesthetics (also Comparative Literature 416)**
Fall. 3 credits. Limited to 17 students. Knowledge of French required, knowledge of German desirable.
M 12:20–2:15. G. Friedman.
In order to rethink the received notion of Romanticism's relation to history, this interdisciplinary seminar will explore inscriptions, oblique as well as direct, of the French Revolution and the Revolution of 1848 in Western European writing. We will be concerned with how the vexed relations among history, politics, aesthetics, and gender both constitute and disarticulate textual strategies for representing revolutionary and counter-revolutionary force. Authors will include Edmund Burke, the Schlegels, Wordsworth, Coleridge, Baudelaire, Marx, Proudhon, and Keats.

**417 The Democratic Revolution and Modern Politics**
Fall and spring. 3 credits. This course will meet for nine weeks in the fall and five weeks in the spring. Limited to 17 students.
W 10:10–12. C. Mouffe.
Explorations of the nature and possibilities of modern democracy, focusing first on the nineteenth century articulation of liberalism and democracy and then on problems posed by the modern extension of the democratic revolution and the formulation of a project of radical and plural democracy. How can the "post-modern" critique of essentialism help elaborate a pluralistic conception of citizenship?

**418 The French Revolution as a Cultural Revolution**
Spring. 3 credits. Limited to 17 students.
W 10:10–12:00. L. Hunt.
This course will consider the impact of the French Revolution on various cultural forms, ranging from paintings and novels to weights and measures, and including theories of sexuality as well as political culture. We will be aiming to answer the question: Was the French Revolution a cultural revolution? At the same time, we will be asking what the French Revolution as an experience might tell us about modern and post-modern theories of culture.

**419 Politics and Gender in Seventeenth-Century Anglo-America (also History 410; Women's Studies 573)**
Fall. 3 credits. Limited to 17 students.
W 2:30–4:25. M. Norton.
An examination of the transition from the political world of Sir Robert Filmer (in which the family and the state were seen as analogous and the state was believed to have originated in the family) to the political world of John Locke (in which the family and the state were viewed as having had separate origins and were regarded as distinctly different in organization and rationale). Through readings in primary and secondary materials, the class will focus on the implications of this transition for both women and men. A major theme will be the development of the modern distinction between the "public" realm of men and the "private" realm of women.

**420 Revolutionary Theory and Practice in Central America**
Spring. 3 credits. Limited to 17 students.
R 2:30–4:25. I. Luciak.
This course examines the revolutionary reality of Central America. The main focus of the seminar will be on Nicaragua and El Salvador but we also discuss Guatemala and Honduras. We begin with an analysis of the major forces in the formation of Latin American revolutionary theory ranging from Marxism to Liberation Theology. The theoretical literature will then serve as a guide in the exploration of the practice of revolutionary movements in Central America.

**421 The Theatre of Revolution: The Politics and Poetics of Spectacle (also English 448)**
Fall. 3 credits. Limited to 17 students.
F 12:20–2:15. R. Parker.
Study of various writings on acting, theater, painting, public eloquence, and political spectacles by Rousseau, Diderot, Burke, Hume, Reynolds, Schiller, and Blake, in conjunction with plays composed or produced in the revolutionary climates of England and France, including Schiller's *The Robbers*, Beaumarchais' *The Marriage of Figaro*, Voltaire's *Brutus*, Shakespeare's *Macbeth*, Wordsworth's *The Borderers*, and Büchner's *Danton's Death*, and with paintings and *fêtes révolutionnaires* of David. The focus throughout will be the public, political role of theatrical art, eloquence, and spectacle in a period when the very notion of the "public" was ripe with the ferment of republican revolution. French and German texts will, where possible, be read in English translation.

**422 The Social Outcomes of Socialist Revolution**
Spring. 3 credits. Limited to 17 students.
M 2:30–4:25. M. Meisner.
The work of the seminar will center on an attempt to identify common or similar features in the socio-historical conditions which have produced politically successful socialist (i.e., Communist) revolutions and pursue a comparative inquiry into the nature of the bureaucratically dominated social formations they have yielded, societies which cannot easily be labeled either "socialist" or "capitalist." Countries which have experienced indigenous communist revolutions—especially Russia, China, Yugoslavia, and Cuba—will be the main areas of inquiry.

**423 Technoculture in the Age of Information**
Spring. 3 credits. Limited to 17 students.
T 12:20–2:15. A. Ross.
In this seminar we will be discussing the cultural practices which have been generated around new reproductive, information processing, knowledge, and media technologies. After a grounding in the social and cultural histories and theories associated with the information revolution, we shall try to make sense of the popular or counter-cultural responses to the new systems of surveillance that are increasingly a feature of the postindustrial order. We will also look at popular, mostly science fiction, texts in film, fiction, video, and television.

**425 Remaking Socialism: Contested Meanings in a Mixed Economy (also Sociology 363)**
Fall. 3 credits. Limited to 17 students.
R 12:20–2:15. D. Stark.
This course examines the problems and prospects of restructuring the socialist economies of Eastern Europe. It addresses obstacles to creating markets administratively from above and explores recent efforts from below to create social spheres autonomous from the state. Drawing especially on recent ethnographic studies, it analyzes conceptions of work, worth, and honor where diverse processes of evaluation and justification compete and co-exist.

**426 Religion, Gender, and the Family in Early Modern Anglo-America (also Women's Studies 574; History 422)**
Spring. 3 credits. Limited to 17 students.
W 2:30–4:25. M. Norton
Continues the themes developed in Soc Hum 419/Hist 410 (fall 1989), but with primary reference to religion and the family. The course will examine the role of Puritan ideas in shaping the "modern" concept of the family and women's and men's roles therein; the emerging notion of the family as "private" and separated from the broader society; the regulation of moral and sexual behavior by the state, and the reasons for such regulation; and the eventual severing of the theoretical connections among religion, the family, and the state by the time of the American Revolution.

**428 Writers of the Revolution (also English 430)**
Spring. 3 credits. Limited to 17
R 12:20–2:15. R. Parker.
Readings in polemical and poetical works by various English writers of the 1790s and after, such as Burke, Blake, Wollstonecraft, Paine, Godwin, Wordsworth, Coleridge, Shelley, and Carlyle, read in the context of the ongoing politics, national and international, of the French Revolution. A major interest will be to test the notion of the romantic poet as one whose power depends on the transcendence, through disillusionment, of intense political concerns. Students should have either some general (undergraduate) knowledge of the English Romantic period and the French Revolution or be ready to do collateral work.

**430 The Legacy of Resistance in Postwar Europe (also History 431)**
Spring. 3 credits. Limited to 17 students.
T 2:30–4:25. J. Weiss
For some of its participants, the antifascist Resistance became an attempt to carry out a revolution in European politics, society, and personal relations. The course will deal with how Resistance visions became articulated, how they were challenged, and how their reformulation in response to those challenges contributed to shaping postwar political culture. The course will examine contemporary films, literature, and political writings as well as later scholarship that examines the functioning of the collective memory and the process of commemoration.

## South Asia Program

N. Uphoff, director; R. Barker, R. Colle, E. W. Coward, E. Erickson, S. Feldman, J. W. Gair, A. Gold, D. Gold, D. Holmberg, J. Jasanoff, V. Kayastha, S. Jasanoff, M. Katzenstein, K. A. R. Kennedy, B. Lust, B. G. MacDougall, K. March, F. McCarthy, B. Miller, C. Minkowski, S. Mohanty, A. Nussbaum, S. O'Connor, B. Oja, S. Oja, P. Olpadwala, T. Poleman, D. Sisler, D. Sudan, M. Walter, S. White

The South Asia Program coordinates research, teaching, and special campus events relating to Bangladesh, India, Pakistan, Nepal, and Sri Lanka. The program faculty includes members from a variety of disciplines, including agricultural economics, agricultural engineering, anthropology, architecture, city and regional planning, communication, comparative religion, ecology and systematics, English, government, history of art, human ecology, international agriculture, linguistics, rural sociology, and science, technology, and society. Undergraduates with a special interest in the region may major in Asian studies with a South Asian concentration. The languages regularly offered are Bengali, Hindi, Nepali, Sinhala, Tamil, Telugu, Urdu, Sanskrit, and Pali. Cornell is a class A member of the American Institute of Indian Studies (AIIS), and undergraduates as well as graduate students are eligible for AIIS intensive language program fellowships in India. For courses available in South Asian studies and details on the major, see the Department of Asian Studies listing in this volume.

Students who want further information on courses and research opportunities should direct questions to the program office, 170 Uris Hall.

## Southeast Asia Program

R. Barker, director; B. R. Anderson, T. Chaloemtiarana, E. W. Coward, Jr., G. Diffloth, G. S. Fields, M. F. Hatch, H. K. Khanh, A. T. Kirsch, S. J. O'Connor, T. Shiraishi, J. T. Siegel, K. W. Taylor, J. U. Wolff, D. K. Wyatt

Southeast Asia studies at Cornell is included within the framework of the Department of Asian Studies. Fourteen full-time faculty members in the colleges of Arts and Sciences and Agriculture and Life Sciences participate in an interdisciplinary program of teaching and research on the history, culture, and societies of the region stretching from Burma through the Philippines. Courses are offered in such fields as agricultural economics, anthropology, Asian studies, government, history, history of art, linguistics, music, and rural sociology. Instruction is also offered in a wide variety of Southeast Asian languages: Burmese, Cambodian, Cebuano (Bisayan), Indonesian, Javanese, Tagalog, Thai, and Vietnamese, for which Foreign Language Area Studies Fellowships are available. Intensive instruction is offered in the Full-Year Asian Language Concentration (FALCON) in Indonesian at the beginning and intermediate levels. Intensive advanced Indonesian language programs are held from June through August in Indonesia each summer. The formal program of study at Cornell is enriched by a diverse range of extracurricular activities, including an informal weekly luncheon seminar, the concerts of the Gamelan Ensemble, a weekly Southeast Asia film series, and public lectures. The John M. Echols Collection on Southeast Asia, in Olin Library, is the most comprehensive collection on this subject in America.

Undergraduates may major in Asian studies with a focus on Southeast Asia and its languages, or they may elect to take a concentration in Southeast Asia studies by completing 15 credits of course work. Students interested in exploring these opportunities should consult the director, Southeast Asia Program, 120 Uris Hall.

## Statistics Center

The Cornell Statistics Center coordinates a university-wide program in statistics and probability. Students interested in graduate study in probability and statistics should apply to the Field of Statistics or to one of the other graduate fields of study that offer related course work. A list of courses in probability and statistics recommended for graduate students in the Field of Statistics can be found in the description of the Cornell Center for Statistics in the section "Interdisciplinary Centers and Programs." Further information can be obtained from the director of the Statistics Center in Caldwell Hall.

## Women's Studies Program

I. Hull, acting director; L. Abel, J. Allen, D. Bathrick, S. Bem, L. Beneria, J. Bernstock, J. Blackall, J. Brumberg, D. Castillo, A. Cook, I. DeVault, I. Ezergailis, J. Farley, S. Feldman, F. Firebaugh, J. Fortune, G. Fraser, N. Furman, J. Gerner, J. Ginsburg, M. Hite, D. Holmberg, B. J. Isbell, M. Jacobus, M. Katzenstein, J. Locey, S. McConnell-Ginet, K. March, B. Martin, H. Mullen, M. B. Norton, S. Samuels, R. Savin-Williams, M. Small, L. Smith-Lovin, L. Waugh

Women's Studies, a university program in the College of Arts and Sciences, has three goals: to encourage the development of teaching about women and sex roles for women and men; to examine assumptions about women in various disciplines and to develop, systematize, and integrate back into the disciplines new knowledge about women; and to cooperate in public service activities with the extension divisions of the university.

The program is guided by a board composed of faculty, staff, and students at Cornell and members of the Ithaca community who have an intellectual interest in women's studies. Program facilities in Uris Hall, including a reading room–lounge and a seminar room, are open to all interested students and faculty.

### Program Offerings

Undergraduate students in the College of Arts and Sciences who want to major in women's studies can design their own major through the College Scholar or Independent Major programs. Any graduate student in the university may elect a women's studies minor. Students interested in either the major or the minor should obtain further information from the Women's Studies Office, 332 Uris Hall.

The program typically sponsors a noncredit seminar/study group for graduate students and faculty to facilitate sharing of knowledge across disciplinary lines. During the academic year the program also sponsors frequent public lectures dealing with social, political, and intellectual issues in women's studies.

### The Concentration

Undergraduate students who wish to graduate with a concentration in women's studies should consult with the director of undergraduate studies in women's studies to select an adviser. In collaboration with that adviser, students will design a coherent program in women's studies to complement their major. Before graduation students will submit to their adviser a final summary on their completed work in women's studies. The concentration is open to students in all colleges of the university.

The concentration in women's studies consists of four courses. Typically, two courses are selected from the list of general courses and two from the list of specialized courses (see below). Freshman writing seminars, related courses, or independent study in women's studies may be substituted for specialized courses in the concentration with the prior approval of the adviser.

For further information or to meet with the director of undergraduate studies to select an adviser, students should contact the Women's Studies Office, 332 Uris Hall, 255-6480.

### Distribution Requirement

Distribution requirements are satisfied by any two women's studies courses in any of the following categories:

*Social sciences:* (a) any two of 208, 218, 238, 244, 277, 305, 321, 353, 363, 366, 406, 408, 425, 428, 450, 454, 480 or (b) any one of 210, 365, plus one from list a.

*History:* any two of 227, 238, 273, 307, 357, 426, 438.

*Humanities:* (a) any two of 248, 251, 281, 297, 348, 349, 363, 365, 366, 390, 402, 404, 445, 456, 460, 476, or (b) any one of 210, 365, 493, plus one from list a.

### Courses

Keeping in mind that women's studies is interdisciplinary, it is useful to distinguish six core areas, or foci, within the program: ideology and culture, institutions and society, history, literature and the arts, psychology and human development, and natural sciences.

The program offers undergraduate and graduate courses in all of the core areas, both independently and in cooperation with other departments. Women's studies courses are grouped into four categories to assist students in selecting the level or degree of specialization suited to their program:

I) Freshman writing seminars

II) General courses (which provide a general introduction to a broad subject area or core focus within women's studies)

III) Specialized courses and seminars (which have smaller enrollments and focus upon more specialized topics within each of the core areas)

IV) Related courses and seminars (which need not focus exclusively upon women's studies issues but include significant consideration of sex differences, feminist criticism, or gender)

### I. Freshman Writing Seminars

**105 Feminine and Masculine Ideals in Japanese Culture (also Asian Studies 105)**
Spring. 3 credits.
M W F. 10:10. Staff.
In its long history, Japanese culture has developed a large number of role models—the aristocrat, poet-priest, warrior, entertainer, "salary man," and "education mama"—and idealized them in its literature and art. Using these ideals as its subject matter, the seminar will give students practice in reading texts closely, analyzing ideas, and writing various types of papers. Through studying Japanese concepts of femininity and masculinity, the students will not only explore a new culture but will also gain new perspectives on their own cultures.

**106 Women and Writing (also English 105)**
Fall and spring. 3 credits.
Hours to be arranged. Staff.
What is a woman? How does she confront her personal experience? Does she play a special role in history, in our definition of society, or in our understanding of language and literature? This course will explore the relation between women and writing. We will discuss writings by and about women, debate our attitudes toward feminism, and analyze the relevance of these questions to our own written work. Individual sections will emphasize different aspects of the relation between women and writing. Which section to choose should depend on your own interest in exploring how women appear in private or autobiographical writings, historical contexts, and/or literary works. Further information on specific sections is available in the freshman writing seminar office. Textual overlap among the sections is kept to a minimum so that students can take more than one Women and Writing seminar during their time at Cornell.

**[107 The Family in American History (also History 107)**
3 credits. Not offered 1989–90.
M. B. Norton.]

### II. General Courses

**210 Introduction to Women's Studies**
Fall. 4 credits. Limited to 20 students. Permission of instructor required .
Lec, M 12:20–2:15; disc, W 12:20 or 1:25.
K. King.
This course introduces students to critical approaches in feminist scholarship to the cultural, socioeconomic, and political situation(s) of women. Particular attention will be paid to the conceptual challenges and dangers posed by attempts to study women without taking account of relations between race, class, and gender in ideological and social formations. Readings will draw on work in various disciplines and will include literary texts and visual images.

**[214 Biological Basis of Sex Differences (also Biological Sciences 214)**
3 credits. Prerequisite: one year of introductory biology. Next offered fall 1990.
The structural and functional differences between the sexes are examined. Emphasis is placed on mechanisms of mammalian reproduction. Where possible, special attention is given to studies of humans. Current evidence on the effects of gender on nonreproductive aspects of life (behavior, physical and mental capabilities) is discussed.

The course is intended to provide students with a basic knowledge of reproductive endocrinology and with a basis for objective evaluation of sex differences in relation to contemporary life.]

**218 The Economics of Gender (also City and Regional Planning 218)**
Spring. 3 credits.
T R 3:30–5. L. Beneria.
An introduction to economic analysis of gender relations and women's work, with emphasis given to understanding different analytical approaches to these issues. Although the course focuses mostly on the United States, some basic questions regarding international development and women will be dealt with.

**[227 Modern American Sex Roles in Historical Perspective (also History 227)**
4 credits. Not offered 1989–90. Each section limited to 20 students. Intended primarily for sophomores.
M. B. Norton.
A reading and discussion course. The class will begin by examining sex roles in the United States in the 1980s, looking at a variety of sources like popular magazines and contemporary commentaries. We will then move backwards in time in an attempt to uncover the roots of current attitudes. The students will help to determine which topics the class will investigate in detail.]

**244 Language and the Sexes (also Linguistics 244)**
Spring. 4 credits.
Hours to be arranged.
S. McConnell-Ginet.
This course explores connections between language (use) and gender/sex systems, addressing such questions as the following. How do sex and gender affect the ways we speak, the ways we interpret and evaluate speech? How do sociocultural differences in women's and men's roles affect their language use, their relation to language change? What is meant by sexist language? How does conversation structure the social worlds of women and men? Readings draw from work in linguistics, anthropology, philosophy, psychology, literature, and general women's studies and feminist theory.

**[273 Women in American Society, Past and Present (also History 273)**
Spring. 4 credits. Not offered 1989–90.
M. B. Norton.
A survey of women's experiences in America from the seventeenth century to the present. Among the topics to be discussed are women's familial roles, the changing nature of household work, the women's rights movement, employment of women outside the home, and contemporary feminism.]

**277 Psychology of Sex Roles (also Psychology 277 and Sociology 277)**
Spring. 3 credits. Limited to 200 students. Prerequisite: an introductory psychology course.
T R 2:55–4:25. S. Bem.
Addresses the question of why and how adult women and men come to differ in their overall life-styles, work and family roles, personality patterns, cognitive abilities, etc. This broad question is examined from five perspectives: (a) the psychoanalytic perspective; (b) the biological perspective; (c) the historical and cultural evolutionary perspective; (d) the child development perspective; and (e) the social-psychological and contemporaneous perspective. Each of these perspectives is also brought to bear on more specialized phenomena relating to the psychology of sex roles, including psychological androgyny, women's conflict over achievement, the male sex role, egalitarian marriage relationships, gender-liberated childrearing, female sexuality, homosexuality, and transsexualism.

**321 Sex and Gender in Cross-Cultural Perspective (also Anthropology 321)**
Fall. 4 credits.
Lec M F 12:20, Disc W 9:05, 10:10, 11:15, 12:20, 1:25, 2:30. K. S. March.
An introduction to the study of sex roles cross-culturally and to anthropological theories of sex and gender. The course examines various aspects of the place of the sexes in social, political, economic, ideological, and biological systems to emphasize the diversity in gender and sex role definition around the world.

**[353 Feminism: State and Public Policy (also Government 353)**
4 credits. Not offered 1989–90.
M. Katzenstein.
The course examines aims and strategies of the feminist movement in the United States and the response of both society and the state to feminist claims. It is thus a course about political protest and the capacity of American political institutions to promote and shape, as well as to counter social change. In examining the law and public policy on such issues as job discrimination, wife battery, rape, abortion, etc., the course explores the contradictions between, and the congruence of, the dual ideals of individual choice and group equality.]

**365 Directions in Feminist Theory (also Government 362)**
Spring. 4 credits. Limited to 25 students.
T R 1:25–2:40. C. A. Martin.
This course is designed to explore developments in contemporary feminist theory with particular attention to feminist critiques, reinterpretations, and uses of Marxist, psychoanalytic, and (post)structuralist thought. We will be concerned with the ways in which radical feminist questions converge with developments in these fields and the ways in which feminist analyses challenge some of the most basic assumptions embedded in these and other social theories. We will consider the approaches of a variety of feminist thinkers to the relations between a gender, race, class, and sexual divisions.

## III. Specialized Courses and Seminars

**208 Gender, Race, and Medical "Science" (also Africana Studies 208 and Anthropology 208)**
Fall. 3 credits.
T R 11:40–12:55. G. Fraser.
The course will examine the social construction of race and gender in the medical sciences from the turn of the century to the present. Beginning with readings that propose a new view of scientific medicine as a system of signs and symbols and as culturally embedded, we will proceed to an examination of some of the following topics: racism and experimentation: the treatment of venereal disease and tuberculosis; the demise of social childbirth; the body as a medical product; menstruation as pathology; the monitored mind: women and psychiatry; the political economy of health care; medical authority; the training of medical students; political anatomy of the body; sites of resistance; and alternative systems: cross-cultural case studies.

**238 The Historical Development of Women as Professionals, 1800–Present (also Human Development and Family Studies 258)**
Spring. 3 credits.
Hours to be arranged. J. Brumberg.
The historical evolution of the female professions in America (midwifery, nursing, teaching, librarianship, home economics, and social work) as well as women's struggles to gain access to medicine, law, the clergy, and the academy. Lectures, reading, films, and discussion are geared to identifying the cultural patterns that fostered the conception of gender-specific work and the particular historical circumstances that created these different work opportunities. The evolution of professionalism and the consequences of professionalism for women, family structure, and American society are also discussed.

**[248 Major Nineteenth-Century Women Novelists (also English 247)**
4 credits. Not offered 1989–90.
J. Blackall.
This course gives particular attention to the biographical and social circumstances surrounding the novels, their critical reception within their own time, and the themes and subject matter that women novelists elected to write about. The reading includes masterworks and certain other works that exerted a major imaginative impact on contemporary readers. Readings are Austen, *Persuasion*; C. Bronte, *Jane Eyre*, E. Bronte, *Wuthering Heights*, Gaskell, *Mary Barton*; Stowe, *Uncle Tom's Cabin*; Eliot, *The Mill on the Floss*; Gilman, *The Yellow Wallpaper*; Chopin, *The Awakening*. In addition, two twentieth-century works, Jean Rhys's *Wide Sargasso Sea* and Edith Wharton's *Ethan Frome*, will be approached as imaginative sequels to *Jane Eyre* and *Wuthering Heights* respectively.]

**251 Twentieth-Century Women Novelists (also English 251)**
Spring. 4 credits.
Hours to be arranged. S. Samuels.
This course will be particularly concerned with self-consciously experimental novels and with some of the questions about women's experience, perspective, and language raised by recent feminist criticism. We will read works by Virginia Woolf, Jean Rhys, Djuna Barnes, Doris Lessing, Toni Morrison, Margaret Atwood, Alice Walker, and others.

**281 Gender and Society in the Muslim Middle East (also Near Eastern Studies 281)**
Fall. 3 credits.
T R 1:25–2:40. L. Peirce.
This course examines conceptions of gender in traditional Muslim society and the ways in which they have affected the experiences of Muslim women. Topics to be covered include the position of women in the religious law of Islam, female seclusion and the harem, social hierarchies and family structure, sexuality, and the problem of Western perceptions of Muslim women. Although attention will be given to gender issues in the contemporary Middle East, the course focuses on the historical roots of the present-day situation of Muslim women. Readings include primary sources in translation; visual materials (slides, movies) form an integral part of the course.

**[297 Beyond the Stereotype: Images of Women in the Middle East (also Near Eastern Studies 297)**
Not offered 1989–90.
S. Mehrez.
We will be reading nonfictional works on women, as well as works of fiction on and by women, in an attempt to re-evaluate certain stereotypic functions and roles ascribed to Middle Eastern women throughout history. Our starting point will be the Koran, the text that continues to regulate the formation of the image of women. We will investigate the degree of acceptance or rejection of such an imposed image as it manifests itself in contemporary texts.]

**307 African-American Women from Slavery to Freedom (also History 303)**
Spring. 4 credits.
T R 11:40–12:55. M. Creel.
This course thematically explores the history of African-American women from a sociopolitical perspective. Topics include the images and depictions of Black women, how Black women have engaged in political struggle, race progress vs. feminism, the relationship between racism and sexism, and Black women in family life.

**[310 Feminist Constructions and Practices of Science Fiction**
Not offered 1989–90.
K. King.]

**312 Feminisms and Writing Technologies**
Spring. 3 credits.
Hours to be arranged. K. King.
This course concerns the stories feminists and others tell about the boundaries and distinctions between the oral and the written. In it we approach the entity "women's writing" by asking particular kinds of questions: How do we talk about women's writing in a world in which two-thirds of those who can't read and write are women? How do the writing technologies we use tie us into this world system? How are distinctions between the oral and written used to create political identities and encode race/class/sex? The point of the course is to allow us to become savy about the stories about the oral and the written and to make our own feminist interventions into this "field of production." Readings will be critically analyzed, and both analytical and creative writing will be used in response.

**348 The Female Literary Tradition: Wollstonecraft to Woolf (also English 348)**
Fall. 4 credits.
T R 11:40–12:55. M. Jacobus.
A survey of the (mainly British) female literary tradition from the French Revolution to early twentieth-century modernism. The course will trace the dual legacies of romanticism and revolution through their monstrous and gothic forms, exploring their repressed presence in Victorian women's fiction until they surface again in the writing of the 1848 revolution and after. As well as the social protest literature of the mid-nineteenth century, we will look at the literature of the (female) uncanny, through which Victorian women writers confront their inner worlds, before turning to the emergence of the "new woman" and Utopian women's fiction at the end of the nineteenth century and to the beginnings of the twentieth-century modernist experiment by women. Texts will include works by Wollstonecraft, Austen, Mary Shelley, Emily and Charlotte Bronte, Eliot, Barrett Browning, Gaskell, Gilman, Schreiner, and Woolf.

**[349 Women in Medieval Literature (also German Studies 348 and Comparative Literature 349)**
4 credits. Not offered 1989–90.
B. Buettner.
A study of women and their roles in the social order as portrayed in the literature of the Middle Ages. Readings will illustrate the range of attitudes toward women from asceticism and antifeminism to their idealization in courtly love lyric and romance. We will examine woman's putative influence in literature, both positive and negative, on man and society and the debates over woman's "proper" attitude and role. Works in English translation will include a play by Hroswitha of Gandersheim, *the Nibelungenlied*, selected Mariological and mystical poems, courtly love lyric, *Parzival, Tristan and Isolde*, and *The Book of the City of Ladies*.]

**363 Representations of Women in Ancient Greece and Rome (also Classics 363)**
Fall. 4 credits.
M W 2:30–3:45. L. S. Abel, J. Ginsburg.
Classical authors created and left behind powerful images of women and of what women ought and ought not to be. These writers also provide fleeting insights into the real lives of women in antiquity. In this course, we will examine the ancient evidence to trace the origin of some Western attitudes about women and to analyze the assumptions that underlie the representations of women in ancient Greece and Rome. How are these images constructed and how do they work? How can we use the ancient evidence to assess the real lives and social roles of women in antiquity?

**[366 Feminism, Sexuality, and the Politics of Identity (also Government 366)**
4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
Hours to be arranged. C. A. Martin.
The purpose of this course is (1) to explore the theoretical and political significance within feminism of sexuality and sexual identity; (2) to examine attempts to define the construct "lesbianism"; (3) to consider the limitations of "identity politics"; and (4) to analyze the implications of class, race, and ethnicity for a "sexual politics."]

**[390 The Fiction of Modern Hispanic Women (also Spanish 390)**
Taught in Spanish. Not offered 1989–90.
D. Castillo.
This course will survey a representative sampler of novels and short stories by twentieth-century Hispanic women. We will be giving particular attention to typical themes and subject matter relating to women's experience and perspectives in the context of questions raised by recent feminist criticism. Readings will include works by Silvina Ocampo, Rosario Ferre, Susana Torres Molina, Carmen Martin Gaite, Carmen Gomez Ojea, Luisa Valenzuela, Cristina Peri Rossi, Mercedes Salisachs, and Albalucia Angel.]

**[402 Black Women and Their Fictions (also English 401, Comparative Literature 401)**
4 credits. Not offered 1989–90.
H. Gates.
This course intends to define the precise shape and contours of the tradition of Black women's writing in English. How do Black women use language to represent their experiences? How does their writing resemble or diverge from the Black male tradition? How does Black feminist theory differ from white feminist theory? These are the concerns of this class. Readings are by Harriet E. Wilson, Frances Harper, Anna Julia Cooper, Nelly Larsen, Zora Neale Hurston, Gwendolyn Brooks, Ann Petry, Paule Marshall, Toni Morrison, Toni Cade Bambara, Gayle Jones, Alice Walker, Gloria Naylor, and Jamaica Kincaid.]

**404 Women Artists (also History of Art 404)**
Fall. 4 credits. Prerequisite: permission of instructor. Auditing not permitted.
T 2:30–4:30. J. Bernstock.
This seminar will be devoted to a study of the work of women artists from antiquity to the present. The works of the most important women artists from each period will be studied in relation to the changing roles of women in society and to the art produced contemporaneously by men.

**406 The Culture of Lives (also Anthropology 406)**
Spring. 4 credits.
K. March.
This seminar explores the insights provided by biographical-autographical accounts into both the particularities of individual lives and into the wider social and cultural forms of those lives. We will look at the place of life histories within development of anthropology as a discipline from the earliest explorers' accounts, through the florescence of their importance in early American ethnographic description, and into the contemporary resurgence of interest in personal narratives as windows onto both the social or cultural construction of the person and the personal construction of the social or cultural. Course materials draw heavily upon women's lives and their representations, both to contrast women's and men's accounts and to underscore the special significance of women's narratives in anthropology.

**408 Gender Symbolism (also Anthropology 408)**
Spring. 4 credits.
K. March.
This seminar looks at how cultural meaning is constructed about biological sex differences. We begin from the presumption that sex difference and gender are culturally defined as a system of categories and meanings interacting with people's cognitive, intellectual, and affective experience of their worlds. The seminar has two primary conceptual objectives: (1) to analyze the relations among gender symbols and (2) to explore the relations between these symbols and the social worlds of the people who believe in them.

**[425 Gender Relations and Social Transformation (also Rural Sociology 425)**
3 credits. Students in the endowed colleges must register for Women's Studies 425. Not offered 1989–90.
S. Feldman.
A comparative analysis of women's contribution to domestic-household and agricultural labor as production practices change. The course emphasizes the configuration of various economic and social sectors and their realignments in and between countries. Changes occur in response to technology transfer, the transformation of the labor market, the international division of labor, and changing family relations.]

**[426 Undergraduate Seminar in Early American History (also History 426)**
4 credits. Not offered 1989–90.
M 1:25–3:20. M. B. Norton.
Topic for 1988: women and the family in early America. An intensive examination of women's experience in America before 1820. Whites, Blacks, and Indians will all be considered. Each student will write a research paper based on primary sources.]

**[428 Spirit Possession, Shamanism, Curing, and Witchcraft (also Anthropology 428)**
4 credits. Limited to 20 students. Prerequisite: background in anthropology or women's studies. Not offered 1989–90.
D. Holmberg.
An anthropological consideration of witchcraft, shamanisms, and cults of spirit possession, with special attention to the play of gender. Classic anthropological accounts of non-Western societies will be considered along with ethnographic and historical accounts of Western societies. The course also addresses general problems in the study of women and gender and the anthropology of myth, ritual, and symbolism.]

**438 Female Adolescence in Historical Perspective, 1815–1960 (also HDFS 415)**
Fall. 3 credits. Limited to 12 students. Permission of instructor required.
W 1–3:30. J. Brumberg.
The changing nature of female adolescence in the United States is explored using nineteenth-century primary sources available in the Department of Manuscripts and University Archives. Olin Library multidisciplinary readings and discussions are designed to uncover the nature of women's childhood, patterns of authority within the family, cultural attitudes toward sexuality, female friendships, courtship patterns, and rites of passage into adulthood.

**[445 Jane Austen, Elizabeth Gaskell, and George Eliot (also English 445)**
4 credits. Not offered 1989–90.
J. Blackall.
A close focus on five masterworks of the nineteenth century—Austen's *Pride and Prejudice* and *Emma*; Gaskell's *Life of Charlotte Bronte* and *Wives and Daughters*; and Eliot's *Middlemarch*—with particular regard for the circumstances, biographical and social, from which these works emerged. We will examine these writers' perception of the institution of marriage; their delineation of the problem of attaining self-fulfillment and self-expression within a domestic and rural community, especially for women; and their concepts of a "heroine" and a "hero." Emphasis will be on reading and discussion. Participants will keep journals reflecting their personal responses to the books and their pursuit of chosen topics, these notes leading to one final essay of moderate length.]

**450 Seminar in the Psychology of Gender (also Psychology 450)**
Fall. 4 credits. Limited to 15 junior and senior psychology majors. Prerequisite: Psychology/Sociology/Women's Studies 277 or permission of instructor.
W 2:30–5. S. Bem.
This seminar is designed primarily for advanced students in psychology who have a strong interest in empirical research. Each time the course is offered, a particular research topic will be selected by the instructor for consideration in depth. The topic will be announced at the first meeting of the course. All interested students should attend that meeting.

**[453 Victorians and Modernists: Literary Legends from Wilde to Woolf (also English 453)**
4 credits. Not offered 1989–90.
S. Siegel.]

**454 Women, Revolution, and Socialism (also Asian Studies 454)**
Spring. 4 credits.
Hours to be arranged. C. White.
The course will examine the theory and practice of revolution and socialist development from the viewpoint of women revolutionaries and socialist thinkers as well as male socialist writers on the "Woman Question." The theoretical focus will be on the articulation of revolution in gender relations with other revolutionary struggles against colonial, class, and ethnic domination. Case study material includes the Soviet Union, China, Vietnam, Mozambique, Central America (Nicaragua and Guatemala), and Malaysia. Issues include marriage law reform, land reform and cooperativization, military struggle, political mobilization and leadership, and nonrevolutionary forms of everyday resistance.

**[456 Edith Wharton, Willa Cather, and Eudora Welty (also English 456/656)**
4 credits. Not offered 1989–90.
J. F. Blackall.
A representative selection of the best fiction of three distinguished American women writers with particular regard for their representation of women in relation to environment, for their characteristic themes and materials, and for their practice of the craft of fiction. Readings: Wharton, *The House of Mirth*, Summer, *The Age of Innocence*, and selected short stories; Cather, *O, Pioneers!*, *A Lost Lady*, *The Professor's House*, and selected short stories; and Welty, *The Robber Bridegroom*, *The Golden Apples*, *The Optimist's Daughter*, and selected short stories. Discussion format with three essays.]

**[460 Gender in Nineteenth-Century America (also English 461/661)**
4 credits. Not offered 1989–90.
S. Samuels.
A study of the relation between historical experience and literary texts. We will examine from the perspectives of both historical and literary analysis the rise of women writers, the novel's preoccupation with conflicts between men and women, the cultural uses of feminism and antifeminism, and the impact of the new woman. Bringing traditional literary texts—novels and poetry—into dialogue with "nonliterary" writings like journalism, political treatise, social reform manifestos, and etiquette books, we will draw on the methods and theories of cultural history and literary criticism to ask how gender relations and the history of women bear on the plots, discourses, and images of literary texts. A tentative reading list would include Susannah Rowson's *Charlotte Temple*, Lydia Maria Child's *The Mother's Book*, Catherine Beecher's *A Treatise on Domesticity*, Nathaniel Hawthorne's *The Blithedale Romance*, works by Angelina and Sarah Grimke, Harriet Beecher Stowe's *Uncle Tom's Cabin*, poems by Emily Dickinson and Walt Whitman, Louisa May Alcott's *Little Women*, Edith Wharton's *House of Mirth*, William Dean Howells's *A Hazard of New Fortunes*, and Charlotte Perkins's *Gilman's Herland*.]

**[476 Women's Poetry (also English 476)**
4 credits. Limited to 25 students. Prerequisite: permission of instructor. Not offered 1989–90.
D. Mermin.
A historical survey of the female poetic tradition in Britain and America, including such writers as Bradstreet, Dickinson, Bronte, Barrett Browning, Bishop, Brooks, and Plath.]

**480 Toward an Anthropology of the Female Body (also Anthropology 480)**
Spring. 4 credits.
Hours to be arranged. G. Fraser.
The main purpose of this course is to create a context for the discussion of central issues in the cross-cultural literature on the relationship between the female self, her body-mind, and the wider social order(s). All too easily Western feminists acknowledge but neglect to incorporate into their theoretical framework the perspectives of women from non-Western societies, from different historical periods, and from divergent classes. Do the differences challenge or support our vision of gender as a unifying category? By focusing on women's embodied selves, the hope is that we will begin to develop a critical theory that will reshape the boundaries of our old assumptions.

**[493 French Feminisms (also French 493)**
Fall. 4 credits. Not offered 1989–90.
N. Furman.
This course will examine the political, theoretical, and literary concerns of contemporary French writers who have addressed "la question de la femme/la question du féminin." Readings will include representative texts by Simone de Beauvoir, Monique Wittig, Julia Kristeva, Jacques Lacan, Luce Irigaray, Jacques Derrida, and Helene Cixous. Taught in English.]

**499 Directed Study**
Fall or spring. Variable credit. Prerequisites: one course in women's studies and permission of a faculty member of the Women's Studies Program Board.
Hours to be arranged. Staff.

**513 The Political Economy of Women and Work I (also City and Regional Planning 513)**
Fall. 4 credits.
W 7–10 p.m. L. Beneria.
This course deals with the question of how to understand and analyze the economic condition of women, starting with some general issues about the "question of origins," reproduction and production, and the underestimation of women's economic activities. It focuses on different approaches to the analysis of women's work in the household and in the labor market (from an economic and feminist perspective). The empirical material concentrates mostly on the United States with some glances at other industrial countries and the international economy.

**514 The Political Economy of Women and Work II (also City and Regional Planning 514)**
Spring. 4 credits.
W 7–10 p.m. L. Beneria.
A continuation of Women's Studies 513. The focus here is on development issues and on how the development process has affected women in the Third World. The analysis is placed in the context of the global economy, including the connections between the Third World and the more industrialized countries.

**573 Politics and Gender in Seventeenth-Century Anglo-America (also History 410 and Society for the Humanities 419)**
Fall. 3 credits. Limited to 17 students.
W 2:30–4:30. M. B. Norton.
An examination of the transition from the political world of Sir Robert Filmer (in which the family and the state were seen as analogous and the state was believed to have originated in the family) to the political world of John Locke (in which the family and the state were viewed as having had separate origins and were regarded as distinctly different in organization and rationale). Through readings in primary and secondary materials, the class will focus on the implications of this transition for both women and men. A major theme will be the development of the modern distinction between the "public" realm of men and the "private" realm of women.

**574 Religion, Gender, and the Family in Early Modern Anglo-America (also History 422 and Society for the Humanities 426)**
3 credits.
W 2:30–4:25. M. B. Norton.
Continues the themes developed in Women's Studies 573/History 410/Society for the Humanities 419 (fall 1989), but with primary reference to religion and the family. The course will examine the role of Puritan ideas in shaping the "modern" concept of the family and women's and men's roles therein; the emerging notion of the family as "private" and separated from the broader society; the regulation of moral and sexual behavior by the state, and the reasons for such regulation; and the eventual severing of the theoretical connections among religion, the family, and the state by the time of the American Revolution.

**[626 Graduate Seminar in the History, of American Women (also History 626)**
4 credits. Limited to graduate students. Not offered 1989–90.
M. B. Norton.
A reading and research seminar intended for graduate students. Major works in American women's history will be carefully scrutinized, and each student will prepare a lengthy research paper.]

**[638 Contemporary German Women Writers (also German Literature 638)**
4 credits. Not offered 1989-90.
I. Ezergailis.]

**[660 Black Women and Their Fictions (also Women's Studies 402 and English 401)**
4 credits. Not offered 1989–90.
H. Gates.
This course intends to define the precise shape and contours of the tradition of black women's writing in English. How do black women use language to represent their experiences? How does their writing resemble or diverge from the black male tradition? How does black feminist theory differ from white feminist theory? These are the concerns of this class. Readings are by Harriet E. Wilson, Frances Harper, Anna Julia Cooper, Nelly Larsen, Zora Neale Hurston, Gwendolyn Brooks, Ann Petry, Paule Marshall, Toni Morrison, Toni Cade Bambara, Gayle Jones, Alice Walker, Gloria Naylor, and Jamaica Kincaid.]

**[685 Seminar in Sex Differences and Sex Roles (also Psychology 685 and Sociology 685)**
4 credits. Prerequisite: permission of instructor. Not offered 1989–90.
S. Bem.]

**690 German Feminist Criticism and Theory (also German Studies 690)**
Spring. 4 credits. Open to qualified undergraduates with permission of instructor. Reading knowledge of German recommended but not required.
W 1:25–3:25. C. A. Martin.
This course is designed to explore developments in feminist literary theory with particular attention to the field of German literature. We will consider competing critical strategies and their political implications by working through different readings of specific literary texts and by raising questions about the implications for feminism of competing critical strategies in the general field of literary theory; the relations between feminism and established critical schools; the tension in feminist *Germanistik* between critical attention to the "male canon" and the construction of a female literary tradition; the impact on West and East German feminism(s) of their translations of French and American work; the impact and treatment of the Nazi period; the effects of the East-West divide on development in both Germanys; the impact on feminist literature and criticism of Third World women in Germany; and approaches in West and East Germany to imperialism and racism.

**[692 Hispanic Feminisms (also Romance Studies 690)**
4 credits. Taught in Spanish. Not offered 1989–90.
D. Castillo.
This seminar is designed to explore the interrelationship of feminist literary theory and the narrative production of the Hispanic world. In this inquiry, we will be developing feminist critical methodologies (based on readings of essays by thinkers such as Barthes, Castellanos, Derrida, Freud, and Glantz) and defining strategies or possibilities for feminist criticism(s). Finally, we will study the ways in which feminist analyses of literature alter our readings of texts by men (Isaacs, Cortazar, Onetti, Garcia Lorca) as well as by women (Pardo Bazan, Tusquets, Valenzuela, Garro), and how they change our conception of criticism and the task of the critic.]

**699 Topics in Women's Studies**
Fall or spring. Variable credits.
Staff.
Independent reading course for graduate students on topics not covered in regularly scheduled courses. Students develop a course of readings in consultation with a faculty member in the field of Women's Studies who has agreed to supervise the course work.

**[772 Advanced Topics on International Development and Women (also City and Regional Planning 772)**
4 credits. Not offered 1988–89; next offered 1989–90.
L. Beneria.
A seminar to explore theoretical and empirical issues of interest to master's and Ph.D. degree students working on topics related to gender and international development. The focus will be on a few narrow topics–such as the effect of the foreign debt crisis on women, the formal sector in women's work, and gender aspects in demographic change–to be explored in depth in preparation for research and thesis writing. Students will be encouraged to explore and exchange ideas as well as to provide mutual support and criticism.]

## IV. Related Courses and Seminars

**305 Emotion, Cognition, and Culture (also Anthropology 305)**
Fall. 4 credits.
T R 2:55–4:10. B. J. Isbell.
This course introduces students to the current anthropological perspective on the following topics: (1) cultural shaping of emotion, (2) acquisition and production of gender and sexuality, and (3) cognition and classification in cross-cultural context. It is appropriate for students majoring in anthropology, psychology, cognitive studies, and human development and family studies.

**[329 Race, Gender, and Politics (also Government 329)**
4 credits. Open to sophomores and juniors. Limited to 5 students. Not offered 1989–90.
M. Katzenstein.]

**357 American Families in Historical Perspective (also Sociology 359 and Human Development and Family Studies 359)**
Spring. 3 credits. Prerequisite: Human Development and Family Studies 150 or one 200-level social science or history course. Students in endowed units must register for Women's Studies 357 or Sociology 359.
T R 2:30–4. J. Brumberg.
An introduction to, and overview of, problems and issues in the historical literature on American families and the family life cycle. Reading and lectures will demonstrate the pattern of American family experience in past time, focusing on class, ethnicity, sex, and region as important variables. Analysis of the private world of the family in past time will deal with changing cultural conceptions of sexuality, sex roles, generational relationships, stages of life, and life events. Students will be

required to do a major research paper on the history of their family, covering at least two generations and demonstrating their ability to integrate life-course development theory, data drawn from the social sciences, and historical circumstances.

**[463 The Repressed Feminine in the Writings of Marx (also Government 466)**
4 credits. Not offered 1989–90.
S. Buck-Morss.]

**[671 Readings in Contemporary Social Theory (also Government 670)**
4 credits. Not offered 1989–90.
S. Buck-Morss.
Issues raised by neo-Marxism, critical theory, poststructuralism, and feminism.]

**[759 Virginia Woolf (also English 759)**
5 credits. Prerequisite: permission of instructor. Not offered 1989–90.
S. Siegel.]

### Related Courses in Other Departments

**Gender Issues in Planning and Architecture (City and Regional Planning 415)**

**Time as a Human Resource (Consumer Economics and Housing 411)**

**German Women Writers of the Fin de Siècle (German Studies 754)**

**The Family in Modern Society (Human Development and Family Studies 150)**

**The Family in Cross-cultural Perspective (Human Development and Family Studies 354)**

**Theories of Adult Interpersonal Relationships (Human Development and Family Studies 358)**

**Families and Social Policy (Human Development and Family Studies 456)**

**Contemporary Family Theory and Research (Human Development and Family Studies 650)**

**Women at Work (Industrial and Labor Relations 366)**

**Literary History through Feminist (and other) Theories: The Case of the British Eighteenth Century (Society for the Humanities 420)**

**Fantasies of Power: Gender, Class, and Print Culture in Seventeenth-Century England (Society for the Humanities 423)**

**Dress: A Reflection of American Women's Roles (Textiles and Apparel 245)**

## Writing Program

See "John S. Knight Writing Program," p. 21 and p. 319.

# FACULTY ROSTER

Abolafia, Mitchell Y., Ph.D., SUNY at Stony Brook. Asst. Prof., Organizational Behavior/Sociology
Abrams, Meyer H., Ph.D., Harvard U. Class of 1916. Professor of English Emeritus, English
Abruña, Hector D., Ph.D., U. of North Carolina at Chapel Hill. Assoc. Prof., Chemistry
Adams, Anne, Ph.D., U. of Michigan. Asst. Prof., Africana Studies and Research Center
Adams, Barry B., Ph.D., U. of North Carolina. Prof., English
Agawu, V. Kofi, Ph.D., Stanford U. Assoc. Prof., Music
Ahl, Frederick M., Ph.D., U. of Texas at Austin. Prof., Classics
Albrecht, Andreas C., Ph.D., U. of Washington. Prof., Chemistry
Alexander, James P., Ph.D., U. of Chicago. Asst. Prof., Physics/LNS
Allmendinger, Richard W., Ph.D., Stanford U. Asst. Prof., Geological Sciences
Ambegaokar, Vinay, Ph.D., Carnegie Inst. of Technology. Prof., Physics/LASSP*
Ammons, Archie R., B.S., Wake Forest Coll. Goldwin Smith Professor of Poetry, English
Anderson, Benedict R., Ph.D., Cornell U. Aaron L. Binenkorb Professor of International Studies, Government
Appiah, Anthony, Ph.D., Cambridge U. (England). Assoc. Prof., Philosophy/Africana Studies and Research Center
Archer, Richard J., M.A., U. of Missouri at Kansas City. Asst. Prof., Theatre Arts
Arroyo, Ciriaco M., Ph.D., U. of Munich (Germany). Emerson Hinchliff Professor of Spanish Literature, Romance Studies/Comparative Literature
Ascher, Robert, Ph.D., U. of California at Los Angeles. Prof., Anthropology
Ashcroft, Neil W., Ph.D., Cambridge U. (England). Prof., Physics/LASSP*
Austin, William W., Ph.D., Harvard U. Given Foundation Professor of Musicology Emeritus, Music
Babby, Leonard H., Ph.D., Harvard U. Prof., Modern Languages and Linguistics/Near Eastern Studies
Bacharach, Samuel B., Ph.D., U. of Wisconsin. Assoc. Prof. Industrial and Labor Relations/Sociology
Baird, Barbara, Ph.D., Cornell U. Assoc. Prof., Chemistry
Banes, Sally, Ph.D., New York. U. Assoc. Prof., Theatre Arts
Barazangi, Muawia, Ph.D., Columbia U. Prof., Geological Sciences
Barbasch, Dan, Ph.D., U. of Illinois. Prof., Mathematics
Bassett, William A., Ph.D., Columbia U. Prof., Geological Sciences
Bathrick, David, Ph.D., U. of Chicago. Prof., German Literature and Theatre Arts
Baugh, Daniel A., Ph.D., Cambridge U. (England). Prof., History
Beckwith, Steven V. W., Ph.D., California Inst. of Technology. Prof., Astronomy/CRSR†
Begley, Tadhg P., Ph.D., California Inst. of Technology. Asst. Prof., Chemistry
Bem, Daryl J., Ph.D., U. of Michigan. Prof., Psychology
Bem, Sandra L., Ph.D., U. of Michigan. Prof., Psychology/Women's Studies
Beneria, Lourdes, Ph.D., Columbia U. Prof., City and Regional Planning/Women's Studies
Bèreaud, Jacques, Doctorat d'Univ., U. of Lille (France). Prof., Romance Studies
Berger, Anne, Ph.D., Paris VII (France). Asst. Prof., Romance Studies
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Morrison, George H., Ph.D, Princeton U. Prof., Chemistry
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Pelliccia, Hayden, Ph.D., Yale U. Asst. Prof., Classics
Pempel, T. John, Ph.D., Columbia U. Prof., Government
Peterson, Charles A., Ph.D., U. of Washington. Prof., History
Philips, Laura A., Ph.D., U. of California at Berkeley. Asst. Prof., Chemistry
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Wetherbee, Winthrop, Ph.D., U. of California at Berkeley. Prof., English/Medieval Studies/Classics
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*Laboratory of Atomic and Solid State Physics.
†Center for Radiophysics and Space Research.
‡National Astronomy and Ionosphere Center.
¶Laboratory of Nuclear Studies.

# DIVISION OF BIOLOGICAL SCIENCES

The Division of Biological Sciences provides a unified curriculum for undergraduate majors enrolled in either the College of Agriculture and Life Sciences or the College of Arts and Sciences. Courses in biological sciences are integral to many disciplines and are basic requirements in many schools and colleges at Cornell.

Graduate study in the biological sciences is administered by more than a dozen specialized fields within the Graduate School, as described in the Announcement of the Graduate School.

## ORGANIZATION

The Division of Biological Sciences is composed of six major sections: Biochemistry, Molecular and Cell Biology; Ecology and Systematics; Genetics and Development; Neurobiology and Behavior; Physiology; Plant Biology; and, in addition, the L. H. Bailey Hortorium and the Shoals Marine Laboratory.

The offices, research laboratories, and classrooms of biology faculty members are located in many different buildings on the campus, primarily in the Colleges of Agriculture and Life Sciences, Arts and Sciences, and Veterinary Medicine.

Student services are provided by the division's Office for Academic Affairs and the Behrman Biology Center, both located in Stimson Hall, where academic advice, information on biological sciences course offerings, other important information, and counseling are available for undergraduates. The Office for Academic Affairs also follows the progress of biology majors and works closely with faculty advisers. Additional services and resources of the Biology Center include academic program planning, tutoring, lecture tapes, examination files, and information on undergraduate research opportunities. The center has comfortable areas for studying and relaxing.

The Shoals Marine Laboratory, a cooperative venture with the University of New Hampshire, is located on Appledore Island in the Gulf of Maine. Its base office in Stimson Hall provides advising and career counseling for students interested in the marine sciences and administers the SEA Semester program for Cornell students pursuing studies at Woods Hole or aboard the schooner *Westward* or brigantine *Corwith Cramer.*

## FACULTY

P. J. Bruns, director; H. T. Stinson, associate director; K. K. Adler, C. F. Aquadro, W. J. Arion, R. Barker, A. H. Bass, D. M. Bates, B. L. Bedford, A. Bensadoun, E. N. Bergman, K. W. Beyenbach, A. W. Blackler, S. E. Bloom, R. Booker, A. C. Borror, A. P. Bretscher, W. J. Brown, W. L. Brown, W. R. Butler, J. M. Calvo, R. R. Capranica, B. F. Chabot, J. L. Cisne, R. A. Corradino, W. B. Currie, P. J. Davies, J. I. Davis, A. Dobson, J. J. Doyle, T. Eisner, S. T. Emlen, P. P. Feeny, G. W. Feigenson, R. H. Foote, J. E. Fortune, T. D. Fox, J. Gibson, Q. H. Gibson, R. F. Gilmour, M. L. Goldberg, N. G. Hairston, B. P. Halpern, O. P. Hamill, W. Hansel, M. R. Hanson, R. G. Harrison, R. M. Harris-Warrick, C. D. Harvell, L. A. Heppel, G. P. Hess, P. C. Hinkle, C. D. Hopkins, K. A. Houpt, T. R. Houpt, R. W. Howarth, S. H. Howell, H. C. Howland, R. R. Hoy, T. C. Huffaker, A. T. Jagendorf, P. A. Karplus, M. N. Kazarinoff, E. B. Keller, K. J. Kemphues, K. A. R. Kennedy, L. V. Kochian, R. P. Korf, T. A. LaRue, A. C. Leopold, S. A. Levin, G. E. Likens, J. T. Lis, E. R. Loew, M. A. Luckow, R. E. McCarty, D. K. McClearn, A. R. McCune, J. M. Fessenden MacDonald, R. J. MacIntyre, W. H. Mark, P. L. Marks, J. K. Moffat, J. B. Nasrallah, K. J. Niklas, K. C. Nixon, T. G. Owens, D. J. Paolillo, M. V. Parthasarathy, D. Pimentel, T. R. Podleski, F. H. Pough, A. G. Power, W. B. Provine, A. Quaroni, E. Racker, E. Adkins Regan, M. E. Richmond, J. W. Roberts, D. Robertshaw, R. B. Root, M. M. Salpeter, A. M. Schneiderman, T. D. Seeley, P. W. Sherman, R. F. Silver, R. M. Spanswick, I. A. Tamas, D. N. Tapper, J. F. Thompson, R. Turgeon, B.-K. Tye, S. Via, V. M. Vogt, C. Walcott, R. H. Wasserman, M. Watford, R. O. Wayne, W. W. Webb, N. F. Weeden, Q. D. Wheeler, D. B. Wilson, D. W. Winkler, M. F. Wolfner, J. F. Wootton, R. Wu, D. A. Young, S. A. Zahler, D. B. Zilversmit

### Other Teaching Personnel

G. Albrecht, R. R. Alexander, R. A. Calvo, C. Eberhard, P. R. Ecklund, M. F. Ferger, J. C. Glase, J. M. Griffiths, J. B. Heiser, C. H. McFadden, H. C. Reiss

## DISTRIBUTION REQUIREMENT

**In the College of Agriculture and Life Sciences**, the biological sciences distribution requirement (Group B) is for a minimum of 9 credits, including at least 6 credits of introductory biology satisfied by Biological Sciences 109–110,105–106, or 101 and 103 plus 102 and 104, or 107–108. Advanced placement in biology with a score of 4 or 5 (6 or 8 credits, respectively) satisfies the requirement for introductory biology. The additional credits may be satisfied by any biological sciences courses except Biological Sciences 152, 200, 202, 205, 206, 301, or 367.

**In the College of Arts and Sciences**, the biological sciences distribution requirement is for a two-semester introductory biology sequence selected from Biological Sciences 109–110,105–106, or 101 and 103 plus 102 and 104, or 107–108. An Advanced Placement score of 4 or 5 fulfills one-half the distribution requirement. Students must taken an upper-level biology course to complete the distribution requirement in biological sciences.

**In the College of Human Ecology**, the natural sciences distribution requirement is for at least 6 credits selected from Biological Sciences 109–110, 101 and 103 plus 102 and 104, 105–106 or 107–108 or from specified courses in chemistry or physics. Advanced placement in biology with a score of 4 or 5 (6 or 8 credits, respectively) also satisfies the distribution requirement in the natural sciences.

*Note:* Biological Sciences 101–102–103–104 should be taken as a unit by students of any college except those with advanced placement credit.

Switching from one introductory biology sequence to another at midyear may *not* be possible because of variation in presentation of topics. Students must receive permission of the instructor to switch sequences. Taking sequences in reverse or inconsecutive order is strongly discouraged.

## THE MAJOR

The Division of Biological Sciences offers a major in biological sciences to students enrolled in either the College of Agriculture and Life Sciences or the College of Arts and Sciences. The undergraduate program is coordinated for students in both colleges through the division's Office for Academic Affairs, where students submit their applications to the major and obtain biology faculty advisers.

During the second semester of the sophomore year, all students who intend to major in biological sciences must apply for acceptance into the major with the associate director for academic affairs, in 118 Stimson Hall. Students in the College of Agriculture and Life Sciences who were admitted directly to the major complete the application process to declare a concentration area and to assure satisfactory progress toward completion of the major. Acceptance into the major requires completion of the course sequences in introductory biology, chemistry, and mathematics (see requirements 1–3 below), plus one semester of organic chemistry lectures. In addition, a 2.75 Cornell cumulative grade-point average is required for final acceptance into the major except for those students admitted directly to the major as freshmen (College of Agriculture and Life Sciences students only) or as transfers. Students in the process of completing these prerequisites for admission to the major may be accepted on a *provisional* basis. Final acceptance into the major is required for graduation with a biological sciences major. It is the student's responsibility to assure that final acceptance has been granted.

Whenever possible, students should include the introductory biology, chemistry, and mathematics sequences in their freshman schedule and complete the organic chemistry lecture course in their sophomore year. Students are not encouraged to continue with the major in biological sciences unless

performance in these four subjects gives evidence of capacity to perform satisfactorily at a more advanced level.

Students who matriculated *before* fall 1988 must complete the major by satisfying the requirements listed below. Students who matriculated fall 1988 and after see changes in the Requirements for the Major. These courses should be taken for a letter grade unless the course is offered for S-U grades only.

1) *Introductory biology for majors* (one year): Biological Sciences 101 and 103 plus 102 and 104, or 105–106. Biological Sciences 107–108, offered during the eight-week Cornell Summer Session for 8 credits, also satisfies the introductory biology requirement for majors. Students may choose to accept advanced placement if they have received a score of 5 on the Advanced Placement Examination of the College Entrance Examination Board (CEEB). Students with a score of 4 must fulfill the introductory biology requirement by taking Biological Sciences 101–102, 101 and 103, 102 and 104, or 103–104. These students should consult information available in the course office (1140 Comstock Hall) and in the Biology Center (G20 Stimson Hall) to determine which semester to take to complete the introductory biology requirement. Students in doubt are advised to take Biological Sciences 101 and 103. These students receive a total of 8 introductory biology credits (4 AP credits plus 4 course credits).
2) **General chemistry** (one year): Chemistry 207–208,* or 215–216,* or 103–104.
3) **College mathematics** (one year, including at least one semester of calculus): Mathematics 111–112,* 105–106, or 111–105. Education 115 may *not* be used to fulfill any part of this requirement.
4) **Organic chemistry:** Chemistry 253 and 251, or 253 and 301, or 357–358 and 251, or 357–358 and 301, or 359–360 and 251, or 359–360 and 301.
5) **Physics:** Physics 207–208,* 112–213,* or 101–102. Those who take Physics 112–213 are advised to complete Physics 214 as well.
6) **Genetics:** Biological Sciences 281.
7) **Biochemistry:** Biological Sciences 330 or 331.
8) **A concentration area** selected from the outline below.
9) **Breadth in biology**, as described below.
10) **Foreign language:** students registered in the College of Agriculture and Life Sciences must satisfy the foreign language requirement of the Division of Biological Sciences by (a) presenting evidence of successful completion of three or more years of study of a foreign language in high school or (b) attaining a score of 560 or more on the reading portion of the College Entrance Examination Board achievement test or (c) achieving "qualification" status in a language as defined by the College of Arts and Sciences or (d) successfully completing at least 6 college credits in a foreign language. Students registered in the College of Arts and Sciences must satisfy the language requirement as stated by that college.

*Since modern biology has an important physical and quantitative orientation, students are advised to undertake basic science courses that emphasize this approach. Asterisks in the above list indicate the courses that provide this orientation, but *all* courses listed are acceptable.

Although not required for the biological sciences major, a course in statistics is recommended for students planning graduate study or a research career. Students should consult their faculty advisers when choosing appropriate courses in statistics.

As an alternative to requirements 8 and 9 above, students may choose to complete the Program in General Biology, outlined below.

## Concentration Areas and Requirements

As noted in the list of requirements above, students accepted into the biological sciences major must choose a concentration area or the Program in General Biology. The concentration requirements are designed to help students achieve depth in one area of biology while ensuring that the selected advanced courses form a coherent and meaningful unit. Because of the flexibility allowed in satisfying these requirements, students should consult their faculty advisers. The possible concentration areas are listed below.

1) *Animal Physiology and Anatomy:* Bio S 316, Cellular Physiology; Bio S 311 and 319, Introductory Animal Physiology, Lectures and Laboratory; and at least one additional course selected from the following: Bio S 313, Histology: The Biology of the Tissues; Bio S 385, Developmental Biology; Bio S 389, Embryology; Bio S 458, Mammalian Physiology; Bio S 492, Sensory Function; An Sc 427, Fundamentals of Endocrinology.

*Note:* Bio S 313, Histology: The Biology of the Tissues, is recommended for those students who have not yet taken Bio S 274, The Vertebrates, as part of their concentration requirements in animal physiology and anatomy. Students should contact their adviser for other possible alternatives.

2) *Biochemistry:* Chemistry 300 or 215–216, Quantitative Chemistry, must be taken. One of the following organic chemistry laboratory sequences must also be taken: Chemistry 301–302 or 251–252 and 302 or 301 or 251–252. In addition, students must take a physical chemistry sequence (Chemistry 389–390 or 287–288.1 or 287–288.2) and a biochemistry laboratory course (Bio S 638 or 430 or 630). Note that Physical Chemistry 288.2 is designed for biologists, but either sequence is appropriate. It is recommended that students take the more rigorous organic chemistry and physics sequences (Chemistry 357–358 or 359–360 and Physics 207–208) and a third semester of calculus.

   Students interested in biochemistry should complete a year of introductory chemistry other than Chemistry 103–104 before the start of their sophomore year. Students are also urged to complete introductory biology in their freshman year.
3) *Botany:* courses chosen with the aid of an adviser to meet the goal of exposing each student to plant structure, function, classification, ecology, and evolution. Three courses, one from each of the three following categories, fulfill the minimum requirements. Students are encouraged to begin the sequence of courses with Bio S 241 (see category b): (a) Bio S 242 and 244 or Bio S 341 and 349, Plant Physiology, Lectures and Laboratory; (b) Bio S 241, Introductory Botany; Bio S 248, Taxonomy of Vascular Plants; Bio S 448, Plant Evolution and the Fossil Record; or Pl Pa 309, Introductory Mycology; and (c) Bio S 345, Plant Anatomy; or Pl Pa 301, Introductory Plant Pathology. Students interested in a broad background in botany are encouraged to take Bio S 346, Algal Physiology; Bio S 463 and 465, Plant Ecology, Lectures and Laboratory; and additional courses in (b) and (c).
4) *Cell Biology:* Chemistry 300 or 215–216, Quantitative Chemistry; Bio S 630, Laboratory in Cell Biology (strongly recommended), Bio S 638, Intermediate Biochemical Methods, or Bio S 430, Basic Biochemical Methods; and one of the following two options:

Option 1: Bio S 432, Survey of Cell Biology, and 8 additional credits distributed between groups A and B and approved by the adviser.

Option 2: The two courses from Group A and 6 additional credits from Group B approved by the adviser.

Group A: Bio S 438, Cell Proliferation and Oncogenic Viruses; Bio S 483, Molecular Aspects of Development.

Group B: Bio S 222, Neurobiology and Behavior II: Introduction to Neurobiology; Bio S 305, Basic Immunology, Lectures; Bio S 307, Basic Immunology, Laboratory; Bio S 313, Histology: The Biology of the Tissues; Bio S 345, Plant Anatomy; Bio S 485, Microbial Genetics, Lectures; Bio S 486, Immunogenetics; An Sc 419, Animal Cytogenetics; Micro 290, General Microbiology Lectures; Micro 291, General Microbiology Laboratory; Micro 484, Cytology of Prokaryotes Lectures; Micro 485, Cytology of Prokaryotes Laboratory.

Students interested in cell biology should complete a year of introductory chemistry other than Chemistry 103–104 before the start of their sophomore year. Students are also urged to complete introductory biology in their freshman year.

Students anticipating graduate work in cell biology should consider taking a physical chemistry sequence (Chemistry 389–390 or 287–288.1 or 287–288.2). Note that Physical Chemistry 288.2 is designed for biologists, but either sequence is appropriate.

5) *Ecology, Systematics, and Evolution:* Bio S 261, Principles of Ecology; Bio S 378, Evolutionary Biology; and at least two of the following courses or one of the following courses and a 400–level, 4–credit course offered at Shoals Marine Laboratory: Bio S 248, Taxonomy of Vascular Plants; Bio S 373, The Invertebrates: Form, Function, and Evolution; Bio S 455, Insect Ecology; Bio S 457/459 (462/464), Limnology; Bio S 461, Population and Evolutionary Ecology; Bio S 462, Marine Ecology; Bio S 463/465, Plant Ecology; Bio S 464, Microevolution and Macroevolution; Bio S 471, Mammalogy; Bio S 472 (473), Herpetology; Bio S 475, Ornithology; Bio S 476, Biology of Fishes; Bio S 478, Ecosystem Biology; Bio S 479 Paleobiology; Bio S 481 Population

Genetics; Bio S 484, Molecular Evolution. Students are encouraged to gain experience in some aspect of field biology through course work at a biological field station or work experience.

6) *Genetics and Development:* 9 credits, usually selected from the following courses: Bio S 378, Evolutionary Biology; Bio S 385, Developmental Biology; Bio S 389, Embryology; Bio S 481, Population Genetics; Bio S 482, Human Genetics and Society; Bio S 483, Molecular Aspects of Development; Bio S 484, Molecular Evolution; Bio S 485 and 487, Microbial Genetics; Bio S 486, Immunogenetics; Bio S 633, Biosynthesis of Macromolecules; Bio S 639, The Nucleus; Bio S 641, Laboratory in Plant Molecular Biology; Bio S 644, Plant Growth and Development; Bio S 653, Plant Molecular Genetics; Bio S 688, Yeast Genetics; An Sc 419, Animal Cytogenetics.

7) *Neurobiology and Behavior:* The two-semester introductory course sequence, Neurobiology and Behavior I and II (Bio S 221 and 222) with discussion section (4 credits per term), and 9 additional credits, among which must be a course from the neurobiology and behavior offerings. Bio S 420, 498, 499, and 720 may *not* be used as this neurobiology and behavior course. The remainder of the 9 credits may be in any course (such as physiology, developmental biology, cellular biology, ecology, vertebrate or invertebrate biology, or neurobiology and behavior) approved by the adviser. Courses used to fulfill the concentration requirements may *not* be counted toward fulfillment of the breadth requirement.

*Note:* Students who declare the concentration in neurobiology and behavior after taking Bio S 221 or 222 for only 3 credits must complete additional course work in neurobiology and behavior. These students should consult the chair of the Section of Neurobiology and Behavior (W119 Seeley G. Mudd Hall) to determine what course(s) to use to make up the deficiency.

8) *Independent Option:* Special programs for students interested in biophysics, microbiology (College of Arts and Sciences students only), or nutrition are available under this option. In addition, students who want to undertake a course of study not covered by the seven existing concentration areas, special programs, or the Program in General Biology may petition the Division of Biological Sciences Curriculum Committee. Information on independent options and Curriculum Committee petition forms are available in the Office for Academic Affairs, 118 Stimson Hall.

## Requirement for Breadth in Biology

To fulfill the requirement for breadth in biology, students must pass a total of two courses outside of their concentration area selected from two of the categories listed below.

Students should consult their faculty advisers, keeping in mind the following rules, when choosing the courses to meet this requirement. A course may not count for breadth if it *could* be used (even if it is not) to fulfill a concentration requirement (see note below). No course may be used to fulfill the breadth requirement if it is also used to fulfill a concentration requirement. Students may not count two courses for breadth credit if one course is a prerequisite to the other course. Students concentrating in animal physiology and anatomy; botany; cell biology; ecology, systematics, and evolution; or genetics and development should see the notes following the list of approved breadth courses.

1) *Animal Physiology and Anatomy:* Biological Sciences 214, 311, 313; Nutritional Sciences 331.

2) *Botany:* Biological Sciences 241, 242 and 244, 248, 341 and 349, 343, 345, 441, 448; Plant Pathology 309.

3) *Cellular Biology:* Biological Sciences 305, 316, 432; Microbiology 290.

4) *Developmental Biology:* Biological Sciences 385, 389, 483; Animal Science 220.

5) *Ecology, Systematics, and Evolution:* Biological Sciences 261, 378.

6) *Neurobiology and Behavior:* Biological Sciences 221, 222.

*Note:* Students concentrating in animal physiology and anatomy may not use Biological Sciences 316, 385, 389, or 432 to fulfill the breadth requirement.

Students concentrating in cell biology may not use Biological Sciences 222, 313, 345, or 483 to fulfill the breadth requirement.

Students concentrating in ecology, systematics, and evolution may not use Biological Sciences 248 to fulfill the breadth requirement.

Students concentrating in genetics and development may not use Biological Sciences 378 or any course in group 4 to fulfill the breadth requirement.

## Program in General Biology

As an alternative to the requirements for a concentration area and for breadth in biology, students may choose to complete the Program in General Biology. These students must fulfill *all* other requirements for the biological sciences major. In addition, students must complete the following:

1) Ecology (Bio S 261 or Bio S 262 [no longer offered]).

2) Neurobiology and Behavior I or II (Bio S 221 or 222).

3) A physiology course from the following: Bio S 242 and 244, or 341 and 349, Plant Physiology; Bio S 311, Introductory Animal Physiology, Lectures.

4) One course from the following: Bio S 241, Introductory Botany; Bio S 248, Taxonomy of Vascular Plants; Bio S 274, Functional and Comparative Morphology of Vertebrates; Entom 212, Insect Biology; Micro 290 and 291, General Microbiology.

5) At least one course offered by the Division of Biological Sciences concentrating on plants. This may be satisfied by a course that also fulfills requirement 3 or 4.

6) At least one course offered by the Division of Biological Sciences with a laboratory. This may be satisfied by a course that also fulfills requirement 3, 4, or 5.

7) A biological sciences course offered for 2 or more credits having as a prerequisite one of the following: Bio S 221, Neurobiology and Behavior I; Bio S 222, Neurobiology and Behavior II; Bio S 241, Introductory Botany; Bio S 242 or 341, Plant Physiology; Bio S 261, Principles of Ecology; Bio S 274, Functional and Comparative Morphology of Vertebrates; Bio S 281, Genetics; Bio S 311, Introductory Animal Physiology, Lectures; Bio S 330 or 331, Principles of Biochemistry.

## Changes in the Requirements for the Major

*Beginning with students who matriculated in fall 1988, the requirements for the major in biological sciences have been modified as follows: (1) a course in evolutionary biology (Bio S 378) is required for all majors; (2) the biology breadth requirement is eliminated; (3) the present areas of concentration are now called programs of study (the requirements for each program of study allow completion of the program of study with 13–15 course credits); (4) the requirements for satisfying the program in general biology have been changed and now constitute a program of study in general biology. The specific descriptions of the programs of study are listed below. These courses should be taken for a letter grade unless the course is offered for S-U grades only.*

1) **Introductory biology for majors** (one year): Biological Sciences 101 and 103 plus 102 and 104, or 105–106. Biological Sciences 107–108, offered during the eight-week Cornell Summer Session for 8 credits, also satisfies the introductory biology requirement for majors. Students may choose to accept advanced placement if they have received a score of 5 on the Advanced Placement Examination of the College Entrance Examination Board (CEEB). Students with a score of 4 must fulfill the introductory biology requirement by taking Biological Sciences 101–102, 101 and 103, 102 and 104, or 103–104. These students should consult information available in the course office (1140 Comstock Hall) and in the Biology Center (G20 Stimson Hall) to determine which semester to take to complete the introductory biology requirement. For students in doubt, Biological Sciences 101 and 103 is advised. These students receive a total of 8 introductory biology credits (4 AP credits plus 4 course credits).

2) **General chemistry** (one year): Chemistry 207–208,* or 215–216,* or 103–104.

3) **College mathematics** (one year, including at least one semester of calculus): Mathematics 111–112,* 105–106, or 111–105. Education 115 may not be used to fulfill any part of this requirement.

4) **Organic chemistry:** Chemistry 253 and 251, or 253 and 301, or 357–358 and 251, or 357–358 and 301, or 359–360 and 251, or 359–360 and 301.

5) **Physics:** Physics 207–208,* 112–213,* or 101–102. Those who take Physics 112–213 are advised to complete Physics 214 as well.

6) **Genetics:** Biological Sciences 281.

7) **Biochemistry:** Biological Sciences 330 or 331.

8) **Evolutionary Biology:** Biological Sciences 378.

9) **A program of study** selected from the outline below.

10) **Foreign language:** students registered in the College of Agriculture and Life Sciences must satisfy the foreign language requirement of the Division of Biological Sciences by (a) presenting evidence of successful completion of three or more years of study of a foreign language in high school or (b) attaining a score of 560 or more on the reading portion of the College Entrance Examination Board achievement test or (c) achieving "qualification" status in a language as defined by the College of Arts and Sciences or (d) successfully completing at least 6 college credits in a foreign language. Students registered in the College of Arts and Sciences must satisfy the language requirement as stated by that college.

*Since modern biology has an important physical and quantitative orientation, students are advised to undertake basic science courses that emphasize this approach. Asterisks in the above list indicate the courses that provide this orientation, but *all* courses listed are acceptable.

Although not required for the biological sciences major, a course in statistics is recommended for students planning graduate study or a research career. Students should consult their faculty advisers when choosing appropriate courses in statistics.

## Programs of Study Requirements

As noted in the list of requirements above, students accepted into the biological sciences major must choose a program of study. The program of study requirements are designed to help students achieve depth in one area of biology while ensuring that the selected advanced courses form a coherent and meaningful unit. Because of the flexibility allowed in satisfying these requirements, students should consult their faculty advisers. The possible programs of study are listed below.

1) *Animal Physiology and Anatomy:* Bio S 311 and 319, Introductory Animal Physiology, Lectures and Laboratory; Bio S 313, Histology: The Biology of Tissues; and Bio S 316, Cellular Physiology.

2) *Biochemistry:* Chemistry 300 or 215–216, Quantitative Chemistry, must be taken. One of the following organic chemistry laboratory sequences must also be taken: Chemistry 301–302 or 251–252–302 or 301 or 251–252. In addition, students must take a physical chemistry sequence (Chemistry 389–390 or 287–288.1 or 287–288.2) and a biochemistry laboratory course (Bio S 638 or 430 or 630). Note that Physical Chemistry 288.2 is designed for biologists, but either sequence is appropriate. It is recommended that students take the more rigorous organic chemistry and physics sequences (Chemistry 357–358 or 359–360 and Physics 207–208) and a third semester of calculus. Students interested in biochemistry should complete a year of introductory chemistry other than Chemistry 103–104 before the start of their sophomore year. Students are also urged to complete introductory biology in their freshman year.

3) *Botany:* A minimum of 13 credits is required from courses chosen with the aid of an adviser to meet the goal of exposing each student to plant structure, function, classification, ecology, and evolution. Three courses, one from each of the three following categories, fulfill the minimum requirements. Students are encouraged to begin the sequence of courses with Bio S 241 (see category b): (a) Bio S 242 and 244 or Bio S 341 and 349, Plant Physiology, Lectures and Laboratory; (b) Bio S 241, Introductory Botany; Bio S 248, Taxonomy of Vascular Plants; Bio S 448, Plant Evolution and the Fossil Record; or Pl Pa 309, Introductory Mycology; and (c) Bio S 345, Plant Anatomy; or Pl Pa 301, Introductory Plant Pathology. Students interested in a broad background in botany are encouraged to take Bio S 346, Algal Physiology; Bio S 463 and 465, Plant Ecology, Lectures and Laboratory; and additional courses in (b) and (c).

4) *Cell Biology:* Chemistry 300 or 215–216, Quantitative Chemistry; Bio S 432, Survey of Cell Biology; Bio S 630, Laboratory in Cell Biology (strongly recommended), **or** Bio S 638, Intermediate Biochemical Methods **or** Bio S 430, Basic Biochemical Methods; **and** at least 5 additional credits chosen from the following courses: Bio S 222, Neurobiology and Behavior II: Introduction to Neurobiology; Bio S 305, Basic Immunology; Bio S 313, Histology: The Biology of the Tissues; Bio S 345, Plant Anatomy; Bio S 435–436, Undergraduate Biochemistry Seminar; Bio S 438, Cell Proliferation and Oncogenic Viruses; Bio S 483, Molecular Aspects of Development; Bio S 444, Plant Cell Biology; Bio S 636, Current Topics in Cell Biology; Bio S 639, The Nucleus; An S 419, Animal Cytogenetics.

   Students interested in cell biology should complete a year of introductory chemistry other than Chemistry 103–104 before the start of their sophomore year. Students are also urged to complete introductory biology in their freshman year. If graduate work in cell biology is anticipated, students should consider taking a physical chemistry sequence (Chemistry 389–390 or 287–288.1 or 287–288.2).

5) *Ecology and Systematics:* Bio S 261, General Ecology, and 10 credits from the following course lists, including at least one course from each group:

   (a) Bio S 241, Introductory Botany; Bio S 274, Functional and Comparative Morphology of Vertebrates; Bio S 373, The Invertebrates: Form, Function, and Evolution; Bio S 471, Mammalogy; Bio S 472, Herpetology; Bio S 475, Ornithology; Bio S 476, Biology of Fishes; Entom 212, Insect Biology.

   (b) Bio S 263, Field Ecology; Bio S 272, Functional Ecology; Bio S 448, Plant Evolution and the Fossil Record; Bio S 455, Insect Ecology; Bio S 457 and 459, Limnology, Lectures and Laboratory, Bio S 461, Population and Evolutionary Ecology; Bio S 462, Marine Ecology; Bio S 463 and 465, Plant Ecology, Lectures and Laboratory; Bio S 464, Microevolution and Macroevolution; Bio Sci 470, Ecological Genetics; Bio S 478, Ecosystem Biology; Bio S 479, Paleobiology; Bio S 481, Population Genetics.

   One 400-level, 4-credit course offered at Shoals Marine Laboratory may be applied toward the 10 credits. Students are encouraged to gain experience in some aspect of field biology through course work at a biological field station or work experience.

6) *General Biology:* The program of study in general biology requires a minimum of 13 credit hours from courses offered by the Division of Biological Sciences and may include Microbiology 290–291. These credits must include one course from the courses listed for at least three of the seven other programs of study, and must include a course with a laboratory and a minimum of two upper-level (300 and above) courses.

7) *Genetics and Development:* A minimum of 13 credits, usually chosen from the following courses: Bio S 385, Developmental Biology; Bio S 389, Embryology; Bio S 480, Seminar in Developmental Biology; Bio S 481, Population Genetics; Bio S 483, Molecular Aspects of Development; Bio S 484, Molecular Evolution; Bio S 485 and 487, Microbial Genetics; Bio S 486, Immunogenetics; Bio S 633 Biosynthesis of Macromolecules; Bio S 639, The Nucleus; Bio S 641, Laboratory in Plant Molecular Biology; Bio S 644, Plant Growth and Development; Bio S 653, Plant Molecular Genetics; Bio S 687, Developmental Genetics; Bio S 688, Yeast Genetics; Bio S 689, Advanced Topics in Population Genetics; An S 419, Animal Cytogenetics.

   Up to 3 credits for this program for study may be chosen from other biological sciences courses with approval of the faculty adviser.

8) *Neurobiology and Behavior:* The two-semester introductory course sequence, Neurobiology and Behavior I and II (Bio S 221 and 222) with discussion section (4 credits per term), and 7 additional credits, among which must be a course from the neurobiology and behavior offerings. Bio S 420, 498, 499, and 720 may not be used as this neurobiology and behavior course. However, these readings and independent research courses may form part of the additional credits (beyond those provided by the advanced neurobiology and behavior course) required to complete the program of study in neurobiology and behavior.

   *Note:* Students who declare the program of study in neurobiology and behavior after taking Bio S 221 or 222 for only 3 credits must complete additional course work in neurobiology and behavior. These students should consult the chair of the Section of Neurobiology and Behavior (W119 Seeley G. Mudd Hall) to determine what course(s) to use to make up the deficiency.

9) *Independent Option:* Special programs for students interested in biophysics, microbiology (College of Arts and Sciences students only), or nutrition are available under this option. In addition, students who want to undertake a course of study not covered by the eight existing programs of study or one of the special

programs may petition the Division of Biological Sciences Curriculum Committee. Information on independent options and Curriculum Committee petition forms are available in the Office for Academic Affairs, 118 Stimson Hall.

### Independent Research and Honors Program

**Individual research projects** under the direction of a faculty member are encouraged as an aspect of study within a concentration (programs of study). Applicants for research projects are accepted by the individual faculty members, who take into account students' previous academic accomplishments, interests, and goals and the availability of space and equipment suitable for the proposed project. Students accepted for independent research enroll for credit in Biological Sciences 499 (Undergraduate Research in Biology) with the written permission of the faculty supervisor. Students register for this course in 118 Stimson Hall. Any faculty member in the Division of Biological Sciences may act as a supervisor. Faculty supervisors outside the division are acceptable only if a faculty member of the division agrees to take full responsibility for the quality of the work. Information on faculty research activities and undergraduate research opportunities is available in the Behrman Biology Center, G20 Stimson Hall.

Research credits may *not* be used in completion of the following concentration (program of study) areas: animal physiology and anatomy; biochemistry; botany; cell biology; ecology, systematics, and evolution; and genetics and development. No more than 4 credits of research may be used in completion of the concentration area (program of study) in neurobiology and behavior.

**The honors program** in biological sciences is designed to offer advanced training in laboratory or field research through the performance of an original research project under the direct guidance of a member of the faculty. Applications for the honors program are available in the Office for Academic Affairs, 118 Stimson Hall, and must be submitted to the Honors Program Committee by the deadline announced early in the senior year. Application forms for the honors program are separate from the enrollment forms for Biological Sciences 499 (Undergraduate Research in Biology). To qualify for the program, students must have been accepted into the biological sciences major, have completed at least 30 credits at Cornell, and have an overall Cornell cumulative grade-point average of at least 3.00. In addition, students must have at least a 3.00 Cornell cumulative grade-point average in all biology, chemistry, mathematics, and physics courses. (Grades earned in courses in other departments that are used to fulfill major requirements are included in this computation.) In addition, candidates must have a faculty member to supervise their research. Any faculty member in the Division of Biological Sciences may act as a supervisor. Students may also work with faculty supervisors outside the division. Students who select supervisors outside the division must arrange for a faculty member of the division to serve as cosigner of the research. The division cosigner must agree to meet with the student on a regular basis, to report to the Honors Program Committee on the progress of the work approximately two months before the thesis is due, and to serve as a reviewer of the thesis. An honors candidate usually enrolls for credit in Biological Sciences 499 (Undergraduate Research in Biology) under the direction of the faculty member acting as honors supervisor, although it is not necessary to do so. Students choosing to earn credit for honors research must enroll in Biological Sciences 499 (Undergraduate Research in Biology) separate from the honors program. Requirements of the honors program include participation in honors research seminars during two semesters, submission of an acceptable honors thesis, completion of all major requirements, and maintenance of the 3.00 Cornell cumulative grade-point average through graduation. Recommendation to the faculty that a candidate graduate with honors is the responsibility of the Honors Program Committee.

Students interested in the honors program should consult their faculty advisers early during their junior year. Students are strongly encouraged to begin their research projects in their junior year, although they are not formally admitted to the honors program until the beginning of their senior year. Students who are considering a year abroad should consult with a member of the Honors Committee before beginning their year abroad. Details pertaining to thesis due dates, seminars, and other requirements may be obtained from the chair of the Honors Program Committee or from the Office for Academic Affairs, 118 Stimson Hall. Information on faculty research activities is available in the Behrman Biology Center, G20 Stimson Hall.

## CURRICULUM COMMITTEE

Many decisions pertaining to the curriculum, to division-wide requirements, to concentration and breadth requirements, and to the programs of study are made by the Curriculum Committee of the division. The committee consists of faculty and elected student members and welcomes advice and suggestions from all interested persons.

## ADVISING

Students in need of academic advice are encouraged to consult their advisers, come to the Behrman Biology Center (G20 Stimson Hall), or contact the associate director for academic affairs (118 Stimson Hall).

Students interested in marine biology should visit the Cornell Marine Programs Office, G14 Stimson Hall.

Students interested in the multidisciplinary program Biology and Society should see "Special Programs and Interdisciplinary Studies," in the College of Arts and Sciences section of this catalog.

## INDEX OF COURSES

The middle digits of biological sciences course numbers are used to denote courses in specific areas: 0, general; 1, animal physiology and anatomy; 2 and 9, neurobiology and behavior; 3, biochemistry and cell biology; 4, botany; 6 and 7, ecology, systematics, and evolution; 8, genetics and development. The middle digit 5 is used when all other course numbers in a particular area have already been assigned.

*Note:* Biological sciences courses count as agriculture and life sciences credits for students in the College of Agriculture and Life Sciences and as arts and sciences credits for students in the College of Arts and Sciences.

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## GENERAL COURSES

**101–102 Biological Sciences, Lectures**
101, fall; 102, spring. 2 credits each term. Prerequisite: concurrent enrollment in Biological Sciences 103 (fall) or 104 (spring). Passing grade (D or better) in 101 is prerequisite to 102 unless written permission is obtained from instructor. S-U grades optional, with permission of instructor. May not be taken for credit after Biological Sciences 105–106 or 109–110.

Lecs, M W F 9:05 or 10:10. 2 lecs each week; to accommodate these, students must reserve all 3 days. Evening prelims: fall, Sept. 28 and Nov. 9; spring, Feb. 22 and Apr. 3. K. K. Adler.

Designed both for students who intend to specialize in biological sciences and for those specializing in other subjects, such as the social sciences or humanities, who want to obtain a thorough knowledge of biology as part of their general education. Plant and animal materials are considered together rather than in separate units. The fall semester covers the chemical and cellular basis of life, energy transformations, anatomy, physiology, and behavior. The spring semester covers genetics, development, evolution, ecology, and the origin of life. Each topic is considered in the light of modern evolutionary theory.

**103–104 Biological Sciences, Laboratory**
103, fall; 104, spring. 2 credits each term. Prerequisite: concurrent enrollment in Biological Sciences 101 (fall) or 102 (spring). 103 is prerequisite to 104 unless written permission is obtained from instructor. S-U grades optional, with permission of instructor. No admittance after second week of classes.

Lab, M T W or R 1:25–4:25, M or W 7:30–10:30 p.m, or T R or S 8–11. One 3-hour lab each week and a weekly lec for discs, special lecs, etc. J. C. Glase, P. R. Ecklund and staff.

Biological Sciences 103–104 is designed to give students laboratory experience with major biological phenomena in order to support an understanding of the important concepts, principles, and theories of modern biology. A second objective of the laboratory course is to help students gain expertise in the methods used by biologists to construct new knowledge. Students are exposed to basic concepts, research methods, including laboratory and data transformation techniques, and instrumentation in the major areas of biology. First-semester topics include biochemistry, physiology, plant biology, and behavior. In the second semester laboratory experience is provided in the areas of genetics, development, organismal diversity, population genetics and growth, and ecology. During the first semester, dissection of a doubly-pithed frog is included. Pithing is done by the instructor.

**105–106 Introductory Biology**
105, fall; 106, spring. 4 credits each term (or 2 credits, with permission of instructor). Enrollment limited to 200 students. Prerequisite: 105 is prerequisite to 106, unless written permission is obtained from instructor. S-U grades optional, with written permission of instructor. May not be taken for credit after Biological Sciences 101–104 or 109–110. No admittance after first week of classes. Fee, $5.

Lec, T 9:05 (1st lec of fall term, R 8/31 9:05); additional study and lab hours to be arranged. C. H. McFadden and staff.

Designed primarily for biology majors, preprofessionals, and other students who desire a challenging, broad introduction to fundamental concepts of biology. Physiology, anatomy (accompanied by preserved vertebrate dissection), and biochemistry are strongly emphasized in the fall semester. Subjects of study in the spring semester are genetics, development, ecology, evolution, behavior, and the diversity of organisms. The course uses an autotutorial format and offers considerable flexibility in scheduling. Completion of the course requires mastery of a group of core units. Testing on these units is primarily by oral examination. Four formal laboratory sessions are offered each semester. Written reports on experimental work are required in the fall; extensive dissections (both invertebrate and vertebrate) with practical exams constitute spring laboratories. The core units include additional laboratory work. Performance on the core units, the laboratories, and the final examination determine the final grade. Students who object to dissecting live invertebrates may want to take another biology course.

**107–108 General Biology**
8-week summer session (107, weeks 1–4; 108, weeks 5–8). 4 credits each. Prerequisite: Biological Sciences 101–103, 105, or 107 is a prerequisite for 108. Fee, $35.

Lecs, M-R 9–12; labs, M T & R 1:30–4:30, F 9–12. A. W. Blackler and staff.

Designed for students who plan further study in biology and for students who want a broad course in biology as part of their general education. Topics covered in Biological Sciences 107 include physiology, biology, and metabolism. The laboratory work involves an introduction to some major techniques, vertebrate dissection, and a survey of plant organization. Topics covered in Biological Sciences 108 include genetics, developmental biology, the biology of populations, and evolution. The laboratory work is a continuation of the material covered in Biological Sciences 107 and involves more techniques, a survey of animal organization, and the design and performance of a field study. Biological Sciences 107–108 fulfills the introductory biology requirement for majors and forms a suitable introductory biology course sequence for students intending to go to medical school.

**109–110 Biological Principles**
109, fall; 110, spring. 3 credits each term. Limited to 600 students. Prerequisite: 109 is prerequisite to 110 unless written permission is obtained from the instructor and student has at least 3 credits of college biology. Letter grades only. May not be taken for credit after Biological Sciences 101–104 or 105–106. This course may be used to fulfill the distribution requirement in the Colleges of Agriculture and Life Sciences, Arts and Sciences, and Human Ecology but may *not* be used as an introductory course for the major in biological sciences. *Note that this course may not always satisfy the prerequisite for second- and third-level courses in biology.*

Lecs, M W F 9:05 or 10:10; lab, M T W R or F 2–4:25 or T 10:10–12:35. Students do not choose lab sections during course enrollment; lab assignments are made during first day of classes. Each student must attend lab on alternate weeks. Evening prelims: fall, Sept. 28 and Nov. 9; spring, Feb. 22 and Apr. 3. R. Turgeon, C. Eberhard.

Students who do not plan to major in biology may take this broad introductory course in modern biology. It is not a course in social biology but addresses itself to biological principles with academic rigor. The content is designed to appeal to anyone who seeks a comprehensive knowledge of biology as part of a general education. Laboratory sections enable small groups of students to meet with the course staff and are used for problem-solving experiments, demonstrations, and discussions. No live dissections are involved; there are dissections of preserved material.

**152 Special Topics in Biology**
Spring. 1 credit. Limited to 30 students. Prerequisites: superior performance in Biological Sciences 109 or equivalent and concurrent enrollment in Biological Sciences 102, 106, or 110, or written permission of instructor. S-U grades only. *This course may not be used in fulfillment of college distribution requirements.*

Lec, M 3:35: occasional field trips to be arranged. R. Turgeon, C. Eberhard, and guest lecturers.

A lecture course designed to complement introductory biology by providing an opportunity for deeper exploration of selected topics of interest. Class involvement and discussion are encouraged.

**200 Special Studies in Biology**
Fall or spring. 1–3 credits. Prerequisites: transfer or special-student status and written permission of instructor and of the associate director of the Division of Biological Sciences. Students must register using a special form available in Stimson 118. S-U grades optional, with permission of instructor.

Hours to be arranged. Staff.

A registration device for students who want to take only a portion of a regular biological sciences course—for example, only the lectures or only the laboratory in a course that includes both. Only students who have already had training equivalent to the portion of the regular course that is to be omitted may register in this manner. May not be substituted for 100–level courses and may not be used in fulfillment of college distribution requirements.

**202 History of Biology (also Biology and Society 288 and History 288)**
Spring. 3 credits. Prerequisite: one year of introductory biology. S-U grades optional.

Lecs, T R 10:10–11:25. W. B. Provine.

An examination of the history of biology, emphasizing the interaction of biology and culture. Original writings of biologists constitute the bulk of reading assignments. Covers the period from classical antiquity to the present, but primary emphasis is on twentieth-century biology.

**205 Ethics and Healthcare (also Philosophy 245 and Biology and Society 205)**
Fall and summer. 4 credits. Limited to 80 students (25 under Biological Sciences 205, 25 under Biology and Society 205, and 30 under Philosophy 245). Registered students not attending during the first week will be dropped from the course. Open to sophomores, juniors, and seniors; permission of instructor required for graduate students.

Lecs, T R 10: 10–11:25; disc, 1 hour each week to be arranged. M. Wachsberg.

Critical *philosophical* analysis of the conceptual frameworks in which ethical problems associated with healthcare can be formulated and solutions evaluated. General topics (with sample issues in parentheses) include knowledge in ethics (ethical skepticism, ethical relativism); proper social allocation of resources for, and within, medicine (entitlement to health care, access to scarce medical resources, cost-benefit analysis); the proper account of basic concepts such as illness, death, autonomy, and personhood (abortion, euthanasia, procreative technologies); and the professional-patient relationship (informed consent, confidentiality, medical paternalism).

**206 Ethics and the Environment (also Philosophy 246 and Biology and Society 206)**
Spring. 4 credits. Open to all undergraduates. Permission of instructor required for graduate students.

Lecs, T R 10:10–11:25; disc, 1 hour each week to be arranged. M. Wachsberg.

Critical *philosophical* analysis of the conceptual frameworks in which policies affecting the environment are formulated and judged. An introductory section of the course discusses the nature of ethics and the possibility of knowledge in ethics. The first major substantive component of the course deals with the nature and extent of individual and social obligations to spatially distant people, future generations, nonhuman animals and nonsentient things (e.g., the ecosystem). The second major component of the course deals with the appropriate analysis of the origin of environmental problems and the range of options for their solution. Topics include individual vs. collective goods, cost-benefit analysis, and coordination problems.

**207 Evolution (also History 287)**
Fall. 3 credits. Intended for students with no background in college biology. May not be taken for credit after Biological Sciences 378. S-U grades optional.

Lecs, T R 10:10; disc, to be arranged. W. B. Provine.

Evolution is the central concept in biology. This course examines evolution in historical and cultural contexts. Aims of the course include understanding the major issues in the history and current status of evolutionary biology and exploring the implications of evolution for culture. Issues range from controversies over mechanisms of evolution in natural populations to the conflict between creationists and evolutionists.

**[301 Biology and Society: The Biocultural Perspective (also Anthropology 301 and Biology and Society 301)**
Fall. 3 or 4 credits (4 credits by arrangement with instructor; 4–credit option required of Biology and Society majors). Prerequisite: one year of introductory biology. S-U grades optional. This is the core course for the Biology and Society major and is also open to other students who have fulfilled the prerequisite. Not offered 1989–90.

Lecs, T R 11:40–12:55. Staff.

Human biology, behavior, and institutions are understood in modern evolutionary theory as the ongoing products of interactions between human biological evolution and cultural change. Nevertheless, numerous attempts to examine evolutionary processes in humans violate key tenets of evolutionary theory, unwittingly reproducing elements of pre-Darwinian views of human nature. After reviewing the pre-Darwinian context and reading *The Origin of Species,* the course explores attempted applications of evolutionary analysis to humans and develops a cultural explanation of the persistence of pre-Darwinian elements in many of them.]

**305 Basic Immunology, Lectures (also Veterinary Medicine 315)**
Fall. 3 credits. Strongly recommended: basic courses in microbiology, biochemistry, and genetics.

Lecs, T R 8:30–9:55. Evening prelims: Oct. 12 and Nov. 9. A. J. Winter.

A survey of modern immunology, with emphasis on the biological functions of the immune response.

**307 Basic Immunology, Laboratory (also Veterinary Medicine 316)**
Fall. 2 credits. Prerequisite: a course in basic microbiology or permission of instructor. Recommended: concurrent enrollment in Biological Sciences 305.

Labs, T R 10:10–1:10. N. L. Norcross.

A series of laboratory exercises selected to illustrate immunological concepts presented in Biological Sciences 305. Exercises are designed to give students experience with the stimulation and measurement of an immune response in the rabbit. Techniques to familiarize students with both humoral and cellular immune phenomena are included, with the goal of offering hands-on experience in immunology. Among the methods and techniques offered are agglutination and precipitation methods, virus neutralization and phagocytosis, measurement of the biological activity of complement components, antibody-dependent cell-mediated cytotoxicity, T and B cell identification, monoclonal antibodies and the ELISA, antibody production by single cells, lymphocyte blastogenesis, and delayed hypersensitivity.

**308 Pathogenic Microbiology (also Veterinary Medicine 317)**
Spring. 2 or 4 credits (2 credits with lecture only). Limited to 20 students. Prerequisites: Microbiology 290 and 291. Recommended: Biological Sciences 307.

Lecs, T R 1:25; labs, T R 2:30–5. Evening prelim to be arranged. L. E. Winter and staff.

A course in medical microbiology. Lectures discuss the bacteria, fungi, and viruses that cause disease in humans. Emphasis is on the pathogenic mechanisms of the microbes and the interrelationships that exist between the host and the microbe. Laboratory sessions are involved with the isolation, culture, and identification of the microbes and the further study and demonstration of the disease process through use of laboratory animal models and tissue cultures. Dissection of small vertebrate animals (mice) is performed in several of the bacteriology laboratories.

**400 Undergraduate Seminar in Biology**
Fall or spring. Variable credit (1–3 credits assigned for individual seminar offerings). May be repeated for credit. S-U grades optional.

Sem to be arranged. Staff.

From time to time specialized seminars on topics of interest to undergraduates are offered by visiting faculty or faculty from the Sections of Ecology and Systematics, Genetics and Development, or Plant Biology. Topics and instructors are listed in the division's catalog supplement issued at the beginning of the semester.

**401 Introduction to Scanning Electron Microscopy (formerly Biological Sciences 600)**
Fall or spring, weeks 1–6. 1 credit. Limited to 8 students (fall), 12 students (spring). Prerequisite: permission of instructor. S-U grades only.

Lec and lab to be arranged. M. V. Parthasarathy.

A general introduction to the principles and the proper use of the scanning electron microscope. Emphasis is on biological material.

**403 Transmission Electron Microscopy for Biologists (formerly Biological Sciences 603)**
Fall. 1 or 2 credits. 2 credits if student takes both sections. Limited to 12 students. Prerequisites: Biological Sciences 313, 345, 443, or written permission of instructor. S-U grades optional.
Lec, T 11:15; labs, M W or T R 1:25–4:25. Two sections: Sec 01, weeks 1–4; sec 02, weeks 5–8. Students may register for one or both sections. M. V. Parthasarathy.
Section 01, weeks 1–4, covers the principles and techniques of preparing biological material for transmission electron microscopy. Using plant, animal, and microbe materials this section studies chemical fixations, ultrathin sectioning, negative staining, and metal shadowing techniques. Section 02, weeks 5–8, covers the principles and use of the transmission electron microscope (TEM), with emphasis on proper operation of the instrument and interpretation of images obtained. Ultrathin sections as well as negatively stained material from samples prepared in Section 01 are used. Students have 2 additional weeks to complete laboratory assignments at the end of each section.

**405 Electron Microscopy in Molecular Biology**
Fall, weeks 9–12. 1 credit. Limited to 12 students. Prerequisites: Biological Sciences 403 or proficiency in transmission electron microscopy and written permission of instructor. S-U grades optional.
Lec, T 11:15; labs, M W or T R 1:25–4:25. M. V. Parthasarathy and M. Kyle.
An introductory course to electron microscopy (EM) for use as a tool in analyzing molecular structure, interactions, and processes. Methods considered to be most generally applicable to current studies in molecular biology are covered, including visualization of nucleic acids, heteroduplexes, protein molecules and filaments, and EM immunolabelling.

**469 Food, Agriculture, and Society (also Biology and Society 469)**
Spring. 3 credits. Prerequisite: an introductory ecology course or permission of instructor. S-U grades optional. Possible fee for course reading materials.
Lecs, T R 1:25–2:40. A. G. Power.
A multidisciplinary course dealing with the social and environmental impact of food production in the United States and in developing countries. Agroecosystems of various kinds are analyzed from biological, economic, and social perspectives. The impacts of traditional, conventional, and alternative agricultural technologies are critically examined in the context of developed and developing economies. Specific topics include pest management, soil conservation, farm labor, land reform, biotechnology, and international food policy.

**498 Teaching Experience**
Fall or spring. 1–4 credits. Enrollment limited. Prerequisites: previous enrollment in the course to be taught or equivalent, and written permission of instructor. S-U grades optional, with permission of instructor. *Students in the College of Arts and Sciences may not count credits from this course toward the 120 credits required for graduation.*
Hours to be arranged. Staff.
Designed to give qualified undergraduate students teaching experience through actual involvement in planning and assisting in biology courses. This experience may include supervised participation in a discussion group, assisting in a biology laboratory, assisting in field biology, or tutoring. Biological sciences courses currently offering such experience include Biological Sciences 105–106, 231, 274, 311, 319, 330, 430, and 475.

**499 Undergraduate Research in Biology**
Fall or spring. Variable credit. *Students in the College of Arts and Sciences may not register for more than 6 credits per term with one supervisor or 8 credits per term with more than one supervisor.* Prerequisite: written permission of staff member who supervises the work and assigns the grade. Students must register in the Office for Academic Affairs in Stimson 118. Each student must submit an independent study statement describing the proposed research project during course registration. (Special forms for this purpose are available in the college offices.) S-U grades optional. Any faculty member in the Division of Biological Sciences may act as a supervisor. Faculty supervisors outside the division are acceptable only if a faculty member of the division agrees to serve as cosigner, taking full responsibility for the quality of the work.
Hours to be arranged. Staff.
Practice in planning, conducting, and reporting independent laboratory and library research programs. Research credits may *not* be used in completion of the following concentration areas (programs of study): animal physiology and anatomy; biochemistry; botany; cell biology; ecology, systematics, and evolution; and genetics and development. No more than 4 credits of research may be used in completion of the concentration area (program of study) in neurobiology and behavior.

**606 Freeze-Fracture Technique**
Spring, weeks 7–12. 1 credit. Primarily for graduate students. Limited to 8 students. Prerequisites: Biological Sciences 403 or equivalent, and permission of instructor. S-U grades only.
Lec, T 11:15; disc to be arranged; labs, T R 1:25–4:25. M. V. Parthasarathy.
Principles of freeze-fracturing and freeze-substitution technique, freezing artifacts, and interpretation of images.

**608 Advanced Electron Microscopy for Biologists**
Spring, weeks 10–14. 1 credit. Primarily for graduate students. Limited to 6 students. Prerequisite: Biological Sciences 403 or equivalent. S-U grades only.
Hours to be arranged. M. V. Parthasarathy.
Project in biological ultrastructure.

**702 X-Ray Elemental Analysis in Biology**
Spring, weeks 7–14. 1 credit. Limited to 6 students. Prerequisites: Biological Sciences 403 or equivalent, and permission of instructor. S-U grades only. Offered alternate years.
Lec and lab to be arranged. M. V. Parthasarathy, C. Daugherty.
Principles of X-ray elemental analysis are discussed, with special reference to the energy-dispersive system. Emphasis is on qualitative elemental analysis of biological specimens and preparation of material for such analysis, including freeze-substitution technique. A brief introduction to quantitative elemental analysis is also given.

**Related Courses in Other Departments**

**Medicine and Civilization (Biology and Society 322)**

## ANIMAL PHYSIOLOGY AND ANATOMY

**[214 Biological Basis of Sex Differences (also Women's Studies 214)**
Fall. 3 credits. Prerequisite: one year of introductory biology. Limited to non-biology majors and freshman and sophomore biology majors. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, T R 8:30–9:55; occasional disc to be arranged. J. E. Fortune.
The structural and functional differences between the sexes are examined. Emphasis is placed on mechanisms of mammalian reproduction; where possible, special attention is given to studies of humans. Current evidence on the effects of gender on nonreproductive aspects of life (behavior, mental and physical capabilities) is discussed. The course is intended to provide students with a basic knowledge of reproductive endocrinology and with a basis for objective evaluation of sex differences in relation to contemporary life.]

**311 Introductory Animal Physiology, Lectures (also Veterinary Medicine 346)**
Fall. 3 or 4 credits (4 credits with discussion section). 4–credit option required of students studying animal physiology and anatomy. Prerequisites: one year of college biology, chemistry, and mathematics. S-U grades optional with permission of instructor.
Lecs, M W F 11:15; disc to be arranged. Evening prelims: Sept. 21 and Nov. 2. E. R. Loew and staff.
A general course in animal physiology emphasizing principles of operation, regulation, and integration common to a broad range of living systems from the cellular to the organismal level. Structure/function relationships are stressed along with underlying physico-chemical mechanisms.

**313 Histology: The Biology of the Tissues**
Fall. 4 credits. Prerequisite: one year of introductory biology. Recommended: background in vertebrate anatomy and organic chemistry or biochemistry.
Lecs, T R 11:15; labs, T R 2–4:25. R. B. Silver.
Provides students with a basis for understanding the microscopic, fine-structural, and functional organization of vertebrates, as well as methods of analytic morphology at the cell

and tissue levels. Dynamic interrelations of structure, composition, and function in cells and tissues are emphasized. The course may include work with invertebrate or vertebrate animals.

**316 Cellular Physiology**
Spring. 4 credits. Limited to 100 students, with preference given to students studying in animal physiology and anatomy. Each lab limited to 24 students. Prerequisite: concurrent or previous enrollment in Biological Sciences 330 or 331.
Lecs, M W F 9:05; lab, M T W or R 1:25–5. A. Quaroni and staff.
Lectures introduce students to the most current information on the ways cells function and regulate themselves and neighboring cells and on what molecules are involved in these regulatory processes. Laboratories provide an introduction to cell and organ culture and to immunological techniques used to study cell structure and function *in vivo* and *in vitro*. Experiments performed in the laboratory are closely related to, and provide practical experience with, subjects covered in the lectures. Vertebrate animals are used in this course. No experimentation is performed on live animals.

**319 Animal Physiology Experimentation (also Veterinary Medicine 348)**
Fall. 3 credits. Enrollment limited to 80 students, with preference given to students studying in animal physiology and anatomy. Each of 4 afternoon laboratory sections limited to 20 students. Prerequisite: concurrent or previous enrollment in Biological Sciences 311 or permission of instructor based on previous meritorious performance in another introductory animal physiology course.
Lab, M T W or R 1:25–5; disc, R 1:25, F 12:20 or 1:25. Student do not choose disc sections during course enrollment; disc assignments are made during first day of classes. R. A. Corradino, P. W. Concannon.
A series of student-conducted *in vitro* and *in vivo* experimental exercises designed to illustrate basic physiological processes in animals and to introduce students to animal physiology research techniques, instrumentation, experimental design, and interpretation of results. Protocols include anesthesia, dissection, vivisection, physiographic recording, and computer simulations. Experiments with living tissues and live animals examine properties of blood, muscle, and nerves; cardiovascular, respiratory and gastrointestinal function and control; and endocrine regulation of mineral metabolism and reproductive tissue activity. Experimental resources include live animals of several vertebrate species, including frogs, birds, rats, and rabbits, which are sacrificed in conjunction with the laboratory exercises. Written reports of laboratory activities are required. Grading is based on evaluation of these reports and on laboratory performance.

**410 Seminar in Anatomy and Physiology**
Fall or spring. 1 credit. May be repeated for credit only once. Limited to upperclass students. S-U grades only.
Sem to be arranged. Organizational meeting first W of each semester at 7:30 p.m. in Stimson 105. Staff (coordinator, D. Robertshaw).
Discussions and seminars on specialized topics in animal physiology and anatomy.

**458 Mammalian Physiology**
Spring. 3 credits. Enrollment limited. Graduate student auditors allowed in lectures. Prerequisite: Biological Sciences 311 or equivalent with permission of instructor.
Lecs, M W F 10:10. K. W. Beyenbach and staff.
An in-depth treatment of selected topics in mammalian physiology and human physiology. Emphasis is on a conceptual and working knowledge of physiology rather than a factual, memorizing knowledge. Topics selected, in order of presentation, include recurrent themes in physiology; basic functional elements of biological systems; design of multicellular animals; mammalian fluid compartments; homeostasis; cardiovascular, respiratory, gastro-intestinal, and renal physiology; and energy metabolism. The course concludes with a discussion of integrative physiology by considering the multiple, parallel short-term responses of the human body to exercise. Recommended for biological sciences majors, pre-med and pre-vet students, and beginning graduate students in physiology, nutrition, and animal science.

**[615 Nutrition and Physiology of Mineral Elements (also Veterinary Medicine 759 and Nutritional Sciences 659)**
Fall. 2 credits. Prerequisites: courses in basic physiology, intermediate biochemistry, and general nutrition. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10. R. H. Wasserman, R. Schwartz, D. R. Van Campen.
Lectures on nutritional aspects and physiological, biochemical, and hormonal relationships of the prominent macroelements and microelements, with emphasis on recent developments. Information on methodologies of mineral research and the requirements for and essentiality, transport, function, homeostasis, interrelationships, and toxicity of various mineral elements.]

**[618 Biological Membranes and Nutrient Transfer (also Veterinary Medicine 752)**
Spring. 2 credits. Prerequisites: courses in animal or plant physiology, quantitative and organic chemistry, and physics. Recommended: a course in cellular physiology. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, T R 11:15. R. H. Wasserman.
An introduction to elementary biophysical properties of biological membranes; theoretical aspects of permeability and transport; mechanism of transfer of inorganic and organic substances primarily across epithelial membranes; and characteristics and properties of transporting macromolecules and ion channels.]

**619 Lipids (also Nutritional Sciences 602)**
Fall. 2 credits.
Lecs, T R 11:15. A. Bensadoun.
Advanced course on biochemical, metabolic, and nutritional aspects of lipids. Emphasis is placed on critical analysis of current topics in lipid methodology; lipid absorption; lipoprotein secretion, molecular structure, and catabolism; mechanism of hormonal regulation of lipolysis and fatty acid synthesis; and cholesterol metabolism and atherosclerosis.

**658 Molecular Mechanisms of Hormone Action (also Veterinary Medicine 758)**
Spring. 2 credits. Prerequisite: permission of instructor. Minimum enrollment of 6 required. Offered alternate years.
Lecs, T R 10:10. R. A. Corradino.
An advanced course developed from the current literature on endocrine mechanisms.

**710–718 Special Topics in Physiology**
Fall or spring. 1 or 2 credits for each topic. May be repeated for credit. Enrollment in each topic may be limited. S-U grades optional, with permission of instructor. Lectures, laboratories, discussions, and seminars on specialized topics.
*Fall 1989:* one topic is offered.

**717 Structure and Function of Joints with Emphasis on Arthritis**
1 credit.
Lec, 1 hour each week to be arranged. G. Lust.
*Spring 1990:* two topics are offered.

**712 Plasma Lipoproteins**
1 credit.
Sem, hour each week to be arranged. A. Bensadoun.

**714 Physiology of Pregnancy**
2 credits.
Lab to be arranged. P. W. Nathanielsz.

**719 Graduate Research in Animal Physiology (also Veterinary Medicine 600)**
Fall or spring. Variable credit. Prerequisites: written permission of the section chair and of the staff member who supervises the work and assigns the grade. Students must register in Vet Research Tower 725. S-U grades optional.
Hours to be arranged. Staff.
Similar to Biological Sciences 499 but intended for graduate students who are working with faculty members on an individual basis.

**753 Animal Biotechnology**
Fall. 3 credits. Prerequisites: two courses in physiology, two courses in biochemistry, and one course in endocrinology or nutrition.
Lec and disc, M 11:15; lab, M 1:25–4:20; additional hours to be arranged. W. Hansel and staff.
A course in animal biotechnology designed to prepare students for research in animal genetic engineering. Standard techniques for cloning DNA in bacteria are discussed. Development of expression systems in bacteria, yeast, and mammalian cells; DNA sequencing and analysis; and insertion of DNA into mammalian cells are carried out in the laboratory.

## Related Courses in Other Departments

**Adaptations of Marine Organisms (Biological Sciences 413)**

**Advanced Work in Animal Parasitology (Veterinary Medicine 737)**

**Animal Development (Veterinary Medicine 507)**

**Animal Reproduction and Development (Animal Science 220)**

**Developmental Biology (Biological Sciences 385)**

**Embryology (Biological Sciences 389)**

**Fundamentals of Endocrinology (Animal Science 427–428)**

**Insect Morphology (Entomology 322)**

**Integration and Coordination of Energy Metabolism (Biological Sciences 637 and Nutritional Sciences 636)**

**Neuroanatomy (Veterinary Medicine 504)**

**Sensory Function (Biological Sciences 492)**

**Teaching Experience (Biological Sciences 498)**

**Undergraduate Research in Biology (Biological Sciences 499)**

## BIOCHEMISTRY, MOLECULAR AND CELL BIOLOGY

**132 Orientation Lectures in Biochemistry**
Spring, weeks 1–3. No credit. Primarily for freshmen, sophomores, and transfer students. S-U grades only (registered students receive an unsatisfactory grade for nonattendance).
Lec, S 10:10–11:00, for first 3 S of semester. Section chair and staff.
Discussions by six professors about their research and promising areas for research in the future.

**231 General Biochemistry**
Fall. 3 credits. Intended for students who have not studied biochemistry previously and who do not expect to pursue it further. Not recommended for students who have taken organic chemistry. Prerequisite: Chemistry 104 or 208 or equivalent. S-U grades optional.
Lecs, M W F 12:20. J. M. Griffiths.
A brief introductory section relating organic chemistry to biochemistry is given, followed by the biochemical material in the usual one-semester introductory courses. Topics of general interest are also included.

**232 Recombinant DNA Technology and Its Applications (also Biology and Society 232)**
Spring. 3 credits. Prerequisite: one year of introductory biology. S-U grades optional.
Lecs, M W F 11:15. F. H. Buttel, J. M. Calvo, J. M. Fessenden MacDonald, and staff.
An introduction to molecular approaches to biology. Basic concepts underlying recombinant DNA technology together with strategies for cloning genes are discussed. Much of the course deals with applications of recombinant DNA technology to basic research and to biotechnology. Applications to be discussed include screening for genetic diseases, animal and plant improvement, and production of proteins useful in medicine, agriculture, and industry. Historical, regulatory, social, and ethical issues are presented and discussed. Recommended especially for freshman with AP biology credit and sophomores desiring a firm background in recombinant DNA technology in preparation for taking genetics and biochemistry. Also appropriate for nonmajors.

**330–331 Principles of Biochemistry**
Introductory biochemistry is offered in two formats: individualized instruction (330) and lectures (331). *Individualized instruction is offered to a maximum of approximately 150 students each semester. Lectures given fall semester only.*

**330 Principles of Biochemistry, Individualized Instruction**
Fall or spring. 4 credits (2 credits if taken after Biological Sciences 231). Prerequisite: Chemistry 253 or 358 or equivalent. May not be taken for credit after Biological Sciences 331. S-U grades optional for graduate students only.
Evening prelims: fall, Oct. 26; spring, Mar. 13. Fall: M. Ferger and staff; spring: M. Ferger, R. Wu, and staff.
The core material of the course includes protein structure and function, enzymes, basic metabolic pathways, DNA, RNA, protein synthesis, and an introduction to gene cloning. There are no formal lectures; the course has an autotutorial format. The core material is divided into twelve units of work that are outlined in a study guide written to accompany the textbook. Students prepare the work on their own, with help from the staff of the Study Center if desired.

Students must pass a quiz on each unit to obtain a grade of C+. Grades above C+ (to a maximum of B+) are determined by the amount of elective work satisfactorily completed by participation in optional discussion groups. Grades above B+ are earned by high grades on the midterm and final exams. The optional discussion groups are scheduled M W F 8 and 10:10 and at other hours. A student attends once a week at one of those times, for a maximum of 8 weeks during the semester. Missed deadlines or very poor exam scores result in grade penalties.

**331 Principles of Biochemistry, Lectures**
Fall or 6–week summer session. 4 credits (or 2 credits if taken after Biological Sciences 231). Enrollment may be limited to 400 students in fall. Prerequisite: Chemistry 253 or 358 or equivalent. May not be taken for credit after Biological Sciences 330. S-U grades optional for graduate students only.
Lecs, M W F S 10:10. J. K. Moffat, R. Barker, B.-K.Tye.
Chemistry of biological substances presented in lecture format. Course content is similar to that of Biological Sciences 330.

**430 Basic Biochemical Methods**
Fall or spring. 4 credits. Enrollment limited. Prerequisites: Biological Sciences 330 or 331, organic chemistry lectures and laboratory, and permission of instructor obtained by preregistering in Stimson 229. Concurrent registration in Biological Sciences 330 or 331 may be arranged in the fall term for graduate students.
Lec and disc, F 1:25; labs, M W or T R 12:20–4:25. R. R. Alexander, J. M. Griffiths, and staff.
A laboratory course designed to introduce students to the biochemical techniques commonly used in the study of biological materials. Students work in small groups, and each student may select two of three or four modules offered. Various assay methods, chromatography, electrophoresis, and use of the scintillation counter are taught. Protein isolation, purification, and enzyme characterization methods are included. Techniques used in the clinical laboratory are applied to analyses of blood and urine samples, and some nutritional analyses are done for protein and vitamin contents of foods. In the nucleic acids module, students are introduced to recombinant DNA methodology, isolating DNA, and studying the function of transfer RNA. A student may isolate and purify the lipids from a material of his/her choice and perform thin-layer chromatography and carry out cholesterol and phosphate analyses. Separation techniques are used to isolate cell components and experiments are conducted to illustrate basic biochemical methods.

**432 Survey of Cell Biology**
Spring. 3 credits. Prerequisite: Biological Sciences 330 or 331 or equivalent. S-U grades optional for graduate students only.
Lecs, M W F 11:15. W. J . Brown and staff.
A survey of a wide array of topics focusing on the general properties of eucaryotic cells. The topics include methods used for studying cells, the structure and function of the major cellular organelles, and analyses of cellular processes such as mitosis, endocytosis, cell motility, secretion, cell-to-cell communication, gene expression, and oncogenesis. Some of the material is covered in greater depth in Biological Sciences 438, 483, 632, 636, and 639.

**435–436 Undergraduate Biochemistry Seminar**
435, fall; 436, spring. 1 credit each term. May be repeated for credit. Limited to upperclass students. Prerequisite: Biological Sciences 330 or 331 or written permission of instructor. S-U grades only.
Sem to be arranged. Organizational meeting first W of each semester at 4 p.m. Fall: T. Huffaker; spring: B.-K. Tye.
Selected papers from the literature on a given topic are evaluated critically during six or seven two-hour meetings.

**438 Cell Proliferation and Oncogenic Viruses (also Toxicology 438)**
Spring. 3 credits. Prerequisite: Biological Sciences 330 or 331. Recommended: Biological Sciences 281.
Lecs, T R 12:20–1:35. V. M. Vogt.
A description of the growth properties of animal cells in culture, followed by discussions of the changes in cells that are induced by tumor viruses and carcinogens. Topics include immortalization of cells, the cell cycle, macromolecular growth factors, cell-surface properties, cell cytoskeleton, transcription and translation of retrovirus genes, and structure and function of viral and cellular *onc* genes.

**630 Laboratory in Cell Biology**
Spring. 4 credits. Enrollment limited. Prerequisites: a course in biochemistry or cell biology, and permission of instructor obtained by registering in 258 Biotechnology Building with J. Gibson.
Labs, M W 1:25–4:25 or R 9:05–4:25; disc to be arranged. J. Gibson and staff.
The course emphasizes techniques for handling and experimenting with cells of different kinds and provides experience in experimental design. Limited numbers of vertebrate animals are used for two experiments where no alternative approach exists.

**631 Protein Structure and Function**
Fall. 2 or 3 credits (3 credits with discussion). Prerequisites: introductory biochemistry, physical chemistry, and organic chemistry. Permission of instructor required for discussion. S-U grades optional for lecture; S-U grades only for discussion.
Lecs, M W 9:05; disc, F 9:05. P. A. Karplus.
Lectures on protein structure and the nature of enzymatic catalysis. Discussions cover some of these areas in more depth, through recent research papers.

**632 Membranes and Bioenergetics**
Spring. 2 credits. Prerequisite: Biological Sciences 330 or 331 or equivalent. Offered alternate years.
Lecs, T R 11:15. P. C. Hinkle, R. E. McCarty.
Structure and dynamics of biological membranes, physical methods, model membranes, ionophores, ion-transport ATPases, mitochondrial and chloroplast electron transfer chains, and examples of transport from plants, animals, and bacteria.

**633 Biosynthesis of Macromolecules**
Fall. 2 credits. Prerequisite: Biological Sciences 330 or 331. Recommended: Biological Sciences 281.
Lecs, T R 9:05. J. W. Roberts, D. B. Wilson.
Synthesis of DNA, RNA, and proteins, and regulation of gene expression.

**634 Biochemistry of the Vitamins and Coenzymes (also Nutritional Sciences 634)**
Spring. 2 credits. Prerequisites: Biological Sciences 330 or 331 or equivalent and either Chemistry 358 or 360. Offered alternate years.
Lecs, T R 10:10. M. N. Kazarinoff.
Lectures on the chemistry, biochemistry, and physiology of vitamins and coenzymes. Emphasis is placed on the relationship of structure and function, and mechanisms are examined in detail. Readings from the current primary literature are assigned weekly.

**635 Mechanisms of Metabolic Regulation (also Nutritional Sciences 635)**
Spring. 2 credits. Prerequisites: Biological Sciences 330 or 331 and either Chemistry 358 or 360, or permission of instructor. Offered alternate years.
Lecs, T R 9:05. Staff.
Lectures on the identification and characterization of regulatory steps in metabolism, considered from both theoretical and practical aspects. The intracellular mechanisms of regulation are emphasized, with specific examples in mammalian metabolism examined in detail.

**636 Current Topics in Cell Biology**
Spring. 2 credits. Prerequisites: Biological Sciences 330 or 331, and 432, or their equivalents.
Lecs, T R 10:10. A. P. Bretscher.
Lectures covering current topics in cell biology, including a detailed discussion of secretion, endocytosis, membrane-bound organelles, membrane recycling, the cytoskeleton, cell motility, junctions, the cell cycle, and related topics. Together with Biological Sciences 632 and 639, this course provides broad coverage of the cell biology subject area.

**637 Integration and Coordination of Energy Metabolism (also Nutritional Sciences 636)**
Fall. 3 credits. Prerequisite: Biological Sciences 330 or 331 or equivalent.
Lecs, M W F 9:05. Evening prelims to be arranged. W. J. Arion.
The elements and dynamics of energy metabolism in higher animals are developed systematically through biochemical characterizations of the metabolic components and structure of major tissues and organs. Emphasis is placed on correlations with physiologic functions. Mechanisms that control energy metabolism within individual tissues and coordinate these processes in intact animals are analyzed in the contexts of selected physiologic and pathologic stresses.

**638 Intermediate Biochemical Methods**
Fall or spring. 4 credits. Primarily for graduate students minoring in biochemistry and undergraduates concentrating in biochemistry. Enrollment limited to 24 students in the fall and 48 students in the spring. Admission to the course is dependent upon the results of a personal interview with the teaching support specialist (x5-2435 or x5-5706), which must be held before the first day of classes. *There is no admission to the course without the interview.* Undergraduates are urged to interview during preregistration. May not be taken for credit after Biological Sciences 430.
Lab, T 9:05–4:25 (fall): lab, T or R 9:05–4:25 (spring). D. B. Wilson and staff.
Selected experiments on proteins, enzymes, DNA, and bioenergetics to illustrate basic biochemical properties. The course emphasizes quantitative aspects and techniques currently used in biochemical research.

**639 The Nucleus**
Spring. 2 credits. Prerequisite: Biological Sciences 330 or 331 or equivalent. Recommended: Biological Sciences 281.
Lec, M 8–9:55 p.m. J. T. Lis.
Lectures on topics of eucaryotic gene organization, regulation of gene expression, RNA processing, chromatin structure, the structure and movement of chromosomes, and the architecture of the nucleus. This course and Biological Sciences 632 and 636 provide broad coverage of the cell biology subject area.

**[648 Plant Biochemistry**
Spring. 3 credits. Prerequisites: organic chemistry, biochemistry, and a course in plant physiology. Offered alternate years. Not offered 1989–90.
Lecs, M W F 9:05. A. T. Jagendorf, R. E. McCarty, J. F. Thompson.
Selected areas of plant biochemistry are reviewed in the context of the plant life cycle and responses to the environment. Topics include metabolism of lipids, carbohydrates, organic acids, and proteins; nitrogen and sulfur assimilation; respiration; photosynthesis; development and replication of chloroplasts; and cell-wall composition and properties. Attention is paid to operation of control mechanisms.]

**[650 Nitrogen Metabolism (also Nutritional Sciences 607)**
Spring. 2 credits. Prerequisites: Biological Sciences 330 or 331 and Chemistry 358 or 360. Offered alternate years. Not offered 1989–90.
Lecs, T R 9:05. M. Watford.
A coverage of most aspects of nitrogen metabolism. The first section of the course deals with nitrogen fixation and assimilation, and the metabolism and biological importance of purines, pyrimidines, porphyrins, alkaloids, and amines. This is followed by discussion of the pathways of amino acid biosynthesis and degradation. The final section includes discussion of protein turnover and degradation, nitrogen excretion, and interorgan relationships in higher organisms. Emphasis throughout the course is on hormonal, developmental, and molecular biological aspects of metabolic regulation and evolutionary differences.]

**[659 Risk Management of Toxic Chemicals (also Biology and Society 459 and Toxicology 659)**
Fall. 2 or 3 credits (3 credits with major research paper). Prerequisite: concurrent enrollment in Toxicology 610 or permission of instructor. Limited to 12 students. S-U grades optional. Offered alternate years. Not offered 1989–90.
Sem, T 2:30–4:25. J. M. Fessenden MacDonald.
Selected cases of chemical risk communication and risk management by government agencies, communities, industries, and individuals are reviewed. Potential topics include toxic wastes, groundwater contamination, chemical accidents and occupational and community right-to-know. The roles of social, economic, political, legal, and ethical factors in decision making are discussed. Readings from the various disciplines, as well as scientific reports, provide background for class discussions.]

**731–736 Current Topics in Biochemistry**
Fall or spring. 1/2 or 1 credit for each topic. May be repeated for credit. Prerequisite: Biological Sciences 330 or 331 or equivalent. S-U grades only.
Lectures and seminars on specialized topics.
*Fall 1989:* three topics are offered.

**731 Current Topics in Biochemistry**
1/2 credit.
T R 12:20 (6 lecs) Sept. 12–28. Staff.

**733 Microfilaments and the Regulation of Cell Structure**
1/2 credit.
T R 12:20 (6 lecs) Oct. 24–Nov. 9. A. P. Bretscher.

**735 Transport ATPase, with Emphasis on Plants**
1/2 credit.
T R 12:20 (6 lecs) Nov. 14–Dec. 5. R. E. McCarty.
*Spring 1990:* three topics are offered.

**732 Current Topics in Biochemistry**
1/2 credit.
T R 7:30–9:30 p.m. (6 lecs) Jan. 30–Feb. 15. C. Seeger.

**734 Current Topics in Biochemistry**
1/2 credit.
T R 12:20 (6 lecs) Feb. 20–Mar. 8. Staff.

**736 Molecular Membrane of Growth Factor Action**
1/2 credit.
T R 12:20 (6 lecs) Apr. 3–19. R. Cerione.

**737 Advanced Biotechnology Laboratory**
Summer (3–week session). 3 credits. Enrollment limited to 8 students. Prerequisites: Biological Sciences 630, 638, or equivalent laboratory experience and permission of instructor. S-U grades only.
Lecs, M–F 9–5. D. B. Wilson, J. E. Blankenship, and staff.
Experiments are designed to demonstrate advanced recombinant DNA techniques that are currently of interest. Students prepare intact yeast chromosomes and resolve them electrophoretically using field inversion electrophoresis. The DNA in the gel is transferred to nitrocellulose. The chromosomal location of specific genes is determined. Students end label DNA with 32P and perform DNase footprinting experiments. DNA sequences are determined by chemical modification and dideoxy strand termination methods.

**751 Professional Responsibilities of Toxicologists (also Toxicology 751)**
Fall. 2 credits. Prerequisites: advanced graduate standing and permission of instructor. S-U grades optional. Offered alternate years.
Sem, W 2:30–4:25. J. M. Fessenden MacDonald.
Case studies of professional responsibilities and dilemmas faced by toxicologists in academia, industry, and government, with discussions of possible approaches, alternatives, and outcomes. Readings of scientific, ethical, and general papers provide background for discussions. Topics for consideration include legal liabilities, chemical-safety issues, data presentation and partisanship, communicating with the public, conflicts of interest/commitment, peer review, and professional codes of ethics.

**752 Isotope Kinetics (also Nutritional Sciences 682)**
Spring. 2 credits. Prerequisite: calculus. S-U grades only. Offered alternate years.
Lec, T 7:30–9:30 p.m. D. B. Zilversmit.
Quantitative analysis of the transport and distribution of nutrients, metabolites, and drugs in multicompartmental systems. The material is presented as lectures, discussion groups, and problem sets.

**830 Biochemistry Seminar**
Fall or spring. No credit.
Sem, F 4:30. Staff.
Lectures on current research in biochemistry, presented by distinguished visitors and staff members.

**831 Advanced Biochemical Methods I**
Fall. 6 credits. Limited to graduate students majoring in biochemistry. S-U grades optional.
Labs and discs, 12 hours each week to be arranged. Organizational meeting first R of semester at 10:10. D. B. Wilson and staff.
To learn the basic techniques of biochemical research, each student performs experiments on proteins, enzymes, DNA, and bioenergetics. First half of the fall term is an intensive lab course with defined experiments assigned to the students. Letter grades are assigned for this laboratory portion of the course. Second half of the fall term is devoted to a rotation project in different labs selected by the students. S-U grades only are assigned for the rotation portion of the course.

**832 Advanced Biochemical Methods II**
Spring. 6 credits. Limited to graduate students majoring in biochemistry. S-U grades only.
Lab to be arranged. Staff (coordinator: graduate field representative).
Research in the laboratories of two or three different professors chosen by the student. Arrangements are made jointly between the graduate field representative and the research adviser.

**833 Research Seminar in Biochemistry**
Fall and spring. 1 credit each term. (Students must register for 2 credits each term, since an "R" grade is given at the end of the fall term.) May be repeated for credit. Required of, and limited to, second-, third-, and fourth-year graduate students majoring in biochemistry. S-U grades only.
Sem, T 5–6:30 p.m. T. C. Huffaker, W. J. Brown, J. T. Lis.
Each student presents one seminar per year on his or her thesis research and then meets with instructors and thesis committee members for evaluation.

**Related Courses in Other Departments**

**Lipids (Biological Sciences 619 and Nutritional Sciences 602)**

**Molecular Aspects of Development (Biological Sciences 483)**

**Molecular Mechanisms of Hormone Action (Biological Sciences 658 and Veterinary Medicine 758)**

**Teaching Experience (Biological Sciences 498)**

**Undergraduate Research in Biology (Biological Sciences 499)**

## BOTANY

**241 Introductory Botany**
Fall. 4 credits. Enrollment may be limited, with preference given to sophomores and juniors majoring in agronomy, botany, environmental education, floriculture, horticulture, natural resources, plant sciences, vegetable crops, and wildlife. Prerequisite: one year of introductory biology or permission of instructor.
Lecs, M W F 9:05; lab, M T W R or F 1:25–4:25, or M or W 7:30–10:30 p.m. K. J. Niklas.
Introductory botany for those who plan to specialize in or use some aspect of the plant sciences. Emphasizes structure, reproduction, and classification of angiosperms and the history of life on earth. Laboratory emphasizes development of skills in handling plant materials, including identification. First and second weeks of laboratory are field trips, starting with the first day of classes. *Those who register for an evening laboratory are still required to attend the afternoon field trips.*

**242 Plant Physiology, Lectures**
Spring. 3 credits. Primarily for undergraduates in agricultural sciences. Prerequisites: one year of introductory biology and introductory chemistry. Concurrent enrollment in Biological Sciences 244 required of undergraduates. May not be taken for credit after Biological Sciences 341 except by written permission of instructor.
Lecs, M W F 10:10. C. Reiss.
Plant physiology as applied to plants growing in communities. Examples deal with crop plants or higher plants where possible, though not exclusively. Topics include cell structure and function; plant metabolism, including photosynthesis; light relations in crops; plant-water relations; water uptake, transport, and transpiration; irrigation of crops; sugar transport; mineral nutrition; growth and development—hormones, flowering, fruiting, dormancy, and abscission; stress.

**244 Plant Physiology, Laboratory**
Spring. 2 credits. Prerequisite: concurrent enrollment in Biological Sciences 242. May not be taken for credit after Biological Sciences 349.
Disc and lab, M T W or R 12:20–4:25. C. Reiss.
Experiments exemplify concepts covered in Biological Sciences 242 and offer experience in a variety of biological and biochemical techniques, including use of small amounts of radioisotopes.

**245 Plant Biology**
Summer (6-week session). 3 credits. Limited to 24 students.
Lecs, M–F 11:30–12:45; labs, M W 1:30–4:30. S. Williams.
Introductory botany, including plant identification. Emphasizes structure, reproduction, and classification of angiosperms. Seventy-five percent of the laboratory work is conducted outdoors in an area that surpasses most biological stations. Those who lack college-level biology are expected to work more closely with the instructor on supplemental instructional materials.

**246 Plants and Civilization**
Spring. 3 credits.
Lecs, T R 11:15; disc, T W or R 12:20 or W 1:25. D. M. Bates.
A consideration of the role that plants have played and continue to play in the evolution of human cultures. Emphasis is on the interactions between humans and the plant environment, the nature of plants and manner in which humans use and integrate them into their cultures, and the problems and concerns related to contemporary and future use of plant resources.

**248 Taxonomy of Vascular Plants**
Spring. 4 credits. Prerequisite: one year of introductory biology. May not be taken for credit after Biological Sciences 342.
Lecs, M W F 9:05; labs, W or R 1:25–4:25. J. I. Davis.
An introduction to the classification of vascular plants, with attention to the goals of taxonomy, the processes of plant evolution, and the means of analyzing evolutionary relationships among plants. The laboratory concentrates on methods of plant identification and an overview of vascular plant diversity, with particular attention to the flowering plants.

**341 Plant Physiology, Lectures**
Fall. 3 credits. Prerequisites: one year of introductory biology, organic chemistry, and either concurrent enrollment in Biological Sciences 349 or written permission of instructor. May not be taken for credit after Biological Sciences 242 unless written permission is obtained from instructor.
Lecs, T R 10:10–11:25. D. M. Law.
The behavior, growth, transport processes, and environmental response of plants. Topics include membrane properties, solute and water transport, and function of osmotic forces; mineral and organic nutrition; stress resistance; growth and development controls; metabolism, including photosynthesis and respiration; and responses to environmental influences.

**[342 Taxonomy of Cultivated Plants (also Floriculture and Ornamental Horticulture 342)**
Spring. 4 credits. Prerequisite: one year of introductory biology or written permission of instructor. May not be taken for credit after Biological Sciences 248. Not offered 1989–90.
Lecs, M W 10:10; labs, M W 2–4:25. Bailey Hortorium staff.
A study of ferns and seed plants, their relationships, and their classification into families and genera, emphasizing cultivated plants. Particular emphasis is placed on gaining proficiency in identifying and distinguishing families and in preparing and using analytic keys. Attention is also given to the economic importance of taxa, to the basic taxonomic literature, and to the elements of nomenclature.]

**345 Plant Anatomy**
Fall. 4 credits. Limited to 25 students. Prerequisite: one year of introductory biology or a semester of botany.
Lecs, M W 9:05; labs, M W 2–4:25. D. J. Paolillo.
A descriptive course with equal emphasis on development and mature structure. Lecture, laboratory, and reading are integrated in a study guide. The laboratory offers the opportunity to develop the practical skills required to make anatomical diagnoses and to write anatomical descriptions.

**346 Algal Physiology**
Fall. 3 credits. Prerequisites: one year of introductory biology for majors and Biological Sciences 242 or 341, or permission of instructor. S-U grades optional. Offered alternate years.
Lecs, T R 8:30–9:55. T. G. Owens.
A brief description of the algal classes, as well as classical and emerging criteria for taxonomic classification. Discussions include the interactions of algae with their physical and chemical environments, uptake of inorganic compounds, algal photosynthesis, and metabolic strategies of unicellular and macrophytic algae. Emphasis is placed upon physiological comparisons between algae and higher plants.

**349 Plant Physiology, Laboratory**
Fall. 2 credits. Prerequisite: concurrent enrollment in Biological Sciences 341. May not be taken for credit after Biological Sciences 244.
Lab, W or R 1:25–4:25; disc, W or R 12:20. Lab and disc must be on same day. C. Reiss.
Experiments exemplify concepts covered in Biological Sciences 341 and offer experience in a variety of biological and biochemical techniques, including use of small amounts of radioisotopes.

**[359 Biology of Grasses**
Fall. 3 credits. Limited to 24 students. Prerequisite: one year of introductory biology or an introductory plant taxonomy course, or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10; lab,T 1:25–4:25. J. I. Davis.
Systematics and ecology of the graminoid plant families (grasses, sedges, and rushes), with principal emphasis on grasses. Major topics include taxonomy, phylogenetics, physiology, reproductive biology, ecotypic variation, speciation, biogeography, and population biology. The role of graminoids as ecosystem dominants, weeds, and the origins of cultivated species are discussed. Laboratory concentrates on the diversity of grasses.]

**[440 Plant Geography**
Spring. 2 credits. Prerequisite: Biological Sciences 248 or equivalent. Recommended: Biological Sciences 378 or 463 or both. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10. Bailey Hortorium staff.
Patterns of distribution and variation of plant species and higher taxa, endemism and disjunction and their causes, influences of past continental movements and climatic change on plant distributions, geographical aspects of plant speciation, major biomes and floristic regions of the world, and methods of phytogeographic analysis.]

**[441 Crop Plant Evolution**
Fall. 2 credits. Prerequisite: an advanced-level course in the plant sciences with taxonomic content or permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, T R 11:15. D. M. Bates.
An integrated study of the systematics and evolution of agronomic and horticultural species. Processes of domestication, the evolutionary history of selected cultigens, the nature of weeds and land races, classification and nomenclature as applied to cultivated plants, and underexploited plant resources are among the topics considered.]

**[442 Biology of Plant Species**
Spring. 2 credits. Prerequisite: Biological Sciences 248 or equivalent. Recommended: Biological Sciences 378 and 463. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10. Bailey Hortorium staff.
A comprehensive introduction to the nature and origin of plant species, with coverage of plant evolutionary genetics, race formation and modes of speciation, evolution of reproductive isolating mechanisms, types of species complexes found in plants, cytogenetic aspects of plant speciation, natural hybridization and its consequences, and the origin and nature of higher taxa.]

**[443 Research Methods in Systematic Botany**
Fall. 2 credits. Limited to 10 students. Prerequisite: Biological Sciences 248 or equivalent. Offered alternate years. Not offered 1989–90.
Lab, F 1:25–4:25; additional hours to be arranged. Bailey Hortorium staff.
An introduction to the methodology of plant systematic research: field studies; sampling and collecting methods; preparation of taxonomic revisions and monographs; numerical methods of data analysis; and laboratory methods in cytogenetics, comparative anatomy, and comparative chemistry, as applied to problems in plant systematics.]

**444 Plant Cell Biology**
Fall. 4 credits. Limited to 24 students. Prerequisites: Biological Sciences 242 or 341, and 345, or permission of instructor.
Lecs, M W F 11:15; lab, M or W 1:25–4:25. R. O. Wayne.
Evidence from microscopy, physiology, biochemistry, and molecular biology is used to try to unravel the mystery of the living cell. The dynamics of protoplasm, membranes, and the various organelles are studied. The mechanisms of cell growth and division, the relationship of the cytoskeleton to cell shape and motility, the interaction of the cell with its environment, and the processes that give rise to multicellular differentiated plants are investigated.

**[445 Photosynthesis (also Applied and Engineering Physics 601)**
Fall. 3 credits. Prerequisites: Chemistry 104 or 208, Mathematics 105 or 111, and either Physics 102 or 208 or permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, M W F 10:10. T. G. Owens.
A detailed study of the processes by which plants utilize light energy to grow. Structure of the photosynthetic apparatus, light absorption, photochemistry, and electron transport are emphasized. The course incorporates biophysical, biochemical, physiological, and molecular aspects of photosynthesis. Photosynthetic carbon metabolism is not covered in detail. Discussions include relevant material in bacterial, algal, and higher-plant photosynthesis.]

**[446 Plant Cytogenetics**
Fall. 3 credits. Limited to 18 students. Prerequisite: Biological Sciences 281 or equivalent. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, M W 9:05; lab, R 2–4:25. J. I. Davis.
An analysis of the cellular mechanisms of heredity, particularly the behavior of chromosomes, and the role of chromosome structure and behavior in plant evolutionary processes. The application of chromosomal studies to analyses of plant species biology and phylogenetics is also covered.]

**447 Molecular Plant Systematics**
Fall. 3 credits. Prerequisites: Biological Sciences 248, 281, and 330 or 331, or written permission of instructor. Offered alternate years.
Lecs, T R 10 :10–11: 30. J. J. Doyle.
The study of variation at the molecular level and its application to the taxonomy and evolution of plants, primarily angiosperms. Both micromolecules—particularly flavonoids—and macromolecules are discussed. Topics include analysis of electrophoretic and sequence variation of proteins, the use of such variation as a phylogenetic tool, and genome organization and evolution. Major emphasis is placed on the impact of recombinant DNA technology on plant systematics, with comprehensive treatment of the methods involved. The nuclear, chloroplast, and mitochondrial genomes of plants are treated in detail, with discussion of the use of variation patterns discernible at the restriction-enzyme and DNA-sequence levels. Methods of phylogenetic analysis of molecular data are also covered.

**[448 Plant Evolution and the Fossil Record**
Spring. 3 credits. Prerequisite: Biological Sciences 241 or equivalent, or permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, T R 9:05; lab, R 12:20–2:15. K. J. Niklas.
An introduction to evolution, surveying major changes in plants from the origin of life to the present. Emphasis is placed on plant form and function, adaptations to particular ecologic settings, and evolutionary theory as it relates to plants.]

**450 Optical Methods of Plant Biologists**
Spring. 3 credits. Limited to 12 students. Prerequisite: Biological Sciences 444 or permission of instructor.
Lecs, T R 1:25; lab R 2:15–4:30. R. O. Wayne.
Theoretical and practical aspects of light microscopy, including brightfield, darkfield, phase-contrast, polarization, differential-interference-contrast, and fluorescence microscopy, as well as video- and computer-based digital image enhancement, are studied. Students learn both qualitative and quantitative techniques to probe noninvasively the structure and function of living plant cells.

**[640 Applied Plant Anatomy**
Spring. 3 credits. Prerequisites: Biological Sciences 345 or equivalent, and permission of instructor. Not offered 1989–90.
Lecs and discs, T R 9:05; lab, W 10:10–1:10 or by arrangement with instructor. N. W. Uhl.
The use of anatomy in vascular plants for diagnosis of structure, taxonomic relationships, evolutionary sequences, and ecological adaptions, with emphasis on recent research. The laboratory provides experience in techniques and interpretation.]

**641 Laboratory in Plant Molecular Biology**
Fall. 4 credits. Prerequisites: Biological Sciences 281 or equivalent, 330 or 331 or equivalent, and permission of instructor. S-U grades optional.
Lab to be arranged. J. B. Nasrallah, M. R. Hanson, S. D. Tanksley, P. Palukaitis.
Selected experiments on genome organization, gene expression, and gene transfer in plants. The course emphasizes the application of molecular biology methodology to plant systems.

**[642 Plant Mineral Nutrition (also Agronomy 642)**
Spring. 3 credits. Prerequisite: Biological Sciences 341 or equivalent. Offered alternate years. Not offered 1989–90.
Lecs, M W F 10:10. L. V. Kochian, R. M. Welch.
A detailed study of the processes by which plants acquire and use mineral nutrients from the soil. Topics include the uptake, translocation, and compartmentation of mineral elements; root-soil interactions; the metabolism of mineral elements; the involvement of mineral nutrients in various physiological processes; and the nutrition of plants adapted to extreme environmental stresses (e.g., salinity). Specific mineral elements are emphasized to illustrate these topics.]

**643 Plant Physiology, Advanced Laboratory Techniques**
Fall. 4 credits. Primarily for graduate students in the plant sciences. Prerequisites: organic chemistry, biochemistry, and a course in plant physiology. S-U grades only.
Lab, T or W 8–5; disc, M 4:30–5:30. A. T. Jagendorf.
An introduction to some modern methods in experimental plant biology.

**644 Plant Growth and Development**
Spring. 3 credits. Prerequisites: Biological Sciences 345 and either 242 or 341 or their equivalents, or written permission of instructor. Offered alternate years.
Lecs, M W F 9:05. D. J. Paolillo and staff.
Explores the changes that occur during plant growth and development and their control: morphological and anatomical changes in apices, tissue differentiation, organ formation, embryo development, gene regulation, hormone action and interaction, the influence of light in development, flowering, fruiting, dormancy, abscission, and senescence.

**[645 Families of Tropical Flowering Plants**
Fall. 1 credit. Prerequisite: written permission of instructor. S-U grades only. Offered alternate years. Not offered 1989–90.
Lec and disc, F 11:15. Bailey Hortorium staff.
The families of flowering plants encountered solely or chiefly in tropical regions are considered in lectures, discussions, and demonstrations, with the aim of providing basic points of recognition for, and an understanding of, diversity and relationships in these families for the student venturing into the tropics.]

**[646 Families of Tropical Flowering Plants: Field Laboratory**
Intersession. 3 credits. Limited to 20 students, with preference given to graduate students from member institutions of the Organization for Tropical Studies. Prerequisite: Biological Sciences 342 or 248 or equivalent. Recommended: Biological Sciences 645. S-U grades only. For more details and application, contact the L. H. Bailey Hortorium, 467 Mann Library. Offered alternate years. Not offered 1989–90.
Bailey Hortorium staff.
An intensive orientation to families of tropical flowering plants represented in forests of the American tropics. Emphasis on field identification combined with laboratory analysis of available materials in a "whole-biology" context.]

**647 Seminar in Systematic Botany**
Fall and spring. 1 credit. May be repeated for credit. Prerequisite: written permission of course coordinator required for undergraduates. S-U grades optional.
Sem to be arranged. Bailey Hortorium staff.
Lectures and discussions led by staff, visitors, and students on topics of current importance to systematic botany.

**[648 Plant Biochemistry**
Spring. 3 credits. Prerequisites: organic chemistry, biochemistry, and a course in plant physiology. Offered alternate years. Not offered 1989–90.
Lecs, M W F 9:05. A. T. Jagendorf, R. E. McCarty, J. F. Thompson.
Selected areas of plant biochemistry are reviewed in the context of the plant life cycle and responses to the environment. Topics include metabolism of lipids, carbohydrates, organic acids, and proteins; nitrogen and sulfur assimilation; respiration; photosynthesis; development and replication of chloroplasts; and cell-wall composition and properties. Attention is paid to operation of control mechanisms.]

**649 Transport of Solutes and Water in Plants**
Fall. 3 credits. Prerequisite: Biological Sciences 341 or equivalent. Offered alternate years.
Lecs, M W F 10:10. R. M. Spanswick.
Transport of ions, water, and organic materials in plants; mechanisms of ion transport; relationships between ion transport and metabolism; ion uptake and transport in higher plants; phloem transport; and water relations of single cells and whole plants.

**[651 Quantitative Whole-Plant Physiology**
Fall. 3 credits. Prerequisites: introductory physics, calculus, and plant physiology. S-U grades only. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10–11:30. R. M. Spanswick.
An exploration of the extent to which physiological processes and their interactions can be formulated in a quantitative manner and integrated to describe various aspects of plant behavior, including growth and yield. Consideration is given to characterization of the plant environment, energy balance, gas exchange, water relations, photosynthesis, respiration, translocation, nutrient supply, and the timing of developmental events.]

**653 Plant Molecular Genetics (also Plant Breeding 653)**
Spring. 3 credits. Prerequisites: Biological Sciences 281, and 330 or 331, or their equivalents.
Lecs, T R 10:10–11:30. S. D. Tanksley, M. R. Hanson, J. B. Nasrallah.
A review of the organization, function, and evolution of genetic information in higher plants. An in-depth treatment of the organization of the chloroplast, mitochondrial, and nuclear genomes as well as their interactions. Current information on gene regulation in higher plants is also discussed.

**[654 Plant Nomenclature**
Spring. 1 credit. Prerequisite: written permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lec and disc to be arranged. R. P. Korf.
An analysis of the International Code of Botanical Nomenclature and its application to various plant groups.]

**656 Topics in Paleobotany**
Spring. 1 credit. Prerequisite: Biological Sciences 448 or equivalent background in evolution or written permission of instructor.
Lab and disc to be arranged. K. J. Niklas.
A series of selected topics to provide a background in plant evolution, paleobotanical literature, and evolutionary theory. Among the topics discussed are the origin of a terrestrial flora, the evolution of the seed plants, and the origin and adaptive radiation of the angiosperms.

**[657 Literature of Taxonomic Botany**
Fall. 1 credit. Prerequisite: written permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lec and disc, R 10:10. Bailey Hortorium staff.
A survey of the basic reference works in taxonomy from the pre-Linnaean literature drawn on by Linnaeus to contemporary publications, with comments on the peculiarities of the books (when appropriate), publication dates, typographic devices, and intricacies of bibliographic citation.]

**740 Plant Biology Seminar**
Fall and spring. No credit (no official registration). Required of graduate students doing work in plant biology.
Sem, F 11:15. Staff.
Lectures on current research in plant biology, presented by visitors and staff.

**742 Current Topics in Plant Molecular Biology**
Fall and spring. 1 credit. Limited to 20 students. Primarily for graduate students, with preference given to majors or minors in plant molecular biology; written permission of instructor required for undergraduates. S-U grades only.
Sem, 1 hour each week to be arranged. Staff.
A seminar with critical presentation and discussion by students of original research papers concerning the molecular biology of plants. Staff direction varies each year and is announced a semester in advance.

**749 Graduate Research in Botany**
Fall or spring. Variable credit. May be repeated for credit. S-U grades optional.
Hours to be arranged. Staff.
Similar to Biological Sciences 499 but intended for graduate students who are working with faculty members on an individual basis.

**840 Current Topics in Plant Physiology**
Fall or spring. 2 credits. May be repeated for credit. S-U grades only.
Sem to be arranged. Staff.
Seminar reports by graduate students on current literature in experimental plant physiology or related areas.

### Related Courses in Other Departments

**Marine Botany: Ecology of Marine Plants (Biological Sciences 449)**

**Introductory Mycology (Plant Pathology 309)**

**Mycology (Plant Pathology 709)**

**Mycology Conferences (Plant Pathology 649)**

**Plant Ecology, Lectures and Laboratory (Biological Sciences 463 and 465)**

**Plant Ecology Seminar (Biological Sciences 669)**

**Taxonomy of Fungi (Plant Pathology 729)**

**Teaching Experience (Biological Sciences 498)**

**Undergraduate Research in Biology (Biological Sciences 499)**

## ECOLOGY, SYSTEMATICS, AND EVOLUTION

**261 Principles of Ecology (formerly General Ecology)**
Fall. 4 credits. Prerequisite: one year of introductory biology. S-U grades optional.
Lecs, M W F 11:15; disc, W or R 1:25, 2:30, or 3:35. R. W. Howarth, P. L. Marks, and D. W. Winkler.
An introduction to principles of ecology concerning the interactions between organisms and their environment. The course deals with both terrestrial and aquatic ecology, including phenomena that occur at the population, community, and ecosystem levels of organization. These principles are brought to bear on a number of current environmental problems.

**263 Field Ecology**
Fall. 2 credits. Prerequisite: concurrent or previous enrollment in Biological Sciences 261. Limited to 16 students.
Lec, R 1:25; lab, F 12:20–5. One weekend field trip to the Hudson Valley. P. L. Marks.
Field exercises designed to give students direct experience with field work, with emphasis on developing observational skills, journal keeping, and a landscape perspective. Topics include plant succession, niche relationships of insects, influence of herbivores and competition on plant performance, decomposition of soil litter, sampling plankton, and use of scientific collections.

**272 Functional Ecology**
Spring. 4 credits. Prerequisite: one year of introductory biology for majors. Offered alternate years.
Lecs, M W F 9:05; lab, T or R 1:25–4:25. Evening prelims Feb. 20 and Apr. 3. F. H. Pough.
An introductory course for students interested in how animals work. The features of the physical environment that are important to insects and vertebrates are used to illustrate the interaction of physiological, behavioral, and morphological characteristics in organismal activity and homeostasis. Laboratories include a survey of the diversity of endothermal and ectothermal animals, ecophysiological measurements, and measurements of important environmental parameters in local habitats. This course uses live and preserved vertebrate animals for field observations and laboratory exercises.

**[274 Functional and Comparative Morphology of Vertebrates**
Spring. 4 credits. Prerequisite: one year of introductory biology. Offered alternate years. Not offered 1989–90.
Lecs, T R 12:20; labs, T R 1:25–4:25. D. K. McClearn.
An exploration of the relations between form and function in biological systems with an emphasis on trends in vertebrate evolution. Lectures integrate data from topics such as locomotion, feeding, size, and scaling with issues of historical importance and current interest (e.g., correlation of body parts, adaptationist explanations, developmental constraints, criteria for determining biomechanical and energetic "efficiency"). Laboratories include dissections of preserved vertebrate animals and noninvasive live animal demonstrations (motion analysis, surface electrode, and force-plate recordings).]

**275 Human Biology and Evolution (also Anthropology 275)**
Fall. 3 or 4 credits (4 credits with discussion). S-U grades optional, with permission of instructor.
Lecs, M W F 10:10; optional disc to be arranged. K. A. R. Kennedy, J. D. Haas.
An introduction to the biology of *Homo sapiens* through an examination of human evolution, biological diversity, and modes of adaptation to past and present environments. Evolutionary theory is reviewed in relation to the current evidence from the fossil record and studies of the evolution of human behavior. A survey of human adaptation covers a complex of biological and behavioral responses to environmental stress. Human diversity is examined as the product of long-term evolutionary forces and short-term adaptive responses. Topics such as creationism, the Piltdown fraud, the sociobiology debate, genetic engineering, race and IQ, and racism are presented as examples of current issues in human biology. These topics and others are the focus of the optional one-hour weekly discussions.

**371 Human Paleontology (also Anthropology 371)**
Fall. 4 credits. Prerequisite: one year of introductory biology or Anthropology 101 or permission of instructor. Offered alternate years.
Lecs, M W F 2:30; lab, 1 hour each week to be arranged; occasional field trips. K. A. R. Kennedy.
A broad survey of the fossil evidence for human evolution with special attention to skeletal and dental anatomy, geological contexts, paleoecology, dating methods, archaeological associations, and current theories of primate phylogeny.

**[373 The Invertebrates: Form, Function, and Evolution**
Fall. 4 credits. Limited to 30 students. Prerequisite: one year of introductory biology for majors. Offered alternate years. Not offered 1989–90.
Lecs, M W F 10:10; lab, W 1:25–4:25; one optional weekend field trip to Shoals Marine Laboratory. Small fee for the field trip. C. D. Harvell.
An introduction to the evolution of form and function among the major invertebrate phyla. Strong emphasis is placed on the integration of evolutionary pasts and ecological presents to produce extant forms. Lectures draw heavily on original literature from the field of invertebrate functional morphology. Laboratory dissections and demonstrations often involve live marine and freshwater invertebrates.]

**378 Evolutionary Biology**
Spring. 4 credits (2 credits if taken after Biological Sciences 207). Prerequisite: one year of introductory biology or permission of instructor. S-U grades optional.
Lecs, M W F 10:10; disc, 1 hour each week to be arranged. R. G. Harrison.
The course considers explanations for patterns of diversity and for the apparent "good fit" of organisms to the environment. Topics covered include the genetic and developmental basis of evolutionary change, processes at the population level, the theory of evolution by natural selection, levels of selection, concepts of fitness and adaptation, modes of speciation, long-term trends in evolution, rates of evolution, and extinction.

**455 Insect Ecology (also Entomology 455)**
Fall. 3 credits. Prerequisites: Biological Sciences 261 and Entomology 212 or their equivalents. Offered alternate years.
Lecs, W F 11:15; disc, 1 hour each week to be arranged. R. B. Root.
Ecological and evolutionary principles are integrated by thorough examination of outstanding investigations. Topics include the factors responsible for the great diversity of insects, adaptive syndromes associated with climate, natural history of arthropod guilds, impact of insects on terrestrial vegetation, population regulation, and the contrast between natural and managed ecosystems.

**457 Limnology, Lectures (formerly Biological Sciences 462)**
Fall. 3 credits. Prerequisite: Biological Sciences 261 or written permission of instructor. Recommended: introductory chemistry.
Lecs M W F 11:15. N. G. Hairston, Jr.
The study of continental waters, with emphasis on lakes and ponds. Factors regulating nutrients, population and community dynamics of freshwater organisms, and physical and chemical properties of fresh water are considered.

**459 Limnology, Laboratory (formerly Biological Sciences 464)**
Fall. 2 credits. Prerequisite: concurrent or previous enrollment in Biological Sciences 457.
Lab, T W or R 1:25–4:25; 1 weekend field trip. N. G. Hairston, Jr. and staff.
Laboratories and field trips devoted to studies of the biological, chemical, and physical properties of lakes and other freshwater environments. Vertebrate dissection (fish) during one laboratory exercise and during a portion of weekend field trip.

**461 Population and Evolutionary Ecology**
Spring. 4 credits. Prerequisite: Biological Sciences 261 or 378. S-U grades optional. Offered alternate years. Offered spring 1990; next offered fall 1991 and alternate fall semesters thereafter.
Lecs, M W F 11:15; lab, M 1:25–4:25.
D. W. Winkler and S. A. Levin.
Problems of ecology are viewed from an evolutionary perspective, exploring issues of adaptation and fitness definition by developing advanced understanding of demography and interspecific interactions. Blending theory and empirical findings, the course explores population dynamics; life-history theory; dispersal; competition; predation; parasite-host coevolution; mutualisms; and sexual, kin, and group selection. Methods of estimation and analysis are learned in laboratory.

**462 Marine Ecology**
Spring. 3 credits. Prerequisite: Biological Sciences 261. Offered alternate years.
Lecs and disc, M W F 10:10.
C. D. Harvell and R. W. Howarth.
Lectures and discussion focus on current research in broad areas of marine ecology with an emphasis on processes unique to marine systems. A synthetic treatment of multiple levels of organization in marine systems including organismal, population, community, ecosystems, and evolutionary biology.

**463 Plant Ecology, Lectures**
Fall. 3 credits. Prerequisites: two advanced-level courses in biology, including Biological Sciences 261, or permission of instructor. Recommended: some taxonomic familiarity with vascular plants and concurrent enrollment in Biological Sciences 465.
Lecs, M W F 11:15. Staff.
Principles of plant-environment and plant-plant interactions in relation to the evolution, distribution, structure, and functioning of plants and plant communities.

**464 Microevolution and Macroevolution (also Entomology 464)**
Spring. 4 credits. Limited to 25 students. Prerequisite: Biological Sciences 378 or permission of instructor. S-U grades optional, with permission of instructor. Offered alternate years.
Lecs, T R 10:10–11:30; disc, one hour each week to be arranged.
A. R. McCune and S. Via.
An advanced course in evolutionary biology integrating macroevolutionary and microevolutionary approaches. Areas of emphasis include patterns and processes of speciation, phylogeny reconstruction in populations and higher taxa, the origins and fate of variation, and causes of major evolutionary transitions. Discussion of these problems involve data and approaches from genetics, morphology, systematics, paleobiology, development, and ecology.

**465 Plant Ecology, Laboratory**
Fall. 1 credit. Prerequisite: concurrent enrollment in Biological Sciences 463.
Lab, F 12:05–5. Staff.
Laboratory and field exercises designed to give firsthand experience with the ecology of plants. Emphasis is on making observations and measurements of plants in the field.

**[470 Ecological Genetics (also Entomology 470)**
Spring. 4 credits. Prerequisite: Biological Sciences 378 or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10–11:25; disc, one hour each week to be arranged. S. Via.
A study of the relationships between genetic and ecological processes in populations. Topics include consequences of genetic variation in age-structured populations; demographic concepts of fitness; evaluation of methods for measuring genetic variation and natural selection on ecologically important traits; genetics of competitive ability and predator avoidance; genetic and ecological aspects of phenotypic plasticity; character displacement; maintenance of genetic variability; limits to selection. How theory can be used to formulate hypotheses about evolutionary mechanisms in natural populations is considered and experiments designed to test such hypotheses are evaluated.]

**471 Mammalogy**
Fall. 4 credits. Recommended: Biological Sciences 274. S-U grades optional, with permission of instructor. Offered alternate years. Fee, $15.
Lecs, M W F 9:05; lab, M or T 1:25–4:25; 1 weekend field trip required.
D. K. McClearn.
Lectures on the evolution, classification, distribution, and adaptations of mammals. Laboratory and fieldwork on systematics, ecology, and natural history of mammals of the world, with primary emphasis on the North American fauna. Systematics laboratories held in the museum at Research Park. Live animals are studied in the field and are sometimes used in the laboratory for nondestructive demonstrations or experiments. The systematics laboratory exercises are based on museum specimens.

**[472 Herpetology (formerly Biological Sciences 473)**
Spring. 4 credits. Recommended: Biological Sciences 274. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1989–90. Fee, $10.
Lecs and labs, T R 12:20–4:25; occasional field trips and special projects.
F. H. Pough.
Lectures cover various aspects of the biology of amphibians and reptiles, including evolution, zoogeography, ecology, behavior, and physiology. Laboratory includes systematics, functional morphology, and behavior. Live animals are studied in the field and are sometimes used in the laboratory for nondestructive demonstrations or experiments. The systematics laboratory exercises are based on museum specimens.]

**[474 Laboratory and Field Methods in Human Biology (also Anthropology 474)**
Spring. 4 credits. Prerequisite: one year of introductory biology or Anthropology 101 or permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs and labs, T R 10:10–12:05; additional hours to be arranged. Independent research project required.
K. A. R. Kennedy.
Practical exercises and demonstrations of modern approaches to the methodology of physical anthropology. Emphasis on comparative human anatomy, the human paleontological record, description of skeletal and living subjects, paleopathology, skeletal maturation, and relevant field techniques for the archaeologist and forensic anthropologist.]

**[475 Ornithology**
Fall or summer. 4 credits. Recommended: Biological Sciences 274. S-U grades optional, with permission of instructor. Limited to 30 students. Offered alternate years. Not offered 1989–90. Fee, $15.
Lecs and labs, T R 12:20–4:25; occasional field trips and special projects. Staff.
Lectures cover various aspects of the biology of birds, including anatomy, physiology systematics, evolution, behavior, ecology, and distribution and are fully integrated with laboratory studies. Laboratory includes dissection of dead material, studies of skeletons and plumages, and specimen identification of avian families of the world and species of New York. Independent projects emphasize research skills.]

**[476 Biology of Fishes**
Fall. 4 credits. Prerequisite: Biological Sciences 274 or equivalent experience in vertebrate zoology with written permission of instructor. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs, M W F 9: 05: lab, M 1:25–4:25.
A. R. McCune.
An introduction to the study of fishes: their structure, evolution, distribution ecology, physiology, behavior, classification, and identification, with emphasis on local species. Live animals are studied in the field and are sometimes used in the laboratory for nondestructive demonstrations or experiments. The systematics laboratory exercises are based on museum specimens.]

**[478 Ecosystem Biology**
Spring. 4 credits. Prerequisite: Biological Sciences 261 or equivalent. S-U grades optional. Offered alternate years. Not offered 1989–90.

Lecs, T R 10:10–12:05. R. W. Howarth.
Analysis of ecosystems in terms of energy flow and nutrient cycles, emphasizing an experimental approach and comparative aspects of terrestrial, freshwater, and marine ecosystems. Consideration of anthropogenic effects on ecosystems, such as from acid precipitation and offshore oil pollution. Discussion of the interactions between ecosystem processes and community structure.]

**[479 Paleobiology (also Geological Sciences 479)**
Fall. 3 credits. Prerequisites: one year of introductory biology for majors and either Biological Sciences 274, Geological Sciences 375, Biological Sciences 373, or permission of instructor. Offered alternate years. Not offered 1989–90.

Lecs, M W F 12:20. J. L. Cisne and staff.
A survey of the major groups of organisms and their evolutionary histories. Intended to fill out the biological backgrounds of geology students and the geology backgrouds of biology students concerning the nature and significance of the fossil record for their respective studies.]

**660 Field Studies in Ecology and Systematics**
Spring. Variable credit. Prerequisites: Biological Sciences 261, a taxon-oriented course, and permission of instructor. Estimated cost of room and board (exclusive of transportation) to be announced.

Lecs and labs to be arranged.
P. L. Marks, R. B. Root.
This course provides students an opportunity to learn techniques and a new biota by participating in an intensive series of field exercises. An extended field trip is scheduled during either intersession or spring break. The region visited, trip objectives, and other details are announced by the instructor in charge in the division's catalog supplement issued at the beginning of the semester. Meetings on campus are devoted to orientation and reports on completed projects.

**661 Environmental Policy (also ALS 661 and Biology and Society 461)**
Fall and spring. 2 or 3 credits each term. Limited to 12 students. Prerequisite: permission of instructor.

Sem, R 2:30–4:30. D. Pimentel.
This course uses an interdisciplinary approach to focus on complex environmental and energy problems. Ten to twelve students, representing several disciplines, investigate significant environmental problems. The research team spends two semesters preparing a scientific report for publication in *Science* or *BioScience*.

**[662 Mathematical Ecology (also Statistics and Biometry 662)**
Spring. 3 credits. Prerequisites: one year of calculus and a course in statistics. Recommended: a general ecology course. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1989–90.

Lecs, M W F 12:20. S. A. Levin, C. E. McCulloch.
Mathematical and statistical analysis of populations and communities: theory and methods. Spatial and temporal pattern analysis. Deterministic and stochastic models of population dynamics. Model formulation, parameter estimation, simulation, and analytical techniques.]

**664 Seminar in Insect-Plant Interactions (also Entomology 664)**
Spring. 2 credits. Intended for seniors and graduate students. Limited to 15 students. Prerequisites: courses in entomology, ecology, evolution, and organic chemistry and written permission of instructor. S-U grades optional. Offered alternate years.

Sem, 1 evening each week to be arranged. P. P. Feeny.
Presentations and discussions by students on the evolution of patterns of interaction between plants and insects, emphasizing critical evaluation of concepts and evidence.

**[665 Limnology Seminar**
Spring. 1 credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates. S-U grades optional. Offered alternate years. Not offered 1989–90.

Sem to be arranged. N. G. Hairston, Jr.
A seminar course on advanced limnological topics.]

**[668 Comparative Biogeochemistry**
Fall. 4 credits. Prerequisites: Solid background in ecology, environmental chemistry, or related environmental science. Permission of instructor required for undergraduates. S-U grades optional. Offered alternate years. Not offered 1989–90. Next offered fall 1990, spring 1992, and alternate spring semesters thereafter.

Lecs and disc, T R 10:10–12:05. R. W. Howarth.
Lectures cover the biotic controls on the chemistry of the environment. Emphasis is on cycles of major elements and minor elements globally and in selected ecosystems, stressing the coupling of element cycles. A comparative approach is used to illustrate similarities and differences in element cycling among ecosystems, with slight emphasis on aquatic ecosystems. Analysis of both theoretical and applied issues, including global atmospheric changes and factors controlling the acidification of lakes.]

**669 Plant Ecology Seminar**
Spring. 1 credit. May be repeated for credit. Suggested for students majoring or minoring in plant ecology. S-U grades optional.

Sem to be arranged. Staff.
Includes review of current literature, student research, and selected topics of interest to participants.

**670 Graduate Seminar in Vertebrate Biology**
Fall or spring. 1 credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates. S-U grades only.

Sem to be arranged. Staff.
Seminar presentations and discussions by students on areas of current research in vertebrate biology. Topics vary from semester to semester.

**[673 Human Evolution: Concepts, History, and Theory (also Anthropology 673)**
Fall. 3 credits. Prerequisite: one year of introductory biology, Anthropology 101, or permission of instructor. Offered alternate years. Not offered 1989–90.

Sem, W 7:30–9:30 p.m.; additional hours to be arranged. K. A. R. Kennedy.
The historical background of present-day concepts of man's evolutionary variations and adaptations in space and time is surveyed. The formation of biological anthropology as an area of scientific inquiry within the social and biological sciences is reviewed.]

**674 Principles of Systematics (also Entomology 674)**
Spring. 4 credits. Limited to 15 students. Prerequisite: permission of instructor. Recommended: an introductory biological systematics course. Offered alternate years.

Lecs, discs, and labs, M W 1:25–4:25. Q. D. Wheeler and staff.
An introduction to modern theory and methods of systematic biology. Lectures are on theoretical systematics and include species concepts, classification, phylogenetics, and biogeography. Laboratories include modern methods of analysis of data, including cladistic hand and computer methods and numerical methods. Laboratory grade is based in part on a final paper.

**760 Special Topics in Evolution and Ecology**
Fall or spring. 1–3 credits. May be repeated for credit. Enrollment limited. S-U grades optional, with permission of instructor.

Hours to be arranged. Staff.
Independent or group intensive study of special topics of current interest. Content varies and is arranged between student and staff member.

**[765 Autecology/Population Ecology**
Fall. 4 credits. Prerequisite: Biological Sciences 261 or equivalent. S-U grades optional. Not offered 1989–90.

Lecs and discs, T R 10:10–12:05. Staff.
Comparison of the responses and adaptations of organisms to environments in selected ecosystems. Emphasis on similarities and differences in molecular and organismal mechanisms by which plants and animals cope with their environments. Critical examination of the properties and dynamics of populations. Emphasis on theories of adaptation, population structures, dynamics, and regulation.]

**[766 Communities and Ecosystems**
Spring. 4 credits. Prerequisite: Biological Sciences 261 or equivalent. S-U grades optional. Not offered 1989–90.

Lecs, T R 10:10–12:05. Staff.
Structure, dynamics, and evolution of natural communities; species diversity; niches and gradient relations; and succession, climax, and disturbance. Comparative aspects of terrestrial, marine, and freshwater communities. Analysis of ecosystems in terms of energy flow, biogeochemistry, and model systems. Emphasis on functional and structural properties of communities and ecosystems.]

**767 Current Topics in Ecology and Evolutionary Biology**
Fall. 4 credits. Prerequisites: Biological Sciences 261 and 378 or their equivalents. S-U grades optional.
Lecs and discs, T R 10:10–12:05. Staff.
Critical evaluation and discussion of theory and research in ecology and evolutionary biology. Lectures by faculty and student-led discussions of topics in areas of current importance.

**Related Courses in Other Departments**

**Advanced Soil Microbiology (Agronomy 666)**

**Advanced Work in Parasitology (Veterinary Medicine 737)**

**Animal Social Behavior (Biological Sciences 427)**

**Biology of Plant Species (Biological Sciences 442)**

**Early People: The Archaeological and Fossil Record (Anthropology 203 and Archaeology 203)**

**Marine Sciences Courses (Biological Sciences 363–370, 467, 477)**

**Plant Geography (Biological Sciences 440)**

**Related Courses in Entomology (Entomology 212, 331, 332, 370, 453, 471, 621, 631, 633, 634, 636, 672)**

**Related Courses in Natural Resources (Natural Resources 270, 302, 430, 603)**

**Soil Microbiology, Lectures (Agronomy 476)**

**Taxonomy of Vascular Plants (Biological Sciences 248)**

**Teaching Experience (Biological Sciences 498)**

**Undergraduate Research in Biology (Biological Sciences 499)**

**Undergraduate Seminar in Biology (Biological Sciences 400)**

**Veterinary Parasitology (Veterinary Medicine 510)**

## GENETICS AND DEVELOPMENT

**281 Genetics**
Fall or spring. 5 credits. Not open to freshmen in fall semester. Enrollment may be limited to 200 students. Prerequisite: one year of introductory biology or equivalent. Students who have taken Biological Sciences 282 may register only with written permission of instructor. No admittance after first week of classes.
Lecs, T R 10:10–12:05; lab, M T W or R 2:30–4:25; additional hours to be arranged. Labs may also be scheduled T or R 8–9:55, W or F 10:10–12:05, F 2:30–4:25, or S 10:10–12:05 if enrollment requires it. Students do not choose lab sections during course enrollment; lab assignments are made during first day of classes. T. D. Fox, M. L. Goldberg, R. J. MacIntyre.
A general study of the fundamental principles of genetics in eukaryotes and prokaryotes. Discussions of gene transmission, gene action and interaction, gene linkage and recombination, gene structure, gene and chromosome mutations, genetic aspects of differentiation, genes in populations, breeding systems, and extrachromosomal inheritance. Aspects of recombinant DNA technology are discussed. In the laboratory, students perform experiments with microorganisms and conduct an independent study of inheritance in *Drosophila*.

**282 Human Genetics**
Spring. 2 or 3 credits (2 credits if taken after Biological Sciences 281). Each discussion limited to 25 students. Prerequisite: one year of introductory biology or equivalent; written permission of instructor required for students who have taken Biological Sciences 281.
Lecs, M W 10:10; disc, R 10:10 or F 10:10 or 11:15. R. A. Calvo.
A course designed primarily for nonmajors. Lectures provide the technical background needed to understand controversial personal, social, and legal implications of modern genetics that are discussed in section meetings.

**385 Developmental Biology**
Fall. 3 credits. Prerequisite: Biological Sciences 281.
Lecs, M W F 11:15. A. W. Blackler.
An introduction to the morphogenetic, cellular, and genetic aspects of the developmental biology of animals.

**389 Embryology**
Spring. 4 credits. Prerequisites: one year of introductory biology and a knowledge of mammalian adult anatomy. Limited to seniors.
Lecs, T R 10:10; labs, T R 2–4:25. A. W. Blackler.
A course in the embryonic development of vertebrate animals, with emphasis on the comparative aspects of morphogenesis and function at the tissue level. The laboratory has a strong morphogenetic bias, emphasizing the comparative aspects of developmental anatomy. Preserved materials are used in the laboratory.

**480 Seminar in Developmental Biology**
Spring. 1 credit. May be repeated for credit. Limited to upperclass students. S-U grades only.
Sem to be arranged. Staff.

**481 Population Genetics**
Fall. 4 credits. Prerequisite: Biological Sciences 281 or equivalent.
Lecs, M W F 10:10; disc, M 2:30 or T 1:25. C. F. Aquadro.
A study of factors that influence the genetic structure of Mendelian populations and that are involved in race formation and speciation. Topics include the diversity and measurement of genetic variation, mating and reproductive systems, selection and fitness, genetic drift, migration and population structure, mutation, multilocus models, the genetics of speciation, quantitative traits, and the maintenance of molecular variation. The interplay between theory and the data from experiments and natural populations are emphasized.

**482 Human Genetics and Society**
Fall. 2 credits. Prerequisites: Biological Sciences 281 and 330 or 331. Enrollment limited to senior biological sciences majors, with preference given to students studying genetics and development.
Disc, T 2:30–4:25. R. A. Calvo, H. T. Stinson.
Presentation of the technology and discussion of the ethical, social, and legal implications of recent advances in human genetics. Among the topics that may be considered are new reproductive strategies, wrongful life and wrongful birth, eugenics, genetic counseling, genetic screening (prenatal, neonatal, presymptomatic, carrier, and workplace), genetic effects of abused substances, sociobiology, and gene therapy. Students lead most discussions.

**483 Molecular Aspects of Development**
Spring. 3 credits. Prerequisites: Biological Sciences 281, 330 or 331, and 385. Offered alternate years.
Lecs, T R 10:10–11:45. M. F. Wolfner.
An examination of the molecular biology of developing systems, with emphasis on the genomic, transcriptional, post-transcriptional, translational, and post-translational mechanisms involved in regulating development. Both prokaryotic and eukaryotic systems are considered, but emphasis is on the latter. Topics to be discussed include changes in chromatin structure, DNA rearrangements, control of RNA synthesis and processing, translational controls, nucleo-cytoplasmic interactions, and genetic responses to hormone treatment. The regulation of selected developmental systems is considered in detail.

**484 Molecular Evolution**
Spring. 3 credits. Prerequisites: Biological Sciences 281 and organic chemistry. Offered alternate years.
Lecs, T R 11:15. R. J. MacIntyre.
An analysis of evolutionary changes in proteins and nucleic acids, and gene-enzyme variability in natural populations. Theories on the evolution of the genetic code and the construction of phylogenetic trees from biochemical data are discussed. The second half of the course concerns the evolution and the organization of genomes from viruses to higher eukaryotes.

**485 Microbial Genetics, Lectures**
Fall. 2 credits. Limited to upperclass and graduate students. Prerequisites: Biological Sciences 281 and Microbiology 290, or written permission of instructor. S-U grades optional.
Lec, W 7:30–9:25 p.m. S. A. Zahler.
Genetics of bacteria and their viruses, with emphasis on the mechanisms of genetic phenomena.

**486 Immunogenetics (also Animal Science 486)**
Fall. 3 credits. Limited to seniors and graduate students. Prerequisites: an introductory course in genetics, prior or concurrent enrollment in basic immunology, or written permission of instructor. Offered fall 1989; next offered fall 1991.
Lecs and discs, M W F 10:10. R. R. Dietert.
The genetic control of a variety of cellular antigens and their use in understanding biological and immunological functions. The genetics of antibody diversity, antigen recognition, immune response, transplantation, and disease resistance are discussed

**487 Microbial Genetics, Laboratory**
Fall. 3 credits. Primarily for upperclass students. Limited to 16 students. Prerequisites: concurrent or previous enrollment in Biological Sciences 485, Microbiology 291 or equivalent, and written permission of instructor.
Lab, T 1:25–4:25; additional hours to be arranged. S. A. Zahler.
Problem solving in bacterial genetics.

**686 Mammalian Development**
Spring. 2 credits. Limited to 25 students. Prerequisites: Biological Sciences 281 and 385 or their equivalents. S-U grades optional. Offered alternate years.
Lecs, W F 11:15. W. H. Mark.
An in-depth study of mammalian development using the mouse as the animal model. The course covers classical embryology beginning with gametogenesis followed by morphogenetic and biochemical anayses of pre- or post-implantation development. Current topics in experimental embryology, including genetic analysis of mutants, study of cell lineage with chimeras, in vitro culturing of embryonic stem cells, and molecular approaches to understanding development are examined.

**[687 Developmental Genetics**
Fall. 2 credits. Limited to 20 students. Prerequisites: Biological Sciences 281 or equivalent, Biological Sciences 385 or equivalent. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lec, M 7:30–9:30 p.m. K. J. Kemphues.
Selected topics focus on the use of genetic analysis in understanding mechanisms of development. Topics are drawn primarily from studies in *Drosophila, Caenorhabditis,* and Mouse. Other possible topics include pattern formation, cell lineage, neural development, maternal information in development, germ cell development, sex determination, and intercellular communication. Students read current literature and are given the opportunity to discuss each topic in class.]

**688 Yeast Genetics**
Spring. 2 credits. Prerequisites: Biological Sciences 281, 330 or 331, and 485, or written permission of instructor. S-U grades optional.
Lecs, W 7:30–9:25 p.m. T. D. Fox.
An advanced overview of genetic studies in yeast, primarily *Saccharomyces cerevisiae.* Both formal genetic and molecular approaches to selected problems of biological interest are discussed.

**[689 Advanced Topics in Population Genetics**
Fall. 2 credits. Limited to 20 students. Prerequisites: Biological Sciences 481 or equivalent and written permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lec, T 2:30–4:25. C. F. Aquadro.
An in-depth exploration of current areas of research in population genetics. Readings primarily from recent books and the current literature. Specific topics announced the previous spring and in the division's catalog supplement. Format includes lectures, discussion, and presentations by students.]

**780 Current Topics in Genetics**
Fall and spring. 2 credits. May be repeated for credit. Primarily for graduate students, with preference given to majors in the Field of Genetics; written permission of instructor required for undergraduates. Limited to 20 students. No auditors. S-U grades optional, with permission of instructor.
Sem to be arranged. Staff.
A seminar course with critical presentation and discussion by students of original research papers in a particular area of current interest. Content of the course and staff direction vary each year and are announced a semester in advance.

**781 Problems in Genetics and Development**
Fall. 1 credit. Limited to first-year graduate students in the Field of Genetics.
Disc to be arranged. Staff.
An introduction to the research literature in selected areas through weekly problem sets and discussions.

**782–787 Current Genetics/Development Topics**
Fall or spring. 1/2 or 1 credit for each topic. May be repeated for credit. S-U grades only.
Lectures and seminars on specialized topics to be announced.

**Related Courses in Other Departments**

**Animal Cytogenetics (Animal Science 419)**

**Animal Development (Veterinary Medicine 507)**

**Current Topics in Biochemistry (Biological Sciences 731–736)**

**Laboratory in Plant Molecular Biology (Biological Sciences 641)**

**Evolutionary Biology (Biological Sciences 378)**

**Plant Growth and Development (Biological Sciences 644)**

**Plant Molecular Genetics (Biological Sciences 653)**

**Reproduction and Development of Marine Invertebrates (Biological Sciences 488)**

**Undergraduate Research in Biology (Biological Sciences 499)**

## NEUROBIOLOGY AND BEHAVIOR

**221 Neurobiology and Behavior I: Introduction to Behavior**
Fall. 3 or 4 credits (4 credits with discussion and written projects). 4–credit option required of students studying neurobiology and behavior. Each discussion limited to 20 students, with preference given to students studying neurobiology and behavior. Not open to freshmen. Prerequisite: one year of introductory biology for majors. May be taken independently of Biological Sciences 222. S-U grades optional.
Lecs, M W F 12:20; disc to be arranged. P. W. Sherman and staff.
A general introduction to the field of behavior. Topics include evolution and behavior, behavioral ecology, sociobiology, chemical ecology, communication, neuroethology, rhythmicity, orientation and navigation, and hormonal mechanisms of behavior.

**222 Neurobiology and Behavior II: Introduction to Neurobiology**
Spring. 3 or 4 credits (4 credits with discussion and written projects). 4–credit option required of students studying neurobiology and behavior. Each discussion limited to 20 students, with preference given to students studying neurobiology and behavior. Not open to freshmen. Prerequisites: one year of introductory biology for majors and one year of chemistry. May be taken independently of Biological Sciences 221. S-U grades optional.
Lecs, M W F 12:20; disc to be arranged. A. H. Bass and staff.
A general introduction to the field of cellular and integrative neurobiology. Topics include neural systems, neuroanatomy, developmental neurobiology, electrical properties of nerve cells, synaptic mechanisms, neurochemistry, motor systems, sensory systems, learning, and memory.

**322 Hormones and Behavior (also Psychology 322)**
Spring. 3 or 4 credits; the 4-credit option involves a one-hour section once a week, in which the students are expected to participate in discussion and read original papers in the field. *Because the 4-credit option has very limited enrollment, students should preregister for 3 credits only.* Limited to juniors and seniors; open to sophomores only by permission. Prerequisites: one year of introductory biology plus a course in psychology or Biological Sciences 221 or 222. S-U grades optional.
Lecs, T R 10:10–11:30; disc to be arranged. E. Adkins Regan, R. E. Johnston.
The relationship between endocrine and neuroendocrine systems and the behavior of animals, including humans. Major emphasis is on sexual, parental, and aggressive behavior.

**324 Biopsychology Laboratory (also Psychology 324)**
Fall. 4 credits. Limited to 24 upperclass students. Prerequisites: laboratory experience in biology or psychology, Biological Sciences 221 and 222 or Psychology 123 and 222; and permission of instructor. S-U grades optional.
Labs, T R 1:25–4:25. T. DeVoogd.
Experiments designed to provide research experience in animal behavior (including learning) and its neural and hormonal mechanisms. A variety of techniques, species, and behavior patterns are included. Live animals are used in the laboratory.

**[326 The Visual System**
Spring. 4 credits. Prerequisites: Biological Sciences 222 or 311, or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90; next offered 1991–92.
Lecs, M W F 10:10; disc, 1 hour each week to be arranged. H. C. Howland.
The visual systems of vertebrates and invertebrates are discussed in breadth and depth. Topics covered include the optics of eyes, retinal neurophysiology, and structure and function of higher visual centers.]

**396 Introduction to Sensory Systems (also Psychology 396)**
Spring. 3 or 4 credits (4 credits with discussion and term paper). No auditors. Prerequisites: an introductory course in biology or biopsychology, and a second course in neurobiology or behavior or perception or cognition or biopsychology; students are expected to have elementary knowledge of perception, neurophysiology, behavior, and chemistry. Permission of instructor required for 4-credit option. Offered alternate years.
Lecs, M W F 9:05. B. P. Halpern.
This course employs the Socratic method, in which the instructor asks questions of the students. Students read, analyze, and discuss in class difficult original literature dealing with both those characteristics of sensory systems that are common across living organisms and those sensory properties that represent adaptations of animals to particular habitats or environments. The principles and limitations of major methods used to examine sensory systems are considered. General principles of sensory systems and auditory, visual, and somesthetic systems are covered. One aspect of each system (e.g., localization of objects in space by sound, color vision, and thermoreception) is selected for special attention. At the level of *An Introduction to the Physiology of Hearing*, by J. O. Pickles; *Photoreceptors: Their Role in Vision*, by A. Fein and E. Z. Szuts; *Comparative Studies of Hearing in Vertebrates*, edited by A. N. Popper and R. R. Ray; and "Information Processing in Cutaneous Mechanoreceptors," Federation Proceedings 42:1983.

**420 Topics in Neurobiology and Behavior**
Fall or spring. Variable credit. May be repeated for credit. Primarily for undergraduates. S-U grades optional.
To be arranged. Staff.
Courses on selected topics in neurobiology and behavior; can include lecture and seminar courses. Topics, instructors, and time of organizational meetings are listed in the division's catalog supplement issued at the beginning of the semester.

**424 Neuroethology**
Fall. 3 credits. Prerequisites: Biological Sciences 221 and 222. S-U grades optional for graduate students only. Offered alternate years.
Lecs, M W 11:15; disc, F 11:15.
C. D. Hopkins.
The integrated study of neurobiology and animal behavior. Representative topics include acoustic communication in insects and amphibians, vocal mechanisms and plasticity of bird song, mammalian hearing, bat echolocation, prey detection by owls, electroproduction and electroreception in fish, neurophysiology and behavior of pheromone communication, neurobehavior of vision in anurans, mammalian visual processing, command neurons and decision networks, locomotion and motor-pattern generation, escape behavior in invertebrates, and neural correlates of learning. Assigned readings include original articles in the scientific literature. A term paper on the neural basis of animal behavior is required.

**[426 Electronics for Neurobiology**
Spring. 3 credits. Limited to 20 students. Prerequisites: Biological Sciences 222 and one year of introductory physics. Offered alternate years. Not offered 1989–90.
Lecs, T R 9:05; lab, 4 hours each week to be arranged. D. W. McBride.
Electronics as applied to electrophysiological instrumentation, data acquisition, and analysis. Topics include a review of basic electrical concepts, the cell as a circuit, design of amplifiers and pulse generators for biological use, and computer interfacing to an experiment.]

**[427 Animal Social Behavior**
Fall. 3 credits. Limited to 30 students. Prerequisites: Biological Sciences 221 and 261. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1989–90.
Lecs and discs, T R 2:30–4:20.
S. T. Emlen.
An intensive course for upper-division students interested in the adaptive bases of social behavior. Lectures, discussions, and student presentations examine topics including spacing systems, mating systems, sexual selection, mate choice, conflict and cooperation in animal societies, and the evolution of deceit, honesty, and altruism.]

**[428 Mechanisms of Animal Behavior: Field and Laboratory Studies**
Spring. 3 credits. Limited to 15 students. Prerequisite: Biological Sciences 221. S-U grades optional, with permission of instructor. Not offered 1989–90; next offered 1991–92.
Lecs and discs, T R 2:30–4:20.
K. K. Adler.]

**[429 Olfaction and Taste: Structure and Function (also Psychology 429)**
Fall. 3 or 4 credits (4 credits with term paper on research project, which can, but need not, study nonhuman vertebrates). Prerequisite: a 300-level course in biopsychology or equivalent. Preference given to junior and senior psychology and biology majors and graduate students. S-U grades optional for graduate students only. Offered alternate years. Not offered 1989–90.
Lecs, T R 9:05. B. P. Halpern.
The structural and functional characteristics of olfaction and taste are explored by reading and discussing current literature in these areas. Structure is examined at the light- and electron-microscope levels, as well as at the molecular level. The neurophysiological and biochemical aspects of function are considered. The emphasis of the course is on vertebrates, especially air-breathing vertebrates in the case of olfaction, although there is some coverage of invertebrate forms.]

**491 Principles of Neurophysiology**
Fall. 4 credits. Limited to 20 students. Prerequisite: Biological Sciences 222 or written permission of instructor. S-U grades optional.
Lecs, M W 10:10; lab, M W 12:20–4:25; additional hours to be arranged.
B. R. Johnson.
A laboratory-oriented course designed to teach the theory and techniques of modern cellular neurophysiology. Lecture time is used to present laboratory exercise results, to supplement laboratory topics, and to encourage discussion of primary research papers. Laboratory topics include electrical modeling of neurons; intracellular and extracellular recording, and analysis of neuronal properties such as nerve conduction velocities, resting potentials, electrical synaptic transmission; voltage-clamp analysis of ionic currents; and neuronal architecture. A variety of preparations, both invertebrate and vertebrate, are used as model systems. Computer acquisition and analysis of laboratory results are emphasized.

**[492 Sensory Function (also Psychology 492)**
Spring. 4 credits. Prerequisite: Biological Sciences 222 or 311 or an upper-level course in biopsychology, or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90; next offered 1990–91.
Lecs, M W F 10:10; disc, 1 hour each week to be arranged. H. C. Howland, B. P. Halpern.
Classical topics in sensory function such as vision, hearing, touch, and balance, as well as some more modern topics, including sensory coding, location of stimulus sources in space, and the development of sensory systems. Both human and nonhuman systems are discussed. In all cases the chemical, physical, and neurophysiological bases of sensory information are treated and the processing of this information is followed into the central nervous system. At the level of *The Senses*, edited by Barlow and Mollon, and *An Introduction to the Physiology of Hearing*, by Pickles.]

**[493 Developmental Neurobiology**
Fall. 3 credits. Prerequisite: Biological Sciences 222 or permission of instructor. S-U grades optional, with permission of instructor. Offered alternate years. Not offered 1989–90; next offered 1990–91.
Lecs, T R 9:05; disc to be arranged.
R. Booker.
Lectures covering the development of the nervous system taking examples from both vertebrates and invertebrates. Emphasis is on cellular and molecular issues, that is, How do nerve cells differentiate both morphologically and biochemically? The role of cues such as hormones and developmental genes in neural development are discussed. Readings are taken from original journal articles.]

**[494 Comparative Vertebrate Neuroanatomy (formerly Biological Sciences 694)**
Spring. 3 credits. Intended for juniors, seniors, and graduate students. Prerequisite: Biological Sciences 222 or equivalent. S-U grades optional. Offered alternate years. Not offered 1989–90.
Lecs, T R 10:10–11:30. A. H. Bass.
Organization and evolution of neuroanatomical pathways as substrates for species-typical vertebrate behaviors. The course is divided into two major sections: principles of brain organization and vertebrate brain evolution.]

**495 Membrane Ion Channels**
Spring. 3 credits. Limited to 15 students. Prerequisites: Biological Sciences 222, college introductory physics, and calculus, or permission of instructor. S-U grades optional. Offered alternate years.
Lecs, M W F 10:10. O. P. Hamill.
The functional and mechanistic aspects of membrane ion channels, beginning with basic concepts and model systems. Theories of ion permeation and channel gating are discussed. Development of membrane ion channels during neuron differentiation and the role of membrane channels in disease states are also considered.

**497 Neurochemistry and Molecular Neurobiology**
Fall. 3 credits. Limited to 30 students. Prerequisites: Biological Sciences 222 and either 330 or 331, or permission of instructor. S-U grades optional. Offered alternate years.
Lecs, T R 9:05; disc, T 10:10.
T. R. Podleski.
This course focuses primarily on synaptic neurochemistry. The presynaptic regulation of release and postsynaptic mechanism of action of the major classes of neurotransmitters are discussed, as well as selected neuromodulators and hormones. Second-messenger mechanisms are stressed. Readings are primarily from journal articles.

**623 Chemical Communication (also Chemistry 622)**
Fall. 3 credits. Primarily for research-oriented students. Limited to 30 students. Prerequisites: one year of introductory biology for majors or equivalent, course work in biochemistry, and Chemistry 358 or equivalent. Offered alternate years.
Lecs, M W F 1:25. T. Eisner, J. Meinwald, W. L. Roelofs, and guest speakers.
The production, transmission, and reception of chemical signals in communicative interactions of animals, plants, and microorganisms. Studies of insects are emphasized. Specific topics are treated with varying emphasis on chemical, biochemical, ecological, behavioral, and evolutionary principles.

**[626 Sex Differences in Brain and Behavior (also Psychology 524)**
Spring. 2 credits. Limited to 12 students. Prerequisite: Biological Sciences 322 or permission of instructor. Not offered 1989–90.
Disc and sem, M W 3:35–5:30.
T. DeVoogd.
A survey of the newly discovered animal models for sex differences in the brain. Topics include the role of steroids in brain development, whether hormones can modify the structure of the adult brain, and the consequences of such sex differences in anatomy for behavior.]

**628 Computer Interfacing for Neurobiologists**
Spring. 3 credits. Limited to 20 students. Prerequisites: Biological Sciences 222 and 426, or permission of instructor. S-U grades optional. Offered alternate years.
Lecs, T R 9:05; lab, 4 hours each week to be arranged. D. W. McBride.
Lectures and laboratories deal with interfacing a computer with an experiment and doing data acquisition and computer control of the experiment. Topics include introduction to digital electronics, data acquisition and monitoring of an experiment (A/D conversions and digital input), some data analysis and decision making, computer control of an experiment (D/A conversions and digital output), communication (RS-232 and IEEE), assembler language programming, sampling theory and Fourier analysis, feedback control using computers, optimizing data through-put, and storage to disk. A Mac II computer is used in this course.

**720 Seminar in Advanced Topics in Neurobiology and Behavior**
Fall or spring. Variable credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates. S-U grades optional.
Sem to be arranged. Staff and students.
Designed to provide several study groups each semester on specialized topics. A group may meet for whatever period is judged adequate to enable coverage of the selected topics. Ordinarily, topics are selected and circulated during the preceding semester. Discussion of current literature is encouraged. Suggestions for topics should be submitted by faculty or students to the chair of the Section of Neurobiology and Behavior.

**721 Graduate Survey of Behavior**
Fall. 1 credit. Limited to graduate students. Concurrent registration in Biological Sciences 221 is *not* required. S-U grades optional.
Sem to be arranged. P. W. Sherman and staff.
A survey course involving readings of the original literature in behavior. A weekly seminar, primarily in the form of student-led discussions, is held to discuss readings linked to the material presented in Biological Sciences 221.

**722 Graduate Survey of Neurobiology**
Spring. 1 credit. Limited to graduate students. Concurrent registration in Biological Sciences 222 is *not* required. S-U grades optional.
Sem to be arranged. A. H. Bass and staff.
A survey course involving readings of the original literature in neurobiology. A weekly seminar, primarily in the form of student-led discussions, is held to discuss readings linked to the material presented in Biological Sciences 222.

**723 Advanced Topics in Animal Behavior**
Fall or spring. Variable credit. May be repeated for credit. Primarily for graduate students in behavior. Prerequisite: permission of instructor. S-U grades optional.
Sem to be arranged. Staff.
A seminar on a specific topic in animal behavior. The instructor presents lectures during the first few course meetings; the remainder of the course is devoted to student presentations. Topic and instructor are listed in the division's catalog supplement issued at the beginning of the semester.

**724 Field Methods in Animal Behavior**
Fall or spring. Variable credit. May be repeated for credit. Primarily for graduate students in behavior. Prerequisite: permission of instructor. S-U grades optional.
Sem and fieldwork to be arranged. Staff.
A seminar-field experience course designed for first-year graduate students in animal behavior. Weekly seminars discussing field methodology, data collection, and hypothesis testing are followed by an intensive period (ten days to two weeks) in the field. Specific topics and field sites vary from semester to semester. Topic and instructor are listed in the division's catalog supplement issued at the beginning of the semester.

**790 Advanced Topics in Cellular and Molecular Neurobiology**
Fall or spring. Variable credit. May be repeated for credit. Limited to graduate students and advanced undergraduates studying neurobiology and behavior. Prerequisite: Biological Sciences 222. S-U grades optional.
Lecs and sem to be arranged. Staff.
A lecture-seminar course on selected topics in cellular and molecular neurobiology. Students read original papers in the scientific literature and lead discussions of these articles. Suggestions for topics may be submitted by faculty or students to the chair of the Section of Neurobiology and Behavior. Topic and instructor are listed in the division's catalog supplement issued at the beginning of the semester.

**792 Advanced Laboratory in Cellular and Molecular Neurobiology**
Fall or spring. 2 credits. May be repeated for credit. Primarily for graduate students. Prerequisites: Biological Sciences 330 or 331 or equivalent, 491 or equivalent, and written permission of instructor. S-U grades optional.
Lab to be arranged. Staff.
A two-week intensive laboratory course designed to provide experience with a specific technique currently used in cellular and molecular neurobiology. The technique under study and instructor in charge vary from semester to semester and are listed in the division's catalog supplement issued at the beginning of the semester.

**793 Advanced Topics in Integrative Neurobiology**
Fall or spring. Variable credit. May be repeated for credit. Primarily for graduate students; written permission of instructor required for undergraduates. S-U grades optional.
Lecs and discs to be arranged. Staff.
A course designed to provide in-depth knowledge of current research in anatomical and physiological bases of vertebrate and invertebrate behavior. Readings are primarily from specialty books and selected journal articles. Topic and instructor are listed in the division's catalog supplement issued at the beginning of the semester.

**794 Advanced Laboratory Techniques in Integrative Neurobiology**
Fall or spring. Variable credit. May be repeated for credit. Prerequisite: permission of instructor based upon a personal interview.
Lab to be arranged. Staff.
A laboratory in the integrative, or neuroethological, approach to studies of animal behavior. Designed to provide practical working knowledge of research methods in anatomical, physiological, and behavioral approaches to studies of vertebrate and invertebrate behavior. Laboratory technique to be covered and instructor are listed in the division's catalog supplement issued at the beginning of the semester.

### Related Courses in Other Departments

**Animal Behavior (Psychology 535)**

**Biochemistry and Human Behavior (Psychology 361 and Nutritional Sciences 361)**

**Brain and Behavior (Psychology 425)**

**Developmental Biopsychology (Psychology 422)**

**Evolution of Human Behavior (Psychology 326)**

**Human Behavior: A Sociobiological Perspective (Anthropology 476)**

**Insect Behavior Seminar (Entomology 662)**

**Teaching Experience (Biological Sciences 498)**

**Undergraduate Research in Biology (Biological Sciences 499)**

## COURSES IN MARINE SCIENCES

Although there is no concentration (program in study) in marine sciences offered to Cornell undergraduates, there is extensive opportunity at the undergraduate level to prepare for more advanced study. Students interested in the marine sciences may enroll in courses offered at Cornell's Shoals Marine Laboratory (SML), a seasonal field station located on ninety-five acre Appledore Island, six miles off the Maine and New Hampshire coasts.

The Ithaca campus functions of the Shoals Marine Laboratory are centered in the Cornell Marine Programs Office, G14 Stimson Hall. The office serves as an advising center for students interested in the marine sciences, maintains a browsing library with updated information on graduate study and career opportunities as well as on marine programs at other institutions, and administers the SEA Semester, a 17-credit program offered in cooperation with the Sea Education Association.

The following marine sciences courses are currently administered by the Cornell Marine Programs Office.

**204 Biological Illustration**
Summer. No credit or 1 credit. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, supplies, and ferry transportation), $500.

Daily sessions for 1 week. SML faculty.
General discussion of scientific publishing, illustration labeling, color techniques, and printing processes. The course provides the scientist or science student a chance to experience several illustration techniques with the goal of obtaining an overview of scientific and wildlife illustrations. The student may choose a single technique to explore in depth. Course size is limited so that individual attention can be emphasized.

**306 Marine Microbial Ecology**
Summer. 2 credits. Prerequisites: one year of introductory college biology and chemistry. Recommended: an introductory course in microbiology. S-U grades optional. A special 2-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,100.

Daily lecs, labs, and fieldwork for 2 weeks. SML faculty.
Designed to provide a strong practical and theoretical understanding of the ecology, physiology, and systematics of marine microbes from diverse marine ecosystems. Intertidal zone, salt marsh, coastal water, open ocean, and hydrothermal vent communities are covered. Particular cellular arrangements, metabolic pathways, and biogeochemical cycles are covered in detail, as are general principles concerning microbial ecology and evolution.

**309 Bioclimatology: A Field Introduction**
Summer. 2 credits. Prerequisite: one year of college level biology; background preferred in physics/physical geography. S-U grades optional. A special 2-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $975.

Daily lecs, labs, and fieldwork for 2 weeks. SML faculty.
A study of the fundamentals of organism-environment interaction developed through defining and measuring abiotic factors including solar radiation, temperature, atmospheric moisture, precipital wind, and currents. In-site exploration of the dynamics of meteorology and the role of abiotic and biotic factors in the life of coastal and marine plants and animals including humans.

**329 Ecology of Animal Behavior**
Summer. 2 credits. Prerequisite: one year of introductory college biology. Recommended: course work in ecology, evolution, or behavior. S-U grades optional. A special 2-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N. H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,100.

Daily lecs and fieldwork for 2 weeks. SML faculty.
The ecological significance of behaviors of coastal organisms, with emphasis on field and laboratory research methods. Lectures and readings address the major subareas of behavior (communication, orientation, social behavior, foraging, predator avoidance, and sensory mechanisms). Each student engages in short-term behavioral observation and prepares a research proposal for studying a problem within the course subject area. Dissection of vertebrate animals will be a part of one or more laboratory sessions.

**363 Marine Biology for Teachers**
Summer. 1 credit. Primarily for teachers, grades 6 through 12, but open to others. Prerequisite: one year of introductory college biology. S-U grades optional. A special 10-day course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $750.

Daily lecs, labs, and fieldwork for 10 days. SML faculty.
Designed to give an overview of living marine organisms (algae, invertebrates, fishes, marine mammals, and shorebirds) and of the environment they inhabit. Fieldwork is emphasized. Occasional lectures and films deal with additional topics such as coastal-zone problems, marine fisheries, economics of marine organisms, and educational resources of the marine environment. The core faculty of marine biologists is augmented by specialists in science and environmental education. Dissection of vertebrate animals will be a part of one or more laboratory sessions.

**364 Field Marine Science**
Summer. 6 credits. Prerequisite: one year of college biology or other supporting subject. S-U grades optional. A special 4-week course offered twice each summer at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML Office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,975.

Daily lecs, labs, and fieldwork for 4 weeks. 3 core faculty members assisted by up to 15 visiting lecturers, including representatives of governmental agencies, and commercial fishermen. SML faculty.
Designed for the student who desires an initial overview of the marine sciences, this course emphasizes living material in natural habitats. Most of the course work is concerned with the biology of intertidal plants and animals, biological oceanography, ichthyology, and fisheries. Attention is also given to introductory physical and chemical oceanography and marine geology. Marine ecology and the effects of human activity on the marine environment are included. Dissection of vertebrate animals will be a part of one or more laboratory sessions.

**365 Underwater Research**
Summer. 2 credits. Prerequisites: one year of college-level biology or other supporting subject, recognized scuba certification, and a medical examination. S-U grades optional. A special 2-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,250.

Daily lecs and fieldwork for 2 weeks. Team-taught by a diving-safety officer, two faculty members, and guest lecturers.
For competent divers only. Covers special problems of underwater research, including random sampling, use of dive tables, underwater instrumentation, special diving equipment, photographic techniques, integration with boat and shore facilities, and emergency procedures. Students are required to conduct a transect study on both soft and hard substrates.

**366–370 SEA Semester**
In cooperation with the Sea Education Association (SEA), the Shoals Marine Laboratory office offers a semester-length sequence of courses designed to provide college undergraduates with a thorough academic, scientific, and practical understanding of the sea. *This sequence is repeated approximately once every two months throughout the year.* Students spend the first half of SEA Semester (the six-week shore component) in Woods Hole, Massachusetts, receiving instruction in oceanography, nautical science, and maritime studies. The second half of SEA Semester (the six-week sea component) is spent at sea aboard R/V *Westward* or the R/V *Corwith Cramer*. Applicants are interviewed in Ithaca before

admission. Enrollment is open to men and women judged capable of benefiting from SEA Semester; no specific prior training or study is required. *Cornell students enrolled in the SEA Semester must take the entire sequence.*

For more details and an application, consult the Shoals Marine Laboratory office, G14 Stimson Hall. Program costs are to be paid in place of regular Cornell tuition and fees: tuition for entire 17-credit SEA Semester, about $6,200; room and board for sea component (six weeks) only, about $1,875.

Instructors for the SEA Semester include faculty of the Sea Education Association and the Woods Hole Oceanographic Institution and others.

### Shore Component (six weeks)

**366 SEA Introduction to Oceanography**
3 credits. Prerequisites: a laboratory course in physical or biological science and concurrent enrollment in Biological Sciences 367 and 368. A survey of the characteristics and processes of the global ocean. Oceanographic concepts are introduced and developed from their bases in biology, physics, chemistry, and geology. Provides a broad background in oceanography with special attention to areas pertinent to the subsequent cruise. Guest lecturers from the Woods Hole research community interpret current trends and activities in this rapidly evolving field. Students develop individual projects to be carried out at sea.

**367 SEA Introduction to Maritime Studies**
3 credits. Prerequisite: concurrent enrollment in Biological Sciences 366 and 368.
An interdisciplinary consideration of our relationship with the marine environment. Covers the elements of maritime history, law, literature, and art necessary to appreciate our marine heritage and to understand the political and economic problems of contemporary maritime affairs.

**368 SEA Introduction to Nautical Science**
3 credits. Prerequisites: college algebra or equivalent, and concurrent enrollment in Biological Sciences 366 and 367. An introduction to the technologies of operation at sea. The concepts of navigation (piloting, celestial, and electronic), naval architecture, ship construction, marine engineering systems, and the physics of sail are taught from their bases in astronomy, mathematics, and physics. Provides the theoretical foundation for the navigation, seamanship, and engineering that students employ at sea.

### Sea Component (six weeks)

Courses 369 and 370 take place aboard the R/V *Westward*, a 125-foot steel auxiliary-powered staysail schooner built in 1961, or the R/V *Corwith Cramer*, a 134-foot steel auxiliary-powered brigantine built in 1987 for SEA. Both ships normally put to sea with a ship's company of thirty-four. The professional staff of nine includes the captain, the chief scientist, two science watch officers, three deck watch officers, an engineer, and a steward. In addition, one or more visiting investigators are frequently aboard. Up to twenty-five students round out the complement.

**369 SEA Practical Oceanography I**
4 credits. Prerequisite: Biological Sciences 366. Theories and problems raised in the shore component are tested in the practice of oceanography at sea. Students are introduced to the tools and techniques of the practicing oceanographer. During lectures and watch standing, students are instructed in the operation of basic oceanographic equipment; in the methodologies involved in the collection, reduction, and analysis of oceanographic data; and in the attendant operations of a sailing oceanographic research vessel.

**370 SEA Practical Oceanography II**
4 credits. Prerequisite: Biological Sciences 368. Building on the experience of Practical Oceanography I, students assume increasing responsibility for conducting oceanographic research and overseeing operations of the vessel. The individual student is ultimately responsible directly to the chief scientist and the master of the vessel for the safe and orderly conduct of research activities and related operations of the vessel. Each student undertakes an individual research project designed during the shore component.

**372 An Introduction to the Ecology and Chemistry of Rock-Pool Environments**
Summer. 1 credit. Prerequisite: an introductory biology, chemistry, or marine science course at the college level or permission of instructor. S-U grades optional. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $675.
Daily lecs, labs, and fieldwork for 1 week. SML faculty.
A fundamental field-oriented introduction to the interrelationships of the chemistry and biology of both rock- and tide-pool ecosystems, using the numerous pools on Appledore Island as natural laboratories.

**413 Adaptations of Marine Organisms**
Summer. 4 credits. Prerequisite: Biological Sciences 364 or a course in physiological ecology. S-U grades optional. A special 3-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,550.
Daily lecs, labs, and fieldwork for 3 weeks. SML faculty.
An introduction to the physiological ecology and functional morphology of marine plants and animals, with emphasis on selected algal and invertebrate examples from the Gulf of Maine. Topics covered include photosynthesis in the marine environment; respiration in intertidal organisms; carbohydrates, proteins, and lipids as nutrients in the sea; acclimation and tolerance of tide-pool biota; and biological responses to competition and grazing. Field and laboratory exercises explore principles and procedures used to characterize the physical, chemical, and biotic environment of intertidal and shallow subtidal organisms, including determination of temperature, light, salinity, oxygen and nutrient levels, and *in vivo* functional analyses of metabolic phenomena. Dissection of vertebrate animals will be a part of one or more laboratory sessions.

**449 Marine Botany: Ecology of Marine Plants**
Summer. 2 credits. Prerequisite: Biological Sciences 364 or general familiarity with marine algae. S-U grades optional. A special 2-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,100.
Daily lecs, labs, and fieldwork for 2 weeks. SML faculty.
An overview of the major marine algal groups, including aspects of anatomy, morphology, development, life histories, physiology, and use. Laboratories and fieldwork emphasize relationships between distribution and major environmental parameters and involve student projects.

**466 Ecology and Chemistry of Rock-Pool Environments**
Summer. 4 credits. Prerequisites: one year of introductory college chemistry and an introductory ecology course at the college level. S-U grades optional. A special 3-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,550.
Daily lecs, labs, and fieldwork for 3 weeks. SML faculty.
A field-oriented course emphasizing the interrelationships of the chemistry and biology of both rock- and tide-pool ecosystems, using the numerous pools on the island as natural laboratories. Laboratory work includes organism identification; chemical analyses of pools for nutrients, pH, alkalinity, dissolved carbon dioxide and oxygen, salinity, plant pigments, and primary production; and determinations of lethal temperature, salinity, and oxygen level for different species and populations. Lectures and class research projects cover the effects of pool morphology and algal growth on pool temperature, chemistry, and stratification; salinity changes caused by evaporation, rainfall, and seawater splash; dissolved oxygen and pH changes associated with primary production; nutrient dynamics relative to rainfall, flow through, primary production, microbial activities, and proximity to nesting birds; primary production differences among pool types; and predation experiments with fish implantation. Food web and energy models for different rock-pool ecosystems are presented. The use of microcomputers for interpretation of data is emphasized.

**467 Chemical Oceanography of Coastal Waters**
Summer. 4 credits. Prerequisites: one year of introductory college chemistry and an introductory marine science course at the college level. S-U grades optional. A special 3-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,550.
Daily lecs, labs, and fieldwork for 3 weeks. SML faculty.
A field-oriented course in the chemical oceanography of coastal waters. Lectures, frequent field trips, and laboratory sampling

and analysis; includes tests of salinity, temperature, pH, chlorophyll, alkalinity, total CO2, nutrients, organic material, and suspended materials in coastal waters, with some work on the analysis of coastal sediments.

**468 Marine Plankton Ecology**
Summer. 2 credits. Limited to 20 students. Prerequisites: one year of introductory college biology and Biological Sciences 364 or equivalent, or a course in invertebrate zoology or introductory oceanography. S-U grades optional. A special course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,100.

Daily lecs, labs, and fieldwork for 2 weeks. SML faculty.

An introduction to the biology of plankton and their ecological role in representative marine environments, including estuaries, coastal areas, open ocean gyres, and polar seas. Includes an overview of morphology, life histories, and nutrition of planktonic bacteria, protozoans, algae, and metazoans (coelenterates, crustaceans, ctenophores, chaetognaths, and tunicates). The role of these groups in different ecosystems is related to the hydrography of the area, as well as the life cycles and trophic interactions of the dominant species. During several one-day cruises in the Gulf of Maine and Great Bay Estuary students use simple field techniques to address current research problems.

**477 Marine Vertebrates**
Summer. 4 credits. Prerequisite: Biological Sciences 364 or 274 or a course in vertebrate biology. S-U grades optional. A special 3-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,550.

Daily lecs, labs, and fieldwork for 3 weeks. SML faculty.

Topics in marine vertebrate biology emphasizing laboratory studies, field collections or observations, and readings from the current literature. Topics covered include systematics of fishes of the Gulf of Maine, elasmobranch physiology, interpretation of life history and parameters from otolith microstructure, teleost skeletomuscular structure and function, population biology and the contemporary Gulf of Maine fishery, Mesozoic marine reptiles, the biology of sea turtles in cold water, coloniality in sea birds, avian adaptations to life at sea, evolution and systematics of marine mammals, diving physiology, and ecology and conservation of existing marine mammal populations. Dissection of vertebrate animals is a part of one or more laboratory sessions.

**488 Reproduction and Development of Marine Invertebrates**
Summer. 4 credits. Prerequisite: Biological Sciences 364 or a course in invertebrate zoology. S-U grades optional. A special 3-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $1,550.

Daily lecs, labs, and fieldwork for 3 weeks. SML faculty.

A laboratory-oriented course emphasizing processes of fertilization and early development through the metamorphosis of larvae in species selected from an extensive variety of local marine invertebrates. Practical experience includes collecting specimens intertidally and from the plankton, culturing embryos through metamorphosis, camera lucida and photomicrographic recording of embryonic development, and design and execution of basic experiments on eggs and embryos. Lectures complement laboratory work through phylogenetic examination of classical invertebrate embryology and modern experimental developmental biology.

**Archaeology of Maritime Communities (Archaeology 300: Individual Study in Archaeology)**
Summer. 1 credit. Prerequisite: Archaeology 319 or permission of instructor. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $675.

Daily lecs, labs, and fieldwork for 1 week. SML faculty.

Fieldwork on various land sites and their adjacent offshore marine environments. Artifact analysis, preliminary conservation, and the proper recording of finds are emphasized. Methods of archaeological research, including the use of archives and historical materials, and publication methodologies as well as the larger questions in the discipline are discussed.

**Coastal and Oceanic Law and Policy (Natural Resources 306)**
Summer. 1 credit. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML) on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $675.

Daily lecs and discs for 1 week. SML faculty.

Intended for persons interested in careers in management of marine or coastal resources or in the natural sciences. Subjects include law and policy related to ocean dumping, marine sanctuaries, environmental impact statements, water and air pollution, fisheries management, offshore gas and oil production, and territorial jurisdiction. Lectures on the status and history of law are accompanied by discussion of relevant policy and analysis of the efficacy of various legal techniques. A case study that requires extensive use of the laboratory's library and personnel is assigned. The week concludes with a mock hearing.

**Marine Pollution (Agricultural Engineering 420)**
Summer 2 credits. Prerequisite: Biological Sciences 364 or permission of instructor. A special 2-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $975.

Daily lecs, labs, and fieldwork for 2 weeks. SML faculty.

Dispersion modeling and the effects of pollutants (including oil, outfalls, solid wastes, sludge and dredge spoils, and radioactive wastes) are discussed from the perspectives of elementary physical oceanography and biological processes. Laboratories include basic methods for targeting and tracing wastewater; organic carbon determinations; and practical field projects.

**Marine and Coastal Geology (Geological Sciences 213)**
Summer. 1 credit. Prerequisite: an introductory course in geology or permission of instructor. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $675.

Daily lecs, labs, and fieldwork for 1-week. SML faculty.

With "the New England coast" defined as beginning at the -200 meter isobath and proceeding westward, this course examines specific geological events and processes important in shaping the area's bedrock and surficial sediments. Petrology, geophysics, and the Pleistocene geology of the region are investigated. Consideration of the geologic history of New England within the plate tectonic model is emphasized. Examination of insular geology is used to integrate micro-, meso-, and macroscale geological evolution of continental margins in general. Marine geology is approached through basic geophysical exploration and bottom-sediment collection followed by data analysis and interpretation. Experience aboard a coastal research vessel is an integral part of the course.

**Marine Resources: Economic Modeling of Use and Regulation (Agricultural Economics 252)**
Summer. 1 credit. Prerequisite: an introductory course in economics or permission of instructor. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $675.

Daily lecs and discs for 1 week. SML faculty.

Resource economics in general is concerned with the optimal allocations through time of renewable and nonrenewable resources. This course examines fisheries management, offshore oil and gas recovery, and ocean-minerals mining. Models of optimal resource use are developed and used to assess both the behavior of those harvesting marine resources and the adequacy of current governmental policy. An integral part of the course is the special opportunity to observe and interview those professionally involved in harvesting marine resources in the Gulf of Maine.

**Archaeology Underwater (Archaeology 319)**
Summer. 1 credit. Prerequisites: recognized scuba certification and a medical examination required for students engaging in underwater research. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $700.

Daily lecs, labs, and fieldwork for 1 week. SML faculty.

An introduction to the subject and a review of this contemporary subdiscipline of archaeology. The approach of the course is practical, with a strong potential for actual on-site experience in search, site recognition, survey, and recording. The course also covers the history and development of the subject, the legal aspects of underwater research, and the worldwide potential of the field. Since any archaeological research project involves a great deal more than digging, the course provides ample opportunities for those who are interested in the subject but are not divers or sufficiently experienced in scuba.

**Wetland Resources (Natural Resources 417)**

Summer. 1 credit. Prerequisite: one year of college biology. A special 1-week course offered at Cornell's Shoals Marine Laboratory (SML), on an island off Portsmouth, N.H. For more details and an application, consult the SML office, G14 Stimson Hall. Estimated cost (includes tuition, room and board, and ferry transportation), $675.

Daily lecs, labs, and fieldwork for 1 week. SML faculty.

An examination of coastal and adjacent freshwater wetlands from historic, destruction, and preservation perspectives, including fresh- and salt-marsh ecology and management. Field trips to selected examples of the wetlands under discussion and follow-up laboratories emphasize successional features, plant identification and classification, and examination of the dominant insect and vertebrate associations.

## COURSES IN BIOPHYSICS

Biophysics is an interdisciplinary undergraduate and graduate program. A special program for undergraduate students interested in biophysics is offered as an independent concentration (program of study) in the biological sciences major (see option 8 under "Concentration Areas and Requirements" and option 9 under "Programs of Study"). Information on this independent option is available in the Office for Academic Affairs, 118 Stimson Hall. Students interested in graduate work in biophysics should inquire at the Program in Biophysics Office, 210 Clark Hall.

The following courses are available for students interested in biophysics:

**Biomechanical Systems—Analysis and Design (Mechanical and Aerospace Engineering 565)**

**Chemistry of Nucleic Acids (Chemistry 677)**

**Electron Microscopy for Biologists (Biological Sciences 401, 403, 405, 606, 608)**

**Enzyme Catalysis and Regulation (Chemistry 672)**

**Membrane Biophysics (Applied and Engineering Physics 615)**

**Membranes and Bioenergetics (Biological Sciences 632)**

**Neuroethology (Biological Sciences 424)**

**Photosynthesis (Biological Sciences 445)**

**Physical Chemistry of Proteins (Chemistry 686)**

**Principles of Neurophysiology (Biological Sciences 491)**

**Protein Structure and Function (Biological Sciences 631)**

**Special Topics in Biophysical and Bioorganic Chemistry (Chemistry 782)**

**Transport of Solutes and Water in Plants (Biological Sciences 649)**

## FACULTY ROSTER

### New York State College of Agriculture and Life Sciences

Adler, Kraig K., Ph.D., U. of Michigan. Prof., Neurobiology and Behavior

Bates, David M., Ph.D., U. of California at Los Angeles. Prof., Bailey Hortorium

Beyenbach, Klaus W., Ph.D., Washington State U. Prof., Physiology/Veterinary Physiology†

Bruns, Peter J., Ph.D., U. of Illinois. Prof., Genetics and Development

Calvo, Joseph M., Ph.D., Washington State U. William T. Keeton Professor in Biological Sciences; Biochemistry, Molecular and Cell Biology

Davies, Peter J., Ph.D., U. of Reading (England). Prof., Plant Biology

Davis, Jerrold I., Ph.D., U. of Washington. Asst. Prof., Bailey Hortorium

Doyle, Jeffrey J., Ph.D., Indiana U. Asst. Prof., Bailey Hortorium

Eisner, Thomas, Ph.D., Harvard U. Jacob Gould Schurman Professor, Neurobiology and Behavior

Emlen, Stephen T., Ph.D., U. of Michigan. Prof., Neurobiology and Behavior

Feeny, Paul P., Ph.D., Oxford U. (England). Prof., Ecology and Systematics/Entomology*

Fox, Thomas D., Ph.D., Harvard U. Assoc. Prof., Genetics and Development

Gibson, Jane, Ph.D., U. of London (England). Prof., Biochemistry, Molecular and Cell Biology

Goldberg, Michael L., Ph.D., Stanford U. Assoc. Prof., Genetics and Development

Hanson, Maureen R., Ph.D., Harvard U. Assoc. Prof., Genetics and Development

Harrison, Richard G., Ph.D., Cornell U. Assoc. Prof., Ecology and Systematics

Harris-Warrick, Ronald M., Ph.D., Stanford U. Assoc. Prof., Neurobiology and Behavior

Harvell, C. Drew, Ph.D., U. of Washington. Asst. Prof., Ecology and Systematics

Hopkins, Carl D., Ph.D., Rockefeller U. Prof., Neurobiology and Behavior

Jagendorf, Andre T., Ph.D., Yale U. Liberty Hyde Bailey Professor of Plant Physiology, Plant Biology*

Keller, Elizabeth B., Ph.D., Cornell U. Prof., Biochemistry, Molecular and Cell Biology

Kemphues, Kenneth J., Ph.D., Indiana U. Asst. Prof., Genetics and Development

Lis, John T., Ph.D., Brandeis U. Assoc. Prof., Biochemistry, Molecular and Cell Biology

Loew, Ellis R., Ph.D., U. of California at Los Angeles. Assoc. Prof., Physiology/Veterinary Physiology†

Luckow, Melissa A., Ph.D., U. of Texas at Austin. Asst. Prof., Bailey Hortorium

McCarty, Richard E., Ph.D., Johns Hopkins U. Prof., Biochemistry, Molecular and Cell Biology

McCune, Amy R., Ph.D., Yale U. Asst. Prof., Ecology and Systematics

MacIntyre, Ross J., Ph.D., Johns Hopkins U. Prof., Genetics and Development*

Marks, Peter L., Ph.D., Yale U. Prof., Ecology and Systematics

Moffat, J. Keith, Ph.D., Cambridge U. (England). Prof., Biochemistry, Molecular and Cell Biology

Nasrallah, June B., Ph.D., Cornell U. Asst. Prof., Plant Biology

Niklas, Karl J., Ph.D., U. of Illinois. Prof., Plant Biology/Ecology and Systematics

Nixon, Kevin C., Ph.D., U. of Texas at Austin. Asst. Prof., Bailey Hortorium

Owens,Thomas G.,Ph.D., Cornell U. Asst. Prof., Plant Biology

Paolillo, Dominick J., Jr., Ph.D., U. of California at Davis. Prof., Plant Biology

Parthasarathy, Mandayam V., Ph.D., Cornell U. Prof., Plant Biology

Pough, F. Harvey, Ph.D., U. of California at Los Angeles. Prof., Ecology and Systematics/Physiology

Quaroni, Andrea, Ph.D., U. of Pavia (Italy). Asst. Prof., Physiology

Roberts, Jeffrey W., Ph.D., Harvard U. Prof., Biochemistry, Molecular and Cell Biology*

Root, Richard B., Ph.D., U. of California at Berkeley. Prof., Ecology and Systematics/Entomology

Spanswick, Roger M., Ph.D., U. of Edinburgh (Scotland). Prof., Plant Biology

Tye, Bik-Kwoon, Ph.D., Massachusetts Inst. of Technology. Assoc. Prof., Biochemistry, Molecular and Cell Biology

Vogt, Volker M., Ph.D., Harvard U. Assoc. Prof., Biochemistry, Molecular and Cell Biology

Walcott, Charles, Ph.D., Cornell U. Prof., Neurobiology and Behavior/Laboratory of Ornithology

Wayne, Randy O., Ph.D., U. of Massachusetts. Asst. Prof., Plant Biology

Winkler, David W., Ph.D., U. of California at Berkeley. Asst. Prof., Ecology and Systematics

Wu, Ray, Ph.D., U. of Pennsylvania. Prof., Biochemistry, Molecular and Cell Biology

Zahler, Stanley A., Ph.D., U. of Chicago. Prof., Genetics and Development

### Other Teaching Personnel

Alexander, Renee R., Ph.D., Cornell U. Sr. Lecturer, Biochemistry, Molecular and Cell Biology

Calvo, Rita A., Ph.D., Cornell U. Lecturer, Genetics and Development

Ecklund, P. Richard, Ph.D., Oregon State U. Lecturer, Neurobiology and Behavior

Ferger, Martha F., Ph.D., Cornell U. Medical College. Sr. Lecturer, Biochemistry, Molecular and Cell Biology

Glase, Jon C., Ph.D., Cornell U. Sr. Lecturer, Neurobiology and Behavior

Griffiths, Joan M., Ph.D., Cornell U. Lecturer, Biochemistry, Molecular and Cell Biology

Heiser, John B., Ph.D., Cornell U. Sr. Lecturer, Ecology and Systematics

McFadden, Carol H., Ph.D., Cornell U. Sr. Lecturer, Physiology

Reiss, H. Carol, M.S., Cornell U. Lecturer, Plant Biology

### Joint Appointees

Barker, Robert, Prof., Provost's Office/Biochemistry, Molecular and Cell Biology

Bedford, Barbara L., Adjunct Asst. Prof., Ecosystems Research Center/Ecology and Systematics

Bloom, Stephen E., Assoc. Prof., Poultry and Avian Sciences/Biological Sciences
Borror, Arthur C., Adjunct Prof., U. of New Hampshire/Biological Sciences
Brown, William L., Jr., Prof., Entomology/Ecology and Systematics
Butler, Walter R., Assoc. Prof., Animal Science/Physiology
Currie, W. Bruce, Assoc. Prof., Animal Science/Physiology
Edelestein, Stuart M., Adjunct Prof., U. of Geneva (Switzerland)/Biochemistry, Molecular and Cell Biology
Foote, Robert H., Jacob Gould Schurman Professor, Animal Science/Physiology
Howell, Stephen H., Adjunct Prof., Boyce Thompson Institute/Plant Biology
Kochian, Leon V., Adjunct Asst. Prof., USDA Science and Education Administration/Plant Biology
Korf, Richard P., Prof., Plant Pathology/Bailey Hortorium
LaRue, Thomas A., Adjunct Prof., Boyce Thompson Institute/Plant Biology
Leopold, A. Carl, Adjunct Prof., Boyce Thompson Institute/Plant Biology
Pimentel, David, Prof., Entomology/Ecology and Systematics
Richmond, Milo E., Assoc. Prof., USDI Fish and Wildlife Service/Natural Resources/Ecology and Systematics
Tamas, Imre A., Adjunct Assoc. Prof., Ithaca College/Plant Biology
Thompson, John F., Adjunct Prof., USDA Science and Education Administration/Plant Biology
Via, Sara, Asst. Prof., Entomology/Ecology and Systematics
Weeden, Norman F., Asst. Prof., Horticultural Sciences/Bailey Hortorium
Wheeler, Quentin D., Assoc. Prof., Entomology/Bailey Hortorium

## College of Arts and Sciences

Aquadro, Charles F., Ph.D., U. of Georgia. Assoc. Prof., Genetics and Development/Ecology and Systematics
Bass, Andrew H., Ph.D., U. of Michigan. Asst. Prof., Neurobiology and Behavior
Blackler, Antonie W., Ph.D., U. of London (England). Prof., Genetics and Development
Booker, Ronald, Ph.D., Princeton U. Asst. Prof., Neurobiology and Behavior
Bretscher, Anthony P., Ph.D., Leeds U. (England). Assoc. Prof., Biochemistry, Molecular and Cell Biology
Brown, William J., Ph.D., U. of Texas Health Science Center at Dallas. Asst. Prof., Biochemistry, Molecular and Cell Biology
Capranica, Robert R., Sc.D., Massachusetts Inst. of Technology. Prof., Neurobiology and Behavior
Chabot, Brian F., Ph.D., Duke U. Prof., Ecology and Systematics‡
Feigenson, Gerald W., Ph.D., California Inst. of Technology. Assoc. Prof., Biochemistry, Molecular and Cell Biology
Gibson, Quentin H., Ph.D./D.Sc., Queen's U. (Northern Ireland). Greater Philadelphia Professor in Biological Sciences; Biochemistry, Molecular and Cell Biology
Hairston, Nelson G., Jr., Ph.D., U. of Washington. Prof., Ecology and Systematics
Halpern, Bruce P., Ph.D., Brown U. Prof., Neurobiology and Behavior/Psychology
Hamill, Owen P., Ph.D., U. of New South Wales (Australia). Asst. Prof., Neurobiology and Behavior
Heppel, Leon A., Ph.D., U. of California at Berkeley. Prof., Biochemistry, Molecular and Cell Biology
Hess, George P., Ph.D., U. of California at Berkeley. Prof., Biochemistry, Molecular and Cell Biology
Hinkle, Peter C., Ph.D., New York U. Prof., Biochemistry, Molecular and Cell Biology
Howarth, Robert W., Ph.D., Massachusetts Inst. of Technology/Woods Hole Oceanographic Institution. Assoc. Prof., Ecology and Systematics
Howland, Howard C., Ph.D., Cornell U. Prof., Neurobiology and Behavior/Physiology
Hoy, Ronald R., Ph.D., Stanford U. Prof., Neurobiology and Behavior‡
Huffaker, Tim C., Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Biochemistry, Molecular and Cell Biology
Karplus, Paul A., Ph.D., U. of Washington. Asst. Prof., Biochemistry, Molecular and Cell Biology
Kennedy, Kenneth A.R., Ph.D., U. of California at Berkeley. Prof., Ecology and Systematics
Levin, Simon A., Ph.D., U. of Maryland at College Park. Charles A. Alexander Professor of Biological Sciences; Ecology and Systematics‡
McClearn, Deedra K., Ph.D., Harvard U. Asst. Prof., Ecology and Systematics
MacDonald, June M. Fessenden, Ph.D., Tufts U. Assoc. Prof., Biochemistry, Molecular and Cell Biology/Program on Science, Technology, and Society
Mark, Willie H., Ph.D., U. of Wisconsin—Madison. Asst. Prof., Genetics and Development
Podleski, Thomas R., Ph.D., Columbia U. Prof., Neurobiology and Behavior‡
Power, Alison G., Ph.D., U. of Washington. Asst. Prof., Ecology and Systematics/Program on Science, Technology, and Society
Provine, William B., Ph.D., U. of Chicago. Prof., Ecology and Systematics/History
Racker, Efraim, M.D., U. of Vienna (Austria). Albert Einstein Professor of Biochemistry; Biochemistry, Molecular and Cell Biology
Salpeter, Miriam M., Ph.D., Cornell U. Prof., Neurobiology and Behavior/Applied and Engineering Physics§
Schneiderman, Anne M., Ph.D., Harvard U. Asst. Prof. Neurobiology and Behavior
Seeley, Thomas D., Ph.D., Harvard U. Assoc. Prof., Neurobiology and Behavior
Sherman, Paul W., Ph.D., U. of Michigan. Assoc. Prof., Neurobiology and Behavior
Silver, Robert B., Ph.D., U. of California at Berkeley. Assoc. Prof., Physiology
Turgeon, Robert, Ph.D., Carleton U. (Canada). Assoc. Prof., Plant Biology
Wilson, David B., Ph.D., Stanford U. Prof., Biochemistry, Molecular and Cell Biology
Wolfner, Mariana F., Ph.D., Stanford U. Asst. Prof., Genetics and Development

### Other Teaching Personnel

Albrecht, Genia S., Ph.D., U. of Washington. Lecturer, Biochemistry, Molecular and Cell Biology
Eberhard, Carolyn, Ph.D., Boston U. Sr. Lecturer, Plant Biology

### Joint Appointees

Likens, Gene E., Adjunct Prof., New York Botanical Garden Institute of Ecosystem Studies, Cary Arboretum/Ecology and Systematics
Regan, Elizabeth Adkins, Prof., Psychology/Neurobiology and Behavior

## New York State College of Veterinary Medicine

Corradino, Robert A., Ph.D., Cornell U. Assoc. Prof., Physiology/Veterinary Physiology
Fortune, Joanne E., Ph.D., Cornell U. Assoc. Prof., Physiology/Veterinary Physiology
Gilmour, Robert F., Ph.D., SUNY Upstate Medical Center. Assoc. Prof., Physiology
Hansel, William, Ph.D., Cornell U. Liberty Hyde Bailey Professor of Animal Physiology, Physiology/Veterinary Physiology/Animal Science‡
Robertshaw, David, Ph.D., Glasgow U. (Scotland). Prof., Physiology
Tapper, Daniel N., Ph.D., Cornell U. Prof., Physiology/Veterinary Physiology
Wasserman, Robert H., Ph.D., Cornell U. Prof., Physiology/Veterinary Physiology/Nutritional Sciences*‡

### Joint Appointees

Bergman, Emmett N., Prof., Veterinary Physiology/Physiology
Dobson Alan, Prof., Veterinary Physiology/Physiology
Houpt, Katherine A., Prof., Veterinary Physiology/Physiology
Houpt, T. Richard, Prof., Veterinary Physiology/Physiology
Kallfelz, Francis A., Prof., Clinical Sciences/Veterinary Physiology/Physiology
Nathanielsz, Peter W., Leading Prof., Clinical Sciences/Veterinary Physiology/Physiology
Wootton, John F., Prof., Veterinary Physiology/Physiology

## College of Engineering

### Joint Appointee

Cisne, John L., Assoc. Prof., Geological Sciences/Biological Sciences
Webb, Watt W., Prof., Applied and Engineering Physics/Biological Sciences

## Division of Biological Sciences

Stinson, Harry T., Jr., Ph.D., Indiana U. Prof., Biological Sciences/Genetics and Development*

## Division of Nutritional Sciences

### Joint Appointees

Arion, William J., Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology
Bensadoun, Andre, Prof., Nutritional Sciences/Physiology
Kazarinoff, Michael N., Assoc. Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology
Watford, Malcolm, Asst. Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology
Zilversmit, Donald B., Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology

*Joint appointment with the College of Arts and Sciences.
†Joint appointment with the College of Veterinary Medicine.
‡Joint appointment with the College of Agriculture and Life Sciences.
§Joint appointment with the College of Engineering.

# COLLEGE OF ENGINEERING

## ADMINISTRATION

William B. Streett, dean

K. Bingham Cady, associate dean for college affairs

S. Leigh Phoenix, associate dean for research and graduate studies

Christopher Pottle, associate dean for computing

Richard N. White, associate dean for undergraduate student affairs

Mary F. Berens, assistant dean and director of development and alumni affairs

Mary Thompson, assistant dean and director of minority programs

Richard Hale, director of admissions

Mark K. Spiro, director of administration, planning, and facilities

Richard K. Mosher, registrar

## FACILITIES AND SPECIAL PROGRAMS

Most of the academic units of the College of Engineering are on the Joseph N. Pew, Jr. Engineering Quadrangle. Facilities for applied and engineering physics are located in Clark Hall on the College of Arts and Sciences campus, and facilities for agricultural engineering are centered in Riley-Robb Hall on the campus of the New York State College of Agriculture and Life Sciences.

Special university and college facilities augment the laboratories operated by the various engineering schools and departments, and special centers and programs contribute to opportunities for study and research.

Computing equipment, for example, is available through centers administered by the university and by the College of Engineering, as well as in laboratories run by schools, departments, or programs. The university facilities include personal computers for student use, terminals connected to the mainframe, computer-graphics equipment, and a supercomputer. The College of Engineering operates, in addition to several computing centers for student use, the Computer-Aided Design Instructional Facility, which provides advanced computer-graphics equipment used in course work throughout the college.

Cornell programs and centers of special interest in engineering include the following:

*Center for Applied Mathematics.* A cross-disciplinary center that administers a graduate program and incorporates the recently formed, federally sponsored Mathematical Sciences Institute.

*Center for Environmental Research.* A sponsor of interdisciplinary programs that are currently in the areas of environmental law and policy, ecosystem research, remote sensing, water resources, the global environment, biological resources, waste management, and solid waste combustion.

*Center for Radiophysics and Space Research.* An interdisciplinary unit that facilitates research in astronomy and the space sciences.

*Center for Theory and Simulation in Science and Engineering.* A national supercomputer facility used for advanced research in engineering and the physical and biological sciences.

*Cornell High Energy Synchrotron Source.* A high-energy synchrotron radiation laboratory operated in conjunction with the university's high-energy storage ring.

*Cornell Manufacturing Engineering and Productivity Program.* A joint venture of Cornell, industrial organizations, and the federal government to encourage the development and implementation of modern manufacturing systems.

*Cornell Program in Power Systems Engineering.* A research and instructional program centered in a laboratory that has the most complete real-time model of an electric power system ever constructed.

*Earthquake Engineering Research Center.* A facility recently established by the National Science Foundation at a group of universities in New York State.

*Laboratory of Plasma Studies.* A center for interdisciplinary research in plasma physics and lasers.

*Materials Science Center.* An interdisciplinary facility with substantial support from the National Science Foundation, providing sophisticated equipment.

*National Astronomy and Ionosphere Center.* The world's largest radio-radar telescope facility, operated by Cornell in Puerto Rico.

*National Nanofabrication Facility.* A center that provides equipment and services for research in the science, engineering, and technology of structures (including electronic components) with dimensions as small as the nanometer range.

*Program of Computer Graphics.* An interdisciplinary research center that operates one of the most advanced computer-graphics laboratories in the United States.

*Program on Science, Technology, and Society.* A cross-disciplinary unit that sponsors courses and promotes research.

*SRC Center for the Program on Microscience and Technology.* A center sponsored by the Semiconductor Research Corporation to promote research essential to the development of VLSI devices and circuits.

*Statistics Center.* Coordinates a university-wide program in statistics and probability.

*Ward Laboratory of Nuclear Engineering.* Irradiation, isotope production, and activation analysis facilities for interdisciplinary research.

Programs sponsored by College of Engineering units include several for industrial affiliates. These are in the areas of injection molding, computer science, materials science, geologic study of the continents, and submicrometer structures.

## DEGREE PROGRAMS

Cornell programs in engineering and applied science lead to the degrees of Bachelor of Science, Master of Engineering (with field designation), Master of Science, and Doctor of Philosophy.

General academic information concerning the Bachelor of Science degree is given here under the heading "Undergraduate Study." Curricula for major studies are described under the various academic areas.

Programs leading to the Master of Science and Doctor of Philosophy degrees are administered by the Graduate School. They are described in the *Announcement of the Graduate School* and the special announcement *Graduate Study in Engineering and Applied Science.* The professional Master of Engineering programs and cooperative programs with the Johnson Graduate School of Management are described below.

## UNDERGRADUATE STUDY

Bachelor of Science (B.S.) degrees are offered in the following areas:*

Agricultural engineering†

Chemical engineering

Civil engineering

College program

Computer science

Electrical engineering

Engineering physics

Geological sciences

Materials science and engineering

Mechanical engineering

Operations research and engineering

Students in the College of Engineering begin their undergraduate studies in the Common Curriculum, which is administered by the faculty members of the Common Curriculum Governing Board (CCGB) through the

associate dean for undergraduate programs and the Office of Advising. Subsequently most students enter *field* programs, which are described separately for each academic area. Alternatively students may enter the *College Program* (described below), which permits them to pursue a course of study adapted to individual interests.

Students interested in bioengineering may arrange a suitable curriculum within one of the field programs or through the College Program. Information about these options is available in the Office of Advising, 167 Olin Hall.

*Agricultural engineering, chemical engineering, civil engineering, electrical engineering, engineering physics, materials science and engineering, mechanical engineering, and operations research and engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

†To major in agricultural engineering students generally enroll in the College of Agriculture and Life Sciences for the first, second, and fourth years, and jointly in that college and the College of Engineering for the third year.

## Requirements for Graduation

To receive the Bachelor of Science degree, students must meet the requirements of the Common Curriculum, as set forth by the College of Engineering, including the requirements of the field program, as established by the school or department with which they become affiliated. The Common Curriculum is composed of courses in eight categories.

| *Course Category* | *Credits* |
|---|---|
| 1) Mathematics | 16 |
| 2) Physics | 12 |
| 3) Chemistry | 4 |
| 4) Freshman writing seminar | 6 |
| 5) Computer programming | 4 |
| 6) Engineering distribution (4 courses) | 12 |
| 7) Humanities and social sciences (6 courses) | 18 |
| 8) Electives: | |
| Approved electives | 9 |
| Free electives | 6 |
| Technical electives | 6 |

One approved course in computing applications must also be taken; this course may simultaneously satisfy some other requirement.

Credits for courses in the field program vary between 36 and 48, depending on which program is chosen. Because of this variation the credits needed for graduation range between 129 and 141. Two terms of physical education must be taken in the freshman year to satisfy a university requirement.

### Mathematics

The normal program in mathematics includes Mathematics 191,192, 293, and 294. Students who have little or no acquaintance with calculus take Mathematics 191.

### Physics

The normal program in physics includes Physics 112 or 116, 213 or 217, and 214 or 218. Students in the Field Programs in Civil Engineering or Operations Research and Industrial Engineering may substitute Chemistry 208 for Physics 214.

### Chemistry

Chemistry 207 or 211 is required for all students. Chemistry 207 is normally taken in the first freshman semester; 211 may be taken either in the fall or spring of the freshman year.

Chemistry 211 is a course designed for students who do not intend any further study in chemistry. Therefore students who intend to take more chemistry should register for Chemistry 207 in the fall of their freshman year.

In general, students in the following departments and schools should consider taking Chemistry 211: electrical engineering, operations research and industrial engineering, computer science, mechanical and aerospace engineering, applied and engineering physics (applied and engineering physics students should discuss this option with the field consultant), and civil engineering (not students in environmental engineering). Students in environmental engineering, materials science and engineering, geology and chemical engineering must take Chemistry 207 in the fall of their freshman year.

All students considering a health-related career, for example in medicine, should take Chemistry 207 in their first term.

### Freshman Writing Seminars

Each semester of their freshman year, students choose a freshman writing seminar from among more than seventy courses offered by over twenty different departments in the humanities, social sciences, and expressive arts. These courses offer the student practice in writing English prose. They also assure beginning students the benefits of a small class.

### Computing

In either the first or second term of their freshman year, students take Engr 100, Introduction to Computer Programming. Before graduation they must take an additional course with a significant amount of computing applications; this course may also be used to meet another graduation requirement. Courses that satisfy this requirement are ABEN 475, CS 212, Engr 211, Engr 222, Engr 241, Engr 264, EE 424, M&AE 389, M&AE 489, M&AE 575, and M&AE 670. The recommended choice for students intending to enter the Field Program in Engineering Physics is Engr 264; in Chemical Engineering, Engr 222 or 241; in Computer Science, Engr 222; in Electrical Engineering, Engr 211; in Civil Engineering, Engr 241; in Mechanical Engineering, M&AE 389, M&AE 489, M&AE 575, or M&AE 670; and in Operations Research and Engineering, Engr 211.

### Engineering Distribution

Four engineering distribution courses (12 credits) are required. These courses must be selected from four of the eight areas listed below. A student may use only one of the possible substitutions described.

*1) Scientific computing*

Engr 211, Computers and Programming
Engr 222, Introduction to Scientific Computing
Engr 241, Engineering Computation

Students in the Field Program in Computer Science may substitute CS 212 for Engr 211 (also CS 211).

*2) Materials science*

Engr 261, Introduction to Mechanical Properties of Materials
Engr 262, Introduction to Electrical Properties of Materials

*3) Mechanics*

Engr 202, Mechanics of Solids
Engr 203, Dynamics

Students in the Field Program in Engineering Physics may substitute A&EP 333 for Engr 203.

*4) Probability and statistics*

Engr 260, Introduction to Engineering Probability
Engr 270, Basic Engineering Probability and Statistics

Students in the Field Program in Electrical Engineering may substitute EE 310 for Engr 260. Students in the Field Program in Engineering Physics may substitute EE 310 or Mathematics 471 for Engr 260. Students in the Field Programs in Civil Engineering and Agricultural Engineering may substitute CEE 304 for Engr 270.

*5) Electrical sciences*

Engr 210, Introduction to Electrical Systems
Engr 264, Computerized-Instrumentation Design

*6) Thermodynamics and energy balances*

Engr 219, Mass and Energy Balances
Engr 221, Thermodynamics

Students in the Field Program in Electrical Engineering may substitute EE 480 for Engr 221.

*7) Earth and life sciences*

Engr 201, Introduction to the Physics and Chemistry of the Earth

*8) Introduction to engineering*

Several courses are offered to introduce freshmen to the various fields of engineering. Some of these courses, which begin with Engr 110, may not be included in this announcement. A full listing will be available in the Course and Room Roster at the time of registration.

### Humanities and Social Sciences

The six required courses in the humanities and social sciences (totaling at least 18 credits) must be chosen from approved courses in three categories: (a) humanities or history, (b) social sciences, and (c) expressive or language arts.

Restrictions:* At least three courses and a minimum of 9 credits must be chosen from category (a), and no more than 4 credits may be chosen from category (c). One-credit courses are acceptable only in category (c). Furthermore, in satisfying the humanities and social sciences requirement, the courses selected must provide both breadth and depth, and not be limited to a selection of unrelated introductory courses. This means inclusion of: at least two courses from the same field, one of which is the explicit prerequisite for the other; **or** two related courses in the same field, at least one of which is numbered 300 or above (e.g., one of the history department prerequisites—History 151, 152, 190 or 191—together with a 300-level history course.)

*These restrictions apply to those students matriculating in fall of 1989 or later. Others should refer to earlier editions of this catalog.

#### a) Humanities or History

This category includes all courses designated by the College of Arts and Sciences as humanities and history (see Distribution Requirement section, group 2b and group 3a; disregard the phrase "Any two") as well as the following:

*College of Agriculture and Life Sciences*: Education 472, 473

*College of Architecture, Art, and Planning*: any course in architectural history except freshman seminars

*College of Arts and Sciences*: Economics 315, 326; History of Art, all courses numbered 200 and above; Music, all courses listed as introductory (except 122), music theory, and music history; Theatre Arts, only history, literature, and theory courses (performance courses are not acceptable)

*College of Engineering*: Engineering 250, 292

*School of Industrial and Labor Relations*: 100, 101, 140, 304, 305, 381, 382, 384, 406, 430, 502

#### b) Social Sciences

This category includes all courses designated by the College of Arts and Sciences as social sciences (see Distribution Requirement section, group 2a; disregard the phrase "Any two") as well as the following:

*College of Agriculture and Life Sciences*: Agricultural Economics 150, 252, 332; Communication 116, 120, 314, 416; Education 271, 317, 378; Natural Resources 201, 407; Rural Sociology, all courses

*College of Architecture, Art, and Planning*: Architecture 342; City and Regional Planning 400, 404, 413, 414

*College of Arts and Sciences*: Economics, all courses except 105, 315, 317, 318, 319, 320, 326

*College of Engineering*: Engineering 305, 321, 322, 360, 400

*College of Human Ecology*: Consumer Economics and Housing 110, 111, 148, 247, 310, 355, 356, 430; Design and Environmental Analysis 250; Human Development and Family Study, all courses except 242, 243; Human Service Studies, all courses

*School of Industrial and Labor Relations*: All courses except: courses listed under category a); all courses in Economic and Social Statistics; Personnel and Human Resource Management 266; Interdepartmental Course 452

#### c) Expressive or Language Arts

This category includes all courses defined by the College of Arts and Sciences as expressive arts (see Distribution Requirement, group 3b) as well as the following:

*College of Agriculture and Life Sciences*: Communication, all courses; Floriculture, any course in freehand drawing and scientific illustration

*College of Architecture, Art, and Planning*: Art, all courses

*College of Arts and Sciences*: all nonliterature language courses and all music and theater arts courses that emphasize performance, acting, producing, or directing

*College of Human Ecology*: Design and Environmental Analysis 101, 111, 115

*College of Engineering*: Engineering 301, 350

*School of Industrial and Labor Relations*: Interdepartmental Course 452

### Electives

There are three kinds of electives: approved, free, and technical. Approved electives must be an appropriate part of an overall educational plan or objective.* This constraint allows flexibility for individual goals while maintaining a coordinated, nontrivial program. A free elective may be any course in the university,† although all course selections must be approved by the student's faculty adviser. Technical electives are generally taken in the junior and senior years. They are usually upper-level courses in engineering, mathematics, or the physical sciences, but they also may be courses in other areas as designated by the student's field program.

*No ROTC courses may be used as approved electives unless they are colisted by an academic department.

†Except supplementary courses and ROTC courses at the 100 and 200 level not colisted by an academic department. Up to 6 credits of ROTC courses at the 300 level or above may be used as free electives.

Additional ROTC courses not colisted by an academic department may not be used to meet graduation requirements.

### Social Issues of Technology

It is important for engineers to realize the social and ethical implications of their work. Consequently, in selecting their humanities, social sciences, approved electives, and free electives, students are urged to consider courses listed within the "Science, Technology, and Society" undergraduate area of concentration (see Interdisciplinary Centers and Programs section). These courses may provide students with an important perspective on their studies and their future careers.

## Office of Advising

From the time that students enter the college as freshmen until they become affiliated with a major field or the College Program, they are under the administration of the Office of Advising, which implements the academic policies of the Common Curriculum Governing Board. The office also offers general advising and counseling services, publishes a college newsletter, maintains files on scholarships, and provides support for all students in the college. The Office of Minority Programs provides additional specialized services.

To remain in good standing, students in the College of Engineering must affiliate with a field by the end of their sophomore year, but some fields permit (and encourage) affiliation at the *beginning* of the sophomore year. Transfer students automatically affiliate with a field of study on matriculation.

Engineering courses taken at the freshman and sophomore levels are listed under "Engineering Common Courses." Additional engineering courses of general interest are also listed in this section.

Following is a typical curriculum for freshmen who have not received advanced placement in mathematics. Many variations are possible, depending on the individual student's background, advanced placement credit, and career goals. Those receiving advanced placement for first term calculus may take Physics 112 in term one. Students with an interest in bioengineering may take biology in terms one and two as approved electives. Students preparing to study medicine should take one year of biology and Chemistry 208 in the first year.

| *Term 1* | *Credits* |
|---|---|
| Math 191, Calculus for Engineers | 4 |
| Chem 207 or Chem 211, * General Chemistry | 4 |
| Engr 100, Introduction to Computer Programming | 4 |
| Introduction to Engineering, a humanities or social science course, or an approved elective | 3 |
| Freshman writing seminar | 3 |

*Chem 211 may be postponed until term 2 with adviser approval.

| *Term 2* | *Credits* |
|---|---|
| Math 192, Calculus for Engineers | 4 |
| Phys 112, Mechanics and Heat | 4 |
| Two electives | 6 to 8 |
| Freshman writing seminar | 3 |

## Field Program

The specific program for each field is described in the following pages. Students with a grade-point average of at least 2.0 who are making normal progress toward their degree may apply to enroll in a field program at the beginning or end of their sophomore year. Students who intend to enter the Field Program in Chemical Engineering should take Chemistry 208 and Chemistry 287–289 as approved electives in terms two and three, and Chemistry 288–290 as a field course in term four. Students intending to major in mechanical engineering must take Engr 203, and students in agricultural engineering must take Engr 221 as a field course in term three or four.

Students intending to major in computer science must take CS280 as a field course in term three or four. Mechanical engineering students should also complete Engr 221 in their sophomore year. Students who intend to enter the Field Program in Electrical Engineering must earn grades of at least C in Math 293 and 294, at least C in Physics 213 and 214, and at least C+ in Engr 210.

Some fields require a specific engineering distribution course as a prerequisite for the upperclass course sequence. These requirements are:

Chemical Engineering: Engr 219

Civil Engineering: Engr 202

Computer Science: Engr 211

Electrical Engineering: Engr 210

Engineering Physics: Engr 221

Materials Science and Engineering: Engr 261

Mechanical Engineering: Engr 202

Operations Research and Engineering: Engr 260

### College Program

Individually arranged courses of study under the College Program are possible for those well-qualified students whose educational objectives cannot be met by one of the regular field programs. Often the desired curriculum is in an interdisciplinary area. Each program is developed by the student in consultation with faculty advisers and must be approved by the College Program Committee, which is responsible for supervising the student's work.

Students apply to enter the College Program early in the second term of the sophomore year. A student should seek assistance in developing a coherent program from professors in the proposed major and minor subject areas. If approved, the program is the curricular contract to which the student must adhere. Generally, students applying to the College Program should have a 3.0 cumulative grade point average.

Every curriculum in the College Program, with the exception of certain faculty-sponsored programs, must comprise an engineering major and an educationally related minor. The major may be in any subject area offered by schools or departments of the college; the minor may be in a second engineering subject area or in a logically connected nonengineering area. The combinations must clearly form an engineering education in scope and in substance and should include engineering design and synthesis as well as engineering sciences. In addition to 42 credits in the major and minor subjects, including at least 21 credits in engineering courses, each program includes the normally required courses in humanities and social sciences and free electives.

Further information about the College Program may be obtained from Professor R. N. White, 252 Carpenter Hall, or from a counselor in the Office of Advising, 167 Olin Hall.

### Dual Degree Option

A special academic option, intended for superior students, is the dual degree program, in which both a Bachelor of Science and a Bachelor of Arts degrees can be earned in five years. Students registered in the College of Engineering, the College of Arts and Sciences, or other undergraduate divisions of the university may apply and, after acceptance of their application, begin the dual program in their second or third year. Those interested should contact Professor R. N. White in 252 Carpenter Hall or see a counselor in the Office of Advising, 167 Olin Hall.

### Double Major in Engineering

Another program that is attractive to many students is the double major. This option, which makes it possible to develop expertise in two allied fields of engineering, generally requires at least one semester beyond the usual four years. Students affiliate with one field in the normal way and then apply for entrance into a second field before the end of their junior year. All the requirements of both fields must be satisfied. Further information is available from the Office of Advising, 167 Olin Hall, and the individual field consultant offices.

### Writing Program in Engineering

The Writing Program in Engineering offers instruction in written, oral, and visual communication. Engineering Communications 350, a three-credit seminar course, is for students who desire intensive work in these areas. Enrollment is limited to seventeen students per section. Course assignments involve engineering materials and contexts, and students work individually and in teams. A second course, Engineering 301, is offered only in conjunction with particular writing-intensive engineering courses. This one-credit class prepares students for the writing assignments in those courses.

The Writing Program consults with faculty in engineering who wish to stress writing in their courses; maintains a writing-resource library; advises the staff of the *Cornell Engineer*; offers help with essays submitted for competition; and arranges discussions of communications with students and alumni.

### Engineering Cooperative Program

A special program for undergraduates in most fields of engineering is the Engineering Cooperative Program, which provides an opportunity for students to gain practical experience in industry and other engineering-related enterprises before they graduate. By supplementing course work with carefully monitored, paid jobs, co-op students are able to explore their own interests and acquire a better understanding of engineering as a profession.

Sophomores in the upper half of their class are eligible to apply for the co-op program. (Students in computer science and agricultural engineering are eligible, even though they may not be registered in the College of Engineering.) Applicants are interviewed by representatives of cooperating companies and select their work assignments from any offers they receive. Those students who are offered assignments and elect to join the program usually take their fifth-term courses at Cornell during the summer following their sophomore year and begin their first co-op work assignment that fall. They return to Cornell to complete term six with their classmates and then undertake a second work assignment with the same company the following summer. Co-op students return to campus for their senior year and graduate with their class.

Further information may be obtained from the Engineering Cooperative Program office, 105 Hollister Hall.

## MASTER OF ENGINEERING DEGREE PROGRAMS

One-year Master of Engineering (M.Eng.) programs are offered in twelve fields. These programs are discussed in this announcement in connection with the corresponding upperclass engineering field programs because the curricula are integrated. Cornell baccalaureate engineering graduates frequently continue their studies in the M.Eng. program, although the program is also open to qualified graduates of other schools. The twelve M.Eng. degrees and the academic fields under which they are described are listed below.

**M.Eng.(Aerospace):** Mechanical and aerospace engineering

**M.Eng.(Agricultural):** Agricultural engineering

**M.Eng.(Chemical):** Chemical engineering

**M.Eng.(Civil):** Civil and environmental engineering

**M.Eng.(Computer Science):** Computer sciences

**M.Eng.(Electrical):** Electrical engineering

**M.Eng.(Engineering Physics):** Applied and engineering physics

**M.Eng.(Geology):** Geological sciences

**M.Eng.(Materials):** Materials science and engineering

**M.Eng.(Mechanical):** Mechanical and aerospace engineering

**M.Eng.(Nuclear):** Nuclear science and engineering

**M.Eng.(OR&IE):** Operations research and industrial engineering

A new program allows candidates for a professional master's degree to specialize in manufacturing systems engineering. This specialization, which is attested to by a Dean's Certificate in addition to a diploma at the time of graduation, may be centered in any one of the fields listed above.

An M.Eng. option of potential interest to engineers from all fields is the program in engineering management, offered by the School of Civil and Environmental Engineering. This option is described in the section related to the M.Eng.(Civil) degree.

Cornell engineering graduates in the upper half of their class will generally be admitted to M.Eng. programs; however, requirements for admission vary by field. Superior Cornell applicants who will be, at the time of matriculation, eight or fewer credits short of a baccalaureate degree may petition for early admission. Other applicants must have a baccalaureate degree or its equivalent from a

college or university of recognized standing, in an area of engineering or science that is judged appropriate for the proposed field of study. They must also present evidence of undergraduate preparation equivalent to that provided by a Cornell undergraduate engineering education, a transcript, two letters of recommendation, and a statement of academic purpose. A candidate who is admitted with an undergraduate background that is judged inadequate must make up any deficiencies in addition to fulfilling the regular course requirements for the degree. Applicants from foreign universities must submit the results of the Graduate Record Examination aptitude tests and must have an adequate command of the English language. Financial aid providing partial support is available for very highly qualified candidates, primarily those who are residents of the U.S. Industry-sponsored internships, which extend the program to two years, are also available to residents of the United States. Application forms and further information are available from the Master of Engineering Office, 113 Hollister Hall.

### Cooperative Programs with the Johnson Graduate School of Management

Two programs culminate in both Master of Engineering and Master of Business Administration degrees. One, which students enter during their undergraduate career, makes it possible to earn the B.S., M.Eng., and M.B.A. in six years—one year less than such a program would normally require. The other program, which is available to students who already hold baccalaureate degrees from Cornell or other institutions, requires five semesters and leads to both the M.Eng. and M.B.A.

Undergraduate students interested in the six-year program should seek advice and information from the department with whose field they intend to affiliate during their upperclass years. Information about admission to either program and about special scholarship aid may be obtained from the Master of Engineering Office, 113 Hollister Hall.

## ACADEMIC PROCEDURES AND POLICIES

### Advanced Placement Credit

The College of Engineering awards a significant amount of advanced placement (AP) credit to entering freshmen who demonstrate proficiency in the subject areas of introductory courses. Students may qualify for AP credit in one of two ways:

1) by receiving sufficiently high scores on advanced placement examinations given and scored by the College Entrance Examination Board (CEEB); or

2) by receiving sufficiently high scores on Cornell's departmental placement examinations, which are given during orientation week before fall-term classes begin. Advanced placement is granted only to first-term freshmen, and the placement examinations are scored before the students begin classes.

Advanced placement credit is intended to permit students to develop more challenging and stimulating programs of study. Students who receive AP credit for an introductory course may use it in three different ways.

1) They may enroll in a more advanced course in the same subject right away.

2) They may substitute an elective course from a different area.

3) They may enroll in fewer courses, using the AP credit to fulfill basic requirements.

A detailed description of the college's policies concerning advanced placement credit and its use in developing undergraduate programs may be found in the pamphlet *Advanced Placement and Transfer Credit for First-Year Engineering Students*, which may be obtained at the Office of Advising, 167 Olin Hall.

### Transfer Credit

Entering freshmen and entering transfer students who have completed courses at recognized and accredited colleges may, under certain conditions, have credits for such courses transferred to Cornell. Such courses must represent academic work in excess of that required for the secondary school diploma. Courses deemed acceptable for transfer credit must be equivalent in scope and rigor to courses at Cornell.

College courses completed under the auspices of cooperative college and high school programs may be considered for advanced standing as follows. Credit for such courses is not granted unless students demonstrate academic proficiency by taking the appropriate CEEB or Cornell departmental placement examination, as described above.

After matriculation no more than 9 credits of transfer or Cornell extramural credit may be used to satisfy bachelor's degree requirements. Summer session courses at Cornell are the only exception to this rule.

A more detailed description of the college's regulations governing transfer credit may be found in the for *Engineering Student Handbook*, available from the Office of Advising, 167 Olin Hall.

### Academic Standing

The requirements for good standing in the college vary slightly among the different divisions. First-term freshmen must have a grade point average of 1.7 or higher with no failing, unsatisfactory, or *incomplete* grades and must be making adequate progress toward the four-year degree. Second-term freshman and sophomore requirements are the same, except that the grade-point average must be at least 2.0. Upperclass requirements for good standing and for satisfactory performance in courses that are prerequisite for field courses vary slightly for different fields of study, as specified in the following sections or the *Engineering Student Handbook*.

Dean's List citations are presented each semester to engineering students with exemplary academic records. The criteria for this honor, which are determined by the dean of the college, are a term average of 3.25 or higher with no failing, unsatisfactory, or incomplete grades (even in physical education) and 12 credits or more of **letter grades**. Students may earn Dean's List status retroactively if they meet these criteria after making up incompletes according to college rules.

### Standard of Performance for Mathematics

Every student must attain a grade of at least C– in Mathematics 192, 293, and 294, or other courses that may be approved as substitutes for these courses. If this requirement is not met the first time a course is taken, the course must be repeated immediately and a satisfactory grade attained before the next course in the sequence may be taken. Courses that are taken a second time in order to meet this requirement do not yield additional credit toward a degree.

### S-U Grades

The option of receiving a grade of "satisfactory" or "unsatisfactory" (S-U) in a particular course, rather than a grade on a graduated scale, may be selected only in the following circumstances. Students who want to take a course on an S-U basis must have completed at least one full semester of study at Cornell, and they may take only one course per semester on an S-U basis. Only courses in the humanities and social sciences, approved electives, and free electives may be taken as S-U courses. Students may preregister for the S-U option. To change a grading option, a properly completed and approved add/drop form must be filed with the registrar of the College of Engineering by the end of the first three weeks of the semester. After this, the grading option *may not be changed under any circumstances.*

The S-U policy does not apply to courses in physical education and other courses that are not taken to fulfill degree requirements. When a particular course is offered **only** on an S-U basis, a student may petition to take a second S-U course in the same term.

### Residence Requirements

Candidates for an undergraduate degree in engineering must spend at least four semesters or an equivalent period of instruction as full-time students at Cornell. They must also spend at least three semesters of this time affiliated with an engineering field program or with the College Program.

Students who are voluntarily not enrolled at Cornell as full-time students may take individual courses through the Extramural Division. Students who have been asked to take time off are permitted to register for courses extramurally only with the approval of their field (or the college, for unaffiliated students). No more than 9 credits earned through study in the Extramural Division or acquired as transfer credit may be used to satisfy the requirements for the bachelor's degree in engineering.

Degree candidates may spend periods of time studying away from the Cornell campus with appropriate authorization. Such students must register for study in absentia and pay a fee. Information on programs sponsored by other universities and on procedures for direct enrollment in foreign universities is available at the Cornell Abroad office, 474 Uris Hall.

Programs should be planned in consultation with Professor Richard Lance, 219 Kimball Hall, or with the staff of the Office of Advising, who can provide information on credit-evaluation policies and assist in the petitioning process.

### Leave of Absence and Withdrawal

Students may interrupt their studies for a period of time by taking a leave of absence. A formal petition must be filed, an exit interview conducted, and written approval granted. Leaves of absence for more than two years are not generally granted. Credit earned while on leave of absence is subject to the limitation placed on extramural and transfer credit.

Students who voluntarily *withdraw* from the engineering degree program sever all connection with the college, and if they subsequently want to return, they must make a formal application for readmission. Students who fail to register in the first three weeks of the semester, without having received a leave of absence or permission for study in absentia, may be classified, by action of the faculty, as having withdrawn.

## ENGINEERING CAREER SERVICES

Advising is available for students who desire assistance in career and job-search matters. Also, interviews are arranged between students and company representatives who visit the campus to recruit employees. This service, which is available to both undergraduates and graduates, can be used to find permanent or summer employment. A résumé and referral service is available to engineering alumni. Further information on all services is available from the Office of Engineering Placement, 201 Carpenter Hall.

## AGRICULTURAL AND BIOLOGICAL ENGINEERING

G. E. Rehkugler, chair; L. D. Albright, D. J. Aneshansley, J. A. Bartsch, J. R. Cooke, A. K. Datta, R. C. Derksen, R. B. Furry, K. G. Gebremedhin, W. W. Gunkel, D. A. Haith, J. B. Hunter, L. H. Irwin, W. J. Jewell, D. C. Ludington, J.-Y. Parlange, R. E. Pitt, N. R. Scott, T. S. Steenhuis, M. B. Timmons, L. P. Walker, M. F. Walter

### Bachelor of Science Curriculum

The Field Program in Agricultural Engineering prepares students for engineering practice in agriculture, its support industries and agencies, and biological systems. Engineering is applied to production, storage processing, distribution, and use of plant and animal products and biomass. Issues of environmental quality and safety and preservation of soil and water resources are studied. Emerging areas of study include engineering aspects of the development of biotechnology. Biological, social, and agricultural sciences are integrated into the field program along with the engineering design and science studies. Areas of concentration include biological engineering, food engineering, international agriculture, machinery, power and energy, local roads, soil and water, structures and their environments, and waste management.

This program is jointly administered by the College of Engineering and the College of Agriculture and Life Sciences. Students are enrolled in the College of Agriculture and Life Sciences in the first four semesters and jointly in the College of Engineering in the remaining semesters. Engineering college tuition is paid in the fifth and sixth semesters of study.

Graduates find employment not only in agricultural and food related industries but also in environmentally related firms and agencies. Professional education is also the choice of many of the graduates. Agricultural engineers are employed throughout the entire spectrum of private industry, consulting firms, government agencies, utility companies, and educational institutions. The unique blend of engineering and the biological sciences in the education of the agricultural engineer is often attractive to employers.

For further details see the department's undergraduate programs brochure, available at 106 Riley-Robb Hall.

The field program requirements are outlined below.

| *Basic Subjects* | *Credits* |
|---|---|
| Math 191, 192, 293, 294, Calculus for Engineers and Engineering Mathematics | 16 |
| Chem 207, General Chemistry | 4 |
| Phys 112, 213, 214, Physics I, II, and III | 12 |
| Introductory biological sciences | 6 to 8 |
| ABEN 151, computer programming and introduction to field | 4 to 6 |
| Engineering distribution (four courses, including Mechanics of Solids and Thermodynamics) | 12 |
| Humanities and social sciences (eight courses, including two in written expression, one in oral expression, and a minimum of 9 credits in humanities) | 24 |
| *Advanced and Applied Subjects* | |
| Engineering sciences (must include fluid mechanics and dynamics), ABEN 250, and a minimum of four agricultural and biological engineering courses (at least 12 credits) chosen from courses 350 to 399 and/or above 450 but excluding seminars and special-problems courses | 33 |
| Biological or agricultural sciences (3 credits of biological sciences required) | 12 |
| Free electives | 6 |

### Master of Engineering (Agricultural) Degree Program

The program for the M.Eng.(Agricultural) degree is intended primarily for those students who plan to enter engineering practice. The curriculum is planned as an extension of the Cornell undergraduate program in agricultural engineering but can accommodate graduates of other engineering programs. The curriculum consists of 30 credits of courses intended to strengthen the students' fundamental knowledge of engineering and develop their design skills. Six of the required 30 credits are earned for an engineering design project that culminates in a professional-level report.

A candidate for the M.Eng.(Agricultural) degree may choose to concentrate in one of the subareas of agricultural engineering or take a broad program without specialization. The subareas are (a) power and machinery, (b) soils and water engineering, (c) agricultural structures and associated systems, (d) electric power and processing, (e) energy management, (f) agricultural waste management, (g) bioengineering, (h) secondary-road design and construction, and (i) food engineering. Engineering electives are chosen from among subject areas relevant to agricultural engineering, such as thermal engineering, mechanical design and analysis, theoretical and applied mechanics, structural engineering, hydraulics, environmental engineering, soil engineering, waste management, and electronics.

## APPLIED AND ENGINEERING PHYSICS

R. A. Buhrman, director; M. S. Isaacson, associate director; B. W. Batterman, J. D. Brock, K. B. Cady, D. D. Clark, T. A. Cool, H. G. Craighead, H. H. Fleischmann, V. O. Kostroun, J. A. Krumhansl, B. R. Kusse, R. L. Liboff, R. V. E. Lovelace, M. S. Nelkin, T. N. Rhodin, M. M. Salpeter, J. Silcox, R. N. Sudan, W. W. Webb, F. W. Wise, G. J. Wolga

The undergraduate engineering physics curriculum is designed for students who want to pursue careers of research or development in applied science or advanced technology and engineering. Its distinguishing feature is a focus on the physics and mathematics fundamentals, both experimental and theoretical, that are at the base of modern engineering and research and have a broad applicability in these areas. By choosing areas of concentration, the students may combine this physics base with a good background in a conventional area of engineering or applied science.

The industrial demand for graduates with baccalaureates is high, and many students go directly to industrial positions where they work in a variety of areas that either combine, or are in the realm of, various more conventional areas of engineering. Recent examples include bioengineering, computer technology, electronic-circuit design, energy conversion, geological analysis, laser technology, microwave technology, nuclear technology, power engineering, and solid-state-device development. A number of our graduates go on for advanced study in all areas of basic physics, as well as in a diverse range of areas in advanced science and engineering. Examples include astrophysics, atmospheric sciences, biophysics, computer engineering, electrical engineering, environmental science, fluid mechanics, geotechnology, laser optics, materials science and engineering, mathematics, medicine, nuclear engineering, oceanography, physics, and software engineering. The undergraduate program can also serve as an excellent preparation for medical school, business school, or specialization in patent law.

The engineering physics program fosters this breadth of opportunity because it both stresses the fundamentals of science and engineering and gives the student direct exposure to the application of these fundamentals. Laboratory experimentation is emphasized, and ample opportunity for innovative design is provided. Examples are A&EP 110, The Laser and Its Applications in Science, Technology, and

Medicine (a freshman course); A&EP 264, Computerized-Instrumentation Design (a sophomore course); A&EP 363, Electronic Circuits (a junior course); Physics 410, Advanced Experimental Physics, and A&EP 436, Physical and Integrated Optics (senior courses).

Undergraduates who plan to enter the Field Program in Engineering Physics are advised to arrange their Common Curriculum with their developing career goals in mind. However, they are required to take Engr 221, Thermodynamics, as an engineering distribution course. Students are also encouraged to take Physics 112 during their first semester (if their advanced placement credits permit) and to satisfy the computing applications requirement with an engineering distribution course, e.g., A&EP 264. Engineering physics students need to take only three engineering distribution courses, since A&EP 333, which they take in their junior year, counts as a fourth member of this category.

The upperclass course requirements of the field program are as follows:

| *Course* | *Credits* |
|---|---|
| A&EP 333, Mechanics of Particles and Solid Bodies | 4 |
| A&EP 355, Intermediate Electromagnetism | 4 |
| A&EP 356, Intermediate Electrodynamics | 4 |
| A&EP 361, Introductory Quantum Mechanics | 4 |
| A&EP 363, Electronic Circuits | 4 |
| A&EP 423, Statistical Thermodynamics | 4 |
| A&EP 434, Continuum Physics | 4 |
| Physics 410, Advanced Experimental Physics | 4 |
| A&EP 321, Mathematical Physics I; Mathematics 421; or T&AM 610 (applied mathematics) | 4 |
| A&EP 322, Mathematical Physics II; Mathematics 422; or T&AM 611 (applied mathematics) | 4 |
| Applications of quantum mechanics* | 3 or 4 |
| A third technical elective (in addition to the two required by the Common Curriculum)† | 3 |

*Courses that will satisfy this requirement are Physics 444, Nuclear and High-Energy Particle Physics; Physics 454, Introductory Solid-State Physics; A&EP 609, Low-Energy Nuclear Physics; EE 430, Lasers and Optical Electronics; and EE 531, Quantum Electronics I.

†If a scientific computing course was not selected as an engineering distribution course, one of these technical electives may be needed to satisfy the computing applications requirement. For students going on to graduate school a third course in mathematics is recommended.

**Areas of concentration**. With a total of five electives in the junior and senior years, students are encouraged to develop areas of concentration in accordance with their individual career goals and interests. For those who look toward an industrial position after graduation, these electives should be chosen to widen the necessary background in a specific area of practical engineering. A different set of electives could be selected as preparation for medical, law, or business school. For students who plan on graduate studies, the electives provide an excellent opportunity to explore upper-level and graduate courses. Various programs are described in a special brochure available from the School of Applied and Engineering Physics, Clark Hall. Students interested in such programs are advised to consult with a professor active in their area or with the associate director of the school, Professor Michael S. Issacson.

Electives need not be all formal course work: Qualified students may undertake informal study under the direction of a member of the faculty (A&EP 490). This may include research or design projects in areas in which faculty members are active. While free electives may be selected (with the permission of the faculty adviser) from among almost all the courses offered at the university, the student is encouraged to select those that will provide further preparation in the area of technical interest. The minimum requirement is two courses or six credits.

The variety of course offerings provide a sizable flexibility in scheduling. In addition, if scheduling conflicts arise, the school may allow substitution of courses nearly equivalent to the listed required courses: Physics 325–326 is similar to A&EP 355–356; Physics 318 (offered in the spring) and T&AM 570 are similar to A&EP 333; Physics 443 (offered in the fall), is similar to A&EP 361; and advanced courses in fluid mechanics or elasticity are similar to A&EP 434.

The engineering physics student is expected to pass every course for which he or she is registered, to earn a grade of C- or better in specifically required courses, and to attain each term an overall grade point average of at least 2.3.

### Master of Engineering (Engineering Physics) Degree Program

The M.Eng.(Engineering Physics) degree may lead directly to employment in engineering design and development or may be a basis for further graduate work. Students have the opportunity to broaden and deepen their preparation in the general field of applied physics, or they may choose the more specific option of preparing for professional engineering work in a particular area such as laser technology, microstructure science, device physics, or materials characterization. A wide latitude is allowed in the choice of the required design project.

One example of a specific area of study is solid-state physics and chemistry as applied to microstructure science. Core courses in this specialty include the microcharacterization of electronic materials and the fabrication of microstructures and devices. The design project may focus on semiconductor materials, device physics, or microstructure science.

Each individual program is planned by the student in consultation with the program chair. The object is to provide a combination of a good general background in physics and introductory study in a specific field of applied physics. Candidates may enter with an undergraduate preparation in physics, engineering physics, or engineering. Those who have majored in physics usually seek advanced work with an emphasis on engineering; those who have majored in an engineering discipline generally seek to strengthen their physics base. Candidates coming from industry usually want instruction in both areas. All students granted the degree will have demonstrated competence in an appropriate core of basic physics; if this has not been accomplished at the undergraduate level, subjects such as electricity and magnetism, or classical, quantum, and statistical mechanics should be included in the program.

The general requirement for the degree is a total of 30 credits for graduate-level courses or their equivalent, earned with a grade of C or better and distributed as follows:

1) a design project in applied science or engineering (not less than 6 nor more than 12 credits)

2) an integrated program of graduate-level courses, as discussed below (14 to 20 credits)

3) a required special-topics seminar course (4 credits)

The design project, which is proposed by the student and approved by the program chair, is carried out on an individual basis under the guidance of a member of the faculty. It may be experimental or theoretical in nature; if it is not experimental, a laboratory physics course is required.

The individual program of study consists of a compatible sequence of courses focused on a specific area of applied physics or engineering. It is planned to provide an appropriate combination of physics and physics-related courses (applied mathematics, statistical mechanics, applied quantum mechanics) and engineering electives (such as courses in electrical engineering, materials science, computer science, mechanical engineering, physical geology, or bioengineering). Additional science and engineering electives may be included. Some courses at the senior level are acceptable for credit toward the degree; other undergraduate courses may be required as prerequisites but are not credited toward the degree.

Students interested in the M.Eng.(Engineering Physics) degree program should contact Professor R. V. E. Lovelace.

## APPLIED MATHEMATICS

The Center for Applied Mathematics administers a broadly based interdepartmental graduate program that provides opportunities for study and research in a wide range of the mathematical sciences. For detailed information on opportunities for graduate study in applied mathematics, contact the director of the Center for Applied Mathematics, Sage Hall.

There is no special undergraduate degree program in applied mathematics. Undergraduate students interested in application-oriented mathematics may select an appropriate program in the Department of Mathematics or one of the departments in the College of Engineering.

A list of selected graduate courses in applied mathematics may be found in the description of the Center for Applied Mathematics, in the section "Interdisciplinary Centers and Programs."

## CHEMICAL ENGINEERING

K. E. Gubbins, director; G. F. Scheele, associate director; A. B. Anton, P. Clancy, P. Clark, C. Cohen, R. K. Finn, D. A. Hammer, P. Harriott, D. L. Koch, R. P. Merrill, W. L. Olbricht, A. Panagiotopoulos, F. Rodriguez, M. L. Shuler, P. H. Steen, W. B. Streett, J. A. Zollweg

### Bachelor of Science Curriculum

The undergraduate Field Program in Chemical Engineering comprises a coordinated sequence of courses beginning in the sophomore year and extending through the fourth year. Special programs in biochemical engineering and polymeric materials are available. Students who plan to enter the field program take Chemistry 208 as an approved elective during the freshman year. The program for the last three years, for students who have taken two engineering distribution courses during the first year, is as follows:

| *Term 3* | *Credits* |
|---|---|
| Math 293, Engineering Mathematics | 4 |
| Phys 213, Electricity and Magnetism | 4 |
| Chem 287–289, Physical Chemistry (approved elective) | 5 |
| Chem E 219 (engineering distribution course) | 3 |
| Humanities or social sciences course | 3 |
| *Term 4* | |
| Math 294, Engineering Mathematics | 4 |
| Phys 214, Optics, Waves, and Particles | 4 |
| Chem 288–290, Physical Chemistry | 5 |
| Engineering distribution course | 3 |
| Humanities or social sciences course | 3 |
| *Term 5* | |
| Chem 357, Organic Chemistry† | 3 |
| Chem 251, Organic Chemistry Laboratory | 2 |
| Chem E 313, Chemical Engineering Thermodynamics | 4 |
| Chem E 323, Fluid Mechanics | 3 |
| Humanities or social sciences course | 3 |
| *Term 6* | |
| Chem 358, Organic Chemistry† | 3 |
| Chem E 101, Nonresident Lectures | 0 |
| Chem E 324, Heat and Mass Transfer | 3 |
| Chem E 332, Analysis of Separation Processes | 4 |
| Chem E 390, Reaction Kinetics and Reactor Design | 3 |
| Humanities or social sciences course | 3 |
| *Term 7* | |
| Chem E 432, Chemical Engineering Laboratory | 4 |
| Electives* | 9 |
| Humanities or social sciences course | 3 |
| Term 8 | |
| Chem E 462, Chemical Process Design | 4 |
| Chem E 472, Process Control | 3 |
| Electives* | 6 |
| Humanities or social sciences course | 3 |

*The electives in terms seven and eight comprise 6 credits of technical electives, 6 credits of free electives, and 3 credits of Chem E process or systems elective. Chem E process or systems electives include Chem E 566, Computer-aided Process Design; Chem E 640, Polymeric Materials; Chem E 643, Introduction to Bioprocess Engineering.

†Chemistry 253 plus an applied science elective may be substituted for Chem 357–358. Applied science electives include Biological Sciences 330 and 331, Principles of Biochemistry; Chem E 640, Polymeric Materials; Chem E 673, Adsorption and Catalysis; MS&E 331, Structural Chracterization and Properties of Materials; MS&E 332, Electrical and Magnetic Properties of Materials; MS&E 441, Microprocessing of Materials; MS&E 442, Macroprocessing of Materials; Microbiology 290, General Microbiology Lectures; any A&EP course numbered 333 or above; any Chemistry course numbered 301 or above; any Physics course numbered 300 or above.

### Master of Engineering (Chemical) Degree Program

The professional master's degree, M.Eng.(Chemical), is awarded at the end of one year of graduate study with successful completion of 30 credits of required and elective courses in technical fields including engineering, mathematics, chemistry, physics, and business administration. Courses emphasize design and optimization based on the economic factors that affect design alternatives for processes, equipment, and plants. General admission and degree requirements are described in the college's introductory section.

Specific requirements include

1) two courses in advanced chemical engineering fundamentals chosen from Chem E 711, 713, 731, 732, and 751

2) two courses in applied chemical engineering science chosen from Chem E 564, 566, 640, and 643

3) a minimum of 3 credits of a design project, Chem E 565

## CIVIL AND ENVIRONMENTAL ENGINEERING

A. H. Meyburg, director; J. M. Gossett, associate director; J. F. Abel, J. J. Bisogni, Jr., W. H. Brutsaert, G. G. Deierlein, R. I. Dick, G. P. Fisher, P. Gergely, M. D. Grigoriu, K. C. Hover, A. R. Ingraffea, G. H. Jirka, F. H. Kulhawy, J. A. Liggett, L. W. Lion, P. L-F. Liu, D. P. Loucks, W. R. Lynn, A. H. Nilson, T. D. O'Rourke, T. Pekoz, W. R. Philipson, W. D. Philpot, M. J. Sansalone, R. E. Schuler, C. A. Shoemaker, J. R. Stedinger, H. E. Stewart, M. A. Turnquist, R. N. White.

### Bachelor of Science Curriculum

The School of Civil and Environmental Engineering offers an accredited undergraduate program in civil engineering. The civil engineering curriculum is designed to ensure adequate depth and breadth in each of the subdisciplines of civil engineering. For students who want to specialize in a particular subdiscipline, illustrative sets of courses are available in the school office (220 Hollister Hall). Concentrations are offered in structural engineering; civil engineering materials; geotechnical engineering; water quality engineering; environmental and hazardous-waste engineering; environmental management and planning; fluid mechanics, hydraulics, and hydrology; transportation systems planning; and remote sensing.

Students planning to enter the Field Program in Civil Engineering are required to take Mechanics of Solids (Engr 202) during the sophomore year.* Prospective majors are strongly encouraged to obtain a "typical course schedule" from the school office.

For the Field Program in Civil Engineering the following courses are required in addition to those required for the Common Curriculum:†

| *Courses* | *Credits* |
|---|---|
| Engr 202, Mechanics of Solids* | 3 |
| Engr 203, Dynamics | 3 |
| Engr 261, Introduction to Mechanical Properties of Materials* | 3 |
| Engr 241, Engineering Computation†† | 3 |
| CEE 304, Uncertainty Analysis in Engineering** | 4 |
| CEE 323, Engineering Economics and Management | 3 |
| CEE 331, Fluid Mechanics | 4 |
| CEE 341, Introductory Soil Mechanics | 3 |
| CEE 351, Environmental Quality Engineering | 3 |
| CEE 361, Introduction to Transportation Engineering | 3 |
| CEE 371, Structural Behavior | 4 |
| Civil engineering distribution courses (four courses selected from four different catagories of approved civil engineering distribution courses: the list is available at the school office, 220 Hollister Hall) | 12 |

Civil engineering design course (at least one course from an approved list. This is not intended to be the requirement of an additional course; students may—and usually will—satisfy the civil engineering design-course requirement through appropriate selection of civil engineering distribution, approved elective, technical elective, or free elective courses. The list of currently approved CE design courses is available at the school office, 220 Hollister Hall).

*These courses can also be used to satisfy the Common Curriculum requirements for engineering distribution courses.

†Chem 208 can be substituted for Phys 214.

††Engr 241 can be used to satisfy both the computer application requirement and an engineering distribution requirement of the Common Curriculum.

**Students in Civil Engineering may use CEE 304 as a substitute for Engr 270, applying it toward the engineering distribution requirement. If this is done, the technical elective requirement is increased by 3 credits. Alternatively, Engr 270 may be accepted (on petition) as a substitute for CEE 304 in the field program, but only if Engr 270 is taken before entry into the field.

### Master of Engineering (Civil) Degree Program

The M.Eng. (Civil) degree program is a 30-credit (usually ten-course) curriculum designed to prepare students for professional practice. There are two options in this program: one in civil and environmental engineering design and one in engineering management. Both options require a broad-based background in an engineering field. Applicants holding an ABET-accredited (or equivalent) undergraduate degree in engineering automatically satisfy this requirement. Those without such preparation will require course work beyond the graduate program's 30-credit minimum to fulfill the engineering preparation requirement. Both options also require one course in professional practice and a two-course project sequence. The project entails synthesis, analysis, decision making, and application of engineering judgment. Normally it is undertaken in cooperation with an outside practitioner, and it includes an intensive, full-time, three-week session between semesters. The general degree requirements and admissions information are described above in the section entitled "Master of Engineering Degree Programs." Each student's program of study is designed individually in consultation with an academic adviser and then submitted to the school's Professional Degree Committee for approval.

For the M.Eng. (Civil) program in civil and environmental engineering design options, the requirements are:

1) Three courses, two in professional engineering practice (CEE 503) and one design project (CEE 501 and 502)

2) Specialization in a major—three to five courses in either environmental engineering, environmental and public systems engineering, geotechnical engineering, hydraulic engineering, remote sensing, structural engineering, or transportation engineering

3) Two courses in a single related or minor area

4) Technical electives (up to two courses)

Courses in the minor and electives may consist of graduate or advanced courses in fields related to the major, either inside or outside of the school.

For the M.Eng. (Civil) program in the engineering management option, the requirements are:

1) Four courses: Management Practice (CEE 590), Engineering Management Methods (CEE 593), and the Management Project (CEE 591 and 592)

2) Two courses from a list of engineering management electives

3) Two elective courses in general management from outside the school, including accounting, finance, law and regulation, marketing, and organizational behavior

4) Two engineering and/or technical elective courses

The School of Civil and Environmental Engineering cooperates with the the Johnson Graduate School of Management in two joint programs leading to both Master of Engineering and Master of Business Administration degrees. See the introductory section under College of Engineering.

Applications for the six-year B.S./M.Eng./M.B.A. program must be submitted at the beginning of the sixth term of study.

## COMPUTER SCIENCE

G. Bilardi, K. Birman, T. Coleman, R. L. Constable, B. Donald, D. Gries, J. Hartmanis, J. E. Hopcroft, D. Huttenlocher, D. Kozen, K. Marzullo, P. Panangaden, K. Pingali, G. Salton, F. B. Schneider, A. Segre, D. Subramanian, R. Teitelbaum, S. Toueg, C. Van Loan, S. Vavasis, V. Vazirani

### Bachelor of Science Curriculum

The Field Program in Computer Science is intended for students who are interested in the computing process and in the fundamental structure of algorithms, data, and languages that underlie that process. Those interested in the application of computers in some particular area are ordinarily advised to major in the area of application and take elective course work in computer science.

A student entering the Field Program in Computer Science must take CS 211 or 212 and CS 280 before beginning the upperclass sequence. Students who do not earn a grade of B– or better in both CS 211 or 212 and CS 280 are strongly advised against attempting the computer science field program. Students who have not maintained an average of at least 3.0 in the mathematics courses required by the Common Curriculum are also discouraged from entering the program. Apart from these requisites and those of the college, the courses required for the Field Program in Computer Science are:

| *Course Work* | *Credits* |
|---|---|
| Systems sequence | 8 |
| CS 314, Systems and Organization | |
| CS 410, Data Structures | |
| Theory sequence | 8 |
| CS 381 or 481, Theory of Computing | |
| CS 482, Analysis of Algorithms | |
| Numerical Analysis | 3–4 |
| CS 222, Scientific Computation, or | |
| CS 421, Numerical Solutions of Algebraic Equations | |
| Electrical Engineering | 4 |
| EE 230, Digital Systems* | |
| Computer science electives | 7–9 |
| Two nonrequired computer science courses numbered 400 or above.† One must be a course or course-laboratory combination that includes a substantial programming project—for example, CS 412, 414–415, 417–418, 432–433, or 472. | |
| Related electives | 14–16 |
| One mathematically oriented course plus three courses forming a coherent sequence in mathematics, operations research, electrical engineering, or another technical area. | |

*EE 230 also counts as an approved elective.

†Except CS 415, 418, 433, 600, 601, and seminar courses.

For more information, refer to the *Computer Science Undergraduate Handbook*, available from 303 Upson Hall.

The performance of students in the Field of Computer Science is reviewed each term. To remain in good standing with the department, they must have an overall term average of at least 2.3 with no courses failed and a term average for field program courses of at least 2.7 with no course grade less than C–, and they must be making satisfactory progress in the field.

### Cooperative Program with the Johnson Graduate School of Management

Undergraduates majoring in computer science may be interested in a program that can lead, in the course of six years, to B.S., M.Eng.(Computer Science), and M.B.A. degrees. This program, which is sponsored jointly by the College of Engineering and the Johnson Graduate School of Management, enables students to study several subjects required for the M.B.A. degree as part of their undergraduate curriculum. Planning must begin early, however, if all requirements are to be completed on schedule.

For further details, application forms, and assistance in planning a curriculum, students should contact the computer science undergraduate coordinator in Upson Hall.

### Master of Engineering (Computer Science) Degree Program

The one-year program leading to the degree of M.Eng.(Computer Science) admits approximately ten students a year. Admission standards are the same as those applied to doctoral candidates. A good undergraduate background in mathematics or computer science is required.

In the curriculum the emphasis can be on programming languages and systems, on theory of algorithms and theory of computation, on numerical analysis, on artificial intelligence, or on information processing, which includes databases and information organization and retrieval. (Students who are interested in logical design or computer architecture will find it more appropriate to apply for admission to a graduate program in electrical engineering.) The required design project could be, for example, the design of a compiler for a large subset of a general-purpose programming language.

## ELECTRICAL ENGINEERING

N. C. MacDonald, director; V. Anantharam, J. M. Ballantyne, T. Berger, A. W. Bojanczyk, R. Bolgiano, Jr., G. M. Brown, R. R. Capranica, H.-D. Chiang, R. C. Compton, H. G. Craighead, D. F. Delchamps, L. F. Eastman, D. T. Farley, T. L. Fine, L. K. Grover, T. Hagfors, M. W. Hauser, C. Heegard, L. W. Hillman, C. R. Johnson, Jr., M. C. Kelley, P. M. Kintner, R. Kline, J. P. Krusius, C. A. Lee, S.-Y. Lee, M. E. Leeser, R. L. Liboff, F. T.-C. Luk, P. R. McIsaac, J. A. Nation, N. F. Otani, T. W. Parks, C. R. Pollock, C. Pottle, A. P. Reeves, C. E. Seyler, Jr., J. R. Shealy, A. O. Steinhardt, R. N. Sudan, C. L. Tang, R. J. Thomas, J. S. Thorp, H. C. Torng, N. M. Vrana, C. B. Wharton, E. D. Wolf, G. J. Wolga

### Bachelor of Science Curriculum

Reflecting the large scope of this engineering discipline, the undergraduate Field Program in Electrical Engineering provides a broad foundation in a number of important and fundamental areas.

Areas of concentration include computer engineering; control systems; electronic circuit design; information, communication, and decision theory; microwave electronics; plasma physics; power and energy systems; quantum and optical electronics; radio and atmospheric physics; and semiconductor devices and applications.

Students planning to enter the Field Program in Electrical Engineering must take EE 210, Introduction to Electrical Systems, as an engineering distribution course. In addition, the field program requires twelve courses, as shown below. Many of these courses are taught only once a year, either spring or fall, as indicated in the course descriptions.

| *Course* | *Credits* |
|---|---|
| EE 230, Introduction to Digital Systems | 4 |
| EE 301, Electrical Signals and Systems I | 4 |
| EE 303, Electromagnetic Waves and Fields I | 4 |
| EE 315, Electrical Laboratory I | 4 |
| A choice of three courses from among: | 12 |
| EE 302, Electrical Signals and Systems II | |
| EE 304, Electromagnetic Waves and Fields II | |
| EE 306, Fundamentals of Quantum and Solid State Electronics | |
| EE 308, Fundamentals of Computer Engineering | |
| EE 310, Probability and Random Signals | |
| EE electives with laboratory (3 courses) | 12 |
| EE electives (2 courses) | 6 |
| Total | 46* |

*Credits in excess of 46 may be used to fill approved-, technical-, or free-elective requirements of the Common Curriculum.

EE electives may be selected from all courses taught in electrical engineering. At least one of the required EE electives with laboratory must be selected from a list including EE 316, 425, 431, 435, 437, and 475. The other two may be selected from the above list or from among EE 424, 425, 432, 451, 452, 471, 476, 526, 533, 534, 535, 536, 539, and 572. (If EE 539 is taken for 6 credits, it counts as two courses.)

Specialization is achieved through the five electrical engineering elective courses, as well as other courses in electrical engineering or related subjects taken as technical, approved, or free electives. The School of Electrical Engineering offers more than thirty courses that are commonly taken as electives by undergraduates. Students with advanced standing frequently take one or more graduate-level courses prior to graduation.

Students majoring in electrical engineering are expected to meet the following academic standards:

1) Students must achieve a grade-point average of at least 2.3 every semester.

2) No course with a grade of less than C– may be used to satisfy degree requirements in the field program or technical elective categories, or serve as a prerequisite for an electrical engineering course.

3) Students must complete EE 301, 303, and 315 by the end of the first semester of the junior year, and accumulate at least 10 credits each semester toward the remaining degree requirements in the field program and technical elective categories.

### Master of Engineering (Electrical) Degree Program

The M.Eng.(Electrical) degree program prepares students either for professional work in electrical engineering and closely related areas or for further graduate study in a doctoral program. The M.Eng. degree differs from the M.S. mainly in its emphasis on design and analysis skills rather than basic research.

The program requires 30 credits of advanced technical course work, including a minimum of two two-term course sequences in electrical engineering. (A list of approved course sequences is available from the Master of Electrical Engineering Program Office.) All but 8 credits of course work applied toward degree requirements must be at the graduate level (courses numbered 500 or above). An engineering design project is also required and may account for 3 to 8 credits of the M.Eng. program. Occasionally, students take part in very extensive projects and may apply for a waiver of the 8-credit maximum. Students with special career goals, such as engineering management, may apply to use up to 8 credits of courses that have significant technical content, but are taught in disciplines other than engineering, mathematics, or the physical sciences.

Admission to the M.Eng.(Electrical) program is highly competitive, although well-qualified students are urged to apply. Further information is available from the Master of Electrical Engineering Program Office in 222 Phillips Hall.

## GEOLOGICAL SCIENCES

D. L. Turcotte, chair; R. W. Allmendinger, M. Barazangi, W. A. Bassett, J. M. Bird, A. L. Bloom, L. D. Brown, L. M. Cathles, J. L. Cisne, B. L. Isacks, T. E. Jordan, D. E. Karig, S. Kaufman, R. W. Kay, J. E. Oliver, F. H. T. Rhodes, W. B. Travers, W. M. White

### Bachelor of Science Curriculum

Study in geological sciences is offered for students who are preparing for careers in solid earth science, for those who want a broad background in the geological sciences as preparation for careers in other fields, and for those who want to combine geological training with other sciences such as agronomy, astronomy and space science, biological sciences, chemistry, economics, mathematics, physics, or various fields of engineering. The Department of Geological Sciences is organized as an intercollege department in the College of Arts and Sciences and the College of Engineering. College of Arts and Sciences students should consult that college's section on geological sciences as well as the course listing here.

Students in the College of Engineering who plan to enter the Field Program in Geological Sciences are required to take Geol 201 (Engr 201) during their freshman or sophomore year. Those interested in geobiology should also take Biological Sciences 101–103 and 102–104.

Geological Sciences requires the following courses for the major: Geol 326, 355, 356, 375, 388, and one other 300- or 400-level course. A summer field geology course is also required.

Core courses may be taken in any reasonable sequence, except that Geol 355, which is offered in the fall, should be taken before Geol 356, which is offered in the spring. Geol 326 and 375 should be taken relatively early in the major program as preparation for the summer field camp, which usually follows the junior year. Students with adequate preparation may attend field camp at an earlier time.

It is recommended that students intending to specialize in *geophysics* select most of their approved and technical electives from the following courses or their equivalents:

A&EP 333, Mechanics of Particles and Solid Bodies

A&EP 355, Intermediate Electromagnetism

A&EP 356, Intermediate Electrodynamics

A&EP 434, Continuum Physics

Phys 410, Advanced Experimental Physics

T&AM 310–311, Advanced Engineering Analysis I and II

It is recommended that students intending to specialize in *geochemistry* (including petrology and mineralogy) select most of their approved and technical electives from the following courses or their equivalents:

Chem 208, General Chemistry

Chem 287–288, Introductory Physical Chemistry

Chem 300, Quantitative Chemistry

Chem 301, Experimental Chemistry I

Chem 302, Experimental Chemistry II

Chem 303, Experimental Chemistry III

Chem 357–358, Introductory Organic Chemistry

Chem 389–390, Physical Chemistry I and II

MS&E 331, Structural Characterization and Properties of Materials

MS&E 335, Thermodynamics of Condensed Systems

It is recommended that students intending to specialize in *geobiology* select most of their approved and technical electives from the following courses or their equivalents:

Bio S 241, Introductory Botany

Bio S 274, The Vertebrates

Bio S 371, Human Paleontology

Bio S 373, The Invertebrates

Bio S 261, General Ecology

Bio S 448, Plant Evolution and the Fossil Record

Bio S 378, Organic Evolution

Chem 253, Elementary Organic Chemistry

It is recommended that students who want to pursue further training or immediate employment in *applied geology* (environmental and engineering geology, geohydrology, petroleum geology, or geological engineering) select most of their approved and technical electives from the following courses or their equivalents, with two of the four from the same field:

Agron 361, Genesis, Classification, and Geography of Soils

Agron 667, Soil Physics

Agron 366, Soil Chemistry

CEE 341, Introductory Soil Mechanics

CEE 611, Remote Sensing Applications

CEE 612, Physical Environment Evaluation

CEE 615, Digital Image Processing

CEE 640, Foundation Engineering

MS&E 331, Structural Characterization and Properties of Materials

MS&E 445, Mechanical Properties of Materials

CEE 331, Fluid Mechanics

CEE 332, Hydraulic Engineering

CEE 351, Environmental Quality Engineering

CEE 633, Flow in Porous Media and Groundwater

OR&IE 260, Introductory Engineering Probability

OR&IE 370, Introduction to Statistical Theory with Engineering Applications

Students intending to specialize in *economic geology* or pursue careers in the mining industries or mineral exploration should consider including economics courses among their humanities and social sciences electives and should select most of their approved and technical electives from the groups of courses listed above for geochemistry and applied geology plus the following additional courses:

CEE 654, Aquatic Chemistry

CEE 741, Rock Engineering

Students who want a more general background or who want to remain uncommitted with regard to specialty must choose at least two of their three approved electives from the same field, at a level comparable to the courses listed above. The technical electives may be chosen from offerings in geological sciences or in other science or engineering fields and should be at the 300 level or above. Outstanding students may request substitution of Geol 491 and 492, Undergraduate Research, for a fourth-year technical elective.

Students intending to pursue graduate study in geology are reminded that some graduate schools require proficiency in reading the scientific literature in one or two of the three languages, French, German, and Russian. Undergraduate preparation in at least one of these languages is therefore advantageous.

### Master of Engineering (Geological Sciences Degree Program)

The Master of Engineering (Geological Sciences) degree is intended to provide future professional geologists with the geological and engineering background they will need to analyze and solve engineering problems that involve geological variables and concepts. Students may choose a program from one of several options, or tailor a program to meet their special interests with the help of a faculty adviser.

The program requires 30 credits of postgraduate instruction, at least 10 of which must involve engineering design. Students must also complete a design project, worth between 3 and 12 credits, that has a significant geological component and results in substantial conclusions or recommendations.

General information on admission and degree requirements for the M.Eng. degree programs can be found in the college's introductory section.

## MATERIALS SCIENCE AND ENGINEERING

J. M. Blakely, director; D. G. Ast, C. B. Carter, R. Dieckmann, E. Gianellis, D. T. Grubb, E. W. Hart, H. H. Johnson, D. L. Kohlstedt, E. J. Kramer, C. Y. Li, J. W. Mayer, C. Ober, R. Raj, A. L. Ruoff, S. L. Sass, M. O. Thompson, Y. K. Vohra

### Bachelor of Science Curriculum

Students who major in materials science and engineering are required to take MS&E 261, Introduction to Mechanical Properties of Materials, before the end of their junior year. They are strongly urged to take it as an engineering distribution course during their freshman or sophomore year. Students may enter the field after taking MS&E 262, Introduction to Electrical Properties of Materials, but they must still take MS&E 261 in order to graduate. Students who choose to major in materials science and engineering can concentrate in any one of the following areas of specialization: materials science, solid state, metallurgy, ceramic materials, polymeric materials, or electrical materials. Specialization is achieved through the selection of technical electives in the junior and senior years. The materials science and engineering field program leading to the Bachelor of Science degree consists of

| *Courses* | *Credits* |
|---|---|
| MS&E 331, Structural Characterization and Properties of Materials | 4 |
| MS&E 332, Electrical and Magnetic Properties of Materials | 3 |
| MS&E 333, Research Involvement I, or a field-approved elective* | 3 |
| MS&E 334, Research Involvement II, or a field-approved elective* | 3 |
| MS&E 335 Thermodynamics of Condensed Systems | 3 |
| MS&E 336, Kinetics, Diffusion, and Phase Transformations | 3 |
| MS&E 441, Microprocessing of Materials | 3 |
| MS&E 442, Macroprocessing of Materials | 3 |
| MS&E 443/435, Senior Materials Laboratory I or Senior Thesis I | 3/4 |
| MS&E 444/436, Senior Materials Laboratory II or Senior Thesis II | 3/4 |
| MS&E 445, Mechanical Properties of Materials | 3 |
| MS&E 447, Materials Design Concepts I | 1 |
| MS&E 448, Materials Design Concepts II | 2 |
| | 37/39 |

*These courses serve as two of the four required specialization courses. The other specialization courses are technical electives. The optional research involvement courses provide undergraduates with the opportunity to work with faculty members and their resesearch groups on current projects.

To continue in good standing in the Field of Materials Science and Engineering, students must

1) Maintain an overall 2.0 term average

2) Maintain an average of 2.3, with no grade below C, in the department's basic curriculum. The department's basic curriculum consists of all the required MS&E courses including MS&E 261 and the four courses comprising the student's area of specialization.

An attractive and very challenging program combines the materials science and engineering curriculum with that of either electrical engineering or mechanical engineering, leading to a double major. The combination of materials science and engineering with electrical engineering is particularly well suited to students who will eventually be employed in the electronic materials industry. Mechanical engineers knowledgeable in materials science also will be well equipped for technical careers. Curricula leading to the double-major degree must be approved by both of the departments involved. Students are urged to plan such curricula as early as possible.

### Master of Engineering (Materials) Degree Program

Students who have completed a four-year undergraduate program in engineering or the physical sciences may be considered for admission to the M.Eng.(Materials) program, which includes a project and course work. The project, which must require individual effort and initiative, is worth 12 credits. It is carried out under the supervision of a member of the faculty, and is usually experimental, although it can also be analytical.

Courses, worth an additional 18 credits, may be selected from graduate-level courses in materials science and engineering or other courses approved by the faculty. These courses should be half MS&E courses and half technical electives. One 3-credit technical elective must be in advanced mathematics (modeling, computer applications, or computer modeling), beyond the MS&E undergraduate requirements. Other electives may be in MS&E or allied fields.

# MECHANICAL AND AEROSPACE ENGINEERING

F. C. Moon, director; P. L. Auer, C. T. Avedisian, D. L. Bartel, J. F. Booker, A. H. Burstein, D. A. Caughey, B. J. Conta, P. R. Dawson, P. C. T. deBoer, A. R. George, F. C. Gouldin, S. E. Landsberger, S. Leibovich, M. Y. Louge, J. L. Lumley, F. K. Moore, S. L. Phoenix, S. B. Pope, M. L. Psiaki, E. L. Resler, Jr., S. F. Shen, D. G. Shepherd, D. L. Taylor, K. E. Torrance, H. B. Voelcker, K. K. Wang, Z. Warhaft, G. G. Weber, R. L. Wehe

Members of the faculty of the graduate Fields of Aerospace Engineering and Mechanical Engineering are listed in the *Announcement of the Graduate School.*

## Bachelor of Science Curriculum in Mechanical Engineering

The upperclass Field Program in Mechanical Engineering is designed to provide a broad background in the fundamentals of this discipline as well as to offer an introduction to the many professional and technical areas with which mechanical engineers are concerned. Two main areas of concentration, corresponding to the two major streams of mechanical engineering technology, are offered in the field program.

*Mechanical systems, design, and manufacturing* is concerned with the design, analysis, testing, and manufacture of machinery, vehicles, devices, and systems. Particular areas of concentration include mechanical design and analysis, computer-aided design, vehicle engineering, composite materials, vibrations and control systems, biomechanics, and manufacturing engineering.

*Engineering of fluids, energy, and heat-transfer systems* has as its main concerns the experimental and theoretical aspects of fluid flow and heat transfer; the development of fossil, solar, and other energy sources for uses such as electric-power generation; industrial heating; terrestrial and aerospace transportation; and the use of heating, air conditioning, refrigeration, and noise- and pollution-control techniques to modify the human environment.

The undergraduate field program is a coordinated sequence of courses beginning in the sophomore year. During that year students who plan to enter the field of mechanical engineering take Engr 202 (also T&AM 202) as an engineering distribution course. They also take Engr 203 (also T&AM 203) which is a field requirement that may simultaneously satisfy Common Curriculum requirements as an approved (or free) elective. Both of these courses are prerequisites for courses to be taken during the junior year. During either the sophomore or junior year students take Engr 221 (also M&AE 221) and Engr 261 (also MS&E 261).

The requirements for the degree of Bachelor of Science in mechanical engineering are as follows:

1) Completion of the Common Curriculum. During the upperclass years this will typically mean earning credit for two technical electives, one approved elective, two free electives, and three humanities or social sciences courses.

2) Completion of the field requirements, which consist of ten required courses (beyond Engr 202 and 203, already mentioned), and three elective courses (9 credits). The ten additional required courses are

Engr 210, Introduction to Electrical Systems

Engr 221, Introduction to Thermodynamics

Engr 261, Introduction to Mechanical Properties of Materials

M&AE 312, Fundamentals of Manufacturing Processes

M&AE 323, Introduction to Fluid Mechanics

M&AE 324, Heat Transfer

M&AE 325, Mechanical Design and Analysis

M&AE 326, Systems Dynamics

M&AE 427, Mechanical Engineering Laboratory

M&AE 428, Engineering Design (required starting with the class of 1989)

If Engr 210 or 221 or 261 is taken as an engineering distribution course, the corresponding field requirement is replaced by an alternate technical elective. The three elective courses consist of one mathematics elective (3 credits), a field elective (3 credits), and a field design elective (3 credits). These electives are chosen from lists approved by the faculty of the Sibley School of Mechanical and Aerospace Engineering.

An additional graduation requirement of the field program is proof of elementary competence in technical drawing. This proof may be given in a number of ways, including satisfactory completion of

*a)* a technical drawing course in high school or in a community college

*b)* Engineering 102, Drawing and Engineering Design

*c)* another technical drawing course at Cornell, or

*d)* a departmental examination.

The proof is expected before completion of M&AE 325, Mechanical Design and Analysis.

The computer applications requirement of the Common Curriculum may be satisfied by several courses, including M&AE 489, 575, and 670.

The requirements listed are those currently in effect. Requirements for classes earlier than 1989 differ somewhat from the ones listed.

Introduction to Electrical Systems (EE 210) may be replaced or supplemented by Introductory Electronics (Physics 360).

A limited set of third-year courses is offered each summer under the auspices of the Engineering Cooperative Program.

More-detailed materials describing the field program and possible concentrations may be obtained from the Sibley School of Mechanical and Aerospace Engineering, Upson Hall.

## Preparation in Aerospace Engineering

Although there is no separate undergraduate program in aerospace engineering, students may prepare for a career in this area by majoring in mechanical engineering and taking a number of aerospace engineering electives such as M&AE 405, 506, 507, 530, 531, and 536. Students may prepare for the graduate program in aerospace engineering by majoring in mechanical engineering, in other appropriate engineering specialties such as electrical engineering or engineering physics, or in the physical sciences. Other subjects recommended as preparation for graduate study include thermodynamics, fluid mechanics, applied mathematics, chemistry, and physics.

## Master of Engineering (Aerospace) Degree Program

The M.Eng.(Aerospace) degree program provides a one-year course of study for those who want to develop a high level of competence in current technology and engineering design. This degree requires 30 credits of course work and is subject to the rules adopted by the Graduate Professional Program Committee. Because aerospace engineering is continually engaged in new areas, an essential guideline for the program is to reach beyond present-day practices and techniques. This is achieved by supplying the student with the fundamental background and the analytical techniques that will remain useful in all modern engineering developments. Aerospace students register for 1 credit a term on an S-U basis in M&AE Colloquium (M&AE 799). All other courses must have letter grades. To fulfill the design project requirement, students register for M&AE 592, Seminar and Design Project in Aerospace Engineering, for 2 credits a term. Other requirements are four aerospace core courses (minimum of 12 credits), two math courses (6 credits), and two technical electives (6 credits).

*Aerospace Core Courses*

3 credits:

M&AE 506, Aerospace Propulsion Systems

M&AE 507, Dynamics of Flight Vehicles

M&AE 530, Fluid Dynamics

M&AE 531, Boundary Layers

M&AE 536, Turbomachinery and Applications

M&AE 543, Combustion Processes

M&AE 559, Introduction to Controlled Fusion

M&AE 569, Mechanical and Aerospace Structures I

4 credits:

M&AE 601, Foundations of Fluid Dynamics and Aerodynamics

M&AE 602, Incompressible Aerodynamics

M&AE 603, Compressible Aerodynamics

M&AE 608, Physics of Fluids

M&AE 630, Atmospheric Turbulence and Micrometeorology

M&AE 648, Seminar on Combustion

M&AE 651, Advanced Heat Transfer

M&AE 652, Thermodynamics and Phase Change Heat Transfer

M&AE 653, Experimental Methods in Fluid Mechanics, Heat Transfer, and Combustion

M&AE 670, Mechanical and Aerospace Structures II

M&AE 704, Theory of Viscous Flows

M&AE 732, Analysis of Turbulent Flows

M&AE 733, Stability of Fluid Flow

M&AE 734, Turbulence and Turbulent Flow

M&AE 736, Computational Aerodynamics

M&AE 737, Computational Heat Transfer and Fluid Mechanics

Nominations of Special Committee chair (adviser) must be filed with the Graduate School within three weeks of the start of classes. A formal selection of course work for the term must be filed within three weeks of the start of classes. A program of courses must be submitted for committee approval by the end of the first week of classes.

The school has particular strengths in the areas of fluid dynamics, aerodynamics, high-temperature gasdynamics, turbulence, chemical kinetics, aerodynamic noise, sonic boom, nonlinear waves, atmospheric flows, combustion processes in low-pollution engines, and solution of flow problems by numerical methods. Professional design projects may be arranged in any of these areas.

### Master of Engineering (Mechanical) Degree Program

The M.Eng.(Mechanical) degree program provides a one-year course of study for those who want to develop a high level of competence in current technology and engineering design.

The program is designed to be flexible so that candidates may concentrate on any of a variety of specialty areas. These areas include biomechanical engineering, combustion, energy and power systems, fluid mechanics, heat transfer, materials and manufacturing engineering, mechanical systems and design, and CAD/CAM (computer-aided design/computer-aided manufacturing). An individual student's curriculum includes a 4-credit design course, a major consisting of a minimum of 12 credits, and sufficient technical electives to meet the degree requirement of 30 credits. Students register for 1 credit per term on an S–U basis in M&AE Colloquium (M&AE 799). The design course (M&AE 590) is a formal consideration of the complete design process, including planning, cost analysis, and analytical methods. Students conduct one or more specific projects during the course. These projects may arise from individual faculty interests or from collaboration with industry. In special cases a student may petition the Master of Engineering Committee of the Sibley School of Mechanical and Aerospace Engineering to replace the design course with an independent design project. Such a project must have a mechanical engineering design focus and have the close supervision of a faculty member.

A coordinated program of courses for the entire year is agreed upon by the student and the faculty adviser. This proposed program, together with a statement of overall objectives and a statement of purpose for the major, is submitted for approval to the Master of Engineering Committee at matriculation. Any subsequent changes must also be approved by this committee.

The courses that constitute the major must be graduate-level courses in mechanical and aerospace engineering or a closely related field such as theoretical and applied mechanics. At least 24 credits of the total for the degree must be in mechanical engineering or related areas, and in general all courses must be beyond the level of those required in the undergraduate program in mechanical engineering. Credit may be granted for an undergraduate, upper-level first course in some subject area if the student has done little or no previous work in that area, but such courses must have the special approval of the Master of Engineering Committee.

The technical electives may be courses of appropriate level in mathematics, physics, chemistry, or engineering; a maximum of 6 credits may be taken in areas other than these if the courses are part of a well-defined program leading to specific professional objectives. It is expected that all students will use technical electives to develop proficiency in mathematics beyond the minimum required of Cornell engineering undergraduates if they have not already done so before entering the program. Courses in advanced engineering mathematics or statistics are particularly recommended.

Students enrolled in the M.Eng.(Mechanical) program may take courses that also satisfy the requirements of the Cornell Manufacturing Engineering and Productivity Program (COMEPP), leading to a special dean's certificate in manufacturing engineering.

## NUCLEAR SCIENCE AND ENGINEERING

Faculty members in the graduate Field of Nuclear Science and Engineering who are most directly concerned with the Master of Engineering (Nuclear) curriculum include D. D. Clark (faculty representative), K. B. Cady, H. H. Fleischmann, D. A. Hammer, and V. O. Kostroun.

### Undergraduate Study

Although there is no special undergraduate field program in nuclear science and engineering, students who intend to enter graduate programs in this area are encouraged to begin specialization at the undergraduate level. This may be done by choice of electives within regular field programs (such as those in engineering physics, materials science and engineering, and civil, chemical, electrical, or mechanical engineering) or within the College Program.

### Master of Engineering (Nuclear) Degree Program

The two-term curriculum leading to the M.Eng.(Nuclear) degree is intended primarily for individuals who want a terminal professional degree, but it may also serve as preparation for doctoral study in nuclear science and engineering. The course of study covers the basic principles of nuclear reactor systems with a major emphasis on reactor safety and radiation protection and control. The special facilities of the Ward Laboratory of Nuclear Engineering are described in the *Announcement of the Graduate School.*

The interdisciplinary nature of nuclear engineering allows students to enter from a variety of undergraduate specializations. The recommended background is (1) an accredited baccalaureate degree in engineering, physics, or applied science; (2) physics, including atomic and nuclear physics; (3) mathematics, including advanced calculus; and (4) thermodynamics. Students should see that they fulfill these requirements before beginning the program. In some cases, deficiencies in preparatory work may be made up by informal study during the preceding summer. General admission and degree requirements are described in the college's introductory section.

The following courses are included in the 30-credit program:

*Fall term*

A&EP 609, Low-Energy Nuclear Physics

A&EP 612, Nuclear Reactor Theory

A&EP 633, Nuclear Engineering

Technical elective

*Spring term*

A&EP 651, Nuclear Measurements Laboratory

Technical elective

Engineering design project

Mathematics or physics elective

Engineering electives should be in a subject area relevant to nuclear engineering, such as energy conversion, radiation protection and control, feedback control systems, magnetohydrodynamics, controlled thermonuclear fusion, and environmental engineering. The list below gives typical electives.

M&AE 651, Advanced Heat Transfer

EE 581, Introduction to Plasma Physics

EE 582, Advanced Plasma Physics

EE 589 Magnetohydrodynamics

EE 471, Feedback Control Systems

EE 572, Digital Control Systems

A&EP 636, Seminar on Thermonuclear Fusion Reactors

A&EP 638, Intense Pulsed Electron and Ion Beams: Physics and Technology

NS&E 484, Introduction to Controlled Fusion: Principles and Technology

MS&E 459, Physics of Modern Materials Analysis

## OPERATIONS RESEARCH AND INDUSTRIAL ENGINEERING

J. A. Muckstadt, director; R. G. Bland, L. I. Weiss, associate directors; E. Arkin, R. R. Barton, R. E. Bechhofer, L. J. Billera, D. C. Heath, P. L. Jackson, W. L. Maxwell, J. S. B. Mitchell, N. U. Prabhu, J. Renegar, S. Resnick, R. Roundy, D. Ruppert, G. Samorodnitsky, T. J. Santner, L. W. Schruben, D. B. Shmoys, E. Tardos, M. J. Todd, L. E. Trotter, Jr., B. W. Turnbull

### Bachelor of Science Curriculum

The program is designed to provide a broad and basic education in the techniques and modeling concepts needed to analyze and

design complex systems and to provide an introduction to the technical and professional areas with which operations researchers and industrial engineers are concerned. An accelerated honors program is available for exceptional students interested in pursuing graduate studies.

A student who plans to enter the Field Program in Operations Research and Engineering should take Introductory Engineering Probability (Engr 260). For a student who has not taken Engr 260, entry into the field program in OR&E is possible only by permission of the associate director for undergraduate studies. In addition, it is recommended that Computers and Programming (CS 211 or Engr 211) be taken before entry into the OR&E field program. Early consultation with a faculty member of the school or with the associate director for undergraduate studies can be helpful in making appropriate choices. The required courses for the OR&E field program and the typical terms in which they are taken are as follows:

| *Term 5* | *Credits* |
|---|---|
| OR&IE 320, Optimization I | 4 |
| OR&IE 350, Cost Accounting, Analysis, and Control | 4 |
| OR&IE 361, Introductory Engineering Stochastic Processes | 4 |
| CS 211, Computers and Programming* | 3 |
| Course in humanities and social sciences | 3 |

*If CS 211 has already been taken, an appropriate 3- or 4-credit technical elective must be substituted.

| *Term 6* | |
|---|---|
| OR&IE 321, Optimization II | 4 |
| OR&IE 370, Introduction to Statistical Theory with Engineering Applications | 4 |
| OR&IE 410, Industrial Systems Analysis | 4 |
| Behavioral science† | 3 |
| Course in humanities and social sciences | 3 |

†The behavioral science requirement can be satisfied by any one of several courses of an advanced nature, including Graduate School of Management (GSM) NCC 504 (offered only in the fall), which is recommended for those contemplating the pursuit of a graduate business degree, and Industrial and Labor Relations 120, 121, 151, and 320. The adviser must approve the selection in all cases.

The basic senior-year program, from which individualized programs are developed, consists of the following courses:

| *Minimum credits* | |
|---|---|
| OR&IE 580, Digital Systems Simulation | 4 |
| Three upperclass OR&IE electives as described below | 9 |
| Two technical electives | 6 |
| Two courses in humanities and social sciences | 6 |
| Two free electives | 6 |

Available OR&E electives are as follows:

Industrial systems: OR&IE 416, 417, 421, 451, 525, and 562 and GSM NBA 601 and 641*

Optimization methods: OR&IE 431, 432, and 435

Applied probability and statistics: OR&IE 462, 471, 472, 561, 563, 565, and 577

*No more than one course in the Graduate School of Management may be taken as an OR&E elective.

Scholastic requirements for the field are a passing grade in every course, an overall average of at least 2.0 for each term the student is enrolled in the school, an average of 2.0 or better for OR&IE field courses, and satisfactory progress toward the completion of the degree requirements. The student's performance is reviewed at the conclusion of each term.

## Master of Engineering (OR&IE) Degree Program

This one-year professional degree program stresses applications of operations research and industrial engineering and requires completion of a project. The course work centers on additional study of analytical techniques, with particular emphasis on engineering applications, especially in the design of new or improved man-machine systems, information systems, and control systems.

General admission and degree requirements are described in the introductory "Degree Programs" section. The M.Eng.(OR&IE) program is integrated with the undergraduate Field Program in Operations Research and Industrial Engineering. Also welcome are requests for admission from Cornell undergraduates in engineering programs other than OR&E or from qualified non-Cornellians. To ensure completion of the program in one calendar year, the entering student should have completed courses in probability theory and basic probabilistic models and in computer programming and should have acquired some fundamental knowledge of economic concepts required for decision making. Students interested in the manufacturing systems engineering option and the manufacturing internship program should obtain further information regarding program requirements from the office of the Cornell Manufacturing Engineering and Productivity Program, 319 Upson Hall.

*I. For matriculants with preparation comparable to that provided by the undergraduate Field Program in Operations Research and Engineering:*

| *Fall term* | *Credits* |
|---|---|
| OR&IE 516, Case Studies | 4 |
| OR&IE 893, Applied OR&IE Colloquium | 1 |
| OR&IE 599, Project | 1 |
| Three technical electives | 9 |
| *Spring term* | |
| OR&IE 894, Applied OR&IE Colloquium | 1 |
| OR&IE 599, Project | minimum of 4 |
| Three technical electives | 9 |

The electives specified above will normally be chosen from graduate courses offered by the School of Operations Research and Industrial Engineering. A minimum of 30 credits must be taken to complete the program.

*II. For matriculants from other fields who minimally fulfill the prerequisite requirements (students who have the equivalent of OR&IE 370, 520, and 523 will take technical electives in their place):*

| *Fall term* | *Credits* |
|---|---|
| OR&IE 370, Introduction to Statistical Theory with Engineering Applications | 4 |
| OR&IE 520, Operations Research I | 4 |
| OR&IE 516, Case Studies | 4 |
| OR&IE 580, Digital Systems Simulation | 4 |
| OR&IE 893, Applied OR&IE Colloquium | 1 |
| OR&IE 599, Project | 1 |
| *Spring term* | *Credits* |
| OR&IE 523, Introduction to Stochastic Modeling | 4 |
| OR&IE 894, Applied OR&IE Colloquium | 1 |
| OR&IE 599, Project | minimum of 4 |
| Two technical electives | 6 |

Students fulfill the project requirement by working as part of a group of no more than four students on an operational systems problem that actually exists in some organization. Appropriate problems are suggested by manufacturing firms, retailing organizations, service organizations, government agencies, and educational institutions.

## Cooperative Program with the Johnson Graduate School of Management

Undergraduates majoring in operations research and engineering may be interested in a cooperative program at Cornell that leads to both Master of Engineering and Master of Business Administration (M.B.A.) degrees. With appropriate curriculum planning such a combined B.S./M.Eng./M.B.A. program can be completed in six years.

An advantage for OR&E majors is that they study, as part of their undergraduate curriculum, several subjects that are required for the M.B.A. degree. (This is because modern management is concerned with the operation of production and service systems, and much of the analytical methodology required to deal with operating decisions is the same as that used by systems engineers in designing these systems.) An early start on meeting the business-degree requirements permits students accepted into the cooperative program to earn both the M.Eng.(OR&IE) and M.B.A. degrees in two years rather than the three years such a program would normally take.

The details of planning courses for this program should be discussed with the admissions office of the Johnson Graduate School of Management.

In accordance with this program the candidate would qualify for the B.S. degree at the end of four years, the M.Eng.(OR&IE) degree at the end of five years, and the M.B.A. degree at the end of six years.

Further details and application forms may be obtained at the office of the School of Operations Research and Industrial Engineering, Upson Hall, and at the admissions office of the Johnson Graduate School of Management.

## STATISTICS CENTER

The Cornell Statistics Center coordinates a university-wide program in statistics and probability. Students interested in graduate study in probability and statistics should apply to the Field of Statistics or to one of the other graduate fields that offer related coursework.

A list of courses in probability and statistics recommended for graduate students in the Field of Statistics can be found in the description of the Cornell Center for Statistics in the section "Interdisciplinary Centers and Programs." Further information can be obtained from the director of the Statistics Center, George Casella, 272 Caldwell Hall.

## THEORETICAL AND APPLIED MECHANICS

J. A. Burns, chair; H. D. Conway, J. M. Guckenheimer, E. W. Hart, T. J. Healey, P. J. Holmes, C. Y. Hui, J. T. Jenkins, R. H. Lance, S. Mukherjee, Y. H. Pao, R. H. Rand, P. Rosakis, A. L. Ruina, W. H. Sachse, A. Zehnder

### Undergraduate Study

The Department of Theoretical and Applied Mechanics is responsible for courses in engineering mechanics and engineering mathematics, some of which are part of the Common Curriculum.

### College Program in Engineering Science

A student may enroll in the College Program in Engineering Science, which is sponsored by the Department of Theoretical and Applied Mechanics. The College Program is described in the section on undergraduate study in the College of Engineering.

## ENGINEERING COURSES

Courses offered in the College of Engineering are listed under the various departments and schools.

Courses are identified with a standard abbreviation followed by a three-digit number.

| | |
|---|---|
| Engineering Common Courses | Engr |
| Agricultural Engineering | ABEN |
| Applied and Engineering Physics | A&EP |
| Chemical Engineering | Chem E |
| Civil and Environmental Engineering | CEE |
| Computer Science | CS |
| Electrical Engineering | EE |
| Geological Sciences | Geol |
| Materials Science and Engineering | MS&E |
| Mechanical and Aerospace Engineering | M&AE |
| Nuclear Science and Engineering | NS&E |
| Operations Research and Industrial Engineering | OR&IE |
| Theoretical and Applied Mechanics | T&AM |

## ENGINEERING COMMON COURSES

### Courses of General Interest

**100 Introduction to Computer Programming (also CS 100)**
Fall, spring, summer. 4 credits. The course content is the same as that of CS 100.
2 lecs, 1 rec (optional), 3 evening exams.
An introduction to elementary computer programming concepts. Emphasis is on techniques of problem analysis and algorithm and program development. The subject of the course is programming, not a particular programming language. The principal programming language is Pascal. The course does not presume previous programming experience. An introduction to numerical computing is included, although no college-level mathematics is presumed. Programming assignments are tested and run on interactive, stand-alone microcomputers.

**101 The Computer Age (also CS 101)**
Fall, summer. 3 credits. Credit is granted for both CS 100 and 101 only if 101 is taken first.
2 lecs, 1 rec, 1 evening exam.
An introduction to computer science and programming for students in nontechnical areas. The aims of the course are to acquaint the student with the major ideas in computer science and to develop an appreciation of algorithmic thinking. Topics include the history of computation; microtechnology; the retrieval and transmission of information; scientific computing; computer graphics, art, and music; robotics, natural-language processing, and machine intelligence. Students become acquainted with the notion of an algorithm by writing several programs in Pascal or LISP and testing them on microcomputers. The amount of programming is about half that taught in Engr 100. Each student writes a term paper on some aspect of computing.

**102 Drawing and Engineering Design (also M&AE 102)**
Fall, spring. 1 credit. Half-term course offered twice each semester. Enrollment limited to thirty students each half term. Recommended for students without previous mechanical drawing experience. S-U grades optional.
2 lecs, 1 lab.
Introduction to drawing and graphic techniques useful in design, analysis, and presentation of ideas. Use of computer-aided drafting software is introduced in the final design project.

**250 Technology in Western Society (also EE 250)**
Fall. 3 credits. Meets humanities distribution requirement.
R. Kline.
A survey of the history of technology and engineering in Western society from the earliest times to the present. We will also compare Chinese and European technology prior to the Renaissance and will focus on American technology after 1800. The lectures and readings will address such themes as the relationship between science and technology, the development of the engineering profession, and the role of the government in supporting and regulating technological change. Special attention is given to the origins of the factory system, the microelectronics revolution, and the social responsibility of the engineer.

**292 The Electrical and Electronic Revolutions (also EE 292)**
Spring. 3 credits. Approved for humanities distribution, not for EE or as a technical elective.
R. Kline.
A survey of the history of electricity in society from the telegraph to the personal computer. The course considers both the technical and social history of telecommunication, the electric power industry, microelectronics, and computers. Emphasis is placed on the changing relationship between science and technology, the institutional context of research and development, and the electrical engineer and society.

**301 Writing in Engineering**
Fall and spring. Can be used to satisfy requirements in expressive arts or as a free or approved elective.
Offered only in conjunction with "writing-intensive" engineering courses. Faculty from the college's Writing Program prepare students for writing assignments and guide them through composing, drafting, editing, and revising. Strengthens understanding of the course materials and communication skills. Work is discussed in class and in individual conferences. May be taken more than once, with different engineering courses, but may not be taken independently.

**305 Social Issues in Computing (also CS 305)**
Spring. 3 credits. Prerequisite: CS 100 or 101 or permission of instructor. Not offered every year.
2 lecs.
Economic, political, legal, and cultural impact of computers and computer-related technology; the role of computers in coordinating diversity and reducing disorder; the effect of computers on the individual; data banks and privacy; machine creativity and machine intelligence.

**321 Microeconomic Analysis (also CEE 321 and Economics 313, section 5)**
Fall. 4 credits. Prerequisite: one semester of calculus. A social science elective for engineering students.
R. E. Schuler.
Intermediate microeconomic analysis similar to Economics 313 but emphasizing mathematical techniques and engineering-design implications. Theory of consumer choice and efficient production; analysis of monopoly and competitive markets; theories of distribution, market equilibrium, and welfare economics.

**322 Economic Analysis of Government (also CEE 322 and Economics 308)**
Spring. 4 credits. Prerequisites: one semester of calculus, plus CEE 321 or Economics 313. A social science elective for engineering students.
R. E. Schuler.
Analysis of government intervention in a market economy and implications for engineering planning and design. Market imperfections, public goods and public decision making, public finance, cost-benefit analysis of government projects, environmental regulation, risk management, and macroeconomic topics.

**323 Engineering Economics and Management (also CEE 323)**
Spring. 3 credits. Primarily for juniors and seniors.
D. P. Loucks.
Introduction to engineering and business economics and to methods of operations research. Intended to give students a working knowledge of money management and how to make economic comparisons of alternative engineering designs or projects. Project management, inflation, taxation, depreciation, financial planning, and basic operations-research techniques of simulation and optimization are discussed.

**350 Engineering Communications**
Fall and spring. 3 credits. Limited to 17 students.
Instruction and practice in written, oral, and visual presentation. Communications in real-life engineering contexts are analyzed; assignments include case studies or problems which resemble actual engineering work. The class also considers the social and ethical implications of communications. By composing letters, memoranda, summaries, instructions, explanations, proposals, and reports, students learn to address audiences having different levels of technical expertise. Some assignments include oral or graphic presentation. The goal throughout is clear, well-organized, responsible, and graceful professional communication.

**360 Ethical Issues in Engineering**
Spring. 3 credits. A social-science elective for engineering students. Open to juniors and seniors.
3 lecs.
A discussion of ethical issues encountered in engineering practice, such as the rights of engineers in corporations, responsibility for harmful actions, whistleblowing, conflicts of interest, and decision making based on cost-benefit analysis. Use of codes of ethics of professional engineering societies and ethical theory to help sort conflicting obligations the engineer may feel toward public safety, professional standards, employers, colleagues, and family. Students will present a case study to the class, along the lines of the Space-Shuttle Challenger disaster, the Kansas City Hyatt-Regency Hotel walkway failure, or the Ford Pinto gas-tank design.

**[400 Science, Risk, and Public Policy (also T&AM 400 and Economics 358)**
Fall. 3 credits. Not offered 1989–90.
The scientific and humanistic bases of risk assessment and management, examined from a variety of perspectives. Emphasis on the measurement of natural and social phenomena; the psychological and political components in assessing the human and economic costs of risk; and the policies that individuals, institutions, and governments establish to manage risks.]

**454 Introduction to Solar Energy**
Summer. 3 credits. No prerequisites. Not accepted as a technical or field elective for mechanical engineers.
B. Conta.
The elements of thermodynamics and heat transfer necessary for the study of solar energy utilization. Fundamentals of solar radiation. Direct solar radiation as a source of heat and electrical energy. The direct use of solar radiation; water, wind, and biomass. Applications to solar architecture and environmental control by both active and passive means.

## Introduction to Engineering Courses

**110 The Laser and Its Applications in Technology, Science, and Medicine (also A&EP 110)**
Fall, spring. 3 credits.
2 lecs, 1 lab.
The principles of laser action, types of laser systems, elements of laser design, and applications of lasers in science, technology, and medicine are discussed. In the laboratory students build and operate a nitrogen laser and a tunable dye laser. Demonstration experiments with several types of lasers illustrate phenomena such as holography, laser-induced chemistry, Raman spectroscopy, frequency doubling, and interferometry. Guest lectures by prominent medical and industrial scientists introduce students to current fields of laser application and research.

**111 Elements of Materials Science and Engineering (also MS&E 201)**
Fall, spring. 3 credits.
Autotutorial.
Relations between atomic structure and macroscopic properties of such diverse materials as metals, ceramics, and polymers. Properties discussed include magnetism, superconductivity, insulation, semiconductivity, mechanical strength, and plasticity. Design problems involving microelectronics, desalinization by reverse osmosis, superconducting power transmission lines, synthetic bones and joints, etc.

**112 Introduction to Chemical Engineering (also Chem E 112)**
Fall, spring. 3 credits. Limited to freshmen.
2 lecs, 1 rec. F. Rodriguez and staff.
This course is designed to acquaint students with the scope of chemical engineering. Topics such as polymers, fluid flow, and plant design will be introduced at an elementary level. Quantitative discussions buttressed by lecture demonstrations will show how the engineering approach differs from a purely scientific one. The rapid solving of numerical problems is emphasized in homework and on tests.

**[113 Computer-aided Design in Environmental Systems (also CEE 113)**
Fall. 3 credits. Not offered 1989–90.
3 lecs. A. H. Meyburg.
Planning, design, and management of environmental systems. Emphasis on use of computer-aided techniques, including interactive computer graphics. Sample problems will include transportation network design and water quality management. The objective of the course is to provide students with an opportunity to experiment with alternative design and management strategies in several areas of environmental engineering.]

**115 Engineering Application of Operations Research (also OR&IE 115)**
Fall, spring. 3 credits.
2 lecs, 1 lab.
Techniques for optimal decision making and engineering design. Computer graphics and mathematical modeling. Allocation of scarce resources, simulation of complex systems, design and analysis of networks, strategies in competitive games. Engineering applications and problem solving will be stressed.

**116 Modern Structures (also CEE 116)**
Spring. 3 credits.
2 lecs, 1 sec. G. G. Deierlein.
An introduction to the basic principles of structural engineering and to structural forms. Emphasis is placed on how various types of structures carry loads. Concepts are illustrated by a series of case studies of major structures such as spacecraft, skyscrapers, bridges, shell structures, and dams. The philosophy of engineering design and lessons learned from structural failures are discussed. The Computer-Aided Design Instructional Facility (CADIF) and the Craig Miller Laboratory for Structural Modeling in Hollister Hall are used to demonstrate how engineering materials and structures behave under load. A semester project involves the design and construction of a small balsa-wood bridge.

**117 Introduction to Mechanical Engineering (also M&AE 117)**
Fall. 3 credits. Consists of two half-term minicourses chosen from a list of three. Two of these minicourses alternate; the third (Drawing and Engineering Design) is offered every half term but has limited enrollment.
2 lecs, 1 lab.
Drawing and Engineering Design (see Engr 102) will enable students without prior mechanical drawing experience to understand and create basic engineering graphics. The other two minicourses provide an introduction to topics of current interest typifying two broad areas within mechanical engineering: energy conversion, and mechanical design and manufacturing.

**119 Introduction to Manufacturing Engineering (also M&AE 119 and OR&IE 119)**
Spring. 3 credits.
2 lecs, 1 lab.
Engineering considerations in the design, manufacturing, distribution, and service of products. Transformation from functional requirements to material and processing techniques. Engineering problems in the design and management of a manufacturing facility and distribution channels. Visits may be made to local industries.

**121 Fission, Fusion, and Radiation (also NS&E 121)**
Spring. 3 credits.
2 lecs, 1 lab demonstration.
A lecture, demonstration, and laboratory course on (1) the physical nature and biological effects of nuclear radiation; (2) the benefits and hazards of nuclear energy; (3) light-water reactors, breeder reactors, and fusion reactors; and (4) the uses of nuclear radiation in physical and biological research. The laboratory work and demonstrations involve criticality and the control of Cornell's two research reactors; detection of, and protection against, nuclear radiation; neutron activation analysis using gamma-ray spectroscopy; and plasma sources and devices.

**123 Sensors and Actuators**
Fall. 3 credits.
2 lecs, 1 lab.
A sensor or an actuator is the element by which information is converted from one form of energy to another. It is the key component in all measurement and control systems. This course will focus on the operational features of a wide variety of sensors and actuators that are used in scientific and engineering metrology, in industrial process control applications, and in consumer products. The devices may be based on electrical, mechanical, acoustical, optical, and thermal phenomena. Students will measure the parameters of various thermo-mechanical sensors and actuators and they will be expected to design, fabricate, and verify the operation of a sensor meeting specific design objectives.

## Engineering Distribution Courses

**201 Introduction to the Physics and Chemistry of the Earth (also Geol 201)**
Spring. 3 credits. Prerequisites: Mathematics 191, Physics 112, and Chemistry 207.
2 lecs; 1 rec, lab, or field trip. L. M. Cathles.
Formation of the solar system, accretion and evolution of the earth, radioactive isotopes and the geological time scale, rocks and minerals, the continents and the oceans, erosion and sedimentation, weathering processes, the earth as a heat engine, volcanism, seismology, gravity, magnetism, plate tectonics, deformation of the earth's crust, comparative planetology.

**202 Mechanics of Solids**
Fall, spring. 3 credits. Prerequisite: coregistration in Mathematics 293.
2 lecs, 1 rec, 4 labs each semester, evening exams.
Principles of statics, force systems, and equilibrium; frameworks; mechanics of deformable solids, stress, strain, statically indeterminate problems; mechanical properties of engineering materials; axial force, shearing force, bending moment, plane stress; Mohr's circle; bending and torsion of bars; buckling and plastic behavior.

**203 Dynamics**
Fall, spring. 3 credits. Prerequisite: coregistration in Mathematics 294.
2 lecs, 1 rec, 4 labs each semester, evening exams.
Newtonian dynamics of a particle, systems of particles, a rigid body. Kinematics, motion relative to a moving frame. Impulse, momentum, angular momentum, energy. Rigid-body kinematics, angular velocity, moment of momentum, the inertia tensor. Euler equations, the gyroscope.

**210 Introduction to Electrical Systems (also EE 210)**
Fall, spring. 3 credits. Prerequisites or corequisites: Mathematics 293 and Physics 213.
3 lecs and optional tutorial secs.
Circuit elements and laws, analysis techniques, operational amplifiers. Response of linear systems, with an introduction to complex frequency and phasors, forced response, average power, transfer function, pole-zero concepts, and the frequency spectrum. Terminal characteristics of diodes and transistors, linear models, bias circuits, and frequency response of small-signal amplifiers.

**211 Computers and Programming (also CS 211)**
Fall, spring, summer. 3 credits. Prerequisite: CS 100 or equivalent programming experience.
2 lecs, 1 rec, 2 evening exams.
Intermediate programming in a high-level language and introduction to computer science. Topics include program development, proofs of program correctness, program structure, recursion, abstract data types, data structures, and analysis of algorithms. Pascal is the principal programming language.

**219, 220 Mass and Energy Balances (also Chem E 219, 220)**
219, fall; 220, spring, summer. 3 credits. Corequisite: physical or organic chemistry; 220 is intended for transfer students who cannot take 219 and requires permission of instructor.
G. F. Scheele.
Engineering problems involving material and energy balances. Batch and continuous reactive systems in the steady and unsteady states. Humidification processes. Chem E 220 differs from 219 in that it uses *only self-paced audiovisual instruction at the convenience of the student.* A minimum of seventy clock hours of audiovisual instruction is required to master the subject matter. Student performance in 220 is evaluated by nine tests, two preliminary examinations, and a final examination; superior students may earn exemption from the final examination.

**221 Thermodynamics**
Fall, spring. 3 credits. Prerequisites: Mathematics 192 and Physics 112.
3 lecs.
The definitions, concepts, and laws of thermodynamics. Applications to ideal and real gases, multiphase pure substances, gaseous reactions. Heat-engine and heat-pump cycles, with an introduction to energy-conversion systems.

**222 Introduction to Scientific Computation (also CS 222)**
Spring. 3 credits. Prerequisites: CS 100 and Mathematics 112, 122, or 192.
2 lecs, 3 evening exams.
Students write FORTRAN programs to solve representative problems from elementary calculus. Emphasis is on the design of numerical software that is efficient, reliable, stable, and portable. Special topics include supercomputing and parallel computation.

**241 Engineering Computation (also CEE 241)**
Fall, spring. 3 credits. Prerequisites: CS 100 and Mathematics 293. Corequisite: Mathematics 294.
J. R. Stedinger, J. F. Abel.
This course develops FORTRAN programming proficiency and provides exposure to engineering computation. Numerical methods for solving engineering problems covered in the course address Taylor-series approximations, truncation and roundoff errors, roots of functions, solution of simultaneous linear equations, interpolation, numerical differentiation and integration, and solution of ordinary and of some partial differential equations. Applications are drawn from different areas of engineering.

**260 Introductory Engineering Probability (also OR&IE 260)**
Fall, spring. 3 credits. Prerequisite: first-year calculus.
3 lecs.
The basic tools of probability and their use in engineering. This may be the last course in probability for some students, or it may be followed by OR&IE 361, Introductory Engineering, Stochastic Processes I, or by OR&IE 370, Introduction to Statistical Theory with Engineering Applications. Definition of probability; random variables; probability distributions, density functions, expected values; jointly distributed random variables; distributions such as the binomial, Poisson, and exponential that are important in engineering and how they arise in practice; limit theorems.

**261 Introduction to Mechanical Properties of Materials**
Fall, spring. 3 credits.
2 lecs, 1 rec or lab.
The relation of elastic deformation, plastic deformation, and fracture properties to structure and defects on a microscopic scale in metals, ceramics, polymers, and composite materials. Design and processing of materials to achieve high modulus, damping capacity, hardness, fracture strength, creep resistance, or fatigue resistance. Flaw-tolerant design methods using fracture mechanics.

**262 Introduction to Electrical Properties of Materials**
Spring. 3 credits.
2 lecs, 1 rec or lab.
Electrical and structural properties of semiconductors, the operation of p-n junctions and transistors, and the processing methods used to form modern integrated circuits. Electrical conduction in metal films, semiconductors, bipolar and field-effect transistors and light-emitting diodes. Diffusion, ion implantation, oxidation, metallization, and other process steps in fabricating semiconductor devices. Interplay between structural and electrical properties and their application to the design of semiconductor devices and integrated circuits.

**264 Computerized-Instrumentation Design (also A&EP 264)**
Fall, spring. 3 credits. Prerequisites: Engr 100 or CS 100.
1 lec, 1 lab.
Design techniques for incorporating small computers into experimental apparatus. Experiments in elementary physics are performed with appropriate sensors wired to computer interfaces, under program control that employs routines written in BASIC and ASSEMBLY languages. Analog-to-digital converters, digital-to-analog converters, optical encoders, and stepping motors are used. Graphic display of data and theoretical fit are emphasized.

**270 Basic Engineering Probability and Statistics**
Fall, spring. 3 credits. Students who intend to enter the upperclass Field Program in Operations Research and Industrial Engineering should take Engr 260 instead of this course. Prerequisite: first-year calculus.
3 lecs, evening prelims.
At the end of this course a student should command a working knowledge of basic probability and statistics as they apply to engineering work. For students who want to have greater depth in probability and statistics, a course in probability (OR&IE 260) followed by a course in statistics (OR&IE 370) is recommended.

**285 Art, Isotopes, and Analysis (also MS&E 285)**
Spring. 3 credits.
J. W. Mayer, S. Taft, D. Eddy.
The analysis of paintings and rare books and the physical concepts underlying modern analytical techniques. Each week a work of art will be discussed, focusing on the historical and technical aspects of its creation and modern analysis of it. Visual, infra-red, and x-ray examinations provide insight into the physical properties. Pigments are identified by the radiation emitted in electronic transitions. The ratio of isotopes can be used to identify the geographical origin of a particular pigment as well as a dating method. Examples will be given of authentification and conservation.

## AGRICULTURAL AND BIOLOGICAL ENGINEERING

Courses in agricultural and biological engineering will be found in the section listing the offerings of the College of Agriculture and Life Sciences.

## APPLIED AND ENGINEERING PHYSICS

**110 The Laser and Its Applications in Science, Technology, and Medicine (also Engr 110)**
Fall, spring. 3 credits. This is a course in the Introduction to Engineering series.
2 lecs, 1 lab.
For description see Engineering Common Courses.

**264 Computerized-Instrumentation Design (also Engr 264) Fall, spring. 3 credits. Prerequisites: Engr 100 or CS 100.**
1 lec, 1 lab.
For description see Engineering Common Courses.

**303 Introduction to Nuclear Science and Engineering I (also NS&E 303)**
Fall. 3 credits. Prerequisite: Physics 214 or Mathematics 294.
3 lecs. V. O. Kostroun.
For description see NS&E 303.

**321 Mathematical Physics I**
Fall. 4 credits. Prerequisite: Math 294. Intended for upper-level undergraduates in the physical sciences.
4 lecs.
Review of vector analysis; complex variable theory, Cauchy-Rieman conditions, complex Taylor and Laurent series, Cauchy integral formula and residue techniques, conformal mapping; Fourier Series; Fourier and Laplace transforms; ordinary differential equations, Green's functions, Bessel functions. Texts: *Mathematical Methods for Physicists*, by Arfken; *Mathematical Physics*, by Butkov.

**322 Mathematical Physics II**
Spring. 4 credits. Prerequisite: A&EP 321. Second of the two-course sequence in mathematical physics intended for upper-level undergraduates in the physical sciences.
4 lecs.
Partial differential equations, separation of variables, wave and diffusion equations, Laplace, Helmholtz and Poisson's Equations, transform techniques, Green's functions; integral equations, Fredholm equations, kernals; complex variables, theory, branch points and cuts, Rieman sheets, method of steepest descent; tensors, contravariant and covariant representations; group theory, matrix representations, class and character. Texts: *Mathematical Methods for Physicists*, by Arfken; *Mathematical Physics*, by Butkov.

**333 Mechanics of Particles and Solid Bodies**
Fall. 4 credits. Prerequisites: Physics 112 and coregistration in A&EP 321 or equivalent or permission of instructor.
3 lecs, 1 rec.
Newton's mechanics; linear oscillations; Lagrangian and Hamiltonian formalism for generalized coordinates and constrained motion; non-inertial reference systems; central-force motion; motion of rigid bodies; small vibrations in multi-mass systems; nonlinear oscillations; basic introduction to relativistic mechanics. Emphasis on physical concepts and applications. (On the level of *Classical Dynamics*, by Marion).

**355 Intermediate Electromagnetism**
Fall. 4 credits. Prerequisites: Physics 214 and coregistration in A&EP 321 or equivalent, or permission of instructor.
3 lecs, 1 rec.
Topics: vector calculus, electrostatics, magnetostatics, and induction phenomena; solutions to Laplace's equation in various geometries, electric and magnetic materials, electric and magnetic forces, energy storage, skin effect, quasistatics. Emphasis on physical concepts and applications to design of high-voltage generators, electron guns, and particle accelerators.

**356 Intermediate Electrodynamics**
Spring. 4 credits. Prerequisite: A&EP 355 and coregistration in A&EP 322 or equivalent, or permission of instructor.
3 lecs, 1 rec.
Topics: electromagnetic wave phenomena, transmission lines, waveguides, dispersive media, scattering, radiation, reciprocity, physical optics, special relativity. Emphasis on physical concepts and their application to the design of microwave circuits, antenna arrays, and optically coupled systems.

**361 Introductory Quantum Mechanics**
Spring. 4 credits. Prerequisites: A&EP 333 or Physics 318; coregistration in A&EP 322 or equivalent and in A&EP 356 or Physics 326.
3 lecs, 1 rec.
A first course in the systematic theory of quantum phenomena. Topics include the harmonic oscillator, the Dirac formalism, angular momentum, the hydrogen atom, and perturbation theory. Analytical solutions of the Schroedinger equation are supplemented with numerical solutions on a microcomputer.

**363 Electronic Circuits (also Physics 360)**
Fall, spring. 4 credits. Prerequisite: Physics 208 or 213 or permission of instructor; no previous experience with electronics is assumed. Fall term is generally less crowded.
1 lec, 2 labs.
This laboratory course focuses on designing, building, and testing analog, digital, and microprocessor-based circuits that are useful in electronic instrumentation. Analog topics include basic circuit concepts, applications of operational amplifiers in linear circuits, oscillators and comparators, transistor circuits and diodes in power supplies, waveform-shaping circuits, and protective circuits. Students also design and build digital circuits that incorporate Schmidt triggers, comparators, and combinatorial and sequential logic using meduim-scale integrated circuits. The above circuits are also interfaced to a microprocessor whose architecture, machine instruction set, and programming principles are studied. At the level of *Art of Electronics*, by Horowitz and Hill.

**423 Statistical Thermodynamics**
Spring. 4 credits. Prerequisite: Engr 221 for engineering physics seniors; others by permission of instructor.
3 lecs, 1 rec.
Quantum statistical basis for equilibrium thermodynamics, canonical and grand canonical ensembles, and partition functions. Quantum and classical ideal gases and paramagnetic systems. Fermi-Dirac, Bose-Einstein, and Maxwell-Boltzmann statistics. Introduction to systems of interacting particles. At the level of *Thermal Physics*, by Kittel, and *Statistical Physics*, by Mandl.

**434 Continuum Physics**
Fall. 4 credits. Prerequisites: A&EP 333 and 356 or equivalent.
3 lecs, 1 rec.
Local conservation laws; stress, strain, and rate-of-strain tensors; equations of motion for elastic and viscous response; waves in solids and fluids; dislocations; ideal fluids, potential flow, Bernouli's equation, vorticity and circulation, lift; viscous incompressible flow and the Navier-Stokes equations, Reynolds number, Poiseuille flow in a pipe, Stokes drag on a sphere; boundary layers, Blasius equations; flow instabilities, Rayleigh-Benard convection and the onset of chaotic flow. Introduction to turbulent flow.

**436 Physical and Integrated Optics**
Spring. 4 credits. Prerequisite: A&EP 355.
3 lecs, 1 lab.
The fundamentals of optics: diffraction, polarization, interference, birefringence, scattering, Fourier optics. Applications to optical waveguides, nonlinear optics, integrated optics, optical storage, coherent detection, optical communications. Emphasis on hands-on experimental laboratory demonstrations and computer synthesis of optical phenomena.

**490 Informal Study in Engineering Physics**
Credit to be arranged.
Laboratory or theoretical work in any branch of engineering physics under the direction of a member of the staff. The study can take a number for forms; for example, design of laboratory apparatus, performance of laboratory measurements, or theoretical design or analysis. Details to be arranged with respective staff member.

**606 Introduction to Plasma Physics (also EE 581)**
Fall. 4 credits. Prerequisites: A&EP 355 or 356 or equivalent. Open to fourth-year students with permission of instructor.
3 lecs.
Motion of charged particles in fields, collisions, plasma waves, Boltzmann equation, microinstabilities, Landau damping, introduction to kinetic theory, introduction to M.H.D., single-fluid equations, Tokamak equilibrium, and stability.

**607 Advanced Plasma Physics (also EE 582)**
Spring. 4 credits. Prerequisite: A&EP 606.
3 lecs.
Boltzmann and Vlasov equations; waves in hot plasmas; Landau damping, microinstabilities; drift waves, low-frequency stability, collisional effects; method of dressed test particles; high-frequency conductivity and fluctuations; neoclassical toroidal diffusion, high-powered beams.

**608 Plasma Astrophysics (also Astronomy 660)**
Spring. 2 credits.
Selected topics discussed in detail: (a) the solar corona and the solar wind, (b) hydrodynamic and magnetohydrodynamic flows around compact objects in galactic nuclei, (c) global electrodynamics of double radio sources.

**609 Low-Energy Nuclear Physics**
Fall. 4 credits. Prerequisite: an introductory course in modern physics, including quantum mechanics.
3 lecs.
The nuclear interaction. Properties of ground and excited states of nuclei; models of nuclear structure; alpha, beta, gamma radioactivity; low-energy nuclear reactions—resonant and nonresonant scattering, absorption, and fission. At the level of *Introduction to Nuclear Physics*, by Enge.

**612 Nuclear Reactor Theory**
Fall. 4 credits. Prerequisites: a year of advanced calculus and some nuclear physics.
3 lecs.
Physical theory of fission reactors. Fission and neutron interactions with matter; theory of neutron diffusion; slowing down and thermalization; calculations of criticality and neutron flux distribution in nuclear reactors. Reactor kinetics. At the level of *Nuclear Reactor Theory*, by Lamarsh.

**614 Special Topics in Biophysics**
Topics, credits, and schedule to be announced. Seminars on selected topics of current interest in biophysics research.

**615 Membrane Biophysics**
Fall. 3 credits.
Molecular structure and supramolecular organization of cell membranes. Model membranes and membrane models. Molecular mechanisms of membrane transport, electrophysiology and cell-cell interaction, molecular channels. Physical probes of membrane processes. Dynamics of membrane processes, lateral mobility, diffusion, and flow. Some current problems in cell-surface function and organization of specialized membrane macrostructures.

**[622 Electron Optics**
Spring. 3 credits. Offered alternate years. Not offered 1989–90.
Basic electron optics with emphasis on the fundamental principles of the production and focusing of charged-particle beams. Special consideration is given to the optics appropriate for beam transport and probe forming systems and systems useful in materials characterization. Included are discussions of the calculation of trajectories in multicomponent optical systems, comprehensive treatments of optical aberrations, and practical considerations of electron optical design.]

**633 Nuclear Engineering**
Fall. 4 credits. Prerequisite: introductory course in nuclear engineering.
The fundamentals of nuclear reactor engineering, reactor siting and safety, fluid flow and heat transfer, control, and radiation protection.

**634 Nuclear Engineering Design Seminar**
Spring. 4 credits. Prerequisite: A&EP 633.
A group design study of a selected nuclear system. Emphasis is on safety, siting, and radiation protection in the design of nuclear systems.

**636 Seminar on Thermonuclear Fusion Reactors**
Fall. 3 credits. Prerequisite: basic course in plasma physics or nuclear reactor engineering, or permission of instructor. Offered alternate years.
Analysis of various technological and engineering problems in design and construction of fusion reactors. Topics include basic reactor schemes, materials, mechanical and heat-transfer problems, radiation and safety, superconducting magnets, energy conversion, plasma impurities, and economics.

**638 Intense Pulsed Electron and Ion Beams: Physics and Technology**
Spring. 2 credits. Prerequisites: A&EP 606 (EE 581) and 607 (EE 582) or equivalent, or permission of instructor. Offered alternate years.
D. A. Hammer.
Topics include (1) theoretical aspects of intense electron and ion beams, such as equilibria and stability; (2) technology of intense beam production, such as pulsed-power generator principles, and electron and ion diode operation; and (3) applications of intense beams, such as to controlled fusion, microwave generation, and laser pumping. Extensive discussion of experimental results.

**651 Nuclear Measurements Laboratory**
Spring. 4 credits. Prerequisite: A&EP 609 or equivalent. Primarily for graduate students in nuclear fields. A less-intensive related course, NS&E 551, which has the same lecture but has only one lab period, is intended for students in non-nuclear fields in which nuclear methods are used
One 2-hour lecture and two 1/2 hour labs. D. D. Clark.
Lectures on interaction of radiation with matter, radiation protection, and nuclear instruments and methods. About fifteen experiments are available in radiation detection, attenuation, and measurement; electronic instrumentation, including computerized systems; activation analysis; neutron radiography; neutron moderation and reactor physics; neutron diffraction; and low-energy nuclear physics with neutron beams. The TRIGA reactor and the Zero Power Reactor critical facility are used. The student selects seven or eight experiments to meet his interests and needs. At the level of Radiation Detection and Measurement, by Knoll.

**661 Microcharacterization**
Fall. 3 credits. Prerequisites: Physics 112, 213, and 214, or an introductory course in modern physics.
The basic physical principles underlying the many modern microanalytical techniques available for characterizing materials from volumes less than a cubic micron. Discussion centers on the physics of the interaction process by which the characterizatation is performed, the methodology used in performing the characterization, the advantages and limitations of each technique, and the instrumentation involved in each characterization method.

**662 Microprocessing of Materials**
Spring. 3 credits.
Several field trips.
An introduction to the fundamentals of fabricating and patterning thin-film materials and surfaces, with emphasis on electronic materials. Vacuum and plasma thin-film deposition processes. Photon, electron, X-ray, and ion-beam lithography. Techniques for pattern replication by plasma and ion processes. Emphasis is on understanding the physics and materials science that define and limit the various processes.

**681–689 Special Topics in Applied Physics**
Topics, instructors, and credits to be announced each term. Typical topics include quantum superconducting devices, physics of submicron conductors, nonlinear fluctuators, biophysical processes, molecular fluorescence.

**711 Principles of Diffraction (also MS&E 610)**
Fall. 3 credits.
B. W. Batterman.
Introduction to diffraction phenomena as applied to solid-state problems. Scattering and absorption of neutrons, electrons, and X-ray beams, with particular emphasis on synchrotron radiation X-ray sources. Diffraction from two- and three-dimensional periodic lattices. Fourier representation of scattering centers and the effect of thermal vibrations. Diffraction from almost periodic structures, surface layers, gases, and amorphous materials. Survey of dynamical diffraction from perfect and imperfect lattices. Several laboratory experiments will be conducted.

**751, 752 Project**
751, fall; 752, spring. Credit to be arranged. Required for candidates for the M.Eng. (Engineering Physics) degree.
Informal study under the direction of a member of the university staff. Students are offered research experience through work on a special problem related to their field of interest.

**753 Special Topics Seminar in Applied Physics**
Fall. 4 credits. Prerequisite: undergraduate physics. Required for candidates for the M.Eng. (Engineering Physics) degree and recommended for seniors in engineering physics.
Special topics in applied science, with focus on areas of applied physics and engineering that are of current interest. Subjects chosen are researched in the library and presented in a seminar format by the students. Effort is made to integrate the subjects within selected areas of atomic, plasma, biological, and solid-state physics, as suggested by the students and coordinated by the instructor.

**761 Kinetic Theory (also EE 681)**
Fall. 3 credits. Prerequisite: EE 407, Physics 561, or permission of instructor. Offered alternate years.
2 lecs.
For description see EE 681.

**762 Physics of Solid Surfaces and Interfaces**
Fall. 3 or 4 credits. Lecture course primarily for graduate and qualified senior students. Primarily for beginning graduate students and seniors. Similar to MS&E 703. Offered alternate years.
T. N. Rhodin.
An experimental approach connecting the basic physics and chemistry of electron and atomic structure with processes at surfaces and interfaces. A critical perspective on principles, with an emphasis on applications and devices from an applied-physics viewpoint. Principles involved in characterization will be discussed more than techniques and equipment. Specific concepts and phenomena will be emphasized, and only those theories and models required for their analysis will be covered. Topics include ultrahigh vacuum, surface crystallography, measurement concepts, gas-solid surfaces, solid-solid interfaces, atomic structure, surface reconstruction, electronic processes, chemical bonding, physical and chemical adsorption, nucleation and growth, particle-solid phenomena, and radiation–solid interface phenomena. Typical text could be *Physics at Surfaces* by Zangwill.

## CHEMICAL ENGINEERING

**101 Nonresident Lectures**
Spring. No credit.
1 lec. G. F. Scheele.
Given by lecturers invited from industry and from selected departments of the university to assist students in their transition from college to industrial life.

**112 Introduction to Chemical Engineering (also Engr 112)**
Fall, spring. 3 credits. Limited to freshmen.
2 lecs, 1 rec. F. Rodriguez and staff.
For description see Engineering Common Courses.

**219 Mass and Energy Balances (also Engr 219)**
Fall. 3 credits. Corequisite: physical or organic chemistry or permission of instructor.
3 lecs. 1 computing session. Staff.
For description see Engineering Common Courses.

**220 Mass and Energy Balances (also Engr 220)**
Spring, summer. 3 credits. Corequisite: physical or organic chemistry and permission of instructor. Intended for students who cannot take Chem E 219.
G. F. Scheele.
Self-paced audiovisual instruction in the material of Chem E 219. For description see Engineering Common Courses.

**313 Chemical Engineering Thermodynamics**
Fall. 4 credits. Corequisite: physical chemistry.
4 lecs, 1 computing session. P. Clancy.
A study of the first and second laws, with application to batch and flow processes. Thermodynamic properties of fluids; applications of thermodynamics to compressors, power cycles, refrigeration; thermodynamic analysis of processes. Thermodynamics of mixtures, phase equilibria and phase diagrams. Estimation methods. Heat effects, chemical equilibria.

**323 Fluid Mechanics**
Fall. 3 credits. Prerequisites: Chem E 219 and engineering mathematics sequence.
3 lecs, 1 computing session. P. H. Steen.
Fundamentals of fluid mechanics. Macroscopic and microscopic balances. Applications to problems involving viscous flow.

**324 Heat and Mass Transfer**
Spring. 3 credits. Prerequisite: Chem E 323.
3 lecs, 1 computing session.
D. A. Hammer.
Fundamentals of heat and mass transfer. Macroscopic and microscopic balances. Applications to problems involving conduction, convection, and diffusion.

**332 Analysis of Separation Processes**
Spring. 4 credits. Prerequisites: Chem E 313 and 323.
3 lecs, 1 computing session.
G. F. Scheele.
Analysis of separation processes involving phase equilibria and rate of mass transfer; some use of the digital computer. Phase equilibria; binary, multicomponent, and extractive distillation; liquid-liquid extraction; gas absorption.

**390 Reaction Kinetics and Reactor Design**
Spring. 3 credits. Prerequisites: Chem E 313 and 323.
3 lecs. A. B. Anton.
A study of chemical reaction kinetics and principles of reactor design for chemical processes.

**432 Chemical Engineering Laboratory**
Fall. 4 credits. Prerequisites: Chem E 323, 324, 332, and 390.
2 lecs, 1 lab. Staff.
Laboratory experiments in fluid dynamics, heat and mass transfer, other operations. Correlation and interpretation of data. Technical report writing.

**462 Chemical Process Design**
Spring. 4 credits. Prerequisite: Chem E 432.
Staff.
A consideration of process and economic alternatives in selected chemical processes; design and assessment.

**472 Process Control**
Spring. 3 credits. Prerequisites: Chem E 324 and 390.
3 lecs, 1 lab. P. Clark.
Analysis of the dynamics of chemical processes and design of feedback control systems with emphasis on control of chemical reactors and separation systems.

**490 Undergraduate Projects in Chemical Engineering**
Variable credit.
Research or studies on special problems in chemical engineering.

**564 Design of Chemical Reactors**
Fall. 3 credits. Prerequisite: Chem E 390 or equivalent.
3 lecs. P. Harriott.
Design, scale-up, and optimization of chemical reactors with allowance for heat and mass transfer and nonideal flow patterns. Homework problems feature analysis of data for gas-solid, gas-liquid, and three-phase reaction systems.

**565 Design Project**
Spring. 3 or 6 credits. Required for students in the M.Eng.(Chemical) program.
Staff.
Design study and economic evaluation of a chemical processing facility, alternative methods of manufacture, raw-material preparation, food processing, waste disposal, or some other aspect of chemical processing.

**566 Computer-aided Process Design**
Spring. 3 credits. Prerequisite: Chem E 332 or equivalent.
3 lecs. P. Clark.
An introduction to the synthesis and use of computer systems for steady-state simulation and optimization of chemical processes. Synthesis of heat exchanger networks and separation systems.

**590 Special Projects in Chemical Engineering**
Variable credit. Limited to graduate students.
Non-thesis research or studies on special problems in chemical engineering.

**640 Polymeric Materials**
Fall. 3 credits.
3 lecs. F. Rodriguez.
Chemistry and physics of the formation and characterization of polymers. Principles of fabrication.

**642 Polymeric Materials Laboratory**
Spring. 2 or 3 credits. Prerequisite: Chem E 640.
F. Rodriguez.
Experiments in the formation, characterization, fabrication, and testing of polymers.

**643 Introduction to Bioprocess Engineering**
Fall. 3 credits. Prerequisite: Chem E 390 or permission of instructor. No prior background in the biological sciences required.
3 lecs. M. L. Shuler.
A discussion of principles involved in using microorganisms and enzymes for processing. Application to food and fermentation industries and to biological waste treatment.

**645 Advanced Concepts in Biological Engineering**
Spring. 3 credits. Prerequisite: Chem E 643 or equivalent or permission of instructor.
3 lecs. D. A. Hammer.
Fundamentals of biochemical engineering science with emphasis on enzyme processing, mathematical models of cell growth, bioreactors, product recovery, bioseparations, the use of tissue culture, and genetically modified organisms.

**646 Controlled Cultivation of Microbial Cells**
Spring (January intersession). 3 credits. Prerequisite: Microbiology 291 or equivalent.
Staff.
A projects course. Use of batch- and continuous-stirred jars to explore the physiology of microorganisms under conditions simulating industrial practice.

**648 Polymers in Electronics and Related Areas**
Spring. 3 credits. Prerequisite: 640 or permission of instructor.
3 lecs. F. Rodriguez.
Applications of polymers as resists for microlithography, as insulators, and as conductors. Radiation effects, polymer synthesis, and surface characterization. Additional special topics may be covered.

**661 Air Pollution Control**
Spring. 3 credits.
3 lecs. P. Harriott.
Origin of air pollutants. Design of equipment for removal of particulate and gaseous pollutants formed in combustion and chemical processing.

**[673 Adsorption and Catalysis**
Fall. 2 credits. Not offered 1989–90.
R. P. Merrill.
The physics and chemistry of adsorption on reactive surfaces and catalysis. Emphasis on the use of modern spectroscopic techniques to determine the geometric structure, electronic structure, and reaction sequences on well-defined surfaces. Discussion of several catalytic systems.]

**675 Synthetic Polymer Chemistry (also MS&E 671 and Chemistry 671)**
Fall. 3 credits. Prerequisites: Chem 359–360 or equivalent or permission of instructor. MS&E 620 is recommended.
3 lecs. J. M. J.Frechet.
Modern concepts in chain-growth polymerization reactions. Synthetic strategies for step-growth polymerizations. Polymer architecture and its control. Reactions of polymers, polymer-supported chemistry. Microenvironment effects in polymer media.

**711 Advanced Chemical Engineering Thermodynamics**
Fall. 3 credits. Prerequisite: Chem E 313 or equivalent.
3 lecs. A. Panagiotopoulos.
Postulatory approach to thermodynamics. Legendre transformations. Equilibrium and stability of general thermodynamic systems. Applications of thermodynamic methods to advanced problems in chemical engineering. Introduction to statistical mechanical ensembles, phase transitions, Monte Carlo methods, and theory of liquids.

**713 Applied Chemical Kinetics**
Fall. 3 credits. Prerequisite: Chem E 390 or equivalent.
3 lecs. R. P. Merrill.
Stoichiometry of multiple reactions, complex monomolecular kinetics, lumping analysis in monomolecular and continuous reaction mixtures, nonideal reactors, kinetics of catalyzed reactions, multiple steady states in chemical reactors, principles of heterogeneous catalysis, selected topics in biochemical engineering kinetics.

**721 Thermodynamics and Phase Change Heat Transfer (also M&AE 652)**
Fall. 4 credits. Prerequisite: graduate standing or permission of instructor.
C. T. Avedisian.
Thermodynamics of phase change. Superheated liquids and supersaturated vapors. Thermodynamic stability criteria for metastable liquids and homogeneous nucleation theory. Dynamics of bubble growth and collapse. Pool boiling and the critical heat flux. Hydrodynamics of one-dimensional two-phase flows. Convective boiling and condensation.

**731 Advanced Fluid Mechanics and Heat Transfer**
Fall. 3 credits. Prerequisite: Chem E 323 and 324 or equivalent.
3 lecs. D. L. Koch.
Derivation of the equations of motion for Newtonian fluids. Low Reynolds number fluid dynamics, lubrication theory, inviscid fluid dynamics. Boundary layer theory. Convective and conductive heat transfer.

**732 Diffusion and Mass Transfer**
Spring. 2 credits. Prerequisite: Chem E 731 or equivalent.
C. Cohen.
Conservation equations in multicomponent systems, irreversible thermodynamics, dispersion, and Brownian diffusion. Mass transfer for convective diffusion in liquids. Application to a variety of problems such as coagulation of aerosols, diffusion through films and membranes, liquid-liquid extraction, chemical vapor deposition.

**[734 Fluid Mechanics of Suspensions**
Spring. 3 credits. Prerequisite: Chem E 731, M&AE 601, or equivalent. Offered alternate years. Not offered 1989–90.
D. L. Koch.
Relationship between macroscopically observed transport and rheological behavior of suspensions and composites, and underlying transport processes occurring on the particle-length scale. Methods of treating interparticle hydrodynamic interactions. Derivation of macroscopic properties using ensemble averages, renormalization, and dynamic simulations. Applications will include free suspensions of solid spheres, fibers, and bubbles; composite solids; and porous media.]

**741 Selected Topics in Biochemical Engineering**
Fall, spring. 1 credit (may be repeated for credit). Prerequisite: Chem E 643 or permission of instructor.
D. A. Hammer, M. L. Shuler.
Discussion of current topics and research in biochemical engineering for graduate students.

**[745 Physical Polymer Science I**
Fall. 3 credits. Prerequisite: Chem E 711 or equivalent. Offered alternate years. Not offered 1989–90.
C. Cohen.
Thermodynamic properties of dilute, semidilute, and concentrated solutions from both classical and scaling approaches. Characterization techniques of dilute solutions: osmometry, light scattering, viscometry, and sedimentation. Rubber elasticity; mechanical and thermodynamic properties of gels. Polymer melts: equations of state and glass transition phenomena.]

**746 Physical Polymer Science II**
Fall. 3 credits. Prerequisite: Chem E 731 or equivalent. Offered alternate years.
C. Cohen.
Rheology and processing. Applications and limitations of various rheometers. Linear viscoelasticity; nonlinear continuum models; kinetic theory of polymeric liquids. Pressurization, pumping, and the modelling of processing machines. Injection and compression molding: mold filling, simulations, structure, and orientation.

**751 Mathematical Methods of Chemical Engineering Analysis**
Spring. 4 credits.
3 lecs. D. L. Koch.
Application of advanced mathematical techniques to chemical engineering analysis. Mathematical modeling, scaling, regular and singular perturbation, multiple scales, asymptotic analysis. Linear and nonlinear ordinary differential equations, partial differential equations.

**[753 Analysis of Nonlinear Engineering Systems: Stability, Bifurcation, and Continuation**
Fall. 3 credits. Prerequisite: Chem E 751 or equivalent. Offered alternate years. Not offered 1989–90.
3 lecs. P. H. Steen.
Elements of bifurcation theory. Branch-following techniques. Stability of discrete and continuous systems. Application to population-dynamics, reaction-diffusion, and hydrodynamic systems using software for continuation problems.]

**[772 Theory of Molecular Liquids**
Spring. 3 credits. Prerequisite: Chem E 711 or equivalent. Offered alternate years. Not offered 1989–90.
K. E. Gubbins.
Theory of intermolecular forces, and equilibrium statistical mechanics for nonspherical molecules. Distribution functions. Applications to thermodynamics of such fluids using integral equation and perturbation theory techniques. Mixture properties, phase diagrams for mixtures with polar or quadrupolar components. Surface properties.]

**774 Atomistic Simulation of Materials**
Spring. 3 credits. Prerequisite: Competence in FORTRAN, PASCAL, or C. Prior knowledge of statistical mechanics helpful.
2 lecs, 1 computer lab. P. Clancy.
The statistical mechanical theory behind Monte-Carlo and molecular-dynamics computer-simulation techniques. Strong emphasis is placed on students writing their own MC and MD code. Calculation of distribution functions, thermodynamic, kinetic and structural properties. Introduction to the application of computer graphics to simulation. Interparticle forces and application of atomistic simulation of systems containing metals, semiconductors, and biological materials. Issues of code efficiency and vectorization.

**790 Seminar**
Fall, spring. 1 credit each term.
General chemical engineering seminar required of all graduate students in the Field of Chemical Engineering.

**792 Advanced Seminar in Thermodynamics**
Fall, spring. 1 credit.
K. E. Gubbins, A. Panagiotopoulos.
A forum for talks by graduate students and faculty members on topics of current interest in thermodynamics and statistical mechanics.

**890 Thesis Research**
Variable credit.
Thesis research for the M.S. degree in chemical engineering.

**990 Thesis Research Variable credit.**
Thesis research for the Ph.D. degree in chemical engineering.

# CIVIL AND ENVIRONMENTAL ENGINEERING

## General

**[113 Computer-aided Design in Environmental Systems (also Engr 113)**
Fall. 3 credits. Not offered 1989–90.
3 lecs. A. H. Meyburg.
For description see Engineering Common Courses.]

**116 Modern Structures (also Engr 116)**
Fall, spring. 3 credits.
2 lecs, 1 sec. G. G. Deierlein.
For description see Engineering Common Courses.

**241 Engineering Computation (also Engr 241)**
Fall, spring. 3 credits. Prerequisites: CS 100 and Mathematics 293. Corequisite: Mathematics 294.
J. F. Abel, J. R. Stedinger.
For description see Engineering Common Courses.

**304 Uncertainty Analysis in Engineering**
Fall. 4 credits. Prerequisite: first-year calculus.
J. R. Stedinger.
An introduction to probability theory, statistical techniques, and uncertainty analysis, with examples drawn from civil, environmental, agricultural, and related engineering disciplines. The course covers data presentation, probability theory, commonly used probability distributions, parameter estimation, goodness-of-fit tests, confidence intervals, hypothesis testing, simple linear regression, and nonparametric statistics. Examples include structural reliability, models of vehicle arrivals, analysis of return-period calculations, and distributions describing wind speeds, floods, pollutant concentrations, and soil and material properties.

**309 Special Topics in Civil and Environmental Engineering**
Fall, spring. 1–6 credits.
Staff.
Supervised study by individuals or groups of upper-division students on one or more specialized topics not covered in regular courses.

**501 Civil and Environmental Engineering Design Project I**
Fall. 3 credits. Required for students in the M.Eng.(Civil) program.
School faculty and visiting engineers.
Design of major civil engineering project. Planning and preliminary design in fall term; final design in January intersession (CEE 502).

**502 Civil and Environmental Engineering Design Project II**
Spring (work done during January intersession). 3 credits. Required for students in the M.Eng.(Civil) program. Prerequisite: CEE 501.
School faculty and visiting engineers.
A continuation of CEE 501.

**503 Professional Practice in Engineering**
Spring. 3 credits. Required for and limited to students in the M.Eng.(Civil) program.
W. R. Lynn.
Financial, legal, regulatory, ethical, and business aspects of engineering practice are examined in detail. Students are expected to develop their understanding of the interrelations among the physical, social, economic, and ethical constraints on engineering design.

**701 Environmental Engineering Department Seminar**
Fall, spring. 1 credit.
Staff.
Presentation of topics of current interest in environmental engineering.

## Remote Sensing

**610 Remote Sensing Fundamentals (also Agronomy 660)**
Fall. 3 credits. Prerequisite: permission of instructor.
2 lecs, 1 lab. W. R. Philipson.
An introduction to equipment and methods used in obtaining information about earth resources and the environment from aircraft or satellite. Coverage includes sensors; sensor and ground-data aquisition; data analysis and interpretation; and project design.

**611 Remote Sensing: Environmental Applications (also Agronomy 661)**
Spring. 3 credits. Prerequisite: permission of instructor.
2 lecs, 1 lab. W. R. Philipson.
A survey of how remote sensing is applied in various environmental disciplines. Laboratory emphasis is on using aircraft and satellite imagery for inventorying and monitoring surface features in engineering, planning, agriculture, and natural resource assessments.

**[612 Physical Environment Evaluation**
Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
2 lecs, 1 lab. Staff.
Physical environmental factors affecting engineering planning decisions: climate, soil and rock conditions, water sources. Evaluation methods: interpretation of meteorological, topographic, geologic, and soil maps, aerial photographs, and subsurface exploration records.]

**[613 Image Analysis I: Landforms**
Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
2 lecs, 1 lab. Staff.
Analysis and interpretation of aerial photographs for a broad spectrum of soil, rock, and drainage conditions. Specific fields of application are emphasized.]

**[614 Image Analysis II: Physical Environments**
Fall. 3 credits. Prerequisite: CEE 612 or 613. Not offered 1989–90.
2 lecs, 1 lab. Staff.
Study of physical environments using aerial photographs and other remote sensing methods. Conventional photography; spectral, space, and sequential photography; thermal and radar imageries. Arctic, tropic, arid, and humid climate regions. Project applications.]

**615 Digital Image Processing**
Fall. 3 credits. Prerequisites: facility with algebra (Mathematics 109) and statistics (Engr 206 or Agricultural Economics 310), or permission of instructor.
W. D. Philpot.
An introduction to digital image-processing concepts and techniques, with emphasis on techniques used in remote-sensing applications. Topics include image acquisition, enhancement procedures, spatial and spectral feature extraction, and classification. Assignments will require the use of image-processing software and graphics.

**616 Digital Image Analysis**
Spring. 3 credits. Prerequisites: calculus (Mathematics 192), statistics (Engr 206 or Agricultural Economics 310), and computer programming (FORTRAN or C), or permission of instructor.
W. D. Philpot.
Pattern recognition, feature extraction, and classification of digital images as used in remote-sensing applications. Both spectral and spatial patterns will be considered. Assignments will require the development of computer programs and will make use of existing image-processing software and graphics.

**617 Project—Remote Sensing**
On demand. 1–6 credits.
Staff.
Students may elect to undertake a project in remote sensing. The work is supervised by a professor in this subject area.

**618 Special Topics—Remote Sensing**
On demand. 1–6 credits.
Staff.
Supervised study in small groups on one or more special topics not covered in the regular courses. Special topics may be of a theoretical or applied nature.

**619 Seminar in Remote Sensing (also Agronomy 662)**
Spring. 1 credit. S-U grades only.
W. R. Philipson.
Lectures on current developments in assessing earth resources or the environment. Each week a different topic on remote sensing or geographic information systems is presented by specialists from government, industry, Cornell, or other research or academic institutions.

**710 Research—Remote Sensing**
On demand. 1–6 credits.
Staff.
For students who want to study one particular area in depth. The work may take the form of laboratory investigation, field study, theoretical analysis, or development of design procedures.

**810 Thesis—Remote Sensing**
Fall, spring. 1–12 credits. Students must register for credit with the professor at the start of each term.
A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Environmental and Public Systems

**321 Microeconomic Analysis (also Engr 321 and Economics 313, section 5)**
Fall. 4 credits. Prerequisite: one semester of calculus. A social science elective for engineering students.
R. E. Schuler.
For description see Engineering Common Courses.

**322 Economic Analysis of Government (also Engr 322 and Economics 308)**
Spring. 4 credits. Prerequisites: one semester of calculus, plus CEE 321 or Economics 313. A social science elective for engineering students.
R. E. Schuler.
For description see Engineering Common Courses.

**323 Engineering Economics and Management (also Engr 323)**
Spring. 3 credits. Primarily for juniors and seniors.
D. P. Loucks.
For description see Engineering Common Courses.

**325 System Perspectives on Solid Waste Management**
Fall. 3 credits. Open to juniors and seniors from all colleges who have had a scientific and calculus course.
W. R. Lynn, R. E. Schuler.
An introduction to alternative technological solutions to society's solid waste problems with the interdisciplinary perspective of how those proposals interact with a broad range of public, environmental, and economic concerns. Using engineering, economic, legal, and political professionals, an integrated systems approach to problem solving will be emphasized and will culminate in a term project analogous to an environmental impact assessment process.

**528 Interactive Modeling with Microcomputer Graphics**
Spring. 3 credits. Prerequisite: Engr 241 or Engr 222, and permission of instructor.
D. P. Loucks.
Principles of interactive modeling and its application to the design and management of environmental and water-resources engineering systems. Topics will include tablet and video digitizing, image processing (including editing and overlaying pictures and maps), contouring, opaque and transparent coloring, generating 2-D and 3-D colored graphs, and developing pre- and postprocessors to permit the interactive use of various models for synthesizing designs and operating policies and for predicting system performance. Microcomputers with high-quality color-graphics capabilities will be available together with numerous interactive graphics subroutines.

**529 Water and Environmental Resources Problems and Policies**
Fall. 3 credits. Intended primarily for graduate engineering and non-engineering students but open to qualified upperclass students. Prerequisite: permission of instructor.
Lec-disc. L. B. Dworsky.
Evaluation, appraisal, and prospects for problems involving water and environmental resources. Organization and public policies in the federal system.

**620 Water-Resources Systems I**
Fall. 3 credits. Prerequisite: CEE 323 or equivalent.
D. P. Loucks.
Development and application of techniques for deterministic and stochastic optimization and simulation in water-resources planning. River-basin modeling, including reservoir design and operation, irrigation planning and operation, hydropower-capacity development, flow augmentation, flood control and protection, and water-quality models.

**621 Water-Resources Systems II**
Spring. 3 credits. Prerequisites: CEE 304 and 620 or permission of instructor.
J. R. Stedinger, D. P. Loucks.
Advanced topics in the development and use of optimization and simulation models for water-resources planning. Stochastic hydrologic modeling and stochastic river-basin and reservoir models. Incorporates material in CEE 622.

**622 Stochastic Hydrologic Modeling**
On demand. 2–3 credits. Prerequisite: OR&IE 370 or CEE 304.
J. R. Stedinger.
Develops statistical techniques used to analyze and model stochastic processes. Examination of Box-Jenkins, fractional-Brownian noise, and other single- and multiple-site stream-flow models; review of flood-frequency estimation issues; analysis of simulation output; parameter estimation and Bayesian inference.

**623 Water Quality Systems Analysis**
Spring. 3 credits. Prerequisites: Math 294 and optimization (CEE 323, Ag En 475, or OR&IE 320/520).
C. A. Shoemaker.
Applications of optimization and simulation methods to the design and operation of facilities for managing the quality of surface- and groundwater. Applications include location of wastewater and hazardous-waste facilities, restoration of dissolved oxygen levels in rivers, and reclamation of contaminated aquifers. Optimization techniques include separable convex (linear) programming, integer programming, and nonlinear programming.

**626 Modeling Managed Ecosystems**
Fall, on demand. 3 credits. Prerequisites: Mathematics 294, statistics, and population ecology.
C. A. Shoemaker.
The use of optimization and statistical estimation procedures to develop strategies for managing populations and ecosystems. Primary focus will be on pest management, poikilotherm populations, and mitigation of potential pollution from pesticides.

**721 Environmental and Water Resources Systems Analysis Design Project**
On demand. Variable credit. Prerequisite: permission of instructor. May extend over two semesters.
Staff.
Design or feasibility study of environmental or water resources sytems, supervised and assisted by one or more faculty advisers; individual or group participation. Final report required.

**722 Environmental and Water Resources Systems Analysis Research**
On demand. Variable credit. Prerequisite: permission of instructor. Preparation must be suitable to the investigation to be undertaken.
Staff.
Investigations of particular environmental or water resources systems problems.

**728 Environmental and Water Resources Systems Analysis Colloquium**
Fall, spring. 1 credit.
Staff.
Lectures in various topics related to environmental or water resources systems planning and analysis.

**729 Special Topics in Environmental or Water Resources Systems Analysis**
On demand. Variable credit.
Staff.
Supervised study, by individuals or small groups, of one or more specialized topics not covered in regular courses.

## Fluid Mechanics and Hydrology

**331 Fluid Mechanics**
Fall. 4 credits. Prerequisite: Engr 203 (may be taken concurrently).
3 lecs, 1 rec, evening exams. Staff.
Hydrostatics, the basic equations of fluid flow, potential flow and dynamic pressure forces, viscous flow and shear forces, steady pipe flow, turbulence, dimensional analysis, open-channel flow. Elements of design in water supply systems, canals, and other hydraulic schemes.

**332 Hydraulic Engineering**
Spring. 4 credits. Prerequisite: CEE 331.
2 lecs, 1 lab, field trip. Staff.
Application of fluid-mechanical principles to problems of engineering practice and design: hydraulic machinery, water-distribution systems, open-channel design, river engineering, groundwater flow, and pollutant dispersal. Lectures supplemented by laboratory work and a design project.

**430 Descriptive Hydrology**
On demand. 2 credits. Intended for non-engineering majors. Prerequisite: permission of instructor.
W. H. Brutsaert.
Introduction to hydrology as a description of the hydrologic cycle and the role of water in the natural environment. Topics include precipitation, infiltration, evaporation, groundwater, surface runoff, floods, and droughts.

**431 Geohydrology (also ABEN 471 and Geol 445)**
Fall. 3 credits. Prerequisite: permission of instructor.
W. H. Brutsaert with J.-Y. Parlange and T. S. Steenhuis (in ABEN) and A. L. Bloom and L. Cathles (in Geol).
An intermediate course in aquifer geology, groundwater flow, and related design factors. Includes description and properties of natural aquifers, groundwater hydraulics, soil water, and solute transport.

**[630 Advanced Fluid Mechanics**
Fall. 3 credits. Prerequisite: CEE 331.
Offered alternate years. Not offered 1989–90.
3 lecs. Staff.
Introduction to tensor analysis; conservation of mass, momentum, and energy. Rigorous treatment includes study of exact solutions of the Navier-Stokes equations. Asymptotic approximations at low and high Reynolds numbers. Similitude and modeling. Laminar diffusion of momentum, mass, and heat.]

**631 Flow and Contaminant Transport Modeling in Groundwater**
Spring. 3 credits. Prerequisites: Mathematics 294 or equivalent, Engr 241 or experience in numerical methods and programming, and elementary fluid mechanics.
J. A. Liggett.
Potential flows and their calculation. Numerical methods include finite difference, finite elements, and boundary elements. Fundamental equations of saturated and unsaturated flow in porous media. Flow in fractured media. Numerical modeling of transport in porous media. Diffusion and advective diffusion in one, two, and three dimensions. Anisotropy. Additional terms for reactive substances. The course will include the use of computer programs.

**[632 Analytical Hydrology**
Spring. 3 credits. Prerequisite: CEE 331. Not offered 1989–90.
W. H. Brutsaert.
Physical and statistical prediction methods for design related to hydrologic processes. Hydrometeorology and evaporation. Infiltration and base flow. Surface runoff and channel routing. Linear and nonlinear hydrologic systems. Storage routing and unit hydrograph methods.]

**633 Flow in Porous Media and Groundwater**
Spring. 3 credits. Prerequisite: CEE 331.
W. H. Brutsaert.
Fluid mechanics and equations of single-phase and multiphase flow; methods of solution. Applications involve aquifer hydraulics, pumping wells; drought flows; infiltration, groundwater recharge; land subsidence; seawater intrusion, miscible displacement; transient seepage in unsaturated materials.

**634 Engineering Micrometeorology**
Fall. 3 credits. Prerequisite: CEE 331 or permission of instructor.
3 lecs. W. H. Brutsaert.
Physical processes in the lower atmospheric environment: turbulent transport in the atmospheric boundary layer, surface-air interaction, disturbed boundary layers, radiation. Applications include sensible and latent heat transfer from lakes, plant canopy flow and evapotranspiration, turbulent diffusion from chimneys and cooling towers, and related design issues.

**635 Coastal Engineering I**
Fall. 3 credits. Prerequisite: CEE 331.
3 lecs. P. L.-F. Liu.
Linear wave theory, wave generation by wind, analysis of fluid forces on floating and fixed coastal structures and modification of waves and currents by these structures, coastal processes, and coastal sediment motion.

**636 Environmental Fluid Mechanics**
Spring. 3 credits. Prerequisite: CEE 655.
Offered alternate years.
G. H. Jirka.
Mass- and heat-transport processes in the environment and their interaction with pollutant discharges. Mechanics of discretely and continuously stratified fluids, internal waves, density currents, selective withdrawal, and baroclinic motions. Flow stability, mixing, and turbulence. Turbulent diffusion and shear flow dispersion, including effects of buoyancy. Convective instabilities and mixed-layer dynamics. Concentrated sources of momentum and buoyancy: jets and plumes and their behavior in the environment. Applications to mixing processes in rivers, lakes, the ocean, and the atmosphere.

**637 Project—Hydraulics**
On demand. Variable credit.
Hours to be arranged. Staff.
The student may elect a design problem or undertake the design and construction of special equipment in the fields of fluid mechanics, hydraulic engineering, or hydrology.

**638 Hydraulics Seminar**
Spring. 1 credit. Open to undergraduates and graduates and required of graduate students majoring in hydraulics or hydraulic engineering.
Staff.
Topics of current interest in fluid mechanics, hydraulic engineering, and hydrology.

**639 Special Topics in Hydraulics**
On demand. Variable credit.
Staff.
Special topics in fluid mechanics, hydraulic engineering, or hydrology.

**730 Coastal Engineering II**
Spring. 3 credits. Prerequisite: CEE 635.
3 lecs. P. L.-F. Liu.
Review of linear and nonlinear theories for ocean waves, applicability of different wave theories to engineering problems, wave-energy transmission, tsunamis, behavior of submerged and floating bodies, harbor agitations, ship waves.

**[732 Unsteady Hydraulics**
Spring. 3 credits. Prerequisite: CEE 332 or permission of instructor. Offered alternate years. Not offered 1989–90.
J. A. Liggett.
The physical and mathematical basis for unsteady processes in hydraulic engineering, especially unsteady open-channel flow. Water hammer, unsteady sediment transport, long waves on large bodies of water, circulation. Numerical methods of solution.]

**734 Experimental Methods in Hydraulics**
On demand. 2 credits. Prerequisite: CEE 331.
G. H. Jirka.
Methods used in planning and conducting laboratory and field experiments in hydraulics and fluid mechanics. Dynamic similarity, modeling laws, and applications. General operating principles and performance characteristics of measurement instruments. Specific devices for measurement of fluid properties, pressure, and flow. Data acquisition, processing, and signal analysis. Laboratory demonstrations.

**735 Research in Hydraulics**
On demand. Variable credit.
Staff.
The student may select an area of investigation in fluid mechanics, hydraulic engineering, or hydrology. The work may be either experimental or theoretical in nature. Results should be submitted to the instructor in charge in the form of a research report.

## Geotechnical Engineering

**341 Introductory Soil Mechanics**
Spring. 3 credits.
2 lecs, 1 lab-tutorial. Staff.
Soil as an engineering material. Chemical and physical nature of soil. Engineering properties of soil. Stresses and stress analysis of soil. Basic theory and design for water flow in soil, one-dimensional consolidation of clay and silts, and shear-strength problems. Introduction to slope stability and earth pressure. Introduction to laboratory testing. Synthesis of soil analysis and laboratory-test results for the design of engineering structures.

**640 Foundation Engineering**
Fall. 3 credits. Prerequisite: CEE 341.
3 lecs, optional tutorial. Staff.
Soil exploration, sampling, and in-situ testing techniques. Bearing capacity, stress distribution, and settlement. Design of shallow and deep foundations. Compaction and site preparation. Seepage and dewatering of foundation excavations.

**641 Retaining Structures and Slopes**
Spring. 3 credits. Prerequisite: CEE 341.
3 lecs, optional tutorial. Staff.
Earth pressure theories. Design of rigid, flexible, braced, tied-back, slurry, and reinforced earth walls. Stability of excavation, cut, and natural slopes. Design problems stressing application of course material under field conditions of engineering practice.

**642 Highway Engineering (also Ag and Bio En 491)**
Spring. 3 credits. Prerequisites: junior standing in engineering, fluid mechanics, and soil mechanics (may be taken concurrently).
2 lecs, 1 lab. L. H. Irwin.
For description see Ag En 491.

**643 Pavement Engineering (also ABEN 692)**
Fall. 4 credits. Limited to engineering seniors and graduate students. Prerequisites: CEE 341 and 642. Offered alternate years.
3 lecs, 1 lab. L. H. Irwin.
For description see Ag Bio and En 692.

**647 Design Project in Geotechnical Engineering**
On demand. 1–6 credits.
Students may elect to undertake a design project in geotechnical engineering. The work is supervised by a professor in the subject area.

**648 Seminar in Geotechnical Engineering**
Fall, spring.
Staff.
Presentation and discussion of topics in current research and practice in geotechnical engineering.

**649 Special Topics in Geotechnical Engineering**
On demand. 1–6 credits.
Staff.
Supervised study of special topics not covered in the formal courses.

**740 Engineering Behavior of Soils**
Fall. 3 credits. Prerequisite: CEE 341.
3 lecs. Staff.
Detailed study of physiochemical nature of soil. Stress states and stress-strain-time behavior. In-depth evaluation of the strength, compressibility, and permeability of natural soils. Appropriate methods for laboratory and in-situ strength and property testing.

**741 Rock Engineering**
Fall. 3 credits. Prerequisite: CEE 341 or permission of instructor. Recommended: introductory geology.
2 lecs, 1 lab. Staff.
Geological and engineering classifications of intact rock, discontinuities, and rock masses. Laboratory and field evaluation of properties. Stress states and stress analysis. Design of foundations on, and openings in, rock masses. Analysis of the stability of rock slopes.

**744 Advanced Foundation Engineering**
Spring. 2 credits. Prerequisite: CEE 640.
2 lecs. Staff.
A continuation of CEE 640, with detailed emphasis on special topics in soil-structure interaction. Typical topics include lateral and pullout loading of deep foundations, pile group behavior, foundations for offshore structures, pile-driving dynamics, foundations for special structures.

**745 Soil Dynamics**
Spring. 3 credits. Prerequisite: permission of instructor.
3 lecs. Staff.
Study of soil behavior under dynamic loadings. Laboratory and field techniques for determining dynamic soil properties and strength liquefaction potential. Design of embankments and retaining structures under dynamic loading conditions.

**[746 Embankment Dam Engineering**
Spring. 2 credits. Prerequisites: CEE 641 and 741, or permission of instructor. Not offered 1989–90.
2 lecs. Staff.
Principles of analysis and design for earth and rockfill dams. Materials, construction methods, internal and external stability, seepage and drainage, performance monitoring, abutment and foundation evaluation. Introduction to tailings dams.]

**[747 Case Studies in Geotechnical Engineering**
Spring. 3 credits. Prerequisites: CEE 641 and 741. Not offered 1989–90.
Staff.
Study of case histories in geotechnical engineering. Critical evaluation of successful and unsuccessful projects. Oral presentations and engineering report evaluation of each case.]

**[748 Tunnel Engineering**
Spring. 2 credits. Prerequisites: CEE 641 and 741. Not offered 1989–90.
2 lecs. Staff.
Principles of analysis and design for earth and rock tunnels. Materials, construction methods, stability and support systems, deformations, and performance monitoring.]

**749 Research in Geotechnical Engineering**
On demand. 1–6 credits.
Staff.
For the student who wants to pursue a particular geotechnical topic in considerable depth.

## Environmental Quality Engineering

**351 Environmental Quality Engineering**
Spring. 3 credits.
3 lecs. L. W. Lion.
Introduction to engineering aspects of environmental quality control. Quality parameters, criteria, and standards for water and wastewater. Emphasis on water-quality control concepts, theory, and methods. Elementary analysis pertaining to the modeling of pollutant reactions in natural systems, and introduction to design of unit processes for water and wastewater treatment.

**352 Water Supply Engineering**
Fall. 3 credits. Prerequisite: CEE 351 or permission of instructor.
3 lecs. R. I. Dick.
Analysis of contemporary threats to human health by public-water supply systems. Criteria and standards for potable-water quality. Water-quality control theory. Design of facilities for obtaining, treating, storing, and distributing water.

**651 Microbiology of Water and Wastewater**
Fall. 2 credits. Prerequisite: one semester of college chemistry.
2 lecs. L. W. Lion.
A self-paced autotutorial introduction to fundamental aspects of microbiology, organic chemistry, and biochemistry pertinent to environmental engineering. Course work consists of assigned readings, study questions, and brief exams.

**653 Chemistry of Water and Wastewater**
Fall. 3 credits. Prerequisite: one semester of college chemistry or permission of instructor.
3 lec-recs. L. W. Lion.
Principles of chemistry applicable to the understanding, design, and control of water and wastewater treatment processes and to reactions in receiving waters. Topics include chemical thermodynamics, reaction kinetics, acid-base equilibria, mineral precipitation/dissolution, and electrochemistry. The focus of the course is on the mathematical description of chemical reactions relevant to engineered processes and natural systems, and the numerical or graphical solution of these problems.

**654 Aquatic Chemistry**
Spring. 3 credits. Prerequisite: CEE 653 or Chemistry 287–288.
3 lecs. J. J. Bisogni.
Concepts of chemical equilibria applied to natural aquatic systems. Topics include acid-base reactions, buffer systems, mineral precipitation, coordination chemistry, redox reactions, adsorption phenomena and chemical-equilibria computer programs. In depth coverage of topics covered in CEE 653.

**655 Pollutant Transport and Transformation in the Environment**
Fall. 3 credits. Prerequisite: CEE 331.
J. J. Bisogni, G. H. Jirka.
An introduction to the physical transport and chemical and biochemical transformation processes that govern the fate and distribution of pollutants in the environment. Advective and diffusive mass transport, turbulent diffusion and shear-flow dispersion in water or atmosphere, dispersion in groundwater flow, homogeneous and heterogeneous chemical reactions and their effects on transport phenomena, air-water-soil interface transfer processes. Emphasis on physical mechanisms, with some applications to surface water, groundwater, and atmospheric transport and quality models.

**656 Environmental Quality Management**
Fall; spring on demand. 3 credits (4 with approval of instructor). For upperclass or graduate students. May not be offered 1989–90.
2 lec-discs. L. B. Dworsky.
An introduction to environmental quality management; nature, cause, and control of environmental problems; interaction of physical, social, and cultural environments. Emphasis on the interdependent social, economic, developmental, and environmental issues confronting society.

**658 Sludge Treatment, Utilization, and Disposal**
Spring. 3 credits. Prerequisite: CEE 351 or permission of instructor.
3 lecs. R. I. Dick.
Analysis of the quantity and quality of residues produced from municipal and industrial water-supply and pollution-control facilities as a function of process design and operational variables; alternatives for reclaiming or disposing of hazardous and nonhazardous residues with assessment of potential environmental impacts and factors influencing the magnitude of those impacts; fundamental factors influencing performance of treatment processes for altering sludge properties prior to reuse or ultimate disposal; and considerations in selection and integration of sludge-management processes to approach optimal design.

**659 Environmental Quality Engineering Seminar**
Spring. 1 credit. Intended for all graduate students in environmental engineering; open to others with permission of instructor.
R. I. Dick.
Presentation and discussion of current research and design projects in environmental engineering.

**755 Environmental Engineering Processes I**
Fall. 3 credits. Prerequisite: Previous or concurrent enrollment in CEE 653 or permission of instructor.
3 lecs. J. J. Bisogni.
Theoretical and engineering aspects of chemical and physical phenomena and processes applicable to the removal of impurities from water, wastewater, and industrial wastes and to their transformation in receiving waters. Analysis and design of treatment processes and systems.

**756 Environmental Engineering Processes II**
Spring. 3 credits. Prerequisites: CEE 651 and 755, or permission of instructor.
3 lecs. J. M. Gossett.
Theoretical and engineering aspects of biological phenomena and processes applicable to the removal of impurities from water, wastewater, and industrial wastes and to their transformation in receiving waters. Biokinetic analysis and design of biological treatment process.

**757 Environmental Engineering Processes Laboratory I**
Fall. 1 credit. Prerequisite: concurrent enrollment in CEE 653 and CEE 755.
1 lab. J. J. Bisogni.
Laboratory studies of aquatic chemistry and physical/chemical processes of environmental engineering. Topics include gravimetric analyses; acids/bases; alkalinity; gas chromatography; UV-visible and atomic absorption spectrophotometry; adsorption; filtration; ion exchange; gas transfer; sedimentation; characterization of reactor mixing regimes; coagulation.

**758 Environmental Engineering Processes Laboratory II**
Spring. 1 credit. Prerequisite: CEE 651 and concurrent enrollment in CEE 756.
1 lab. J. M. Gossett.
Laboratory studies of microbiological phenomena and environmental engineering processes. Topics include microscopy; biochemical and chemical oxygen demand; enzymatic assays for microbial inhibition; disinfection; aerobic and anaerobic biological treatability studies; enumeration of bacteria.

**759 Special Topics in Environmental Engineering**
On demand. Variable credit.
Hours to be arranged. Staff.
Supervised study in special topics not covered in formal courses.

**851 Thesis—Environmental Engineering**
Fall, spring. 1–12 credits. Students must register for credit with the professor at the start of each term.
A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Transportation

**361 Introduction to Transportation Engineering**
Spring. 3 credits.
A. H. Meyburg.
Introduction to technological, economic, and social aspects of transportation. Emphasis on design and functioning of transportation systems and their components. Vehicle and system technology; traffic flow and control; supply-demand interactions; system planning, design, and management. Institutional and energy issues; environmental impact.

**[660 Transportation Planning and Policy**
Fall. 3 credits. Not offered 1989–90.
A. H. Meyburg.
Public-sector planning and decision making for transportation. Problems of urban transportation and their implications. A systems-analysis approach to formulation of transportation policy at the local, regional, state, and federal levels. Consideration of urban-transportation planning models.]

**[663 Routing and Scheduling in Transportation Networks**
Fall. 3 credits. Prerequisite: OR&IE 320 or equivalent. Not offered 1989–90.
M. A. Turnquist.
Design of vehicle routes and schedules in transportation systems. Network flow algorithms. Fleet utilization problems. Routing and scheduling under time constraints, multiobjective routing problems, with applications to both passenger and freight systems.]

**[664 Transportation Systems Design**
Spring. 3 credits. Prerequisite: CEE 361 or 663. Not offered 1989–90.
G. P. Fisher.
Advanced techniques for physical and operational design of transportation systems, including analytical modeling techniques underlying design criteria. Evaluation of alternative designs. Management and operating policies, including investment strategies. Facility location decisions, networks, and passenger and freight terminals.]

**[668 Transportation System Operations and Management**
Fall. 3 credits. Prerequisite: CEE 361 or permission of instructor. Not offered 1989–90.
G. P. Fisher.
Planning and management problems in urban transportation systems and their solution. Transit operations planning. Demand forecasting. Consideration and evaluation of transportation system management alternatives such as high-occupancy vehicle lanes, parking prohibitions, auto-free zones, and pricing. Traffic implications of land-use development (site planning).]

**761 Transportation Design Project**
On demand. Variable credit.
Staff.
Design or feasibility study of transportation systems, supervised by one or more faculty advisers. Individual or group participation.

**762 Transportation Research**
On demand. Variable credit.
Staff.
In-depth investigation of a particular transportation planning or engineering problem mutually agreed upon between the student and one or more faculty members.

**[763 Transportation Colloquium**
Fall, spring. 1 credit. Not offered 1989–90.
Lectures in various topics related to transportation planning and analysis.]

**[764 Special Topics in Transportation**
Spring. 3 credits. Not offered 1989–90.
Staff.
Advanced subject matter not covered in depth in other regular courses.]

## Structural Engineering

**371 Structural Behavior**
Fall. 4 credits. Prerequisite: Engr 202.
3 lecs, one 2-hour lab, evening exams.
M. Sansalone.
Fundamental concepts of structural engineering. Behavior, analysis, and design. Loads, structural form, statically determinate analysis, approximate analysis of indeterminate systems. Use of interactive graphical analysis programs. Fundamentals of behavior and design of steel and concrete members.

**372 Structural Analysis**
Spring. 4 credits. Prerequisite: CEE 371.
3 lecs, one 2-hour lab, evening exams.
Staff.
Fundamentals of statically indeterminate structures. Moment-area and virtual-work methods of displacement computation. Matrix force and stiffness methods. Moment distribution analysis. Influence lines. Computer applications to practical structures.

**373 Design of Concrete Structures**
Fall. 4 credits. Prerequisites: CEE 372 or permission of instructor. Prerequisites or corequisites: CEE 376 and Engr 261.
2 lecs, one 2-hour lab, design project. A. H. Nilson.
Behavior and design of reinforced concrete, prestressed concrete, and composite structures.

**374 Design of Steel Structures**
Spring. 4 credits. Prerequisite: CEE 372 or permission of instructor. Prerequisites or corequisites: CEE 376 and Engr 261.
3 lecs, one 2-hour sec, evening exams, design project. G. G. Deierlein.
Behavior and design of steel members, connections, and structures. Discussion of structural systems for buildings and bridges.

**[375 Structural Behavior Laboratory**
Spring. 2 credits. Prerequisite or corequisite: CEE 372. Not offered 1989–90.
R. N. White.
A laboratory course on behavior of structures, utilizing small-scale models. Elastic, inelastic, and nonlinear behavior of structural components and systems. Experimental design and projects.]

**376 Civil Engineering Materials**
Fall. 3 credits.
2 lecs, 1 lab. K. C. Hover.
Engineering properties of concrete, steel, wood, and other structural materials. Design characteristics and significance of test results of materials used in engineering works. Developing QA/QC programs and writing specifications. Extensive laboratory testing and report writing.

**[670 Timber Engineering**
Spring. 1 credit. Prerequisite: CEE 373. Not offered 1989–90.
R. N. White.
Timber properties. Design of timber tension members, beams, and beam-columns. Glued-laminated timber design. Connection behavior and design. Special timber structural systems.]

**671 Random Vibration**
Fall. 3 credits. Prerequisites: M&AE 326, CEE 779, and OR&IE 260; or equivalent and permission of instructor. Offered alternate years.
M. D. Grigoriu.
Review of random-process theory, simulation, and first-passage time. Linear random vibration: second-moment response descriptors and applications from fatigue; seismic analysis; and response to wind, wave, and other non-Gaussian load processes. Nonlinear random vibration: equivalent linearization, perturbation techniques, Fokker-Planck and Kolmogorov equations, Itô calculus, and applications from chaotic vibration, fatigue, seismic analysis, and parametrically excited systems.

**672 Fundamentals of Structural Mechanics**
Fall. 3 credits. Prerequisite or corequisite: CEE 373.
M. D. Grigoriu.
Theory of elasticity, energy principles, plate flexure, failure theories for structural design, beams on elastic foundation, finite-difference method, plate theory, energy principles, introduction to finite-element method.

**673 Advanced Structural Analysis**
Fall. 3 credits. Prerequisites: CEE 372 and computer programming.
Evening exams, programming project. Staff.
Matrix analysis of structures, computer programming of displacement (stiffness) method, use of interactive graphical analysis programs, solution methods, errors and accuracy, special analysis procedures, virtual work in matrix analysis, and introduction to nonlinear analysis.

**[674 Structural Model Analysis and Experimental Methods**
Spring. 3 credits. Not offered 1989–90.
2 lecs, 1 lab. R. N. White.
Dimensional analysis and similitude. Model materials, fabrication, loading, instrumentation techniques, and use of models in design. Experimental stress analysis. Models project.]

**675 Concrete Materials and Construction**
Spring. 3 credits. Prerequisite: CEE 376 or equivalent.
2 lecs, 1 lab. K. C. Hover.
Materials science, structural engineering, and construction technology involved in the materials aspects of the use of concrete. Cement chemistry and physics, mix design, admixtures, engineering properties, testing of fresh and hardened concrete, and the effects of construction techniques on material behavior. Lab assignments.

**678 Low-Cost Housing Primarily for Developing Countries (also Architecture 614)**
Fall. 3 credits. May not be offered 1989–90.
2 lecs, conferences. H. Richardson.
A broad, multidisciplinary approach covering technology, architecture, planning, sociology, economy, and cultural aspects. Students work in teams on a term project, applying their own discipline while being introduced to the problems and approaches of other disciplines. For example, engineering students investigate the technological aspects of the subject but also learn about other matters that influence technological decisions, such as cultural and economic factors.

**680 Structural Engineering Seminar**
Fall, spring. 1 credit. Limited to qualified seniors and graduate students.
Staff.
Presentation of topics of current interest in the field of structures.

**770 Engineering Fracture Mechanics**
Fall. 3 credits. Prerequisite: CEE 772 or permission of instructor. Offered alternate years.
2 lecs, 1 lab. A. R. Ingraffea.
Fundamentals of fracture-mechanics theory. Energy and stress-intensity approaches to fracture. Mixed-mode fracture. Fatigue-crack propagation. Finite- and boundary-element methods in fracture mechanics. Introduction to elastic-plastic fracture mechanics. Interactive computer graphics for fracture simulation. Laboratory techniques for fracture-toughness testing of metals, concrete, and rock.

**772 Finite-Element Analysis**
Spring. 3 credits. Prerequisites: CEE 672 and 673, or permission of instructor.
Staff.
Conceptual, theoretical, and practical bases for finite-element analysis in structural mechanics and other disciplines. Development and evaluation of formulations for one-, two-, and three-dimensional elements. Introduction to boundary-element analysis. Interactive computer graphics for finite- and boundary-element analysis.

**773 Structural Reliability**
Spring. 3 credits.
M. D. Grigoriu.
Review of probability theory, practical measures for structural reliability, second-moment reliability indices, probability models for strength and loads, probability-based design codes, reliability of structural systems, imperfection-sensitive structures, fatigue, stochastic finite-element techniques, elementary concepts of probabilistic fracture mechanics.

**774 Prestressed Concrete Structures**
Spring. 3 credits. Prerequisites: CEE 373 and 376 or equivalent. Recommended: CEE 775.
3 lecs. R. N. White.
Behavior, analysis, design of pretensioned and posttensioned prestressed concrete structures. Flexure, shear, bond, anchorage zone design, cracking, losses. Partial prestressing. Strength, serviceability, structural efficiency of beams, slabs, tension and compression members, frameworks, bridges.

**775 Advanced Reinforced Concrete**
Fall. 3 credits. Prerequisites: CEE 373 and 376 or equivalent.
3 lecs. A. H. Nilson.
General flexural analysis, deflection analysis, columns with uniaxial and biaxial bending, beam-supported slabs, flat-plate slabs, composite steel-deck slabs, ground-supported slabs, yield-line theory, limit-state analysis, footings, retaining walls, deep beams, tall buildings, and seismic design.

**776 Advanced Design of Metal Structures**
Fall. 3 credits. Prerequisite: CEE 374 or equivalent.
T. Pekoz.
Preliminary design of structural systems. Design of members and connections. Behavior and computer-aided design of building frames. Design of composite members.

**777 Advanced Behavior of Metal Structures**
Spring. 3 credits. Prerequisite: CEE 374 or equivalent.
T. Pekoz.
Analysis of elastic and inelastic stability. Behavior and design of hot-rolled and cold-rolled steel and aluminum members, elements, and frames. Critical review of design specifications.

**[778 Shell Theory and Design**
Fall. 3 credits. Offered alternate years. Not offered 1989–90.
P. Gergely.
Fundamentals of practical shell theory. Differential geometry of surfaces; membrane and bending theory of shells; analysis and design of cylindrical shells, polygonal domes, and paraboloids.]

**779 Structural Dynamics and Earthquake Engineering**
Spring. 3 credits.
P. Gergely.
Modal analysis, numerical methods, and frequency-domain analysis. Introduction to earthquake-resistant design.

**780 Advanced Concrete Material Science**
Fall. 3 credits. Prerequisites: CEE 376 or equivalent and CEE 675.
K. C. Hover.
Advanced study of the chemistry, physics, and microstructure of cement and concrete. Investigation of cement manufacture and chemistry, hydration reactions and effect of admixtures. Study of microstructure with scanning electron microscopy, and porosimetry. Engineering properties and behavior include failure mechanisms and elastic and viscoelastic behavior. Durability. Student presentations.

**782 Advanced Topics in Finite-Element Analysis**
Fall. 3 credits. Prerequisite: CEE 772.
Offered alternate years.
J. F. Abel, A. R. Ingraffea.
Lectures and colloquia on selected advanced topics and research in progress, including dynamics, nonlinear analysis, shells, fracture mechanics, fluid dynamics, and computer graphics.

**783 Civil and Environmental Engineering Materials Project**
On demand. 1–3 credits.
Staff.
Individual projects or reading and study assignments involving engineering materials.

**784 Design Project in Structural Engineering**
Fall, spring. Variable credit.
Students may elect to undertake a design project in structural engineering. The work is supervised by a professor in this subject area.

**785 Research in Structural Engineering**
On demand. Variable credit.
Hours to be arranged. Staff.
Pursuit of a branch of structural engineering beyond what is covered in regular courses. Theoretical or experimental investigation of suitable problems.

**786 Special Topics in Structural Engineering**
On demand. Variable credit.
Hours to be arranged. Staff.
Individually supervised study or independent design or research in specialized topics not covered in regular courses.

**880 Thesis—Structural Engineering**
Fall, spring. 1–12 credits. Students must register for credit with the professor at the start of each term. Geotechnical engineering: section 01; structural engineering: section 02. A thesis research topic is selected by the student with the advice of the faculty member in charge and is pursued either independently or in conjunction with others working on the same topic.

## Engineering Management

**590 Engineering Management Practice**
Spring. 3 credits. Prerequisite: permission of instructor.
M. A. Turnquist.
What an engineering manager does in practice, including the planning, organizing, integrating, and measuring. A series of expository lectures is complemented by an integrated seminar series presented by practicing engineering managers.

**591 Engineering Management Project**
Fall. 3 credits. Prerequisite: permission of instructor.
K. C. Hover.
An intensive evaluation of the management aspects of a major engineering project or system. Most students will work on a large group project in the area of project management, but students may also work singly or in small groups on an engineering management topic of special interest to them.

**592 Engineering Management Project**
Spring. 3 credits. Prerequisite: permission of instructor.
K. C. Hover.
A continuation of CEE 591.

**593 Engineering Management Methods I**
Fall. 3 credits. Prerequisite: permission of instructor.
M. A. Turnquist.
Engineering management methods with an emphasis on modern interactive-software tools. Case studies are used extensively to illustrate the application of these methods to engineering management problems. Methods covered include spreadsheets, database managers, statistical-analysis software, project scheduling and optimization, and network flow algorithms.

**594 Engineering Management Methods II**
Spring. 3 credits. Prerequisite: permission of instructor.
M. A. Turnquist.
An extension of CEE 593. The use of interactive graphics and geographic information systems, distributed databases, simulation of complex systems, and the use of expert systems in engineering management. As with CEE 593, extensive use will be made of case studies to illustrate the application of these methods.

**595 Construction Planning and Operations**
Fall. 3 credits. Prerequisite: permission of instructor.
3 lecs. K. C. Hover.
A course on the fundamentals of construction planning: organization of the worksite, construction planning, scheduling, and cost estimating, design of falsework and shoring systems, construction loadings, materials handling for construction, optimization of construction processes, applications of expert systems.

**596 Building Systems Integration**
Spring. 3 credits. Prerequisite: permission of instructor.
3 lecs. Staff.
Emphasizes the engineering design and construction process as a total systems problem: overall structural planning and the sequence of assembly, impact of assembly details on construction procedures, review of designs for constructability, integration of engineering services, introduction to value engineering, construction documents, and contract administration.

**597 Risk Analysis and Management**
Spring. 3 credits. Prerequisite: CEE 304 or OR&IE 270 or equivalent.
2 lecs, 1 sec. M. A. Turnquist, J. R. Stedinger.
The analysis and management of risks in technological systems, including energy production, waste disposal, engineering construction, and transportation. Probability models of failure, exposure, and consequences. Public-sector decsion making and regulation of risks.

**598 Decision Making in Engineering Systems**
Fall. 3 credits. Prerequisite: permission of instructor.
3 lecs. Staff.
An examination of the decision-making behavior of managers and users of engineering systems. Such behavior will be addressed from various perspectives, including economic theories of choice, psychological theories of perception and choice, and consumer theories from marketing research.

# COMPUTER SCIENCE

The Department of Computer Science is in both the College of Arts and Sciences and the College of Engineering.

**100 Introduction to Computer Programming (also Engr 100)**
Fall, spring, summer. 4 credits. Students who plan to take CS 101 or 102 and also 100 must take 101 or 102 first.
2 lecs, 1 rec (optional), 3 evening exams.
An introduction to elementary computer programming concepts. Emphasis is on techniques of problem analysis and algorithm and program development. The subject of the course is programming, not a particular programming language. The principal programming language is Pascal. The course does not presume previous programming experience. An introduction to numerical computing is included, although no college-level mathematics is presumed. Programming assignments are tested and run on interactive, stand-alone microcomputers.

**101 The Computer Age (also Engr 101)**
Fall, summer. 3 credits. Credit is granted for both CS 100 and 101 only if 101 is taken first.
An introduction to computer science and programming for students in nontechnical areas. The aims of the course are to acquaint the student with the major ideas in computer science and to develop an appreciation of algorithmic thinking. Topics include the history of computation; microtechnology; the retrieval and transmission of information; scientific computing; computer graphics, art, and music; robotics, natural-language processing, and machine intelligence. Students become acquainted with the notion of an algorithm by writing several programs in Pascal or LISP and testing them on microcomputers. The amount of programming is about half that taught in CS 100. Each student writes a term paper on some aspect of computing.

**102 Introduction to Microcomputer Applications (also Ag Engr 102)**
Fall. 3 credits. Each lab section limited to 16 students. Not open to engineering students or students who have taken any prior computer courses at Cornell. Students in statutory colleges must enroll in Ag Engr 102.
2 lecs, 1 lab, 2 evening exams.
An introduction to the use of application packages on microcomputers. An attempt will be made to assess and demonstrate the capability and limitations of the current generation of personal computers through software for word processing, spreadsheets, databases, and other applications. The course will involve very little programming with high-level languages.

**211 Computers and Programming (also Engr 211)**
Fall, spring, summer. 3 credits. Credit will not be granted for both CS 211 and 212. Prerequisite: CS 100 or equivalent programming experience.
2 lecs, 1 rec, 2 evening exams.
Intermediate programming in a high-level language and introduction to computer science. Topics include program development, proofs of program correctness, program structure, recursion, abstract data types, data structures, and analysis of algorithms. Pascal is the principal programming language.

**212 Modes of Algorithmic Expression**
Fall. 4 credits. Credit will not be granted for both CS 211 and 212. Prerequisite: CS 100 or equivalent programming experience.
2 lecs, 2 recs, 2 evening exams.
A challenging introduction to programming languages and computer science that emphasizes alternative modes of algorithmic expression. Topics include recursive and higher-order procedures, performance analysis of algorithms, proofs of program correctness, probabilistic algorithms, symbolic hierarchical data, abstract data types, polymorphic functions, object-oriented programming, infinite data types, simulation, and the interpretation of programs. Programs are written in Scheme, a dialect of LISP.

CS 212 emphasizes a varied collection of advanced programming concepts and techniques available in a modern functional programming language. In contrast, CS 211 focuses on perfecting programming skills in a conventional imperative programming language. Corrective transfers between CS 211 and 212 (in either direction) are encouraged during the first few weeks of instruction.

**222 Introduction to Scientific Computation (also Engr 222)**
Spring. 3 credits. Prerequisites: CS 100 and Mathematics 112, 122, or 192.
2 lecs, 1 rec, 2 evening exams.
An introduction to elementary numerical analysis and scientific computation. Students write FORTRAN programs and use high-quality numerical software packages to solve representative problems. Emphasis is on efficient, reliable, and stable methods for the basic problems of computational mathematics. Special topics include supercomputing and parallel computation.

**280 Discrete Structures**
Fall, spring. 4 credits. Prerequisite: CS 211, 212 or permission of instructor.
3 lecs.
Covers mathematical aspects of programming and computing. Topics will be chosen from the following: mathematical induction; logical proof; propositional and predicate calculus; combinatorics and discrete mathematics covering manipulation of sums, recurrence relations, and generating-function techniques; basic number theory; sets, functions, and relations; partially ordered sets; graphs.

**305 Social Issues in Computing (also Engr 305)**
Spring. 3 credits. Prerequisite: CS 100 or 101 or permission of instructor. Not offered every year.
2 lecs.
Economic, political, legal, and cultural impact of computers and computer-related technology; the role of computers in coordinating diversity and reducing disorder; the effect of computers on the individual; data banks and privacy; machine creativity and machine intelligence.

**314 Introduction to Computer Systems and Organization**
Fall, spring, summer. 4 credits. Prerequisite: CS 211 or equivalent.
2 lecs, 1 sec, 2 evening exams.
Introduction to the logical structure of digital computers. Topics include representation of information, machine-assembly language, the input-output channel, hierarchical storage systems, and microprogramming.

**381 Introduction to Theory of Computing**
Fall. 4 credits. Prerequisite: CS 280 or permission of instructor.
3 lecs.
An introduction to modern theory of computing: automata theory, formal languages, and effective computability.

**400 The Science of Programming**
Spring. 4 credits. Prerequisite: CS 280 or equivalent.
3 lecs. D. Gries.
The practical development of correct programs based on the conscious application of principles that are derived from a mathematical notion of program correctness. Besides dealing with conventional sequential programs, the course covers implementations of abstract data types and contains an introduction to problems with concurrency. Issues in programming-language design that arise from program correctness are discussed. Programs are written but not run on a computer.

**410 (310) Data Structures**
Fall, spring, summer. 4 credits. Prerequisite: CS 280 or permission of instructor.
2 lecs, 2 evening exams.
Lists, trees, graphs, arrays, and other forms of data structure and their implementation. Relationship between language and data structure, emphasizing abstract data types. Dynamic storage allocation and memory management. Detailed study of searching and sorting methods. Analysis to determine the more efficient algorithm in a given situation.

**411 Programming Languages and Logics**
Spring. 4 credits. Prerequisite: CS 410 or permission of instructor. Not offered every year.
2 lecs.
A study of major programming paradigms. Basic l-calculus. Functional programming. Programming in ML. Typed l-calculi. Polymorphism, type systems. Object-oriented programming and inheritance. Logic programming. Introduction to formal semantics.

**412 Introduction to Compilers and Translators**
Spring. 4 credits. Prerequisites: CS 314, 381, 410. Not offered every year.
3 lecs.
Overview of the internal structure of modern compilers, with emphasis on implementation techniques. Topics covered include lexical scanning, simple parsing techniques, symbol-table manipulation, type-checking routines, code generation, and simple optimizations. The course entails a compiler implementation project.

**414 Systems Programming and Operating Systems**
Fall. 3 credits. Prerequisite: CS 314 or permission of instructor.
2 lecs, 2 evening exams.
An introduction to the logical design of systems programs, with emphasis on multiprogrammed operating systems. Topics include process synchronization, deadlock, memory management, input-output methods, information sharing, protection and security, and file systems. The impact of network and distributed computing environments on operating systems is also discussed.

**415 Practicum in Operating Systems**
Fall. 2 credits. Prerequisite: CS 410. Corequisite: CS 414.
1 lec.
The practical aspects of operating systems are studied through the design and implementation of an operating system kernel that supports multiprogramming, virtual memory, and various input-output devices. All the programming for the project is in a high-level language.

**417 Computer Graphics (also Architecture 374)**
Spring. 3 credits. Prerequisite: CS 211 or 212.
2 lecs, 1 lab.
An introduction to the principles of interactive computer graphics, including input techniques, display devices, display files, interactive graphic techniques, two- and three-dimensional computer graphics, perspective transformations, hidden-line and hidden-surface algorithms, parametric surfaces, light reflection models, and realistic image synthesis.

**418 Practicum in Computer Graphics (also Architecture 375)**
Spring. 2 credits. Prerequisite: CS 211 or 212. Recommended: CS 314. Corequisite: CS 417.
1 lab.
Two or three programming assignments dealing with sophisticated interactive vector graphics programs on calligraphic displays and solid image generation or raster graphics displays.

**421 Numerical Solution of Algebraic Equations**
Fall. 4 credits. Prerequisites: Mathematics 222 or 294, one additional mathematics course numbered 300 or above, and knowledge of FORTRAN at the CS 222 level.
3 lecs.
Modern algorithms for systems of linear equations, systems of nonlinear equations, and multidimensional optimization. Some discussion of methods that are suitable for parallel computation.

**432 Introduction to Database Systems**
Spring. 3 credits. Prerequisites: Either CS 211or 212, and 410, or permission of instructor. Recommended: CS 314.
2 lecs, 1 rec.
Introduction to modern database management systems. Concepts in data modeling and query processing. Database models and query languages. Storage structures and access methods. Concurrency control.

**433 Practicum in Database Systems**
Spring. 2 credits. Corequisite: CS 432.
1 lab.
Issues related to the design and implementation of database-management systems will be addressed. Students will implement a simplified relational database system, including a file-access method and query-processing algorithms.

**472 Introduction to Artificial Intelligence**
Fall. 4 credits. Prerequisite: CS 410. Open to juniors, seniors, and graduate students.
2 lecs, 1 sec.
An introduction to the major subareas and current research directions in artificial intelligence. Topics include knowledge representation, search, problem-solving, natural-language processing, logic and deduction, planning, and machine learning.

**481 Introduction to Theory of Computing**
Spring. 4 credits. Prerequisite: CS 280 or permission of instructor. Credit will not be granted for both CS 381 and CS 481. Corrective transfers between CS 481 and CS 381 (in either direction) are encouraged during the first few weeks of instruction.
3 lecs.
A faster-moving and deeper version of CS 381.

**482 (382) Introduction to Analysis of Algorithms**
Spring. 4 credits. Prerequisites: CS 410 and either 381 or 481, or permission of instructor.
3 lecs.
Techniques used in the creation and analysis of algorithms. Combinatorial algorithms, computational complexity, NP-completeness, and intractable problems.

**486 Applied Logic (also Mathematics 486)**
Spring. 4 credits. Prerequisites: Mathematics 222 or 294, CS 100, and some additional course in mathematics or theoretical computer science.
2 lecs, 1 lab to be arranged.
Propositional and predicate logic, compactness and completeness by tableaux, natural deduction, and resolution. Equational logic. Herbrand Universes and unification. Rewrite rules and equational logic, Knuth-Bendix method and the congruence-closure algorithm and l-calculus reduction strategies. Topics in Prolog, LISP, ML, or Nuprl. Applications to expert systems and program verification.

**490 Independent Reading and Research**
Fall, spring. 1–4 credits.
Independent reading and research for undergraduates.

**600 Computer Science and Programming**
Fall. 1 credit. Prerequisite: graduate standing in computer science or permission of instructor.
1 lec.
An introduction to practical, modern ideas in programming methodology. Covers style and organization of programs, basic techniques for presenting proofs of correctness of programs, and the use of a "calculus" for the derivation of programs.

**601 Introduction to Programming Logics**
Spring. 1 credit. Prerequisite: graduate standing in computer science or permission of instructor.
1 lec.
Exploration of logics for reasoning about programs, with special emphasis on data types and type theory. Comparison with domain theory and logics of computable functions. The Cornell proof development system Nuprl may be used.

**611 Advanced Programming Languages**
Fall. 4 credits. Prerequisites: CS 410 and 381 or 481, or permission of instructor.
3 lecs.
A survey of programming paradigms; functional, imperative, and logic programming. The untyped lambda-calculus. The typed lambda-calculus, type systems, polymorphism, type inference. Formal semantics of programming languages. Elements of domain theory.

**612 Compiler Design for High-Performance Architectures**
Spring. 4 credits. Prerequisites: CS 314, 410, and 412, or permission of instructor.
3 lecs.
Compiler design techniques for sequential and parallel machines. Principles of optimizing compilers: dataflow analysis, optimizing transformations, code generation. Code generation for pipelined computers: code reorganization to minimize interlock. Principles of vectorization: dependency analysis, solving Diophantine equations, transformations to enhance vector content in programs. Code generation for VLIW machines: trace scheduling. Compiling functional and logic programming languages for dataflow architectures.

**613 Concurrent Programming**
Spring. 4 credits. Prerequisites: CS 414 and 600, or permission of instructor.
3 lecs.
Advanced techniques in, and models of, concurrent systems. Synchronization of concurrent processes; parallel programming languages; deadlock; verification.

**614 Advanced Systems**
Spring. 4 credits. Prerequisite: CS 414 or permission of instructor.
2 lecs.
An advanced course in systems, emphasizing contemporary research in distributed systems. Topics may include communication mechanisms, consistency in distributed systems, fault-tolerance, knowledge and knowledge-based protocols, performance, scheduling, concurrency control, and authentication and security issues.

**[615 Machine Organization**
Spring. 4 credits. Prerequisite: CS 314 or permission of instructor. Not offered 1989–90.
3 lecs.]

**616 VLSI Algorithms**
Spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.
2 lecs.
This course focuses on the area-time performance of VLSI computing systems. After a review of technology, a model of computation for VLSI is defined. General area-time lower-bound techniques are presented and applied to specific problems such as integer arithmetic, matrix operations, signal processing, sorting, and graph problems. Design of parallel algorithms and architectures is then discussed for the same class of problems. Selected topics on computer-aided design for VLSI, such as layout and testing, will also be covered.

**621 Matrix Computations**
Fall. 4 credits. Prerequisites: Mathematics 411 and 431, or permission of instructor.
3 lecs.
Numerical matrix algorithms. Stable and efficient methods for solving systems of linear equations: Gaussian elimination, Cholesky decomposition, bounded and structured systems, the QR factorization, and least-squares methods. The symmetric and unsymmetric eigenvalue problems and related computational problems. The singular value decomposition.

**622 Numerical Optimization and Nonlinear Algebraic Equations**
Spring. 4 credits. Prerequisite: CS 621.
3 lecs.
Modern algorithms for the numerical solution of multidimensional optimization problems and simultaneous nonlinear algebraic equations. Emphasis is on efficient, stable, and reliable numerical techniques with strong global convergence properties: quasi-Newton methods, modified Newton algorithms, and trust-region procedures. Special topics may include large-scale optimization, quadratic programming, and numerical approximation.

**632 Database Systems**
Fall. 4 credits. Prerequisites: CS 410 and 432, or permission of instructor.
2 lecs.
Discussion of data models and the implementation of database systems, with an emphasis on current areas of research. Topics include the relational model, data-dependency theory, semantic modeling, query optimization, transaction management, and advanced issues in distributed databases.

**635 Automatic Text Processing and Information Retrieval**
Spring. 4 credits. Prerequisite: CS 410 or permission of instructor.
2 lecs.
Modern methods for natural language text processing. Topics include text analysis, storage and retrieval, automatic spelling aids, text compression and encryption, language understanding systems, automatic abstracting, and text generation and translation.

**643 Design and Analysis of Computer Networks**
Fall. 4 credits. Prerequisite: CS 414 or permission of instructor. Not offered every year.
2 lecs.
A course in computer networks and layered protocols. The following topics are presented: network topology design; data transmission within the physical layer; data-link sliding-window protocols; network layer in point-to-point long-haul networks, satellite and packet radio networks and local networks; transport and session layer protocols; internetworking. Selected topics from distributed computing will also be discussed.

**655 Mathematical Foundations of Computer Modeling and Simulation (also Mathematics 655)**
Fall. 4 credits. Prerequisites: Mathematics 431 and 432, or the equivalent in both content and level of mathematical sophistication, or permission of instructor. Not offered every year.
3 lecs.
This course has two parts, one purely mathematical and the other emphasizing applications. The first part is intended to introduce students to theoretical tools that are relevant to the study of robotics, solid modeling, and simulation. These tools will be drawn from the areas of real and complex algebraic geometry, topology, differential geometry, and differential equations. The second part of the course will provide applications that illustrate uses of the mathematics and point the way to needed further developments.

**661 Robotics**
Fall. 4 credits. Prerequisites: CS 482 and permission of instructor. Not offered every year.
3 lecs.
State-of-the-art in theoretical and experimental robotics, with an emphasis on robot-motion planning. Topics include: Task-level robot planning, collision-free path planning, grasp synthesis, modeling and propagating uncertainty, planning compliant motions for precision assembly, geometrical planning theories, motion planning with dynamics (and dynamic constraints), computational complexity of robot-motion planning, computational theories of friction, impact, and the physics of manipulation, and error detection and recovery in robotics.

**662 Robotics Laboratory**
Fall. 1 credit. Prerequisite: graduate standing or permission of instructor. Not offered every year.
1 lab.
Introduction to the use of equipment and techniques in a modern robotics laboratory. Includes VAL programming, force sensing, compliant motion, and mechanical assembly.

**671 Introduction to Automated Reasoning**
Fall. 4 credits. Prerequisites: CS 611 and 681 and Mathematics 581. Not offered every year.
3 lecs.
Methods to automate reasoning in mathematics, including decision procedures, theorem provers, and formal proof tactics. Various implemented systems such as Edinburgh LCF, Cornell's Nuprl, and the Boyer and Moore theorem prover may be studied.

**672 Artificial Intelligence Programming**
Spring. 4 credits. Prerequisite: CS 472 or permission of instructor.
3 lecs.
Review of Common LISP programming and an overview of AI programming techniques. Discussion focuses on practical issues faced by implementors of large LISP systems. Topics may include discrimination nets, agendas, deductive retrievers, slot and filler databases, backtracking problem solvers, and truth-maintenance systems. Students will be expected to implement several of the systems discussed in class.

**681 Analysis of Algorithms**
Fall. 4 credits. Prerequisite: CS 381 or 481, or permission of instructor.
3 lecs.
Methodology for developing efficient algorithms, primarily for graph theoretic problems. Understanding of the inherent complexity of natural problems via polynomial-time algorithms, randomized algorithms, NP-completeness, randomized reducibilities. Additional topics such as parallel algorithms and efficient data structures.

**682 Theory of Computing**
Spring. 4 credits. Prerequisite: CS 381 or 481, or permission of instructor.
3 lecs.
Advanced treatment of theory of computation, computational-complexity theory, and other topics in computing theory.

**709 Computer Science Graduate Seminar**
Fall, spring. 1 credit. S-U grades only. For staff, visitors, and graduate students interested in computer science.
A weekly meeting for the discussion and study of important topics in the field.

**711 Topics in Programming Languages and Systems**
Spring. 4 credits. Prerequisites: CS 381 or 481, and 611, or permission of instructor. Not offered every year.
2 lecs.
Topics are chosen at instructor's discretion.

**712 Topics in Programming Languages and Systems**
Spring. 4 credits. Prerequisite: CS 612 or permission of instructor. Not offered every year.
2 lecs.
Topics are chosen at instructor's discretion.

**713 Seminar in Systems and Methodology**
Fall, spring. 4 credits. Prerequisites: CS 414 and an advanced Systems course such as CS 613, 614, 632, or 643, or permission of instructor. Not offered every year.
Discussion of contemporary issues in systems and methodology.

**714 Distributed Computing**
Spring. 4 credits. Prerequisites: CS 414 and an advanced systems course such as CS 613, 614, 632, or 643, or permission of instructor. Not offered every year.
2 lecs.
Principles of distributed computing and their application to fundamental problems. Considerable time will be devoted to modeling distributed computations, the theory of concurrency control, security and protection, and issues in fault tolerance (including consensus problems). Other topics may be optimal resource placement, cache management, the specification of distributed programs, and randomized protocols.

**715 Seminar in Programming Refinement Logics**
Fall, spring. 4 credits. Prerequisite: permission of instructor.
Topics in programming logics, possibly including type theory, constructive logic, decision procedures, heuristic methods, extraction of code from proofs, and the design of proof-development and problem-solving systems.

**719 Seminar in Programming Languages**
Fall, spring. 4 credits. Prerequisite: CS 611 or permission of instructor. S-U grades only.

**721 Topics in Numerical Analysis**
Fall. 4 credits. Prerequisite: CS 621 or 622, or permission of instructor. Not offered every year.
2 lecs.
Topics are chosen at instructor's discretion.

**722 Topics in Numerical Analysis**
Spring. 4 credits. Prerequisite: CS 621 or 622. Not offered every year.
2 lecs.
Topics are chosen at instructor's discretion.

**729 Seminar in Numerical Analysis**
Fall, spring. 1–4 credits (to be arranged). Prerequisite: permission of instructor. S-U grades only.

**[733 Topics in Information Processing**
Not offered 1989–90.
2 lecs.
Topics are chosen at instructor's discretion.]

**[734 Seminar in File Processing**
Fall. Credit to be arranged. Prerequisite: CS 733 or permission of instructor. Not offered 1989–90.]

**739 Seminar in Text Processing and Information Retrieval**
Fall, spring. Credit to be arranged. Prerequisite: CS 635 or permission of instructor. S-U grades only.

**[743 Topics in Fault-Tolerant Distributed Computing**
Prerequisites: CS 614, 643, or 714. Not offered 1989–90.
1 lec.
A study of the latest results and an exploration of open questions in the area of fault-tolerant distributed computing. Topics may include failure models, reliable broadcasts, synchronization, knowledge, and network partitioning. This course is particularly suited to students interested in pursuing research in this area.]

**747 Seminar in Program Logic and Semantics**
4 credits. Prerequisite: permission of instructor. S-U grades only. Not offered every year.

**749 Seminar in Systems Modeling and Analysis**
Fall, spring. 4 credits. Prerequisite: permission of instructor. Not offered every year.
Discussion of advanced topics in modeling and analysis of computer systems and networks, with emphasis on performance.

**771 Topics in Artificial Intelligence**
4 credits. Prerequisite: permission of instructor. Not offered every year.

**772 Robotics Seminar**
4 credits. Prerequisite: permission of instructor. Not offered every year.

**774 Proseminar in Cognitive Studies II (also Cognitive Studies 774 and Linguistics 774)**
Spring. 4 credits. Prerequisite: permission of instructor.

**779 Seminar in Artificial Intelligence**
Fall, spring. Credit to be arranged. Prerequisite: permission of instructor. S-U grades only.

**781 Topics in Analysis of Algorithms and Theory of Computing**
Fall. 4 credits. Prerequisites: CS 681 and 682, or permission of instructor. S-U grades only. Not offered every year.
2 lecs.
Topics are chosen at instructor's discretion.

**782 Topics in Analysis of Algorithms and Theory of Computing**
Spring. 4 credits. Prerequisites: CS 681 and 682, or permission of instructor. S-U grades only. Not offered every year.
2 lecs.
Topics are chosen at instructor's discretion.

**789 Seminar in Theory of Algorithms and Computing**
Fall, spring. 2–4 credits. Prerequisite: permission of instructor. S-U grades only.

**790 Special Investigations in Computer Science**
Fall, spring. Prerequisite: permission of a computer science adviser. Letter grade only. Independent research or Master of Engineering project.

**890 Special Investigations in Computer Science**
Fall, spring. Prerequisite: permission of a computer science adviser. S-U grades only. Master of Science degree research.

**990 Special Investigations in Computer Science**
Fall, spring. Prerequisite: permission of a computer science adviser. S-U grades only. Doctoral research.

# ELECTRICAL ENGINEERING

## Core Courses

**210 Introduction to Electrical Systems (also Engr 210)**
Fall, spring. 3 credits. Prerequisites or corequisites: Mathematics 293 and Physics 213.
3 lecs and optional tutorial sections.
For description see Engineering Common Courses.

**230 Introduction to Digital Systems**
Fall, spring. 4 credits.
2 lecs, 5 lab experiments.
Introduction to basic analysis, design techniques, and methodology of digital systems. Boolean algebra, integrated circuit components used in digital-system implementation, codes and number systems, logic design of combinational circuits, and sequential circuits, register transfer systems, and machine organization. Laboratory experiments are performed on a Macintosh computer using a logic simulator.

**301 Electrical Signals and Systems I**
Fall. 4 credits. Prerequisites: a grade of at least C+ in Engr 210 and C in Mathematics 293 and 294.
3 lecs, 1 rec-computing session.
Linear time-invariant systems as models for active and passive networks, nodal analysis, convolution, unilateral Laplace transforms, relationships between steady-state system response and dynamical behavior; introduction to state variable analysis.

**302 Electrical Signals and Systems II**
Spring. 4 credits. Prerequisite: EE 301.
3 lecs, 1 rec-computing session.
Continuous- and discrete-time signals and systems; Fourier series and transforms; bilateral Laplace and $z$ transforms; applications of complex function theory and contour integration to system analysis; FFTs and DFTs; applications to modulation, filtering, and sampling.

**303–304 Electromagnetic Waves and Fields I and II**
303, fall; 304, spring. 4 credits each term. Prerequisites: grades of C or better in Physics 213 and 214, and Mathematics 294. Corequisite: (for 304) EE 302.
3 lecs, 1 rec-computing session.
Foundation and applications of electromagnetic theory, with emphasis on wave propagation, radiation, and the effects of the medium on wave transmission. Maxwell's equations, boundary conditions, electrostatics, Poynting theorem, electromagnetic basis of material properties and of circuits, plane waves in isotropic media, impedance concept and reflection, transmission lines, simple waveguides, resonant cavities, radiation and antenna systems, wave propagation in inhomogeneous and anisotropic media, and plasma and magnetic field effects. At the level of *Fields and Waves in Communication Electronics,* by Ramo, Whinnery, and Van Duzer, second edition.

**306 Fundamentals of Quantum and Solid-State Electronics**
Spring. 4 credits. Prerequisites: Physics 214, Mathematics 294, and EE 303.
3 lecs, 1 rec-computing session.
Introductory quantum mechanics and solid-state physics necessary for understanding lasers and modern solid-state electronic devices. Quantum mechanics is presented in terms of wave functions, operators, and solutions of Schroedinger's equation. Topics include the formalism and methods of quantum mechanics, the hydrogen atom, the structure of simple solids, energy bands, Fermi-Dirac statistics, and the basic physics of semiconductors. Applications studied include a simple metal, thermionic emission, and the p-n junction.

**308 Fundamentals of Computer Engineering**
Spring. 4 credits. Prerequisites: CS 100 and EE 230.
3 lecs, 1 rec-computing session.
An introduction to theoretical topics basic to computer engineering: discrete mathematics; structured computer organization; data structures and algorithms; and computer arithmetic. Practical applications of these concepts.

**310 Introduction to Probability and Random Signals**
Spring. 4 credits. Prerequisite: Mathematics 294.
3 lecs, 1 rec-computing session.
Introduction to the theory of probability as a basis for modeling random phenomena and signals, calculating the response of systems incorporating these models, and making estimates, inferences, and decisions in the presence of chance and uncertainty. Applications of these models will be given in such areas as communications, control, and device modeling. Specific topics include the basic concept of probability and its presentations through densities, cumulative distribution functions, and characteristic functions; conditional probability; independence; scalar and vector random variables and nonlinear transformations of data; expectation, conditional expectation, moments, correlation; laws of large numbers and central limit theorem; linear least mean square estimation; Bayes decision making.

**315 Electrical Laboratory I**
Fall. 4 credits. Prerequisite: a grade of at least C+ in Engr 210. Corequisite: EE 301.
2 lecs, 2 labs.
Basic electrical and electronic instrumentation and measurements involving circuits and fields of both active and passive elements; an experimental introduction to solid-state theory and devices. Introduction of the personal computer as a laboratory aid.

**316 High-Frequency and Microwave Fundamentals**
Spring. 4 credits. Prerequisites: EE 301, 303, and 315.
3 lecs, 1 lab.
Laboratory and design studies in high-frequency and fast-pulse circuits, microwaves and electro-optics. Technical report writing. Eight experiments and two design projects.

## Computer Engineering

**230 Introduction to Digital Systems**
Fall, spring. 4 credits.
For description see Core Courses.

**424 Computer Methods in Electrical Engineering**
Fall. 4 credits. Prerequisite: EE 301.
3 lecs, 1 rec.
Numerical techniques every electrical engineer should know, presented in the context of circuit simulation. Solution of linear and nonlinear algebraic equations; integration; solution of ordinary differential equations; introduction to sparse-matrix methods; alternative forms of circuit-equation formulation. Starting from a program to simulate simple, linear passive, steady-state circuits, the instructor will add, and the students improve on, procedures that will finally result in a nonlinear transient integrated-circuit simulator that involves most of the techniques discussed in the lectures.

**475 Computer Structures**
Fall. 4 credits. Prerequisite: EE 230.
3 lecs, 1 lab.
Organization and design of digital computers. Hard-wired and microprogrammed control sequencers, arithmetic hardware, and I/O systems, interrupt hardware, and memory organization. Each four- to six-person laboratory group will design and construct a small digital computer. User-programmable logic devices will be employed in the laboratory for circuit implementation.

**476 Microprocessor Systems**
Spring. 4 credits. Prerequisite: EE 475.
3 lecs, 1 lab.
System design using microprocessors. Hardware and software techniques employed for logic design, interfacing, instrumentation, and control. The use of development systems. User-programmable logic devices will be employed in the laboratory for interfacing the microcomputer to hardware.

**539 VLSI Digital-System Design**
Fall and spring. 6 credits (must be taken both semesters). Prerequisite: EE 475 or equivalent.
Fall: 3 lecs, 1 computing sec; spring: 1 lec, 1 lab.
Custom VLSI design as seen by a system designer. Switches as logic devices, MOS transistor, MOS logic design, two-phase clocking, stick diagrams, cell layout, regular control structures, simulation, performance analysis, RC timing model, system design for performance, design for testing, semicustom design, systolic arrays, CAD design tools. A chip design project and design report are required for fall semester. CAD tools are used extensively. Chips are tested for functionality and performance, and the design report is revised during the spring semester.

**541 Advanced Computer Architectures**
Fall. 3 credits. Prerequisite: EE 476 or permission of instructor.
Design and evaluation of processor architectures are examined in the light of actual implementations of both large-scale and small-scale systems. Topics include microprogramming, parallel and pipelined architectures, interleaved memories, cache and virtual memories, I/0 processors, vector and array processors, protection mechanisms, and RISC architectures.

**542 Parallel Processing**
Spring. 3 credits. Prerequisite: EE 541 or permission of instructor.
3 lecs.
Computer architecture for parallel processors that are designed to provide a high computation rate for large scientific problems; primary emphasis on image processing and highly parallel VLSI-based systems. Other applications considered include signal processing and the solution of PDEs. Performance, processor interconnections, algorithms, programming techniques, and fault tolerance will be discussed. Architecture types to be considered include binary-array processors, pipeline processors, inner-product computers, systolic arrays, and MIMD systems.

**543 VLSI Architectures and Algorithms**
Spring. 3 credits. Prerequisite: EE 476 or permission of instructor.
3 lecs.
Since the advent of VLSI, the cost of processing logic is no longer a fundamental constraint on the design of computer architectures. Problems that once were computationally intractable can now be solved on arrays of thousands or even tens of thousands of processors. This course addresses the important question: What are the optimal VLSI structures and algorithms for specific classes of problems? The architectures we will examine include systolic arrays, mesh-connected processors, and data-flow computers; special attention will be given to problems that arise in real-time signal processing.

**545 Computer Networks and Telecommunications I**
Fall. 3 credits. Prerequisites: EE 476, a course in probability, and programming at the level of CS 211.
3 lecs.
Methods and approaches in the design, analysis, and implementation of local area networks and public data networks; circuit switching, packet switching; carrier-sense multiple access with collision detection, token passing; ethernets, busses, and rings; roles and functions of protocols; layering and ISO models.

**546 Computer Networks and Telecommunications II**
Spring. 3 credits. Prerequisite: EE 545 or permission of instructor.
3 lecs.
Introduction to Integrated Service Digital Network (ISDN); circuit switching fundamentals; time division architectures; packet switching architectures; integration of circuit and packet switching; evolution from ISDN to Broadband ISDN.

**547 Computer Vision**
Fall. 3 credits. Prerequisites: EE 302 and 475 or 425, or permission of instructor.
3 lecs.
Computer acquisition and analysis of image data with emphasis on techniques for robot vision. Computer vision is the construction of explicit meaningful descriptions of physical objects from images. This course will concentrate on descriptions of objects at three levels of abstraction: segmented images (images organized into subimages that are likely to correspond to interesting objects), geometric structures (quantitative models of image and world structures), and relational structures (complex symbolic descriptions of images and world structures). The programming of several computer-vision algorithms will be required.

**548 Image Processing**
Spring. 4 credits. Prerequisite: EE 302, 425, or permission of instructor.
3 lecs.
Image formation and perception; digitization, image coding, image enhancement, image restoration, computerized tomography, optical processing, image analysis. The programming of several image-processing algorithms will be required.

**563 Communication Networks**
Fall. 4 credits.
For description see Communication and Information Systems.

**593 RISC Microprocessor Design (also CS 616)**
4 credits over two semesters. Prerequisite: EE 539 or consent of instructors.
L. K. Grover and K. K. Pingali.
RISC (Reduced Instruction Set Computers) is the newest trend in microprocessor architecture—every leading microprocessor manufacturer including Motorola and Intel has announced RISC microprocessors. In this course, we will design and fabricate CAYUGA, a pipelined RISC microprocessor on a VLSI chip. Students will be given the instruction-set specification of the CAYUGA processor. During the course, they will perform the VLSI layout and simulation of the design. The processor will then be fabricated by MOSIS, after which it will be tested to verify that it meets design goals.

**644 Fault-Tolerant Computing**
Spring. 3 credits. Prerequisites: EE 541 and 543.
The discipline of fault-tolerant computing deals with digital systems that operate in applications where the cost of failure is high. Effective and efficient techniques are required for tolerating failures in complex digital systems. The real-time needs of many signal processing problems have led to the development of special-purpose systolic arrays. This course covers general fault-tolerance techniques such as masking redundancy and error detecting and correcting codes, with particular emphasis on those suitable for systolic computing.

## Circuits, Systems, and Signal Processing

**210 Introduction to Electrical Systems**
Fall, spring. 3 credits.
For description see Engineering Common Courses.

**230 Introduction to Digital Systems**
Fall, spring. 4 credits.
For description see Core Courses.

**301 Electrical Signals and Systems I**
Fall. 4 credits.
For description see Core Courses.

**302 Electrical Signals and Systems II**
Spring. 4 credits.
For description see Core Courses.

**424 Computer Methods in Electrical Engineering**
Fall. 4 credits.
For description see Computer Engineering.

**425 Digital Signal Processing**
Fall. 4 credits. Prerequisite: EE 302.
3 lecs, 1 lab.
Fundamentals of signal analysis, review of Fourier, Laplace, and Z transforms. Sampling theory. Discrete Fourier transform properties and computation (FFT). Digital filter design; the approximation problem for FIR and IIR filters, the realization problem–finite word-length limitations and filter structures.

**426 Applications of Signal Processing**
Spring. 3 or 4 credits. Prerequisite: EE 425.
1 lec, 2 labs.
Applications of signal processing, including signal analysis, filtering, and signal synthesis. The course is laboratory oriented and emphasizes individual student projects. Design is done with signal-processing hardware and by computer simulation. Topics include filter design (principally digital filtering) and spectral analysis as well as speech coding, speech processing, digital recording, adaptive noise cancellation, and digital signal synthesis.

**521 Theory of Linear Systems**
Fall. 4 credits. Prerequisite: EE 302 or permission of instructor. Recommended: a good background in linear algebra and differential equations.
3 lecs.
State-space and input-output linear systems. Transition matrices, matrix exponential functions, the Cayley-Hamilton theorem, and the Jordan form. Controllability, observability, stability, realizability. At the level of *Linear Systems,* by T. Kailath.

**522 Theory of Nonlinear Systems**
Spring. 4 credits. Prerequisites: EE 521 or a solid background in linear algebra strongly recommended but not required.
A fairly rigorous introduction to nonlinear systems, including nonlinear differential equations (existence and uniqueness theorems); flows; stability of equilibria and periodic orbits; Lyapunov functions; the Circle Criterion and Popov's Criterion; the Poincaré-Bendixson Theorem.

**[526 Advanced Signal Processing**
Spring. 4 credits. Prerequisites: EE 411 and EE 425. Not offered 1989–90.
3 lecs, 1 lab.
Sampling and signal reconstruction. Approximation theory with 1 [sub p] and Chebyshev norms. Linear inversion theory. Exponential signal modeling. Spectral estimation. Radon transform.]

**528 Multisensor Digital Signal Processing**
Spring. 4 credits. Prerequisite: EE 302, 411.
Addresses signal processing techniques for the coordinated use of data derived from an array of sensors. Application areas for sensor arrays include radar, geophysics, speech enhancement, and satellite comunications. We will discuss propagation and sensor models, beamforming, sidelobe cancellers, source location and direction finding, adaptive detection and estimation, computational approaches (RLS, LMS, and square root) and architectures (systolic arrays and other concurrent schemes). Assignments will involve computer simulations.

**547 Image Processing**
Fall. 3 credits.
For description see Computer Engineering.

**580 Practical Computer Simulation of Partial Differential Equations**
Spring. 3 credits.
For description see Plasmas and Large-Scale Fluids.

**674 Adaptive Parameter Estimation Theory**
3 credits.
For description see Power and Control Systems.

**679 Advanced Topics in Systems and Control**
1–3 credits.
For description see Power and Control Systems.

## Communication and Information Systems

**310 Probability and Random Signals Spring. 4 credits.**
For description see Core Courses.

**411 Random Signals in Communications and Signal Processing**
Fall. 3 credits. Prerequisite: EE 302 and 310 or equivalent.
3 lecs.
Introduction to probability models for random signals in discrete and continuous time; Markov chains, Poisson process, queuing processes, wide-sense stationary processes and power spectral densities, Gaussian random process, including the narrowband case. Electrical engineering phenomena described by such models (e.g., communications channel noise, queues that form in multiple-access telecommunications systems). Response of linear and nonlinear systems to random signals. Elements of estimation and inference as they arise in communications and digital signal processing systems (e.g., problems of extraction of signals from noise via Wiener filtering, power spectral density estimation).

**468 Communications and Signal Processing**
Spring. 4 credits. Prerequisite: EE 302 or 521, and 411 or equivalent.
3 lecs, 1 rec.
Analog signal representation and filtering using Fourier and Hilbert transform techniques. Varieties of amplitude modulation (AM, DSBSC, SSB, VSB, QAM) and their demodulators. Frequency modulation and demodulation. Demodulation of AM and FM in the presence of noise. Sampling theorems and aliasing. Pulse amplitude modulation. Quantization for A/D conversion. Pulse code modulation. Elements of optimal signal parameter estimation. Application to commercial broadcasting and data transmission.

**545 Computer Networks and Telecommunications I**
Fall. 3 credits.
For description see Computer Engineering.

**546 Computer Networks and Telecommunications II**
Spring. 3 credits.
For description see Computer Engineering.

**561 Error-Control Codes**
Fall. 3 credits. Prerequisite: EE 302 or EE 521 or equivalent. A strong familiarity with linear algebra is assumed.
3 lecs.
An introduction to the theory of error-control codes: linear block codes, convolutional and other trellis codes. Hamming codes, minimum distance, standard array, minimum-distance decoding, cyclic codes. The dual of a code. Methods of shortening and combining codes. Hamming and Singleton bounds for error-correcting codes. Algebra: groups, rings, and fields with special emphasis on Galois or finite field theory. The construction and decoding of Bose-(Ray) Chaudhuri-Hocquenghem (BCH) and Reed-Solomon (RS) codes. Algebraic description of binary convolutional codes. Decoding algorithms and construction of Euclidean distance trellis codes.

**562 Fundamental Information Theory**
Spring. 3 credits. Prerequisite: EE 310 or equivalent.
3 lecs.
Fundamental results of information theory with application to storage, compression, and transmission of data. Entropy and other information measures. Block and variable-length codes. Channel capacity and rate-distortion functions. Coding theorems and converses for classical and multiterminal configurations. Gaussian sources and channels.

**563 Communication Networks**
Fall. 4 credits. Prerequisite: EE 310 or permission of instructor.
3 lecs.
Classical line-switched communication networks: point process models for offered traffic; blocking and queuing analyses. Stability, throughput, and delay of distributed algorithms for packet-switched transmission of data over local and wide area communication networks: TDMA, FDMA, ALOHA, slotted ALOHA, Ethernet, reservation, tree, and interval-searched contention resolution protocols. Flow control and capacity assignment algorithms for wideband, robust networks. Examples drawn from packet radio, T1 networks, and satellite communications.

**564 Decision Making and Estimation**
Spring. 4 credits. Prerequisite: EE 411.
An introduction to those methods of making rational decisions and inferences and of forming estimates that are central to problems of communications, detection, and statistical signal processing. Topics covered are drawn from utility theory and rational preferences; Bayes, minimax, and Neyman-Pearson decision theories; Bayes and maximum likelihood point estimation; Cramer-Rao bound, efficient, and consistent estimation; spectral estimation; and robust models for signal extraction.

**566 Queuing Networks**
Spring. 4 credits. Prerequisite: EE 411 or equivalent.
Single-class and multiclass queuing network models of communication networks and computer networks. Little's formula. Jackson networks. Quasi-reversibility. Product-form networks. Output theorem. Analysis of sojourn times. Insensitivity. Server allocation and optimal routing problems. Bandit problem. Fluid approximation. Light traffic approximation. Heavy traffic approximation. Static and dynamic control of queuing networks. Regenerative simulation of performance measures. Fast simulation techniques. Perturbation analysis.

**567 Communication Systems II**
Fall. 4 credits. Prerequisites: EE 411, 468.
This course presents the fundamental principles of the theory of digital communication. Analytical and computational tools required to understand the principles of modern data conversion, transmission, and storage systems are presented. While examples of systems from the "real" world are described, the emphasis of the course is on the fundamental theory involved in the design of digital communication systems.

**664 Foundations of Inference and Decision Making**
Spring. 3 credits. Prerequisite: a course in probability and some statistics, or permission of instructor. Not offered every year.
3 lecs.
An examination of methods for characterizing uncertainty and chance phenomena and for transforming information into decisions and optimal systems. Discussion of the foundations of inference includes topics drawn from comparative probability, interval-valued probability, quantitative probability, relative frequency interpretations, computational complexity, randomness, classical probability and invariance, induction, and subjective probability.

**668–669 Random Processes in Electrical Systems**
668, fall; 669, spring. 3 credits each term.
Advanced topics in the general area of randomness and uncertainty and their relevance to the analysis and design of electrical systems.

## Power and Control Systems

**451–452 Computer-Aided Analysis of Electric Power Systems I and II**
451, fall; 452, spring. 4 credits each term. Prerequisite: EE 302.
3 lec-recs, 1 lab-computing session.
The so-called second-generation and third-generation simulation tools and their computer implementation for large-scale circuits and systems. Modeling of electric power systems for load-flow, stability, economic-dispatch, control, and optimal-power-flow studies. Special properties of electric power systems that enhance the efficiency of simulation tools used for their analysis. The Kettering Power System Laboratory's digital computer is used as a dynamic "laboratory."

**471 Feedback Control Systems**
Fall. 4 credits. Prerequisite: EE 302 or M&AE 326, or permission of instructor.
3 lecs, open lab.
Analysis techniques, performance specifications, and analog-feedback-compensation methods for single-input, single-output, linear, time-invariant systems. Laplace transforms and transfer functions are the major mathematical tools. Design techniques include PID, root-locus, frequency response, and algebraic pole placement. Computer-aided design laboratory examines modeling and control of a computer-simulated dynamic industrial process.

**[555 Advanced Power Systems Analysis I**
Fall. 3 credits. Prerequisites: EE 302 and concurrent registration in 451, or permission of instructor. Not offered 1989–90.
Analysis of power-system components. These components include rotating machines and systems for excitation control, automatic voltage regulation, boiler-turbine control, and speed regulation, as well as ancillary three-phase networks. Emphasis on derivation of mathematical models from first principles; development of algorithms for the formation of applicable network matrices.]

**[556 Advanced Power Systems Analysis II**
Spring. 3 credits. Prerequisite: EE 555 or permission of instructor. Not offered 1988–89.
Computer methods in power systems applied to short-circuit studies, load-flow studies, transient-stability studies, economic dispatch, and security load flows. Use of sparse-matrix techniques. Comparison of algorithms for digital relaying. State-estimation algorithms. Emphasis on the use of the digital computer in the planning and operation of large-scale power systems. At the level of *Computer Methods in Power System Analysis*, by Stagg and El-Abiad.]

**564 Decision Making and Estimation**
Spring. 4 credits.
For description see Communication and Information Systems.

**572 Digital Control Systems**
Spring. 4 credits. Prerequisite: EE 471 or permission of instructor.
3 lecs, open lab.
Analysis and design of feedback control systems using digital devices to implement compensation. Z transforms and linear algebra are the major mathematical tools. Design techniques include PID, root-locus, deadbeat, state-variable feedback, and combined observer-controller. Quantization and sample-rate effects in sampled-data control systems will be considered. Assignments will consist of reports on computer-aided controller design and digitally simulated evaluation.

**573 Estimation and Control in Discrete Linear Systems**
Fall. 4 credits. Prerequisites: EE 302 and 411, or permission of instructor.
3 lecs.
Optimal control, filtering, and prediction for discrete-time linear systems. Approximation on discrete point sets. The principle of optimality. Kalman filtering. Stochastic optimal control.

**574 Optimal Control and Estimation for Continuous Systems**
Spring. 4 credits. Prerequisite: EE 573 or permission of instructor. Not offered every year.
3 lecs.
Control system design through parameter optimization, with and without constraints. The minimum principle; linear regulations, minimum-time and minimal-fuel problems. Computational techniques; properties of Lyapunov and Riccati equations.

**664 Foundations of Inference and Decision Making**
Spring. 3 credits. For description see Communication and Information Systems.

**674 Adaptive Parameter Estimation Theory**
3 credits. Prerequisites: EE 521 and either 526 or 572, or permission of instructor. Recommended: EE 522. Not offered every year.
3 lecs.
Fundamental concepts of adaptive parameter estimation theory as applicable to adaptive filtering, adaptive control, and system identification. Analytical tools are drawn primarily from nonlinear, time-varying feedback-system stability theory. Applications considered include noise cancelling, differential pulse code modulation, channel equalization, model-following control, and pole placement. Assignments will consist of reports on analysis and simulation studies of adaptive parameter-estimator behavior.

**679 Advanced Topics in Systems and Control**
1–3 credits. Prerequisite: permission of instructor. Not offered every year.
Topics include robotics, nonlinear feedback system stability, multivariable control, and qualitative theory on nonlinear systems.

## Solid-State Electronics

**306 Fundamentals of Quantum and Solid-State Electronics**
Spring. 4 credits.
For description see Required Courses.

**431–432 Analysis and Design of Integrated Circuits**
431, fall; 432, spring. 4 credits each term. Prerequisites: EE 301 and 315. Concurrent registration in EE 435 is encouraged.
3 lecs, 1 lab.
Analysis and design of analog and digital circuits using semiconductor devices, with emphasis on integrated circuits in bipolar and MOS technologies. Device models for circuit analysis; common circuit configurations; DC analysis, frequency response and speed limitations; feedback and noise sources. Case studies such as design of high-frequency or operational amplifiers and semiconductor memory, reinforced by laboratory and design projects. At the level of *Analysis and Design of Analog Integrated Circuits*, by Gray and Meyer, and *Analysis and Design of Digital Integrated Circuits*, by Hodges and Jackson.

**435–436 Semiconductor Electronics**
435, fall; 436, spring. 4 credits each term; may be taken for 3 credits without laboratory only with permission of instructor. Prerequisites: EE 306 and 316, or equivalent.
3 lecs, 1 lab.
Semiconductor electronics from point contact transistor to VLSI and beyond. Fall term: electronic characteristics of semiconductors, carrier transport, band diagrams, semiconductor interfaces; pn-junction diode, Si bipolar transistor (BJT), Si MOS transistor (MOSFET). Spring term: advanced MOS topics, Schottky diode, GaAs metal-semiconductor FET (MESFET), AlGaAs/GaAS modulation doped FET (MODFET), heterojunction bipolar transistor (HBT); integrated Si structures such as inverters (NMOS, CMOS, ECL) and memory cells (DRAM, SRAM); integrated GaAs structures; computer simulation of devices; limits and future of semiconductor electronic systems.

**533 Solid-State Microwave Devices and Circuits I**
Fall. 4 credits.
For description see Fields, Waves, and Antennas.

**534 Solid-State Microwave Devices and Circuits II**
Spring. 4 credits.
For description see Fields, Waves, and Antennas.

**535 Semiconductor Physics**
Fall. 4 credits. Prerequisites: EE 304 and 407, or permission of instructor.
3 lecs.
Foundations of semiconductor physics for the description of carrier transport and optical characteristics of semiconductor materials and structures. Crystal structure and symmetry, energy-band structures, statistics, effective mass theorem, classical transport, scattering, high-field transport, quantum transport, optical absorption and reflection, photoconductivity, light generation, deep levels, and surface and interface phenomena. On or above the level of *Semiconductor Physics*, by K. Seeger.

**536 VLSI Technology**
Spring. 4 credits. Prerequisite: EE 435 or permission of instructor.
3 lecs, 1 lab.
Processing technology for silicon MOS and bipolar integrated circuits, especially VLSI. Lithography, crystal growth, diffusion, ion implantation, oxidation, chemical-vapor deposition, evaporation, sputtering, epitaxy, etching, process integrations, and process simulations. At the level of *VLSI Technology*, edited by S. M. Sze.

**538 Introduction to III–V Compound Semiconductor Materials**
Spring. 3 credits. Prerequisites: EE 407 and 436.
J. R. Shealy.
An introduction to III–V compound semiconductor materials and their crystal growth technologies. Topics include the modern epitaxial growth technologies, Molecular Beam Epitaxy and Organometallic Vapor Phase Epitaxy; common methods used for the evaluation of compound semiconductor materials, including Raman spectroscopy. Emphasis is placed on the materials' properties and the related growth and characterization techniques that currently support a variety of research topics in new semiconductor devices.

**539 VLSI Digital-System Design**
Fall and spring. 6 credits.
For description see Computer Engineering.

**580 Practical Computer Simulation of Partial Differential Equations**
Spring. 3 credits.
For description see Plasmas and Large-Scale Fluids.

**636 Advanced Solid-State Devices**
Spring. 3 credits. Prerequisite: EE 535 or equivalent.
3 lecs.
A fundamental analysis of device operation, with emphasis on operational limits. Effects of band structure, low- and high-field transport characteristics, secondary ionization, transferred electron effects, and the details of junction and contact technology relevant to devices at the limits of microfabrication technology. Applications to microwave amplification, generation, and broadband optical detection, including stability, nonlinearity, and noise.

**638 Advanced Semiconductor Devices and Processes**
Fall. 4 credits. Prerequisite: EE 535, EE 636, or permission of instructor. Not offered every year.
3 lecs, special project or term paper.
Advanced topics in solid-state electronic-device physics, fabrication methods, and materials for high-density silicon VLSI and high-speed compound semiconductor technologies. Concepts developed in EE 535 and 636 are applied to current state-of-the-art topics. On the level of *IEEE Transactions on Electron Devices, Journal of Applied Physics,* and current conference proceedings.

## Quantum and Opto-Electronics

**306 Fundamentals of Quantum and Solid-State Electronics**
Spring. 4 credits.
For description see Core Courses.

**407 Quantum Mechanics and Applications**
Fall. 4 credits. Prerequisite: EE 306.
3 lecs, 1 rec.
Fundamentals of quantum mechanics: theory of angular momentum, time-independent and time-dependent perturbation theory, and interaction of radiation with matter. Elementary considerations of the structure of atoms, molecules, and solids. Applications to semiconductors, spectroscopy of atoms and molecules, and lasers.

**430 Lasers and Optical Electronics**
Fall. 3 credits. Prerequisite: EE 306 or equivalent.
3 lecs.
An introduction to the operation of stimulated-emission devices such as lasers and devices based on linear and nonlinear optics. Material covered includes diffraction-limited optics, propagation of laser beams, optical cavities, interaction of radiation with matter, physics of laser operation, laser design, and application of coherent radiation to nonlinear optics, communication, and research.

**437 Fiber and Integrated Optics**
Spring. 4 credits. Prerequisite: EE 306. EE 304 and 430 or equivalents are strongly recommended.
3 lecs, 1 lab–computing session.
The physical principles of fiber optics, integrated optics, and optical applications to communication and sensing. Topics include propagation through lossy waveguides, dispersion and bandwidth limitations, optical sources based on semiconductors, detectors and noise, modulation techniques, nonlinear effects in fibers, and optical sensors. Laboratory includes experiments relevant to lasers and fiber optics.

**531 Quantum Electronics I**
Fall. 4 credits. Prerequisites: EE 306 and 407, or Physics 443.
3 lecs, 1 computing session.
A detailed treatment of the physical principles underlying lasers, related fields, and applications. Topics include the interaction of radiation and matter, including emission, absorption, scattering, and macroscopic material properties; theory of the laser, including methods of achieving population inversions, output power of amplifiers and oscillators, dispersive effects, and laser oscillation spectrum.

**532 Quantum Electronics II**
Spring. 4 credits. Prerequisite: EE 531 or permission of instructor.
3 lecs, 1 lec–computing session.
A continuation of EE 531. Topics include spectroscopy of atoms, molecules, and ions in crystals as examples of laser media; density matrix; nonlinear optics and optical processes; theory of coherence; integrated optics and optical communication.

**535 Semiconductor Physics**
Fall. 4 credits.
For description see Solid-State Electronics.

## Plasmas and Large-Scale Fluids

**[481 Experimental Plasma Physics and Gas Discharges**
Fall. 4 credits. Prerequisite: EE 304 or A&EP 356 or equivalent. Fulfills electrical engineering laboratory requirement and constitutes an M.Eng.(Electrical) course pair with EE 480 or 484. Not offered 1989–90.
2 lecs, 1 lab.
Theory and practice of generation, control, and diagnostics of plasmas and intense particle beams. Coordinated lectures and nine experiments and a field trip. Plasma breakdown, collisions, diffusion, sheaths. Discussion of macroscopic and microscopic measurements. Reflex discharge, vacuum technology, plasma probing. Electromagnetic and space-charge-wave propagation and scattering. Microwave and optical radiation. Intense particle beams. Methods for data collection and analysis.]

**484 Introduction to Controlled Fusion: Principles and Technology (also M&AE 559 and NS&E 484)**
Spring. 3 credits. Prerequisites: EE 301 and 303, or permission of instructor. Intended for seniors and graduate students.
3 lecs.
For description see NS&E 484.

**487 Antennas and Propagation**
Fall. 3 credits.
For description see Fields, Waves, and Antennas.

**580 Practical Computer Simulation of Partial Differential Equations**
Spring. 3 credits. Prerequisites: T&AM 310 or equivalent recommended; familiarity with a scientific computer language such as Fortran required
3 lecs.
A pragmatic approach toward techniques for computer simulation of partial-differential equations. The aim is to allow students to begin doing simulations of topics of their own interest as quickly as possible. Basic stability analysis and accuracy issues will be discussed and applied to standard finite-difference techniques for solving elliptic, parabolic, and hyperbolic equations. Finite-element methods will be introduced. The fast Fourier transform is described and applied to spectral and pseudospectral methods. Particle-in-cell simulation techniques are discussed. The method of characteristics, the semi-implicit method, and various implicit methods are covered. Examples will be taken from fusion and solar plasma physics applications, semiconductor device physics, fluid dynamics, and mathematical biology. Hands-on experience with the various simulation methods described and a simulation project.

**581 Introduction to Plasma Physics (also A&EP 606)**
Fall. 4 credits. First-year graduate-level course; open also to *exceptional* fourth-year students with permission of instructor. Prerequisites: EE 303 and 304, or equivalent.
3 lecs.
Plasma state; motion of charged particles in fields; collisions, coulomb scattering; transport coefficients, ambipolar diffusion, plasma oscillations and waves; hydromagnetic equations; hydromagnetic stability and microscopic instabilities; test particle in a plasma; elementary applications. At the level of *Plasma Physics for Nuclear Fusion,* by Miyamoto.

**582 Advanced Plasma Physics (also A&EP 607)**
Spring. 4 credits. Prerequisite: EE 581.
3 lecs.
For description see A&EP 607.

**583 Electrodynamics**
Fall. 4 credits.
For description see Fields, Waves, and Antennas.

**585 Atmospheric and Ionospheric Physics (also Astronomy 575)**
Fall. 3 credits. Offered alternate years.
Energy-balance and thermal structure of neutral atmospheres. Elements of circulation theory. Waves and instabilities. Coupling of lower atmospheres to upper atmospheres. Observations of the terrestrial atmosphere and of the other planets. Physical processes in the earth's ionosphere and magnetosphere.

Production, loss, and transport of charged particles. Electric fields. Coupling of neutral-atmosphere dynamics with electric fields and charged-particle transport. Diagnostic techniques, including radar and in situ observations. The equatorial electrojet. Observations of ionospheres on the other planets.

**586 Solar Terrestrial Physics (also Astronomy 576)**
Spring. 3 credits. Offered alternate years.
High-latitude ionosphere; electric fields in the polar cap and auroral zone; particle precipitation and the aurora; magnetic and ionospheric storms; plasma instabilities in the ionosphere and magnetosphere; structure and physical processes in the sun, solar corona, and solar wind; interactions between the solar wind and the earth's magnetosphere; trapping, acceleration, and drift of energetic particles in the magnetosphere.

**588 Electromagnetic Wave Propagation II**
Spring. 3 credits. Prerequisites: EE 487 and 581, or permission of instructor.
3 lecs.
For description see Fields, Waves, and Antennas.

**589 Magnetohydrodynamics**
3 credits. Prerequisite: EE 581. Offered upon sufficient demand.
The theory of ideal and nonideal magnetohydrodynamical equations with emphasis on application to controlled thermonuclear fusion. Topics: derivation and domain of applicability; invariants; waves, equilibrium and normal-mode stability analysis; continuous spectrum; energy principle and applications to confinement geometries; nonideal effects, resistivity, finite Larmor radius stabilization. Selected additional topics such as dynamo theory or MHD turbulence.

**681 Kinetic Theory (also A&EP 761)**
Fall. 3 credits. Prerequisite: EE 407, Physics 561, or permission of instructor.
3 lecs.
Classical, quantum, and relativistic kinetic theory, Liouville equation, Prigogine and Bogoliubov analysis of the BBKGY sequence. Master equation, density matrix, Wigner distribution. Derivation of fluid dynamics. Transport coefficients. Boltzmann, Krook, Fokker-Planck, Landau, and Balescu-Lenard equations. Properties and theory of the linear Boltzmann collision operator. The relativistic Maxwellian. At the level of *Introduction to the Theory of Kinetic Equations*, by Liboff.

**[682 Nonlinear Phenomena in Plasma Physics**
Fall. 3 credits. Prerequisite: EE 582. Offered alternate years. Not offered 1989–90.
Single-particle motion, multiple-time-scale analysis and ponderomotive effects, weakly nonlinear waves and solitons, nonlinear Vlasov phenomena, quasilinear theory, resonance broadening and resonant mode-mode coupling, statistical theories of plasma turbulence, recent developments in stochasticity and chaos in plasma physics.]

**[685 Solar Plasma Physics**
Fall. 3 credits. Not offered 1989–90.
This course will be coordinated with the two courses on upper atmospheric physics, EE 585 and 586, to provide an integrated view of solar-terrestrial physics for the graduate student intending a research career in space plasma physics. A thorough understanding of electromagnetic theory and some knowledge of fluid mechanics and plasma physics at the level of EE 581 and 582 are assumed. Offered alternate years beginning 1988–89.]

## Fields, Waves, and Antennas

**303–304 Electromagnetic Fields and Waves**
303, fall; 304, spring. 4 credits each semester.
For description see Core Courses.

**487 Antennas and Propagation**
Fall. 3 credits. Prerequisite: EE 304 or equivalent.
3 lecs.
Fundamentals of antenna theory, including thin wire, aperture, and horn antennas, antenna arrays, and aperture synthesis concepts; diffraction, refraction, and ducting in the troposphere; propagation of radio waves and cold plasma waves in the ionosphere and magnetosphere (magnetoionic theory).

**533 Solid-State Microwave Devices and Circuits I**
Fall. 4 credits. Prerequisite: EE 304.
2 lecs, 1 lab.
State-of-the-art microwave integrated circuit technology. Topics discussed include introductory microwave concepts, computer-aided design and measurement, passive microwave circuits, couplers, microstrip antennas, resonators, and filters. Laboratory covers design of microstrip circuits using CAD tools *Puff* and *Touchstone*, mask generation, circuit fabrication in a clean-room environment, and accurate measurement techniques featuring the Hewlett Packard 8510A network analyzer.

**534 Solid-State Microwave Devices and Circuits II**
Spring. 4 credits. Prerequisites: EE 435 and 533.
2 lecs, 1 lab.
Basic theories of operation of solid-state microwave and millimeter-wave devices: FET, HEMT, Schottky, IMPATT, Gunn, PIN, and tunnel devices. Emphasis on how to integrate these devices into practical circuits—switches, limiters, phase shifters, and satellite communications. Also covered are superconductors, measurement of s-parameters and noise, millimeter-wave quasi-optical curcuits. Oscillators, amplifiers, and mixers will be fabricated and measured in the laboratory.

**580 Practical Computer Simulation of Partial Differential Equations**
Spring. 3 credits.
For description see Plasmas and Large-Scale Fluids.

**583 Electrodynamics**
Fall. 4 credits. Prerequisite: EE 304 or equivalent.
3 lecs.
Maxwell's equations, electromagnetic potentials, integral representations of the electromagnetic field, Green's functions. Special theory of relativity, Lienard-Wiechert potentials, radiation from accelerated charges, Cerenkov radiation. Electrodynamics of dispersive dielectric and magnetic media. At the level of *Classical Electrodynamics*, by Jackson.

**584 Microwave Theory**
Spring. 4 credits. Prerequisites: EE 302 and 304 or equivalent.
3 lecs, 1 rec.
Theory of passive microwave devices. Modal analysis of inhomogeneous waveguides and cavities. Waveguide excitation, perturbation theory. Nonreciprocal waveguide devices. Scattering matrix analysis of multiport junctions, resonant cavities, directional couplers, circulators. Periodic waveguides, coupled-mode theory.

**[588 Advanced Electromagnetic Wave Propagation and Scattering**
Spring. 3 credits. Prerequisite: EE 487 or permission of instructor. Offered alternate years. Not offered 1989–90.
3 lecs.
Full-wave solutions of the wave equations, interactions between particles and waves, scattering of radio waves from random fluctuations in refractive index, scatter propagation, incoherent scatter from the ionosphere and its use as a diagnostic tool, scattering from unstable plasma waves, pulse compression and other radar probing techniques.]

## General

**250 Technology in Western Society (also Engr 250)**
Fall. 3 credits. Approved for humanities distribution.
For description see Engineering Common Courses.

**292 The Electrical and Electronic Revolutions (also Engr 292)**
Spring. 3 credits.
For description see Engineering Common Courses.

**360 Ethical Issues in Engineering**
Spring. 3 credits. A social science elective for engineering students. Open to juniors and seniors.
3 lecs.
For description see Engineering Common Courses.

**480 Thermal, Fluid, and Statistical Physics for Engineers**
Spring. 3 credits. Prerequisite: Physics 214.
Extensive review of thermodynamic principles. Elementary theory of transport coefficients. Elements of fluid dynamics. Shock waves. Central-limit theorem. Random walk. Electrical noise. Fluctuation-dissipation theorem. Quantum and classical statistics. Black-body radiation. Thermal properties of solids. Kramers-Kronig relation. Elementary descriptions of the p-n junction. Shockley equation, superfluidity, superconductivity, and the laser.

**491–492 Senior Project**
491, fall; 492, spring. 1–8 credits.
Individual study, analysis, and, usually, experimental tests in connection with a special engineering problem chosen by the student after consultation with the faculty member directing the project. An engineering report on the project is required.

**493–494 Senior Seminar**
493, fall; 494, spring. 1–3 credits. Prerequisite: Senior standing in EE and permission of instructor.
These limited-enrollment, four-week, one-credit courses provide condensed examination of specialized topics not found in other EE senior electives. Senior seminars meet for three lecture hours per week but only for four consecutive weeks. Three such courses canbe taken in sequence in one semester (if available) for a total of 3 credits. Instructors will typically set specific participation requirements intended to limit enrollment to a small group of the most interested and qualified students. Proposed topics for 1989–90 include: stochastic simulation, wave interactions in fluid media, and electric machines and drives.

**495–496 Special Topics in Electrical Engineering**
1–4 credits.
Seminar, reading course, or other special arrangement agreed on by the students and faculty members concerned.

**591–599 Graduate Topics in Electrical Engineering**
1–4 credits.
Seminar, reading course, or other special arrangement agreed on by the students and faculty members concerned.

**691–692 Electrical Engineering Colloquium**
691, fall; 692, spring. 1 credit each term. For students enrolled in the graduate Field of Electrical Engineering.
Lectures by staff, graduate students, and visiting authorities. A weekly meeting for the presentation and discussion of important current topics in the field. Report required.

**693–694 Electrical Engineering Design**
693, fall; 694, spring. 1–10 credits each term. For students enrolled in the M.Eng.(Electrical) degree program. Uses real engineering situations to present fundamentals of engineering design.

**695–699 Graduate Topics in Electrical Engineering**
1–6 credits.
Seminar, reading course, or other special arrangement agreed on by the students and faculty members concerned.

**791–792 Thesis Research**
791, fall; 792, spring. 1–15 credits. For students enrolled in the master's or doctoral program.

# GEOLOGICAL SCIENCES

## Freshman and Sophomore Courses

**101 Introductory Geological Sciences**
Fall, spring. 3 credits.
2 lecs, 1 lab, field trips, evening exams in the fall term. Fall, J. M. Bird, D. L. Turcotte; spring, W. B. Travers.
To better harmonize human endeavor with the natural earth we need to know what is natural *on* earth. This course teaches observation and understanding of landscape, including coasts, rivers, valleys, and glaciated regions; the genesis of earthquakes, volcanoes, and mountains; evidence for the drifting of continents and its consequences; and the origin, discovery, and development of mineral and water resources. The lab teaches use of topographic and geologic maps and recognition of minerals and rocks and includes field trips to Cascadilla Gorge, Fall Creek, and Enfield Glen.

**102 Introduction to Historical Geology**
Spring. 3 credits. Prerequisite: Geol 101 or permission of instructor.
2 lecs, 1 lab, evening exams. J. L. Cisne.
A continuation of Geol 101. History of the earth and life in terms of evolutionary processes. The geologic record, its formation, and interpretation of earth history. Introduction to the evolution of life and to fossils and their use in reconstructing past environments and dating rocks.

**103 Geology in the Field**
Fall. 3 credits. Limited to 35 students.
1 lec, 1 field trip or lab, 1 rec. A. L. Bloom.
The subject matter of Geol 101, taught as much as possible by field trips on campus and in the vicinity, on foot and by bus. Weekly field trips until November introduce most of the major topics of the course, supplemented by lectures, recitations, and labs (later in the term).

**104 Introduction to Oceanography**
Spring. 3 credits. Prerequisites: high school physics, chemistry, biology, and earth science or permission of the instructor.
2 lecs, 1 lab. W. M. White.
The oceans remain one of the last frontiers, yet they affect our everyday lives in many subtle ways. A survey of what is known of the physics, chemistry, geology, and biology of the oceans, intended for both science and non-science majors. Topics include: sea-floor spreading and plate tectonics; geology and biology of mid-ocean ridges; biological and geological controls on the chemisry of seawater; ocean currents and circulation; the oceans and climate, including El Niño, the greenhouse effect, and the Ice Ages; ecology of open ocean, ocean bottom, and near-shore communities; coastal processes; marine pollution and waste disposal; mineral and biological resources of the sea; Law of the Sea. At the level of *Scientific American.*

**107 Frontiers of Geology I**
Fall. 1 credit. May be taken concurrently with or after Geol 101.
1 lec. J. L. Cisne and staff.
Lectures by members of the department on selected fundamental topics of current interest, such as continental drift and related tectonic processes, volcanoes, earthquake prediction, natural energy sources, and mineral resources.

**108 Frontiers of Geology II**
Spring. 1 credit. May be taken concurrently with or after Geol 101 or 102.
1 lec. J. L.Cisne and staff.
Lectures by members of the department on selected fundamental topics of current interest, such as plate tectonics, the evolution of mountain belts and island arcs, the deep structure of continents, ecology and evolution of fossil organisms, sea-level changes, and fossil fuels.

**111 To Know the Earth**
Fall. 3 credits.
2 lecs, 1 lab, and field trips. J. E. Oliver.
Acquaints the non-scientist with the earth. Geology as an intellectual challenge, a provider of resources, an environment, a danger, a base for culture, and a science among sciences. The story behind landscapes, mountains, earthquakes, volcanoes, oceans, gold, petroleum, and icecaps. The record of the past, the context of the present, the forecast for the future.

**201 Introduction to the Physics and Chemistry of the Earth (also Engr 201)**
Spring. 3 credits. Prerequisites: Mathematics 191, Physics 112, and Chemistry 207.
2 lecs; 1 rec, lab, or field trip.
L. M. Cathles.
For description see Engineering Common Courses.

**202 Environmental Geology**
Spring. 3 credits.
2 lecs; 1 rec, lab, or field trip.
D. E. Karig, A. L. Bloom.
In-depth introduction to geologic processes that affect or are affected by human society, including stream behavior and floods, earthquakes, land stability and mass-wasting, and volcanic hazards. This material provides an application of geology to engineering, natural resources, and land-use planning. Local examples will be discussed and visited on short field trips. The course can be taken as an introduction to geology, but also serves as a continuation of Geol 101.

**210 Introduction to Field Methods in Geological Sciences**
Fall. 2 credits. Prerequisite: Geol 101 or coregistration. Weekly field sessions. A weekend field trip.
D. E. Karig.
An introduction to the methods by which rocks are used as a geological database. Students will be introduced to the field methods used in the construction of geologic maps and cross sections and to systematic description of stratigraphic sections. Field and laboratory sessions are held on Saturday mornings until Thanksgiving; during most of these weeks there will also be one additional lecture. One weekend will be devoted to a field trip to eastern New York.

**212 Special Field Trip**
Fall. 1 credit. Prerequisites: Geol 101 or 201 or equivalent, and permission of instructor. Travel and subsistence expenses to be announced.
1 lec, field trip. Staff.
A trip of one week to ten days during January intersession in an area of interesting geology in the lower latitudes. Interested students should contact the instructor during the early part of the fall semester.

**214 Western Adirondack Field Course**
Spring, one week at the end of the semester. 1 credit. Prerequisite: Geol 101 or 102 or equivalent. Students should be prepared for overnight camping and will have to pay for their own meals.
W. A. Bassett.
Field mapping methods, mineral and rock identification, examination of Precambrian metamorphic rocks and lower Paleozoic sediments, talc and zinc mines.

## Junior, Senior, and Graduate Courses

Of the following, the core courses Geol 326, 355, 356, 375, and 388 may be taken by those who have successfully completed Geol 201 or the equivalent or who can demonstrate to the instructor that they have adequate preparation in mathematics, physics, chemistry, biology, or engineering.

**326 Structural Geology**
Spring. 4 credits. Prerequisite: Geol 101 or 201, or permission of instructor.
3 lecs, 1 lab, field trips.
R. W. Allmendinger.
Nature and origin of deformed rocks at microscopic to macroscopic scales, with emphasis on structural geometry and kinematics.

**355 Mineralogy**
Fall. 4 credits. Prerequisite: Geol 101 or 201 and Chem 207 or permission of instructor.
2 lecs, 2 labs; assigned problems and readings. W. A. Bassett.
Examination of minerals by hand-specimen properties and optical microscopy. Geological setting, classification, crystal structures, phase relations, chemical properties, and physical properties of minerals are studied. X-ray diffraction is introduced.

**356 Petrology and Geochemistry**
Spring. 4 credits. Prerequisite: Geol 355.
2 lecs, 2 labs, 1 field trip; assigned problems and readings. Staff.
Principles of phase equilibrium as applied to igneous and metamorphic systems. Description, classification, chemistry, origin, regional distribution, and dating of igneous and metamorphic rocks. Geochemical distribution of trace elements and isotopes in igneous and metamorphic systems. The petrological evolution of the planets.

**375 Sedimentology and Stratigraphy**
Fall. 4 credits. Recommended: Geol 102 or 201.
3 lecs, 2 labs, field trips. J. L. Cisne, T. E. Jordan.
Formation of sedimentary rocks. Depositional processes. Depositional environments and their recognition in the stratigraphic record. Correlation of strata in relation to time and environment. Seismic stratigraphy. Geological age determination. Reconstruction of paleogeography and interpretation of earth history from stratigraphic evidence.

**388 Geophysics and Geotectonics**
Spring. 4 credits. Prerequisites: Mathematics 192 and Physics 208, 213, or equivalent.
3 lecs, 1 lab. B. L. Isacks.
Global tectonics and the deep structure of the solid earth as revealed by investigations of earthquakes, earthquake waves, the earth's gravitational and magnetic fields, and heat flow.

**401 Field Geology**
Summer. 4 credits. Prerequisites: Geol 210, 214, and 326, or permission of instructor. Four weeks at research sites in the western United States or Canada. Fee, approximately $1,200.
Staff.
Field mapping techniques in igneous, metamorphic, and sedimentary rock, using topographic maps and air photos. The structural geology, petrology, geomorphology, and sedimentology of selected areas in the Rocky Mountains will be included. An independent project and report will be done during the last week.

**412 Experiments and Techniques in Earth Sciences**
Spring. 2 credits. Prerequisites: Physics 213 and Mathematics 192 or equivalents, or permission of instructor.
S. Kaufman.
Laboratory and field experiments chosen in accordance with students' interests. Familiarization with instruments and techniques used in earth sciences. Independent work is stressed.

**424 Petroleum Geology**
Spring. 3 credits. Recommended: Geol 326.
2 lecs, 1 lab. W. B. Travers.
Introduction to hydrocarbon exploration and development. Exploration techniques, including geologic use of well logs, fluid pressures, seismic-reflection methods, gravity, and magnetic measurements to map subsurface structures and stratigraphy. Petroleum origin and migration. Dispersal systems and depositional patterns of petroleum reservoirs. Economics of exploration, leasing, drilling and production, and estimates of petroleum reserves, including tar sands and oil shales.

**431 The Earth's Crust: Structure, Composition, and Evolution**
Fall. 3 credits. Prerequisites: Geol 356 and 388. Offered alternate years.
3 lecs. L. D. Brown.
Structure and composition of the crust from geophysical observations, analysis of xenoliths, and extrapolation of petrological laboratory data. Radioisotopic considerations. The nature of the crust-mantle boundary. Thermal and rheological structure of the crust. Oceanic versus continental crust. Origin and evolution of oceanic and continental crust.

**432 Digital Processing and Analysis of Geophysical Data**
Spring. 3 credits. Prerequisite: Geol 487 or equivalent. Offered alternate years.
3 lecs. L. D. Brown.
Sampling theory. Fourier, Laplace, and Z-transform techniques. Spectral analysis. Temporal and spatial filtering. Seismic processing theory: signal enhancement and imaging. Deconvolution, statics, migration, modeling.

**[433 Exploration Seismology I: Data Acquisition and Processing**
Fall. 3 credits. Prerequisite or corequisite: Geol 487 or equivalent. Offered alternate years. Not offered 1989–90.
3 lecs. L. D. Brown.
Planning seismic reflection and refraction surveys. Array design. Source characteristics and ground coupling. Land and marine operations. 2-D and 3-D surveys. Convolutional seismic model. Applied seismic processing: FK filtering, deconvolution, velocity analysis, stacking, migration, display. True amplitude processing.]

**[434 Exploration Seismology II: Analysis and Interpretation**
Spring. 3 credits. Prerequisite: Geol 487 or equivalent. Offered alternate years. Not offered 1989–90.
3 lecs. L. D. Brown.
Techniques for inferring geologic structure and lithology from multichannel seismic reflection data and crustal refraction data. Migration. Velocity and amplitude interpretation, correlation criteria, resolution wave-form analysis, seismic structure, and stratigraphy. Seismic modeling. 3-D and VSP. Attribute and tau-p analysis.]

**441 Geomorphology**
Fall. 3 credits. Prerequisite: Geol 102 or 201, or permission of instructor.
2 lecs, 1 lab. A. L. Bloom.
Systematic analysis of landforms constructed by tectonic and volcanic processes and their subsequent progressive destruction by climate-controlled erosional processes.

**442 Glacial and Quaternary Geology**
Spring. 3 credits. Prerequisite: Geol 441 or permission of instructor. Offered alternate years.
2 lecs, 1 lab; several field trips.
A. L. Bloom.
Glacial processes and deposits and the chronology of the Quaternary Period.

**445 Geohydrology (also Ag Eng 471 and C&EE 431)**
Fall. 3 credits. Prerequisites: Mathematics 294 and Engr 202.
3 lecs. A. L. Bloom, W. H. Brutsaert, L. M. Cathles, J.-Y. Parlange, T. S. Steenhuis.
Intermediate-level study of aquifer geology, groundwater flow, and related design factors. Includes description and properties of natural aquifers, groundwater hydraulics, soil water, and solute transport.

**452 X-ray Diffraction Techniques**
Spring. 3 credits.
1 lec, 2 labs. W. A. Bassett and staff.
Automated X-ray diffractometer, Debye-Scherrer, real-time Laue, high-temperature diffraction, high-pressure diffraction, and pole-figure analysis. Applications in materials science and geological sciences. Labs will be held in the new Materials Science X-Ray Facility.

**[453 Modern Petrology**
Fall. 3 credits. Prerequisite: Geol 356. Offered alternate years. Not offered 1989–90.
2–1/2 lecs, 1/2 lab. R. W. Kay.
Magmas and metamorphism in the context of plate tectonics. Major and trace element chemistry and phase petrology as monitors of the creation and modification of igneous rocks. Temperature and stress in the crust and mantle and their influence on reaction rates and textures of metamorphic rocks. Application of experimental studies to natural systems. Reading from the literature and petrographic examination of pertinent examples.]

**454 Advanced Mineralogy**
Spring. 3 credits. Prerequisite: Geol 355 or equivalent.
2 lecs, 1 lab. W. A. Bassett.
Crystallography and crystal chemistry of minerals and the methods of their study. X-ray diffraction, optical methods, computer simulation of crystal structures. Emphasis on effects of high pressures and temperatures with implications for understanding of Earth's interior.

**[455 Isotope Geochemistry**
Fall. 3 credits. Prerequisite: Geol 356 or permission of instructor. Offered alternate years. Not offered 1989–90.
3 lecs. W. M. White.
Nucleosynthetic processes and the isotopic abundance of the elements. Dating by Pb, Ar, Sr, and Nd isotope variations. Theories of crustal and mantle evolution. Pleistocene chronology using U-series and $^{14}C$ dating. Time constants for geochemical cycles. The use of O and H isotopes as tracers in the earth's hydrosphere, and hydrothermal circulation systems.]

**456 Geochemistry**
Spring. 3 credits. Prerequisites: Chemistry 207 or 211, Geol 101 or 201 or equivalent, and Mathematics 112 or 192. Recommended: Geol 355 and 356.
3 lecs. W. M. White.
Thermodynamics applied to geology. Principles of trace-element and isotope geochemistry and their application to the study of igneous and metaporphic rocks. Overview of nucleosynthesis, cosmochemistry, and formation and chemical evolution of the earth. Introduction to the chemistry of the oceans and marine sediments.

**[474 Modern Depositional Systems**
Spring. 3 credits. Prerequisite: Geol 375 or permission of instructor. Offered alternate years. Not offered 1989–90.
3 lecs. T. E. Jordan.
Compositions, textures, sedimentary structures, and facies variations of sediments in modern depositional environments. Clastic and carbonate environments; fluvial, alluvial-fan, delta, intertidal, submarine-fan, carbonate-bank, and sabkha systems. Required field trip during spring recess to region of modern examples and/or rock sequences demonstrating ancient examples.]

**[476 Sedimentary Basins: Tectonics and Mechanics**
Spring. 3 credits. Prerequisite: Geol 375 or permission of instructor. Offered alternate years. Not offered 1989–90.
3 lecs. T. E. Jordan.
Subsidence of sedimentary basins from the point of view of plate tectonics and geomechanics. Interactions of subsidence, sediment supply, and environmental characteristics in development of stratigraphic sequences. Framework of active-margin, passive-margin, and cratonic basins; and stratigraphy. Topics include sedimentary petrology, geophysical and stratigraphic modeling, sequence stratigraphy and the role of sea-level fluctuations. Modern and ancient examples.]

**478 Advanced Stratigraphy**
Spring. 3 credits. Prerequisite: Geol 375 or permission of instructor. Offered alternate years.
2 lecs, 1 lab, possible spring break field trip. T. E. Jordan.
Survey of modern improvements on traditional methods of study of ages and of genetic relations among sedimentary rocks, emphasizing 3-D relationships. Techniques and applications of sequence stratigraphy. Physical correlation, dating techniques, and time resolution in sedimentary rocks. Depositional systems. Physical controls on the stratigraphic record and numerical modeling.

**[479 Paleobiology (also Bio Sci 479)**
Fall. 3 credits. Prerequisites: Biological Sciences 101–102 and 103–104 or equivalent, and either Geol 375, Biological Sciences 274, Biological Sciences 373, or permission of instructor. Offered alternate years. Not offered 1989–90.
3 lecs. J. L. Cisne and staff.
Survey of the major groups of organisms and their evolutionary histories. Intended to fill out the biological backgrounds of geology students and the geological backgrounds of biology students concerning the nature and significance of the fossil record for their respective studies.]

**487 Geophysical Prospecting**
Fall. 3 credits. Prerequisites: Physics 213 and Mathematics 192 or equivalents, or permission of instructor.
2 lecs. S. Kaufman.
Physical principles, instrumentation, operational procedures, and interpretation techniques in geophysical exploration for oil, gas, and minerals. Seismic reflection, seismic refraction, gravity, and magnetic and electrical methods of exploration.

**489 Earthquakes and Tectonics**
Fall. 3 credits. Prerequisites: Geol 101 or 201, Mathematics 192, Physics 213, or permission of instructor. Offered alternate years.
3 lecs. B. L. Isacks.
The mechanisms of earthquakes revealed by seismic-wave radiation and by near-source studies of faulting and surface deformation; relationships to regional tectonics; earthquake hazard and prediction.

**490 Honors Thesis (B.A. degree candidates)**
Fall, spring. 2 credits.
Staff.
Thesis proposal to be discussed with director of undergraduate studies during the junior year. Participation requires acceptance of a thesis proposal by the faculty committee.

**491–492 Undergraduate Research**
Fall, spring. 1 credit.
Staff (D. E. Karig and A. L. Bloom, coordinators).
An introduction to the techniques and philosophy of research in the earth sciences and an opportunity for undergraduates to participate in current staff research projects. Topics chosen in consultation with, and guided by, a staff member. A short written report is required, and outstanding projects are prepared for publication.

**500 Design Project in Geohydrology**
Fall, spring 3–12 credits. An alternative to an industrial project for M.Eng. students choosing the geohydrology option. May continue over two or more semesters.
L. M. Cathles.
The project may address one of many aspects of groundwater flow and contamination, and must involve a significant geological component and lead to concrete recommendations or conclusions of an engineering nature. Results are presented in GS 501, Geohydrology Design Project Seminar.

**501 Geohydrology Design Project Seminar**
Fall, spring. 1 credit. Required for the M.Eng. degree, geohydrology option.
1 rec., hours to be arranged.
L. M. Cathles.
In fall, the weekly seminar provides a forum for discussion of courses and development of design projects (see GS 500). In spring, it provides an opportunity to present and discuss design projects.

**502 Case Histories in Groundwater Analysis**
Spring. 4 credits.
L. M. Cathles.
Groundwater flow in a specific area, such as a proposed nuclear-waste disposal site, is analyzed in depth. Geological and resource data on the area are presented early in the course. For the remainder of the semester, the material is analyzed by students working as an engineering analysis team. Each student makes a weekly progress report and writes part of a final report, whose results are presented in a half-day seminar at end of term.

**600–699 Seminars and Special Work**
Fall, spring. 1–3 credits. Prerequisite: permission of instructor.
Advanced work on original investigations in geological sciences. Topics change from term to term.

**621 Tectonic and Stratigraphic Evolution of Sedimentary Basins**
W. B. Travers.

**622 Advanced Topics in Structural Geology**
R. W. Allmendinger.

**625 Rock and Sediment Deformation**
D. E. Karig.

**631 Plate Tectonics and Geology**
J. M. Bird.

**641 Advanced Geomorphology Topics**
A. L. Bloom.

**651 Petrology and Geochemistry**
R. W. Kay.

**653 Mineralogy and Crystallography, X-Ray Diffraction, Microscopy, High-Pressure–Temperature Experiments**
W. A. Bassett.

**655 Advanced Topics in Petrology and Tectonics**
J. M. Bird, W. A. Bassett.

**657 Current Research in Petrology**
R. W. Kay.

**662 Advanced Topics in Petroleum Exploration**
W. B. Travers.

**671 Advanced Topics in Sedimentology and Stratigraphy**
T. E. Jordan.

**673 Paleobiology**
J. L. Cisne.

**680 Seismic Record Reading**
M. Barazangi, B. L. Isacks.

**681 Geophysics, Exploration Seismology**
L. D. Brown.

**683 Advanced Topics in Seismology**
B. L. Isacks.

**685 Exploration Seismology, Gravity, Magnetics**
S. Kaufman.

**687 Geophysics, Seismology, and Geotectonics**
Fall. 2 credits. Offered alternate years.
J. E. Oliver.
The past, present, and future of deep seismic reflection profiling as applied to study of the structure, evolution, and large-scale tectonics of the continents.

**689 Research on Seismic-Reflection Profiling of the Continental Crust**
J. E. Oliver, L. D. Brown, S. Kaufman.

**693 Andes Seminar**
B. L. Isacks, T. E. Jordan, A. L. Bloom, R. W. Allmendinger.

**695 Computer Methods in Geological Sciences**
L. D. Brown, B. L. Isacks.
This course is intended to familiarize students with the growing importance of computers in geological and geophysical research. Students will be required to develop, debug, implement, and document a program relevant to current research in the Department of Geological Sciences. Available facilities include the department's VAX 11/750 and MEGASEIS seismic computers, DI–3000 graphics software, IIS image processor, and numerous graphics and I/O peripherals. The Cornell National Supercomputer Facility may also be used.

**696 Geochemistry of the Solid Earth**
Fall.
W. M. White.

**697 Fluid-Rock Interactions**
L. M. Cathles.

**[721 Marine Tectonics**
Fall. 3 credits. Prerequisites: Geol 326 and a course in geophysics. Offered alternate years. Not offered 1989–90.
3 lecs. D. E. Karig.
Study of geophysical and geological characteristics of the earth's crust beneath the oceans. Emphasis on recent geologic data concerning plate margins in the oceans; island-arc systems, spreading systems, and transforms. Techniques for determining instantaneous and finite plate rotations. Lectures and reviews of recent papers. Term project and paper required.]

**[722 Advanced Structural Geology I**
Spring. 3 credits. Prerequisites: Geol 326 and permission of instructor. Offered alternate years. Not offered 1989–90.
2 lecs, 1 lab, possible weekend field trips. D. E. Karig, R. W. Allmendinger.
Stress-strain theory and application. Advanced techniques of structural analysis. Topics include finite and incremental strain measurement; microstructure, preferred orientation, and TEM analysis; pressure solution and cleavage development; and experimental deformation. Applications to deformation of unconsolidated sediments, brittle and brittle-ductile deformation of supracrustal strata, and ductile deformation of high-grade metamorphic rocks. Kinematic analysis of shear zones and folds in these regimes.]

**724 Advanced Structural Geology II**
Spring. 3 credits. Prerequisites: Geol 326 and permission of instructor. Offered alternate years.
2 lecs, 1 lab, spring-recess trip. R. W. Allmendinger, D. E. Karig.
Geometry, kinematics, and mechanics of structural provinces. Concentration on thrust belts, rift provinces, or strike-slip provinces. Techniques of balanced cross sections.

**728 Geology of Orogenic Belts**
Spring. 4 credits. Prerequisite: permission of instructor.
T R 10:10–12:05. J. M. Bird.
A seminar course in which students study specific geologic topics of an orogenic belt selected for study during the term. The course is intended to complement Geol 781.

**735 Advanced Geophysics I: Quantitative Geodynamics**
Fall. 3 credits. Prerequisite: Geol 388.
3 lecs. D. L. Turcotte.
Stress and strain, elasticity and flexure, heat transfer, gravity, fluid mechanics, rock rheology, faulting, and flow in porous media.

**737 Advanced Geophysics II: Fundamentals of Mantle Convection**
Spring. 3 credits. Prerequisite: Geol 388.
3 lecs. D. L. Turcotte.
Geological and geophysical evidence, structure of the mantle, material properties, heat sources, basic equations, linear stability analysis, approximate solutions, numerical solutions, plumes, laboratory experiments, geochemistry, early thermal history, terrestrial planets and satellites.

**781 Geotectonics**
Fall. 4 credits. Prerequisite: permission of instructor.
2 lecs. J. M. Bird.
Theories of orogeny; ocean and continent evolution. Kinematics of lithosphere plates. Rock-time assemblages of modern oceans and continental margins, and analogs in ancient orogenic belts. Time-space reconstructions of specific regions. Problems of dynamic mechanisms—corollaries and evidence from crustal features.

**[787 Seismology**
Fall. 3 credits. Prerequisite: T&AM 611 or equivalent. Offered alternate years. Not offered 1989–90.
3 lec-recs. B. L. Isacks.
Generation and propagation of elastic waves in the earth. Derivation of the structure of the earth and the mechanism of earthquakes from seismological observations.]

# MATERIALS SCIENCE AND ENGINEERING

## Undergraduate Courses

**201 Elements of Materials Science and Engineering (also Engr 111)**
Fall, spring. 3 credits.
Autotutorial.
For description see Engineering Common Courses.

**261 Introduction to Mechanical Properties of Materials (also Engr 261)**
Fall, spring. 3 credits.
2 lecs, 1 rec or lab.
For description see Engineering Common Courses.

**262 Introduction to Electrical Properties of Materials (also Engr 262)**
Spring. 3 credits.
2 lecs, 1 rec or lab.
For description see Engineering Common Courses.

**285 Art, Isotopes, and Analysis (also Engr 285)**
Spring. 3 credits.
J. W. Mayer, S. Taft, D. Eddy.
For description see Engineering Common Courses.

**331 Structural Characterization of Materials**
Fall. 4 credits.
3 lecs, 1 lab.
Crystal structures and crystal defects, stereographic projection methods. Techniques for materials analysis: X-ray and electron diffraction, optical and electron microscopy. Design of experimental systems for the structural characterization of materials.

**332 Electrical and Magnetic Properties of Materials**
Spring. 3 credits. Prerequisite: MSE 331 or permission of instructor.
3 lecs.
Electrical and magnetic properties of metals and semiconductors as affected by microstructure. Design of semiconductor properties by doping. Carrier drift, diffusion, and recombination. Depletion layers in p-n junctions. Design of semiconductor devices. Principles and design of ferromagnetic materials for transformers, permanent magnets, and bubble memories. Fundamentals and design of superconducting materials for high-field magnets and Josephson junctions.

**333 Research Involvement I**
Fall. 3 credits. Prerequisite: approval of department.
Supervised independent research project in association with faculty member and faculty research group of the department. Students design experiments, set up the necessary equipment, and evaluate the results. Creativity and synthesis are emphasized. Typical projects have involved hot isostatic compaction, sputter etching, and mechanical testing of polymer films.

**334 Research Involvement II**
Spring. 3 credits. Prerequisite: approval of department.
May be a continuation of MS&E 333 or a one-term affiliation with a research group.

**335 Thermodynamics of Condensed Systems**
Fall. 3 credits.
3 lecs.
The three laws of thermodynamics are introduced as a basis for understanding phase equilibria, heterogeneous reactions, solutions, electrochemical processes, surfaces, and defects. One-third of the course involves examples of design and control of materials processing and microstructure.

**336 Kinetics, Diffusion, and Phase Transformations**
Spring. 3 credits. Prerequisite: MS&E 335 or permission of instructor.
3 lecs.
Introduction of absolute rate theory, atomic motion, and diffusion. Applications and design involving nucleation and growth of new phases in vapors, liquids, and solids; solidification, crystal growth, oxidation and corrosion, radiation damage, recrystallization, gas-metal reactions, and thermomechanical processing to produce desired microstructures and properties.

**345 Materials and Manufacturing Processes (also M&AE 312)**
Spring. 3 credits. Prerequisite: T&AM 202 or permission of instructor.
2 lecs, 1 lab.
For description see M&AE 312.

**435–436 Senior Thesis I & II**
435, fall; 436, spring. 4 credits.
Staff.
Open to advanced undergraduates in lieu of the senior materials laboratory. Proposals for thesis topics should be approved by the supervising faculty member prior to beginning the senior year. Approved thesis topics will normally involve original experimental research in direct collaboration with an ongoing research program. Periodic oral and written presentations and a final written thesis are required.

**441 Microprocessing of Materials**
Fall. 3 credits.
3 lecs, occasional lab.
Materials and processing steps involved in the production of large-scale integrated circuits. Design of processes to give a specific device, e.g., a MOSFET is described, not circuit design. Emphasis is on silicon devices, with mention of Gallium Arsenide. All steps in fabrication of circuits are considered, starting with purification of silicon, single-crystal growth, zone refining, and wager slicing. Thin-film growth by epitaxy, by chemical or physical vapor deposition, or by thermal oxidation of silicon to $SiO_2$. Doping of layers by diffusion and by ion implantation. Principles and practice of lithography; comparison of near and far UV, electrons and X-rays for resolution, output, and cost. Photoresists. Wet and dry etching. Characterization and testing, yield. Electromigration and other device failure modes.

**442 Macroprocessing (also M&AE 512)**
Spring. 3 credits.
3 lecs.
Deformation processing of materials, including superplastic forming, sheet-metal forming, massive forming, and powder processing. Time, temperature, and strain-rate effects in warm-forming and hot-forming. Characterization of powder-compaction mechanisms and their use in process design. Forming-limit diagrams. Development of microstructure-based criteria for fracture in large deformations. Optimization and design of forming processes. Development of constitutive equations for superplastic flow. Design of a superplastic forming process starting from basic mechanisms. The course includes a comprehensive experimental project in which the constitutive equations for superplastic flow are measured and computer-aided techniques are used to design a superplastic forming process. The forming experiment is carried out, and the results are compared with the predictions from the numerical analysis.

**443–444 Senior Materials Laboratory**
443, fall; 444, spring. 3 credits.
Projects are available in plasticity of metals and ceramics, mechanical and chemical processing, phase transformations, electrical and ionic conductivity, analysis of defects by electron microscopy, sintering, crystal growth, thin-film fabrication, electronic materials, etc. Emphasis is placed on design of experimental equipment for analysis and evaluation of a material's properties and performance in terms of its processing history and microstructure.

**445 Mechanical Properties of Materials**
Fall. 3 credits. Prerequisites: MS&E 331 and 336, or permission of instructor.
3 lecs.
Relation between stress, strain, and the concept of equivalent stresses and strains; failure criteria for metals, polymers, and ceramics. Applications of fracture mechanics to fail-safe design. Analysis of important mechanical properties such as plastic flow, creep, fatigue, fracture toughness, and rupture and their variation with temperature in terms of the interaction of the microstructure with lattice defects. Application of these principles to the design of improved materials.

**447 Materials Design Concepts I**
Fall. 1 credit.
Speakers from industry and other institutions will give case studies of design problems. Students will write a proposal for a design-study project, which will be approved by the instructor. At the level of *Engineering Design*, by Dieter.

**448 Materials Design Concepts II**
Spring. 2 credits. Prerequisite: MS&E 447.
Each student is expected to complete an extensive design-study project and give a thirty-minute video-taped talk on a materials-design problem that includes a discussion of economic factors as well as the design of processes and the selection of materials. At the level of *Engineering Design*, by Dieter.

**449 Introduction to Ceramics**
Fall. 3 credits. Prerequisite: MS&E 331 or permission of instructor.
3 lecs.
Ceramic processes and products, crystal structures, structure of glasses, point defects (point-defect chemistry and relation to nonstoichiometry), line defects, grain boundaries, diffusion in ionic materials (emphasis on the relationships between diffusion and point-defect structure), phase diagrams, phase transformations, kinetics of solid-state reactions (reactions with and between solids: heterogeneous reactions, reactions between different solids, point-defect relaxation, internal reactions), grain growth and sintering. Physico-chemical aspects are emphasized.

**450 Physical Metallurgy**
Spring. 3 credits.
The service and design requirements of engineering alloys and their testing and characterization. The properties of important alloy systems. The selection and design of alloys for various engineering requirements, such as ASME design codes.

**452 Properties of Solid Polymers**
Spring. 3 credits. Prerequisite: Engr 261 or permission of instructor.
3 lecs.
Synthetic and natural polymers for engineering applications. Production and characterization of long-chain molecules. Gelation and networks, rubber elasticity, elastomers and thermosetting resins. Amorphous and crystalline thermoplastics and their structure. Time- and temperature-dependent elastic properties of polymers. Molecular-weight measurement. Design of high-impact-strength polymers.

**454 Processing of Glass, Ceramic, and Glass-Ceramic Materials**
Spring. 3 credits. Offered alternate years.
Conventional and unconventional techniques for processing glass, glass-ceramic, and ceramic materials. Case studies illustrate the design, engineering, and scientific aspects of such processes. Vapor processes for high-purity optical fibers, hot-processing of ceramic turbine blades, photosensitive materials, and powder processing and sintering of ceramics will be discussed. This course is team taught with two scientists from the research and development laboratory of Corning Glass Works.

**455 Analysis of Manufacturing Processes (also M&AE 512)**
Spring. 3 credits. Prerequisite: M&AE 312.
3 recs.
For description see M&AE 512.

**459 Physics of Modern Materials Analysis**
Fall. 3 credits.
The interaction of ions, electrons, and photons with solids, and the characteristics of the emergent radiation in relation to the structure and composition of materials. Aspects of atomic physics that are necessary for understanding techniques of modern materials analysis, such as Auger electron spectroscopy, ion scattering, and secondary ion mass spectroscopy. Design of experiments for near-surface analysis.

**463 Principles of Electronic Packaging**
Fall. 3 credits.
Design and materials needs for packaging technology, from chip to board. Principles involved in key areas of materials science, and other engineering disciplines. Packaging materials to be discussed include metals, ceramics, and polymers.

## Graduate-Level Professional Courses

**510 Optical Methods and Materials**
Fall. 3 credits.
Principles of geometric and Gaussian optics, instrumentation required for optical experiments, and methods in optical spectroscopy. Fundamental aspects of the interaction between optical waves and crystalline solids. Materials aspects of optical devices such as optical films and coatings, light-modulation devices, displays, lasers and detectors, optical waveguides, electro-optic devices, optical recording, and applications of high-intensity light beams.

**512 Chemical Thermodynamics of Materials**
Fall. 3 credits.
Thermodynamic principles. Chemical potentials, fugacities, and activities. Closed and open systems. Stability of single- and multicomponent systems. Reactions. Binary and multi-component systems and phase diagrams. Compounds. Surfaces, surface tension, and adsorption. Special topics such as electrochemistry, corrosion, and chemical-vapor deposition.

**514 Chemical Processing of Ceramics**
Spring. 3 credits.
Ultrastructure processing of ceramics, glasses, and composites. Chemical approaches in designing and controlling the surfaces and interfaces of materials, devices, and structures at the molecular level. Topics: organometallic routes to ceramics; sol-gel processing, chemical vapor deposition, and pyrolysis techniques; design, synthesis, and chemical properties of inorganic/organometallic precursors; preparation, surface chemistry, and micromechanics of controlled powders; characterization of chemically processed ceramics; application of sol-gel derived materials; advanced structural ceramics.

**516 Thin-Film Materials Science**
Fall. 3 credits.
This course is a fundamental approach to thin-film science that will cover deposition of films, growth of epitaxial layers, formation of multilayered structures such as superlattices and quantum wells, and interdiffusion and reaction in thin films. The course will begin with the structure and thermodynamics of surfaces and ultrathin films. The conditions for epitaxial growth, such as used in semiconductor heterostructures, will be contrasted with those for amorphous or polycrystalline films. The role of thermal processing for reactive thin films involving the formation of surface oxides, metallic silicides, and aluminides will be presented.

**518 Introduction to Electron Microscopy**
Spring. 3 credits. Prerequisite: MS&E 331 or permission of instructor.
3 lecs.
Basic optics and operation of scanning and transmission electron microscopes. Image formation, modes of contrast, and resolution in SEM and TEM. Electron diffraction. Images of perfect crystal and defects in two-beam diffraction contrast. Analytical microscopy; comparison of EDS, WDS, and EELS. X-ray imaging. Overview of specimen preparation and in-situ microscopy.

**520 Practical Electron Microscopy**
Spring. 3 credits. Corequisite: MS&E 518–520. Limited to 12 students. A fee will be charged for instrument usage.
Lab.
Students will be instructed in the proper use of a scanning and a transmission electron microscope. All stages from initial alignment of the instrument to presentation of the results will be covered. Three or four projects will be completed, including obtaining atomic lattice fringe images and X-ray microanalysis.

**553–554 Special Project**
553, fall; 554, spring. 6 credits each term.
Research on a specific problem in the materials area.

## Graduate Core Courses

**601 Thermodynamics of Materials**
Fall. 3 credits.
Basic statistical thermodynamics. Partition function and thermodynamic state functions. Distributions. Laws of thermodynamics. Free-energy functions and conditions of equilibrium. Chemical reactions. Statistics of electrons in crystals. Heat capacity. Heterogeneous systems and phase transitions. Lattice models of 1–, 2–, 3–dimensional interacting systems. Statistical thermodynamics of alloys. Free-energy and phase diagrams. Order-disorder phenomena. Point defects in crystals. Statistical thermodynamics of interfaces. Nucleation phenomena.

**602 Elasticity and Physical Properties of Crystals**
Fall. 3 credits.
Cartesian tensors, elastic stress and strain, constitutive relations between stress and strain, symmetry of crystals, generalized tensor representation of elasticity and other reversible and irreversible properties of crystals; mathematical theory of infinitesimal elasticity with applications, including wave propagation and stress fields of dislocations; mathematical theory of yield stress and plasticity; origin of elastic behavior. At the level of Physical Properties of Crystals, by Nye.

**603 Structural Defects in Solids**
Spring. 3 credits. Prerequisites: MS&E 601 and 602, or equivalent.
Binding energies in perfect crystals. Structure and energetics of point, line, and planar defects in crystalline materials, including metals, ionic solids, covalent solids, and polymers. Interactions between defects. Bonding and random packing in amorphous materials. Observation of defects in crystalline materials. Structural analysis of amorphous materials.

**604 Kinetics of Solid-State Reactions**
Spring. 3 credits.
Point defects (thermal disorder, component-activity-dependent disorder, influence of dopants, different kinds of associates, Coulomb interaction between point defects), dislocations, interfaces, transport in solids (definition and different kinds of diffusion coefficients, reference frames, electrical conduction, diffusion mechanisms, atomic theory of transport, correlation effects, phenomenological theory of transport including some aspects of thermodynamics of irreversible processes), point-defect relaxation (migration controlled, phase-boundary-reaction controlled), interdiffusion, solid-state reactions involving compound formation, behavior of materials in potential gradients, selected solid-state processes (sintering, solid-state galvanic cells, etc.).

**605 Plastic Flow and Fracture of Materials**
Fall. 3 credits.
R. Raj.
Topics in the mechanical behavior of materials from a fundamental standpoint. Atomistic aspects of elastic properties, plastic flow in single crystals and polycrystals, rate-dependent deformation at elevated temperature, mapping of various mechanisms of plastic flow over a wide range of temperature, shear stress and grain size, and superplastic deformation. Fracture is discussed from a thermodynamic as well as an atomistic standpoint. Fracture criteria are developed in terms of crack-tip processes. Cleavage, ductile brittle transition, and intergranular cavitation failure at high temperatures. Emphasis on micromechanical modeling of mechanical behavior. A materials-science approach to modeling that combines concepts from continuum mechanics, thermodynamics, kinetics, and atomic structure.

### Related Course in Another Department

Introductory Solid-State Physics (Physics 454)

### Further Graduate Courses

**610 Principles of Diffraction (also A&EP 711)**
Fall. 3 credits. Offered alternate years.
For description see A&EP 711.

**612 Phase Transformations**
3 credits. Prerequisites: MS&E 601 and 604, or equivalent preparation.
Compositional and structural transitions in condensed systems, including spinoidal decomposition, cellular transformations, and diffusionless transformations; clustering and ordering in solid solutions; radiation-induced precipitation; condensation and evaporation phenomena; order-disorder transformations; transitions in magnetic, ferroelectric, and superconducting materials; phase equilibria and transitions in surface and grain-boundary layers. Phase transformations in metallic, ceramic, semiconducting, and polymeric systems. Thermodynamic, statistical thermodynamic, structural, and kinetic aspects of the transitions. Modern methods of observation. At the level of *The Theory of Transformations in Metals and Alloys*, by Christian; *Critical Phenomena in Alloys, Magnets and Superconductors*, edited by Mills, Ascher, and Jaffee; and current review articles.

**616 Electrical and Magnetic Properties of Materials**
3 credits. Prerequisite: Physics 454 or equivalent.
Electronic transport properties of metals and semiconductors, semiconductor devices, optical and dielectric properties of insulators and semiconductors, laser materials, dielectric breakdown, structural aspects of superconducting materials, ferromagnetism, and magnetic materials. At the level of *Physics of Semiconductor Devices*, by Sze; *Ferromagnetism*, by Bozworth; and current review articles.

**618 Laser Processing of Materials**
3 credits. Offered on demand.
Use of high-intensity lasers in the processing of materials to achieve unique microstructures and metastable phases. Topics: fundamentals of the interaction of E&M fields with metals, semiconductors and ceramics, transfer of energy between electronic and phonon systems, kinetics of rapid solidification, metastable phase transformations, microstructure of rapidly solidified materials, and current industrial applications.

**620 Synthesis of Polymeric Materials**
3 credits. Prerequisite: MS&E 452 or permission of instructor.
Preparation of synthetic polymers by step- and chain-growth polymerization: condensation; free radical, anionic, and cationic mechanisms; ring opening and coordination routes. Statistical and kinetic aspects of homopolymer and copolymer formation. Stereochemistry of polymers and spectroscopic methods for polymer analysis. Molecular aspects of polymer design for properties such as conductivity, elasticity, thermal stability, and engineering properties. Topics will also include liquid crystalline polymers, polymers for photoresists, and adhesive-binder polymers. At the level of *Principles of Polymerization*, by Odian, and current literature.

**622 X-Ray Diffraction in Materials Science**
Fall. 3 credits. Offered on demand.
X-ray scattering and absorption by materials. Reciprocal lattice and brillouin zones. Space groups and various crystal structures. Diffraction from two- or three-dimensional periodic lattices and effect of thermal vibrations. Experimental techniques in X-ray diffraction with particular emphasis on the use of synchrotron sources. Determination of crystal structure by powder and single-crystal diffraction. Use of X-ray diffraction techniques in materials science in studying phase transformation and texture in materials. Diffraction from surface layers and amorphous materials.

**671 Synthetic Polymer Chemistry (also Chem 671 and Chem E 675)**
Fall. 3 credits. Offered on demand. Prerequisites: Chem 359–360 or equivalent, or permission of instructor. Recommended: M&SE 620.
For description see Chem E 675.

## Specialty Courses

**707 Solar Energy Materials**
3 credits. Offered on demand.
3 lecs.
Photovoltaic energy conversion: (1) theory (on the level of Hovel); (2) the role of crystal defects and grain boundaries on the conversion efficiency, and schemes to passivate these defects; (3) current investigations in the DOE program to produce large quantities of solar-grade semiconducting Si; (4) theory and materials for amorphous silicon solar cells.

**714 Advanced Transmission Electron Microscopy**
Fall. 3 credits. Prerequisites: MS&E 518 and 520. Offered on demand.
3 lecs.
Kinematic and dynamic diffraction, dispersion surfaces, and Bloch waves. Anomalous absorption, Kikuchi band theory, and energy selected images. Contrast transfer function theory of phase constrast. Lattice imaging and image modeling. Calculation of multibeam defect images in theory and practice. Weak-beam images. Image processing. High-resolution SEM and STEM images. Convergent beam patterns.

**716 Transition Metal Oxides (also Chem 716)**
Fall. 3 credits. Offered on demand.
For description see Chem 716.

**779 Special Studies in Materials Sciences**
Fall, spring. Variable credit. Offered on demand.
Supervised studies of special topics in materials science.

**798 Materials Science and Engineering Colloquium**
Fall, spring. 1 credit each term. Credit limited to graduate students.
Lectures by visiting scientists, Cornell staff members, and graduate students on subjects of interest in materials sciences, especially in connection with new research.

**799 Materials Science Research Seminars**
Fall, spring. 2 credits each term. For graduate students involved in research projects.
Short presentations on research in progress by students and staff.

**800 Research in Materials Science**
Fall, spring. Credit to be arranged. Prerequisite: candidacy for Ph.D. in materials science. Independent research in materials science under the guidance of a member of the staff.

**801 Research in Materials Science**
Fall, spring. Credit to be arranged. Prerequisite: candidacy for M.S. in materials science. Independent research in materials science under the guidance of a member of the staff.

# MECHANICAL AND AEROSPACE ENGINEERING

## General and Required Courses

**101 Naval Ship Systems (also Naval Science 102)**
Spring. 3 credits. Limited to freshmen and sophomores. A free elective for engineering students.
M. Y. Louge.
An introduction to primary ship systems and their interrelation. Basic principles of ship construction. Stability, propulsion, control, internal communications, and other marine systems.

**102 Drawing and Engineering Design (also Engr 102)**
Fall, spring. 1 credit. Half-term course offered twice each semester. Enrollment limited to thirty students each half term. Recommended for students without previous mechanical drawing experience. S-U grades optional.
2 lecs, 1 lab.
For description see Engineering Common Courses.

**117 Introduction to Mechanical Engineering (also Engr 117)**
Fall. 3 credits.
2 lecs, 1 lab.
For description see Engineering Common Courses.

**119 Introduction to Manufacturing Engineering (also Engr 119)**
Spring. 3 credits.
2 lecs, 1 lab.
For description see Engineering Common Courses.

**221 Thermodynamics (also Engr 221)**
Fall, spring. 3 credits. Prerequisites: Mathematics 191 and 192 and Physics 112.
For description see Engineering Common Courses.

**312 Fundamentals of Manufacturing Processes (also MS&E 345)**
Spring; may be offered in Engineering Cooperative Program. 3 credits. Prerequisites: Engr 202 and 261, or permission of instructor.
2 lecs, 1 lab; evening exams and prelims may be given.
Yield criteria and plastic flow. Manufacturing processes for engineering materials, including metals, polymers, ceramics, and composites. Casting, forming, material removal, and joining processes.

**323 Introductory Fluid Mechanics**
Fall; usually offered in Engineering Cooperative Program. 4 credits. Prerequisites: Engr 202 and 203 and coregistration in 221, or permission of instructor.
4 lecs, evening prelims.
Statics, kinematics, potential flow, dynamics, momentum, and energy relations. Thermodynamics of compressible flow; dimensional analysis; real fluid phenomena, laminar and turbulent motion, boundary layer; lift and drag; supersonic flow and shock waves.

**324 Heat Transfer**
Spring; may be offered in Engineering Cooperative Program. 3 credits. Prerequisite: M&AE 323.
3 lecs, evening prelims.
Conduction of heat in steady and unsteady situations. Surfaces with fins and systems with heat sources. Forced and natural convection of heat arising from flow around bodies and through ducts. Heat exchangers. Emission and absorption of radiation; radiative transfer between surfaces. Introduction to boiling and phase change.

**325 Mechanical Design and Analysis**
Fall; usually offered in Engineering Cooperative Program. 4 credits. Prerequisites: Engr 202 and 203.
3 lecs, 1 lab. Evening prelims may be given.
Application of the principles of mechanics and materials to problems of analysis and design of mechanical components and systems.

**326 Systems Dynamics**
Spring; may be offered in Engineering Cooperative Program. 4 credits. Prerequisite: M&AE 325.
3 lecs, 1 lab, evening prelims.
Dynamic behavior of mechanical systems: modeling, analysis techniques, and applications; vibrations of single- and multi-degree-of-freedom systems; linear control systems, PDF control, stability analysis. Computer simulation (CADIF) and experimental studies of vibration and control systems.

**427 Mechanical Engineering Laboratory**
Fall. 4 credits. Prerequisites: M&AE 324 and 326.
1 lec, 2 labs.
Laboratory exercises in methods, techniques, and instrumentation used in mechanical engineering. Measurements of temperature, heat transfer, viscosity, drag, fluid-flow rate, effects of turbulence, shock wave phenomena, and engine performance.

**428 Engineering Design**
Fall. 1 credit. Prerequisite: completion of six semesters in mechanical engineering or equivalent.
1 lec.
General principles of design, relevant to both the fluids, energy, and heat transfer stem and the mechanical systems and manufacturing stem of mechanical engineering.

## Mechanical Systems and Design and Manufacturing

**389 Computer-Aided Design**
Spring. 3 credits. Limited to juniors and seniors. Prerequisite: A course in programming. May be taken either before or in conjunction with a numerical-methods course. Fulfills computer applications requirement.
2 lecs, 1 sec of computational assignments at CADIF. D. L. Taylor.
A first course in CAD, introducing the use of software and computer methods in mechanical engineering. Topics include simulation, optimization, solution of field equations (finite elements, finite differences), least-square function approximation, geometry (space curves, splines, patches), and computer graphics.

**464 Design for Manufacture**
Spring. 3 credits. Prerequisites: M&AE 312 and 428 and senior standing. Enrollment limited. Fulfills field design requirement.
K. K. Wang.
Principles and methodologies for conceptual design; elimination procedures for selecting design alternatives; emphasis on design for manufacturability, quality, and cost considerations; team design projects from concept, analysis, and computer-aided drafting to manufacturing methods.

**465 Biomechanical Systems—Analysis and Design**
Spring. 3 credits. Prerequisites: Engr 202 and 203.
2 lecs, 1 lab. D. L. Bartel.
Selected topics from the study of the human body as a mechanical system. Emphasis on the modeling, analysis, and design of biomechanical systems frequently encountered in orthopaedic engineering and rehabilitation engineering.

**478 Feedback Control Systems (also EE 471)**
Fall. 4 credits. Prerequisite: EE 302, M&AE 326, or permission of instructor.
3 lecs. Open computer lab. M. L. Psiaki.
Analysis techniques, performance specifications, and analog-feedback-compensation methods for single-input, single-output, linear, time-invariant systems. Laplace transforms and transfer functions are the major mathematical tools. Design techniques include root locus, frequency response, and algebraic pole placement. Feedback architectures include PID, PDF, and lead/lag compensation. Applications include robotics, aerospace vehicles, and industrial processes. Computer-aided design laboratory examines modeling and control of a computer-simulated dynamic system.

**486 Automotive Engineering**
Spring. 3 credits. Prerequisite: M&AE 428 and senior standing. Fulfills field design requirement.
Selected topics in the analysis and design of vehicle components and vehicle systems. Emphasis is on automobiles, trucks, and related vehicles. Power plant, driveline, brakes, suspension, and structure. Other vehicle types may be considered.

**489 Computer-Aided Design Project**
Spring. 4 credits. Prerequisite: M&AE 428; limited to seniors in mechanical engineering. A project-oriented design course. Fulfills both field design and computer applications requirements.
2 lecs, 1 sec of computational assignments at CADIF. D. L. Taylor.
Students will undertake a complete design of a complex system based on specification of performance and functionality. Evaluation will be on how well the design submitted satisfies objective. Topics vary annually, but typical topics include sailboat or aircraft design. Students will be expected to utilize CAD techniques and commercial software (drafting, solid modeling, finite-element analysis, simulation) as appropriate. Attendance in lectures and completion of interim projects will be mandatory.

**512 Analysis of Materials Processing (also MS&E 442)**
Spring. 3 credits. Prerequisite: M&AE 312.
3 lecs. P. Dawson, R. Raj.
Review of the basic principles governing the behavior of crystalline solids. Application of slab models, bound theorems, and slipline theory to problems of forging, extrusion, and rolling. Analysis of sheet-metal forming, including forming limits and springback. Discussion of defect initiation during forming processes.

**514 Numerical Control in Manufacturing**
Fall. 3 credits. Prerequisite: upperclass standing in engineering.
3 lecs. K. K. Wang.
Principles and the state of the art of numerical control (NC) technology; design considerations for control systems and programming methods for NC and computerized NC (CNC) machine tools; modeling of surfaces and solid objects for machining; NC code generation and verification; computer-aided manufacturing (CAM) systems.

**517 Introduction to Robotics**
Fall. 3 credits. Enrollment limited; intended for graduate students but open to seniors. Prerequisites: computer programming and calculus. May be offered 1989–90.
1 lec, 2 labs.
Application of industrial robots in the manufacturing environment. Robot language and programming methods. Sensors and vision. Interfacing and real-time control. Coordinate transformations for manipulator kinematics. World modeling, task-level programming, and task planning.

**569 Mechanical and Aerospace Structures I**
Fall. 3 credits. Prerequisite: M&AE 325 or permission of instructor.
A study of advanced topics in the analysis of stress and deformation of elastic bodies, with applications to the analysis and design of mechanical and aerospace systems. Fundamentals of the theory for deformations of elastic bodies are reviewed and applied to classical problems of solid and structural mechanics.

**575 Microprocessor Applications**
Fall. 3 credits. Enrollment limited; intended for graduate students with limited background in digital circuitry; open to undergraduates with permission of instructor. Prerequisite: background in basic laboratory electronics. Fulfills computer applications requirement.
2 lecs, 1 lab.
Introduction to digital circuitry, microprocessors, and microprocessor-based data acquisition and control systems. Basic concepts of data representation, microprocessor and microcomputer structure, parallel and serial input/output, analog-to-digital conversion, and hardware and software requirements for interfacing. Emphasis on applications of the 8088 microprocessor and assembly language programming. Independent laboratory work on several applications projects, including the process control procedures.

**577 Mechanical Vibrations**
Fall. 3 credits. Open to qualified undergraduates. Prerequisite: M&AE 326 or equivalent. May be offered 1989–90.
2 lecs, 1 lab (occasional).
Further development of vibration phenomena in single– and multiple–degree-of-freedom linear and nonlinear systems, with emphasis on engineering problems involving analysis and design.

**578 Feedback Control Systems Design and Implementation**
Spring. 3 credits. Open to qualified undergraduates. Prerequisite: M&AE 478 or EE 471, or permission of instructor.
1 lec, 2 labs.
Further development of the theory, design, and implementation of feedback control systems with particular emphasis on applications, modeling and system identification, and hardware implementation. Digital control is covered briefly. Labs include real-time microprocessor-based control of a D.C.-motor positioning system, a two-link robot arm, and a two-tank level-control system.

**589 Computer-aided Research, Design, and Development**
Fall. 3 credits. Prerequisite: M&AE 489 or equivalent. May be offered 1989–90.
2 lecs, computational assignments at CADIF. D. L. Taylor.
Introduction to a wide range of topics and programming techniques that are useful in the development of engineering models for computer analysis. Emphasis on data structure and integration of existing packages.
Extensive use of computer graphics. Intended to prepare students to take an active role in the development of CAD software. Topics include computer graphics, data structures, 3-D modeling, role of new languages (LISP, PROLOG, etc.), and program development and debugging.

**590 Mechanical Engineering Design**
Spring. 4 credits. Intended for students in M.Eng.(Mechanical) program.
Formal consideration of the complete design process (including creativity, planning, scheduling, cost analysis, management, and analytical methods) in the context of one or more specific projects carried out by the students. Projects may arise from department research interests or industrial collaboration.

**610 Solid Modeling**
Fall. 4 credits. Prerequisites: graduate standing and two years of engineering mathematics (through linear algebra and Pascal), or similar programming experience.
H. Voelcker.
Development of mathematical and computational models for rectilinear solids (flat-faced polyhedra) from basic principles of geometry, topology, and representation theory; generic algorithms; algorithms for generating graphic displays and calculating mass properties; other applications in design and manufacturing; modeling systems.

**611 Applications of Solid Modeling**
Spring. 2–4 credits to be arranged. Prerequisite: M&AE 610 or permission of instructor.
H. Voelcker.
A study of algorithms based on set-membership classification that provide utilities for operating on representations of solids, and their use in programs and systems for engineering design, analysis, and manufacturing. Topics include: functions and algorithms, set-membership classification, representation conversion, numerical geometry, graphic display and interaction, mass-property calculation, finite-element mesh generation, machine-process modeling, and CAD/CAM systems.

**[612 Motional-Process Modeling: Manipulation and Machining**
Spring. 4 credits. Prerequisites: M&AE 610 and B.S.-level knowledge of mechanical dynamics and control theory. Not offered 1989–90.
H. Voelcker.
Classification of machining and manipulatory processes and host machines; spatial and dynamical modeling of motional machines and processes; low-level motional planning; control of motion; CNC machines and industrial robots; programming hierarchies.]

**615 Composite Materials (also T&AM 555 and MS&E 615)**
Spring. 4 credits. Prerequisites: Engr 202 and 261, graduate standing, or permission of instructor.
Brief history of composite materials; types, geometries, fiber types, and structures; polymer matrices and deformation properties; orthotropic elasticity; stress-strain analysis of lamina and laminates; micromechanics of deformation and stress transfer, effective moduli, theories of strength and fatigue, nondestructive testing and inspection, applications of composites, environmental effects.

**665 Advanced Topics in Orthopaedic Biomechanics**
Spring. 4 credits. Prerequisites: graduate standing, prior or concurrent registration in advanced courses in strength of materials or elasticity, and intermediate dynamics. Offered alternate years.
3 lecs. D. L. Bartel.
Advanced treatment of topics in the biomechanics of the musculoskeletal system. Force analysis of the musculoskeletal system under static and dynamic conditions, compact and trabecular bone as structural materials, structural analysis of bone-implant systems, remodeling of bone.

**670 Mechanical and Aerospace Structures II (Finite-Element Method)**
Spring. 4 credits. Prerequisite: M&AE 569 or permission of instructor. Fulfills computer applications requirement.
Introduction to the finite-element method for static and dynamic analysis of mechanical and aerospace structures (and related nonstructural applications such as conductive heat transfer). Primary emphasis on underlying mechanics and mathematics of solving boundary-value problems numerically. Secondary consideration of inherent capabilities and limitations of large-scale, general-purpose structural mechanics programs. Introduction to computational aspects through development of small finite-element programs or the application of existing multipurpose larger programs. Computing assignments.

**678 Optimal Control and Estimation**
Fall. 3 credits. Prerequisite: M&AE 478, EE 471, or permission of instructor; programming ability in FORTRAN, Pascal, or C. Corequisite: EE 521. May be offered 1989–90.
3 lecs. M. L. Psiaki.
Develops the theory of the design of modern multi-input–multi-output feedback control systems using optimal control techniques. Topics covered include trajectory optimization and the minimum principle, bang-bang optimal control solutions, Kalman filtering, LQR/LQE compensator design, suboptimal control and estimation, and applications to regulator and tracking problems. Both linear and nonlinear systems, and continuous-time and discrete-time control, and considered.

**679 Digital Simulation of Dynamic Systems**
Fall, on demand. 4 credits. Open to qualified undergraduates with permission of instructor. Prerequisite: previous exposure to systems dynamics and digital programming.
J. F. Booker.
Modeling and representation of physical systems by systems of linear and nonlinear ordinary differential equations in state vector form. Selected applications from diverse fields. Simulation by numerical integration. Components and organization of general-purpose, digital-simulation languages (such as DSL and CSMP). Special techniques for large linear systems. Term project.

**680 Random Vibration (also CEE 671)**
Fall, on demand. 4 credits. Prerequisite: Engr 260 or M&AE 326 or equivalent, graduate standing, or permission of instructor.
Basic concepts of probability theory and stochastic processes; time and frequency domain methods for finding second-moment characteristics of linear-system responses; and solutions of nonlinear random-vibration problems including equivalent linearization, perturbation, Fokker-Planck and Kolmogorov equations, and Itô's calculus. Emphasis on engineering applications and estimation of system performance.

**682 Hydrodynamic Lubrication: Fluid-Film Bearings**
Fall, on demand. 4 credits.
J. F. Booker.
Theory of hydrodynamic lubrication and its application to the analysis and design of fluid-film bearings. General topics include viscous flow in thin films, self-acting and externally pressurized bearings with liquid and gas lubricant films, bearing-system dynamics, and computational methods. Also selected special topics such as elastohydrodynamic lubrication.

**[685 Optimum Design of Mechanical Systems**
Fall. 4 credits. Prerequisite: graduate standing or permission of instructor. Offered alternate years. Not offered 1989–90.
D. L. Bartel.
The formulation of design problems frequently encountered in mechanical systems as optimization problems. Theory and application of methods of mathematical programming for the solution of optimum design problems.]

**715 Theory and Practice in Inelastic Deformation**
Fall. 4 credits. Prerequisites: graduate standing and introductory finite-element course, or permission fo instructor.
G. G. Weber.
Topics in finite-deformation inelasticity in the framework of modern continuum mechanics. Material and geometric non-linear formulations on theoretical as well as practical grounds. Emphasis is on developing the underlying principles for proper formulation of engineering boundary-value problems with inelastic constitutive equations. Introductory small-scale simulations to illustrate the principles are also developed. Applications include inelastic design, metal forming, polymer processing, ice mechanics, and powder consolidation. Familiarity with compact tensor notation is recommended but not required.

**716 Advanced Deformation Process Simulation**
Spring. 4 credits. Prerequisites: graduate standing and M&AE 715, or permission of instructor.
P. R. Dawson.
Application of advanced mechanics theories to the simulation of the deformations of solids, with special attention toward materials processing and other severe-loading environments. The selection of model equations based on dominant features of the material behavior and kinematics of a particular application is stressed. The use of state-variable constitutive models are discussed, including micromechanical models such as those of polycrystal plasticity. Assignments consist of simulation projects that assume a working knowledge of the finite-element method.

## Energy, Fluids, and Aerospace Engineering

**405 Introduction to Aeronautics**
Fall. 3 credits. Limited to upperclass engineers; others with permission of instructor.
Introduction to atmospheric-flight vehicles. Principles of incompressible and compressible aerodynamics, boundary layers, and wing theory. Propulsion system characteristics. Static aircraft performance; range and endurance. Elements of stability and control.

**[439 Acoustics and Noise**
Spring. 3 credits. Prerequisite: some knowledge of fluid mechanics or permission of instructor. Not offered 1989–90.
Sound propagation, transmission, and absorption. Sound radiation by surfaces and flow. Loudspeakers. Room acoustics and noise-control techniques. Hearing, music, noise, and noise-control criteria.

**441 Advanced Thermodynamics with Energy Applications**
Spring. 3 credits. Prerequisites: M&AE 221 and 323, or permission of instructor. May not be offered 1989–90.
Review of thermodynamics. Applications to phase changes, heat engines, and combustion and refrigeration cycles. Statistical basis of thermodynamic laws and applications to lasers and semiconductors.

**449 Combustion Engines**
Spring. 3 credits. Prerequisites: Engr 221 and M&AE 323.
Introduction to combustion engines, with emphasis on application of thermodynamics and fluid dynamics. Air-standard analyses, chemical equilibrium, ideal-cycle analyses, deviations from ideal processes. Combustion knock. Formation and control of undesirable exhaust emissions.

**506 Aerospace Propulsion Systems**
Spring. 3 credits. Prerequisite: M&AE 323 or permission of instructor.
3 lecs.
Application of thermodynamics and fluid mechanics to design and performance of thermal-jet and rocket engines. Mission analysis in space. Auxiliary power supply.

**[507 Dynamics of Flight Vehicles**
Spring. 3 credits. Prerequisites: M&AE 405 and Engr 203, or permission of instructor. Offered alternate years. Not offered 1989–90.
Introduction to stability and control of atmospheric-flight vehicles. Review of aerodynamic forces and methods for analysis of linear systems. Static stability and control. Small disturbance equations of unsteady motion. Dynamic stability and transient control response. At the level of *Dynamics of Flight: Stability and Control*, by Etkin.]

**530 Fluid Dynamics**
Fall. 3 credits. Prerequisites: M&AE 323 and senior or graduate standing, or permission of instructor.
F. K. Moore.
Inviscid fluid dynamics and aerodynamics, including imcompressible and supersonic flows, flow over bodies, lift, and drag. Shock waves. Courses 530 and 531 are of interest primarily to seniors and M.Eng. students; however, incoming M.S. or Ph.D. students who will not major in fluid mechanics but need competence in problem solving and basic problem formulation should be interested also. The courses may be taken independently or as a sequence.

**531 Boundary Layers**
Spring. 3 credits. Prerequisites: M&AE 323 and senior or graduate standing, or permission of instructor. Recommended: M&AE 530 or equivalent.
Derivation of the Navier-Stokes equation, simple exact solutions, concept of scaling. Classical laminar boundary layer theory. The role of boundary layers in an overall velocity field past solid objects. Heuristic derivation of Prandtl's boundary layer approximation, physical mechanisms of boundary layer formation; flat plate boundary layer. The method of matched asymptotic expansions for singular perturbation problems of boundary layer type. Similarity solutions. Blasius series for boundary layer flow past an arbitrary two-dimensional body. Behavior of boundary layer flows near a separation point. Interactive boundary layer theory. Turbulent boundary layers: origin of turbulence, concepts of stability and transition to turbulence. Deterministic chaos. Some results of stability theory for boundary layers. Effects of pressure gradient. Fully developed turbulence, turbulent wall layer structure, turbulent boundary layers.

**536 Turbomachinery and Applications**
Spring. 3 credits. Prerequisite: M&AE 323 or equivalent.
3 lecs. F. K. Moore.
Aerothermodynamic design of turbomachines in general, energy transfer between fluid and rotor in specific types, axial and radial devices, compressible flow. Three-dimensional effects, surging.

**543 Combustion Processes**
Spring. 3 credits. Prerequisites: M&AE 323 and 324.
3 lecs.
An introduction to combustion and flame processes, with emphasis on fundamental fluid dynamics, heat and mass transport, and reaction-kinetic processes that govern combustion rates. Thermochemistry, kinetics, vessel explosions, laminar and turbulent premixed and diffusion flames, droplet combustion, combustion of solids.

**554 Solar Engineering Design**
Fall. 3 credits. Corequisites: M&AE 428 and senior standing in M&AE. Fulfills field design requirement. Enrollment limited to 30.
B. Conta.
A broad coverage of solar-energy utilization by humankind. Fundamentals of solar radiation. Direct radiation as a source of heat and work. Indirect radiation utilization or natural collection; water power, windpower, and biomass. The production of liquid and gaseous fuels. Solar architecture and environmental control by both active and passive means. Each student will execute a design project in solar engineering. Course grade will be based on the design project; presentation of a design proposal, an oral presentation on progress of project, and submission of a final design report.

**556 Power Systems**
Fall. 3 credits. Corequisites: M&AE 428 and senior standing. Fulfills field design requirement.
P. L. Auer.
A broad survey of methods of large-scale power generation, emphasizing energy sources, thermodynamic cycle considerations, and component description. Power-industry, economic, and environmental factors. Trends and projections.

**559 Introduction to Controlled Fusion: Principles and Technology (also EE 484 and NS&E 484)**
Spring. 3 credits. Prerequisites: Physics 112, 213, and 214, or equivalent background in electricity and magnetism and mechanics with permission of instructor. Intended for seniors and graduate students.
3 lecs. D. A. Hammer or P. L. Auer.
This course is intended to give engineering and physical science students an introduction to the physical basis and technological requirements for generating useful power by nuclear fusion. For complete description see NS&E 484.

**601 Foundations of Fluid Dynamics and Aerodynamics**
Fall. 4 credits. Prerequisite: graduate standing or permission of instructor.
Foundations of fluid mechanics from an advanced viewpoint. Aspects of kinetic theory as it applies to the formulation of continuum fluid dynamics. Surface phenomena and boundary conditions at interfaces. Fundamental kinematic descriptions of fluid flow, tensor analysis, derivation of the Navier-Stokes equations and energy equation for compressible fluids. Viscous flows, boundary layers, potential flows, vorticity dynamics.

**602 Incompressible Aerodynamics**
Spring. 4 credits. Prerequisite: M&AE 601 or equivalent. Open to qualified undergraduates with permission of instructor.
J. L. Lumley.
Basic equations for inviscid fluid motion. Vorticity dynamics. General results for irrotational flows. Integral representations via Green's theorem. Solution methods based on singularities. Complex variable technique for two-dimensional flows. Airfoil, wing, and slender-body theories. Unsteady phenomena. Three-dimensional boundary layers and separation.

**603 Compressible Aerodynamics**
Spring. 4 credits. Prerequisite: M&AE 601 or equivalent, or permission of instructor.
S. F. Shen.
Basic conservation laws and fundamental theorems of compressible fluid flow. The accoustic approximation. One-dimensional unsteady flows. Characteristics and shock waves. Exact solutions of steady flows. General methods for two-dimensional and axisymmetric steady flows and Bateman principles. Hodograph method. Characteristics method for steady supersonic flows. Approximate methods, series expansion, and perturbation theories; transonic and hypersonic flows.

**608 Physics of Fluids**
Fall. 4 credits. Prerequisite: graduate standing or permission of instructor.
F. C. Gouldin.
Kinetic theory of gases: collisions; transport properties; derivation of the macroscopic equations of mass, momentum, and energy. Statistical mechanics of gases: microcanonical ensemble; partition functions; calculation of thermodynamic properties. Introduction to wave mechanics: harmonic oscillator, rigid rotator, one-electron atom. Atomic and molecular structure: building-up principle, Born-Oppenheimer approximation.

**[630 Atmospheric Turbulence and Micrometeorology**
Spring. 4 credits. Open to qualified undergraduates with permission of instructor. Offered alternate years. Not offered 1989–90.
Z. Warhaft.
Basic problems associated with our understanding of the structure of the velocity field and the transport of scalars such as temperature and moisture in the lower atmosphere from both theoretical and experimental viewpoints. Topics include the second-order turbulence equations and their closure; Monin-Obukhov theory; diffusion of scalars; spectral characteristics of atmospheric variables; experimental techniques, including remote sensing; and the analysis of random-time series.]

**[648 Seminar on Combustion**
Fall. 2 or 4 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
S. B. Pope, C. T. Avedisian.
Discussion of contemporary problems in combustion research, with emphasis on applications of modern experimental and analytical techniques. Typical problems have included formation and removal of pollutants in combustion systems, combustion of alternative fuels, coal combustion, combustion in turbulent flow, and droplet combustion.]

**651 Advanced Heat Transfer**
Spring. 4 credits. Prerequisite: graduate standing or permission of instructor.
M. Y. Louge.
Advanced treatment of conductive and convective heat transfer. Basic equations reasoned in detail. Integral and differential formulations. Exact and approximate solutions. Forced convection. Natural convection. Laminar and turbulent flows. Effects of viscous dissipation and mass transfer.

**[652 Thermodynamics and Phase-Change Heat Transfer (also Chem E 721)**
Spring. 4 credits. Prerequisite: graduate standing or permission of instructor. Not offered 1989–90.
C. T. Avedisian.
Thermodynamics of phase change. Superheated liquids and supersaturated vapors. Thermodynamic stability criteria for metastable liquids and homogeneous nucleation theory. Dynamics of bubble growth and collapse. Pool boiling and the critical heat flux. Hydrodynamics of one-dimensional two-phase flows.]

**653 Experimental Methods in Fluid Mechanics, Heat Transfer, and Combustion**
Fall. 4 credits.
2 lecs, 1 lab. Z. Warhaft.
Study of experimental techniques for measuring pressure, temperature, velocity, and composition of gases, with emphasis on experimental capabilities and physical principles. Topics include laser velocimetry, hot-wire anemometry, spectroscopy, and laser scattering.

**704 Viscous Flows**
Fall. 4 credits. Prerequisite: M&AE 601 or permission of instructor.
S. F. Shen.
A systematic study of laminar-flow phenomena (including compressibility and heat transfer) and methods of analysis. Exact solutions of the Navier-Stokes equations. Linearized problems; flow at small Reynolds numbers, laminar instability. The boundary-layer approximation; general properties. Transformations for compressibility and axisymmetric effects. Approximate methods of calculation. Separation and unsteady problems. Stability of laminar flows.

**732 Analysis of Turbulent Flows**
Spring. 4 credits. Prerequisite: M&AE 601 or permission of instructor. Offered alternate years. May be offered 1989–90.
S. B. Pope.
Study of methods for calculating the properties of turbulent flows. Characteristics of turbulent flows. Direct numerical simulations, large-eddy simulations, and the closure problem. Reynolds-stress equation: effects of dissipation, anisotropy, deformation. Transported scalars. Probability density functions (pdf's): definitions and properties, transport equations, relationship to second-order closures, stochastic modeling, Langevin equation, and Monte Carlo solutions. The course emphasizes comparison of theory with experiment.

**[733 Stability of Fluid Flow**
Fall. 4 credits. S-U grades only. Prerequisite: graduate standing or permission of instructor. Offered alternate years. Not offered 1989–90.
S. Leibovich.
Introduction to stability and bifurcation of fluid flow. Energy stability theory. Convective instability, the Benard problem. Taylor instability of rotating couette flow. Stability of parallel flows. Critical-layer singularities and methods of resolution. Boundary layers, slight departures from parallel flow. Stratified flows and the Taylor-Goldstein equation; swirling flows. Destabilization by "stabilizing" body forces. Nonlinear effects: amplitude equations of the Stuart-Watson type. Modulated nonlinear effects and amplitude equations of the Newell-Whitehead type. Nonlinear critical-layer dynamics.]

**734 Turbulence and Turbulent Flow**
Fall. 4 credits. Prerequisite: M&AE 601 or permission of instructor.
J. L. Lumley.
Topics include the dynamics of buoyancy and shear-driven turbulence, boundary-free and bounded shear flows, second-order modeling, the statistical description of turbulence, turbulent transport, and spectral dynamics.

**[736 Computational Aerodynamics**
Spring. 4 credits. Prerequisites: graduate standing, an advanced course in continuum mechanics or fluid mechanics, and some FORTRAN programming experience. Not offered 1989–90.
D. A. Caughey.
Numerical methods for hyperbolic partial differential equations and those arising in inviscid and high–Reynolds-number fluid-flow problems. Finite difference and finite volume methods. Accuracy, convergence, and stability of explicit and implicit methods, including treatment of boundary conditions and grid generation for complex geometries. General procedures for solving the Euler equations, with a critical survey of current methods for problems of aerodynamic interest, including those that are dominantly hyperbolic (such as unsteady flows with shock waves) or are mixed elliptic-hyperbolic (such as steady transonic flows). Assigned problems are solved using a digital computer.]

**[737 Computational Fluid Mechanics and Heat Transfer**
Fall. 4 credits. Prerequisites: graduate standing; an advanced course in continuum mechanics, heat transfer, or fluid mechanics; and some FORTRAN programming experience. Not offered 1989–90.
K. E. Torrance.
Numerical methods for elliptic and parabolic partial differential equations arising in flow problems involving convection and diffusion. Finite-difference, finite-volume, and spectral methods. Accuracy, stability, convergence, and conservation. Review of current methods. Emphasis on steady and unsteady incompressible flows. Assigned problems are solved on a digital computer and at CADIF.]

### Special Offerings

**001 Introduction to Mechanical Technology**
Fall, spring. 1 credit. Enrollment limited. S-U grades only. Does not meet any graduation requirements.
1 sec.
Offered to students lacking a background in basic understanding of mechanical devices and technology. Hands-on experience with various typical devices such as engines, refrigeration units, heat pumps, etc.

**490 Special Investigations in Mechanical and Aerospace Engineering**
Fall, spring. Credit to be arranged. Limited to undergraduate students. Prerequisite: permission of instructor.
Intended for an individual student or a small group of students who want to pursue a particular analytical or experimental investigation outside of regular courses or for informal instruction supplementing that given in regular courses.

**491 Design Projects in Mechanical and Aerospace Engineering**
Fall, spring. 3–6 credits, to be arranged. Prerequisite or corequisite: M&AE 428. Fulfills field design requirement.
Intended for individual students or small groups of students who want to pursue particular design projects outside of regular courses.

**520 Introduction to Mechanical Tolerancing and Dimensional Metrology**
Spring. 1 credit. Prerequisites: Math 294, Engr 102, and Engr 100, or equivalent; knowledge of manufacturing processes is advantageous. Intended for graduate students; others by permission of instructor.
H. B. Voelcker.
A short course. Introduction to the theory and practice of dimensional tolerancing and "gaging" as used in mechanical design and manufacturing; historical evolution, limit tolerances, geometric tolerances, manual and functional gaging, coordinate measuring machines; limitations and open issues.

**592 Seminar and Design Project in Aerospace Engineering**
Fall, spring. 2 credits each term. Intended for students in M.Eng.(Aerospace) program. Study and discussion of topics of current research interest in aerospace engineering. Individual design projects supervised by separate faculty members.

**594 Manufacturing Engineering Seminar (also OR&IE 894)**
Fall, spring. 1 credit. S-U grades optional. A weekly meeting for Master of Engineering students. Discussion of various topics on manufacturing with faculty members and outside speakers.

**690 Special Investigations in Mechanical and Aerospace Engineering**
Fall, spring. Credit to be arranged. Limited to graduate students.

**695 Special Topics *in* Mechanical and Aerospace Engineering: Chaotic Vibrations**
Spring. 3 credits. Prerequisite: permission of instructor.
F. C. Moon.
Review of classical nonlinear vibration theory. Maps and flows. Routes to chaos. Mathematical models of chaotic physical systems. Experimental Poincaré maps. Theoretical predictive phenomena. Lyapunov exponents. Measures of fractal dimensions. Fractal basin boundaries.

**791 Mechanical and Aerospace Research Conference**
Fall, spring. 1 credit each term. S-U grades only. For graduate students involved in research projects.
Presentations on research in progress by faculty and students.

**799 Mechanical and Aerospace Engineering Colloquium**
Fall, spring. 1 credit each term. Credit limited to graduate students. All students and staff invited to attend.
Lectures by visiting scientists and Cornell faculty and staff members on research topics of current interest in mechanical and aerospace science, especially in connection with new research.

**890 Research in Mechanical and Aerospace Engineering**
Credit to be arranged. Prerequisite: candidacy for M.S. degree in mechanical or aerospace engineering or approval of director.
Independent research in an area of mechanical and aerospace engineering under the guidance of a member of the faculty.

**990 Research in Mechanical and Aerospace Engineering**
Credit to be arranged. Prerequisite: candidacy for Ph.D. degree in mechanical or aerospace engineering or approval of the director.
Independent research in an area of mechanical and aerospace engineering under the guidance of a member of the faculty.

## NUCLEAR SCIENCE AND ENGINEERING

A number of courses in nuclear science and engineering are offered through the School of Applied and Engineering Physics (see A&EP 609, 612, 633, 634, 636, 638, and 651).

**121 Fission, Fusion, and Radiation (also Engr 121)**
Spring. 3 credits.
2 lecs, 1 lab demonstration.
This is a course in the Introduction to Engineering series. For description see Engineering Common Courses.

**303 Introduction to Nuclear Science and Engineering I (also A&EP 303)**
Fall. 3 credits. Prerequisite: Physics 214 or Mathematics 294. This course is designed for juniors or seniors from any engineering field who want to prepare for graduate-level nuclear science and engineering courses at Cornell or elsewhere. It can also serve as a basic course for those who do not intend to continue in the field.
3 lecs. V. O. Kostroun.
Introduction to the fundamentals of nuclear reactors. Topics include an overview of the field of nuclear engineering; nuclear structure, radioactivity, and reactions; interaction of radiation and matter; and neutron moderation, neutron diffusion, the steady-state chain reaction, and reactor kinetics. At the level of *Introduction to Nuclear Engineering,* by Lamarsh.

**484 Introduction to Controlled Fusion: Principles and Technology (also EE 484 and M&AE 559)**
Spring. 3 credits. Prerequisites: Physics 112, 213, and 214, or equivalent background in electricity and magnetism and mechanics, and permission of instructor. Intended for seniors and graduate students.
3 lecs. D. A. Hammer.
Introduction to the physical principles and technology underlying controlled-fusion power. Topics include fundamental aspects of the physics of ionized gases at high temperature (thermonuclear plasmas), requirements (in principle) for achievement of net power from fusion, technological problems of an actual fusion reactor, and progress of the fusion program toward overcoming these problems. Both magnetic and inertial confinement fusion are discussed, and comparisons are made between fusion and fission.

**551 Nuclear Methods in Non-Nuclear Research Fields**
Spring. 3 credits. Prerequisite: Physics 214 or 218, or permission of instructor; some upper-division physics desirable. Primarily for graduate students in geology, chemistry, biology, materials science, and other non-nuclear fields in which nuclear methods are used. Open to qualified undergraduates. A more intensive related course, A&EP 651, which has the same lecture but has an additional lab period, is intended for nuclear specialists.
One 2-hour lecture and one 2-1/2-hour lab. D. D. Clark.
Lectures on interaction of radiation with matter, radiation protection, and nuclear instruments and methods including data reduction. About ten experiments are available on radiation detection, attenuation, and measurement; electronic instrumentation, including computerized systems; activation analysis; and emerging applications such as prompt gamma analysis and neutron radiography. The TRIGA reactor is used. Emphasis is on those nuclear methods, particularly instrumental ones using neutrons, that are used in, or are being adapted for, non-nuclear fields, but tracer and other chemical techniques are not included. Students each select seven or eight experiments to meet their interests and needs. At the level of *Nuclear Analytical Chemistry,* by Brune, Forkman, and Persson.

## OPERATIONS RESEARCH AND INDUSTRIAL ENGINEERING

**115 Engineering Application of Operations Research (also Engr 115)**
Fall, spring. 3 credits. Enrollment not open to OR&IE upperclass majors.
2 lecs, 1 lab.
For description see Engineering Common Courses.

**119 Introduction to Manufacturing Engineering (also Engr 119)**
Spring. 3 credits. Enrollment not open to OR&IE upperclass majors.
2 lecs, 1 lab.
For description see Engineering Common Courses.

**230 Discrete Mathematics**
Spring. 3 credits. Prerequisite: one year of calculus or permission of instructor.
3 lecs.
A broad but thorough introduction to topics of discrete mathematics of use in a variety of fields of science and engineering. Topics include basic combinatorics and counting techniques, recurrence relations and generating functions, introduction to modular arithmetic with application to coding theory and experimental designs, and basic notions of graph theory with applications in optimization such as maximum flow in a network and project planning.

**260 Introductory Engineering Probability (also Engr 260)**
Fall, spring, summer. 3 credits. Prerequisite: first-year calculus. Corequisite: Math 293.
3 lecs.
For description see Engineering Common Courses.

**270 Basic Engineering Probability and Statistics**
Fall; also spring, summer if staffing permits. 3 credits. Prerequisite: first-year calculus. Enrollment not open to OR&IE upperclass majors.
3 lecs. Evening prelims.
For description see Engineering Common Courses.

**320 Optimization I**
Fall. 4 credits. Prerequisite: Mathematics 221 or 294.
3 lecs, 1 rec.
Formulation of linear programming problems and solution by the simplex method. Related topics such as sensitivity analysis, duality, and network programming. Applications include such models as resource allocation and production planning.

**321 Optimization II**
Spring. 4 credits. Prerequisite: OR&IE 320 or equivalent.
3 lecs, 1 rec.
A variety of optimization methods stressing extensions of linear programming and its applications but also including topics drawn from integer, dynamic, and nonlinear programming. Formulation and modeling are stressed as well as numerous applications.

**350 Cost Accounting, Analysis, and Control**
Fall; also spring if staffing permits. 4 credits.
3 lecs, 1 computing-disc.
Principles of accounting, financial reports; job-order and process cost systems—historical and standard costs; cost characteristics and concepts for control, analysis, and decision making.

**361 Introductory Engineering Stochastic Processes I**
Fall, spring. 4 credits. Prerequisite: OR&IE 260 or equivalent.
3 lecs, 1 rec.
Basic concepts and techniques of random processes are used to construct models for a variety of problems of practical interest. Topics include the Poisson process, Markov chains, renewal theory, models for queueing and reliability.

**370 Introduction to Statistical Theory with Engineering Applications**
Fall, spring. 4 credits. Prerequisite: OR&IE 260 or equivalent.
3 lecs, 1 rec.
Provides a working knowledge of basic statistics as it is most often applied in engineering and a basis in statistical theory for continued study. Topics include a review of distributions of special interest in statistics; testing simple and composite hypotheses; point and interval estimation; correlation; linear regression.

**410 Industrial Systems Analysis**
Spring. 4 credits. Corequisite: OR&IE 270 or 370.
3 lecs, 1 computing session.
Design of production facilities, including engineering economy, taxation effects, materials handling, process design, and facility layout. Operations analysis, including process scheduling, process evaluation, procedural analysis, project management, methods analysis and design, work measurement, inventory control, job evaluation, and quality engineering and control.

**416 Design of Manufacturing Systems**
Spring (last 4 weeks). 2 credits. Corequisites: at least one of the following courses: OR&IE 417, 451, 525, and 562.
2 lecs.
Project course in which students, working in teams, design a manufacturing and/or logistics system and conduct capacity, material flow, and cost analysis of their design. Meetings between project teams and faculty advisers are substituted for most lectures.

**417 Layout and Material Handling Systems**
Spring. 3 credits. Prerequisite: OR&IE 361.
2 lecs, 1 rec.
Design of the layout of processes and storage areas and the material- handling system for movement of items. Typical equipment used. The functions of identification control, storage, movement, batching, merging, and dispersion. Introduction to new technologies.

**421 Production Planning and Control**
Fall. 4 credits. Prerequisites: OR&IE 320 and 361, or permission of instructor.
3 lecs, 1 rec.
Introduction to the design, planning, and control of production and distribution systems. Decision making in manufacturing systems is stressed. Topics include inventory planning, work-cell design, work-load smoothing, production planning, and scheduling.

**[431 Discrete Models**
Spring. 4 credits. Prerequisites: OR&IE 320 and CS 100, or permission of instructor. Not offered 1989–90.
3 lecs, 1 rec.
Basic concepts of graphs, networks, and discrete optimization. Fundamental models and applications, and algorithmic techniques for their analysis. Specific models studied include flows in networks, network synthesis, sequencing, partitioning, and fair allocation.]

**432 Applied Linear Algebra and Introductory Nonlinear Programming**
Fall. 3 credits. Prerequisite: Math 294 or 221.
Emphasis is on the ideas and theory of linear algebra that are especially important in optimization applications. Linear techniques are developed in the context of basic nonlinear programming to illustrate how linear algebra is used to study nonlinear systems. Some assignments provide exposure to existing software; other assignments require careful mathematical thought and exposition.

**435 Introduction to Game Theory**
Spring. 3 credits.
3 lecs.
A broad survey of the mathematical theory of games, including such topics as two-person matrix and bimatrix games; cooperative and noncooperative n-person games; games in extensive, normal, and characteristic function form. Economic market games. Applications to weighted voting and cost allocation.

**451 Economic Analysis of Engineering Systems**
Spring. 3 credits. Prerequisites: OR&IE 320 and OR&IE 350.
2 lecs, 1 computing session.
Financial planning, including cash-flow analysis and inventory flow models. Engineering economic analysis, including discounted cash flows and taxation effects. Application of optimization techniques, as in equipment replacement or capacity expansion models. Issues in designing manufacturing systems. Student group project.

**462 Introductory Engineering Stochastic Processes II**
Spring. 4 credits. Prerequisite: OR&IE 361 or equivalent.
3 lecs, 1 rec.
A selection of topics from the following: martingales, Markov and semi-Markov processes, optimal stopping. Examples and applications are drawn from several areas.

**472 Statistical Decision Theory**
Fall. 3 credits. Prerequisite: OR&IE 370 or equivalent.
3 lecs.
Decision rules, admissible decision rules, Bayes decision rules, minimax decision rules. Using regret instead of loss. Criteria for choosing a decision rule and relation to theory of games. Use of linear programming to construct minimax decision rules. Building cost of collecting information into the loss function. Decision problems requiring a sequence of decisions over time and relation to dynamic programming. Use of the empirical cumulative distribution function and applications to inventory problems. Classical statistical theory as special cases of statistical decision theory.

**475 Regression**
Spring. Second half of term. 2 credits. Prerequisite: OR&IE 370.
3 lecs, 1 rec.
Linear models; estimation and testing; confidence sets; diagnostics and residual analysis; variable selection and modeling.

**476 Experimental Design I**
Spring. First half of term. 2 credits. Prerequisite: OR&IE 370.
3 lecs, 1 rec.
One- and two-way ANOVA; blocking with one or two factors; replication and sample-size determination; multiple comparison; selection of best population(s).

**499 OR&IE Project**
Fall, spring. Credit to be arranged. Prerequisite: permission of instructor.
Project-type work, under faculty supervision, on a real problem existing in some firm or institution, usually a regional organization. Opportunities in the course may be discussed with the associate director.

**516 Case Studies**
Fall. 4 credits. Only for M.Eng. students in OR&IE.
3 rec-labs.
Students are presented with unstructured problems that resemble real-world situations. Students work in project groups on the formulation of mathematical models, computer analysis of the data and models, and presentation of oral and written reports.

**520 Operations Research I: Optimization I**
Fall. 4 credits. Prerequisite: Mathematics 221 or 294. Intended for graduate students minoring in operations research. The same course as OR&IE 320, but on the graduate level.
3 lecs, 1 rec.
For description see OR&IE 320.

**521 Optimization II**
Spring. 4 credits. Prerequisite: OR&IE 320 or 520 or equivalent. Intended for graduate students in other fields. Lectures concurrent with OR&IE 321.
3 lecs, 1 rec.
A variety of optimization methods stressing extensions of linear programming and its applications but also including topics drawn from integer, dynamic, and nonlinear programming. Formulation and modeling are stressed, as well as numerous applications.

**523 Operations Research II: Introduction to Stochastic Modeling**
Spring. 4 credits. Prerequisite: OR&IE 260 or equivalent. Intended for graduate students in other fields. Lectures concurrent with OR&IE 361.
3 lecs, 1 rec.
Basic concepts and techniques of random processes are used to construct models for a variety of problems of practical interest. Topics include the Poisson process, Markov chains, renewal theory, models for queuing and reliability.

**525 Scheduling Theory**
Spring. 3 credits. Prerequisite: OR&IE 320.
3 lecs.
Scheduling and sequencing problems. Single-resource scheduling, parallel processing, flow-shop scheduling. Methodology is drawn from dynamic and integer programming, simulation techniques, and heuristic methods.

**[561 Queuing Theory and Its Applications**
Fall. 3 credits. Prerequisite: OR&IE 361 or permission of instructor. Not offered 1989–90.
3 lecs.
Basic queuing models. Delay and loss systems. Finite source, finite capacity, balking, reneging. Systems in series and in parallel. Various queue disciplines. Busy-period problems. Design and control problems. Statistical inference from queuing processes. Priority systems. Queuing networks. Applications to equipment maintenance, telephone traffic, and computer operations.]

**562 Inventory Theory**
Spring. 3 credits. Prerequisite: OR&IE 421 or permission of instructor.
3 lecs, 1 rec.
Discussion of the nature of inventory systems and their design and control. Periodic and continuous review policies for single-item and single-location problems. Multi-item and multi-echelon extensions. Dynamic and static models are discussed. Distribution problems are analyzed. Applications are stressed.

**563 Applied Time-Series Analysis**
Fall. 3 credits. Prerequisites: OR&IE 361 and 370 and CS 211, or permission of instructor.
3 lecs.
Box-Jenkins models, which are versatile, widely used, and applicable to nonstationary and seasonal time series, are covered in detail. The various stages of model identification, estimation, diagnostic checking, and forecasting are treated. As time permits other topics, such as spectral analysis, filtering and long-range dependence are discussed. Analysis of real data is carried out. Assignments require computer work.

**570 Introduction to Statistical Theory with Engineering Applications**
Fall, spring. 4 credits. Prerequisite: OR&IE 260 or equivalent. The same course as OR&IE 370, but on the graduate level.
3 lecs, 1 rec.
For description see OR&IE 370.

**[575 Experimental Design II**
Spring. Half of term. 2 credits. Prerequisite: OR&IE 475. Not offered 1989–90.
3 lecs, 1 rec.
$2^N$ factorials; confounding; $2^{N-P}$ and $3^{N-P}$ fractional factorials.]

**[576 Statistics for Manufacturing**
Spring. Half of term. 2 credits. Prerequisite: OR&IE 475. Not offered 1989–90.
3 lecs, 1 rec.
Use of linear regression and variance components analysis to identify sources of variability in process-control data; modeling a controlled process.]

**[577 Quality Control**
Spring. Half of term. 2 credits. Prerequisites: OR&IE 270 or 370. Not offered 1989–90.
3 lecs, 1 rec.
Control concepts and methods for attributes and variables; process capability analysis; acceptance sampling plans; elementary procedures for variables; acceptance-rectification procedures.]

**580 Digital Systems Simulation**
Fall. 4 credits. Prerequisites: CS 211 and OR&IE 370, or permission of instructor.
3 lecs, 1 rec.
Digital computer programs to simulate the operation of complex discrete systems in time. Modeling, program organization, pseudo–random-variable generation, simulation languages, statistical considerations; applications to a variety of problem areas.

**599 Project**
Fall, spring. 5 credits. For M.Eng. students. Identification, analysis, design, and evaluation of feasible solutions to some applied problem in the OR&IE field. A formal report and oral defense of the approach and solution are required.

**626 Advanced Production and Inventory Planning**
Spring. 3 credits.
3 lecs.
Introduction to a variety of production and distribution planning problems; the development of mathematical models corresponding to these problems; a study of approaches for finding solutions.

**[627 Dynamic Programming**
Fall. 3 credits. Prerequisite: permission of instructor. Not offered 1989–90.
3 lecs.
Optimization of sequential decision processes. Deterministic and stochastic models, infinite-horizon Markov decision models, policy iterations. Contraction mapping methods. Applications drawn from inventory theory, production control.]

**630–631 Mathematical Programming I and II**
630, fall; 631, spring. 3 credits each term. Prerequisites: advanced calculus and elementary linear algebra.
3 lecs.
A rigorous treatment of the theory and computational techniques of linear programming and its extensions. Formulation, duality theory, simplex, and dual simplex methods. Sensitivity analysis. Network flow problems and algorithms. Theory of polyhedral convex sets, systems of linear equations and inequalities, Farkas' Lemma. Introduction to new algorithms (ellipsoid, Karmarkar). Exploiting special structure in the simplex method, computational implementation. Decomposition Principle. Introduction to integer and nonlinear programming and game theory.

**632 Nonlinear Programming**
Fall. 3 credits. Prerequisite: OR&IE 630.
3 lecs.
Necessary and sufficient conditions for unconstrained and constrained optima. Duality theory. Computational methods for unconstrained (e.g., quasi-Newton) problems, linearly constrained (e.g., active set) problems, and nonlinearly constrained (e.g., successive quadratic programming) problems.

**633 Graph Theory and Network Flows**
Fall. 3 credits. Prerequisite: permission of instructor.
3 lecs.
Directed and undirected graphs. Bipartite graphs. Hamilton cycles and Euler tours. Connectedness, matching, and coloring. Flows in capacity-constrained networks. Maximum flow and minimum cost flow problems.

**634 Combinatorial Optimization**
Spring. 3 credits. Prerequisite: permission of instructor.
3 lecs.
Topics in combinatorics, graphs, and networks, including matching, matroids, polyhedral combinatorics, and optimization algorithms.

**[636 Integer Programming**
Fall. 3 credits. Prerequisite: OR&IE 630. Not offered 1989–90.
3 lecs.
Discrete optimization. Linear programming in which the values are restricted to integers. Theory, algorithms, and applications. Cutting-plane methods, enumerative methods, and group-theoretic methods; additional topics are drawn from recent research in this area.]

**639 Convex Analysis**
Spring. 3 credits. Prerequisite: Mathematics 411 and 431, or permission of instructor.
3 lecs.
The theory of finite dimensional convex sets is developed through the study of real-valued convex functions and Fenchel duality. Separation of convex sets, polarity correspondences, recession cones, theorems of Helly and Caratheodory.

**[645 Game Theory**
Spring. 3 credits. Prerequisite: Mathematics 411 or 431, or permission of instructor. Not offered 1989–90.
3 lecs.
Noncooperative n-person games; Nash equilibrium points. Cooperative n-person games; the core, stable sets, Shapley value, bargaining set, kernel, nucleolus. Selected applications.]

**660 Applied Probability**
Fall. 4 credits. Prerequisite: advanced calculus.
3 lecs, 1 rec.
Introduction to basic probability. The sample space; events; probability. Conditional probability. Independence. Product spaces. Random variables. Expectation. Important distributions. Characteristic functions. Convergence concepts. Limit theorems.

**661 Applied Stochastic Processes**
Spring. 4 credits. Prerequisite: OR&IE 660 or equivalent.
3 lecs, 1 rec.
An introduction to stochastic processes that presents the basic theory together with a variety of applications. Topics include Markov processes, renewal theory, random walks, branching processes, Brownian motion, stationary processes, martingales, point processes.

**[662 Advanced Stochastic Processes**
Spring. 3 credits. Prerequisite: OR&IE 661 or equivalent. Not offered 1989–90.
3 lecs.
A selection of topics from the following: stationary processes, Levy processes, diffusion processes, point processes, martingales, regenerative phenomena, random walks, stochastic calculus, weak convergence.]

**[663 Time-Series Analysis**
Fall. 3 credits. Prerequisite: OR&IE 660 or equivalent. Not offered 1989–90.
3 lecs.
Representations of stationary time series. The ARIMA models. Spectral analysis. Long-range dependence. Problems of estimation. Multivariate time series.]

**[664 Deterministic and Stochastic Control**
Fall. 3 credits. Prerequisite: OR&IE 661 or equivalent. Not offered 1989–90.
3 lecs.
Topics include elements of calculus of variations, Pontryagin's maximum principle, Markov decision processes, dynamic programming. Problems in filtering and prediction, production planning and inventory control, congestion phenomena, storage models, and environmental management are discussed.]

**665 Advanced Queuing Theory**
Fall. 3 credits. Prerequisite: OR&IE 660 or equivalent.
3 lecs.
A study of stochastic processes arising in a class of problems including congestion, storage, dams, and insurance. The treatment is self-contained. Transient behavior of the processes is emphasized. Heavy-traffic situations are investigated.

**670 Statistical Principles**
Spring. 4 credits. Prerequisite: OR&IE 660 or equivalent.
3 lecs, 1 rec.
Review of distribution theory of special interest in statistics: normal, chi-square, binomial, Poisson, t, and F; introduction to statistical decision theory; sufficient statistics; theory of minimum variance unbiased point estimation; maximum likelihood and Bayes estimation; basic principles of hypothesis testing, including Neyman-Pearson Lemma and likelihood ratio principle; confidence interval construction; introduction to linear models.

**671 Intermediate Applied Statistics**
Fall. 3 credits. Prerequisite: OR&IE 670 or equivalent.
3 lecs.
Statistical inference based on the general linear model; least-squares estimators and their optimality properties; likelihood ratio tests and corresponding confidence regions; simultaneous inference. Applications in regression analysis and ANOVA models. Variance components and mixed models. Use of the computer as a tool for statistics is stressed.

**[672 Statistical Decision Theory**
Fall. 3 credits. Prerequisite: OR&IE 471 or 670 or equivalent. Not offered 1989–90.
3 lecs.
The general problem of statistical decision theory and its applications. Comparison of decision rules; Bayes, admissible, and minimax rules. Problems involving sequences of decisions over time. Use of the sample cdf and other simple nonparametric methods. Applications.]

**[673 Nonparametric Statistical Analysis**
Fall. 3 credits. Prerequisite: OR&IE 670 or permission of instructor. Not offered 1989–90.
3 lecs.
Estimation of quantiles, cdf's and pdf's. Properties of order statistics and rank-order statistics. Hypothesis testing in one- and several-sample situations; sign tests; use of ranks for tests and estimation. Small and large sample properties of tests. Asymptotic distributions of test statistics. Testing goodness of fit.]

**[674 Design of Experiments**
Spring. 3 credits. Prerequisite: OR&IE 671 or permission of instructor. Not offered 1989–90.
3 lecs.
Use and analysis of experimental designs such as randomized blocks, balanced incomplete blocks, and Latin squares; analysis of variance and covariance, factorial experiments; statistical problems associated with finding best operating conditions; response-surface analysis.]

**[675 Statistical Analysis of Discrete Data**
Spring. 3 credits. Prerequisite: OR&IE 671. Not offered 1989–90.
Varieties of categorical data; cross classifications and contingency tables; simultaneous estimation of parameters; tests for independence; multidimensional tables and log-linear models; maximum likelihood and weighted least-squares estimation; logistic regression.]

**[676 Statistical Analysis of Life Data**
Spring. 3 credits. Prerequisite: OR&IE 671 or equivalent. Not offered 1989–90.
Analysis of data from reliability, fatigue, and life-testing studies in engineering; biomedical applications. Survival distributions, hazard rate, censoring. Life tables. Estimation and hypothesis testing. Standards. Goodness of fit, hazard plotting. Covariance analysis, accelerated life testing. Multiple decrement models, competing risks. Sample-size determination. Adaptive sampling.]

**[677 Statistical Selection and Ranking Procedures**
Fall. 3 credits. Prerequisite: OR&IE 674 or permission of instructor. Not offered 1989–90.
3 lecs.
A study of multiple-decision problems, in which a choice must be made among two or more courses of action. Major emphasis is on selection and ranking problems involving choosing the "best" category where goodness is measured in terms of a particular parameter of interest. Statistical formulations of such problems; indifference-zone, subset, and other approaches. Single-stage, two-stage, and sequential procedures. Applications. Recent developments.]

**[678 Asymptotic Methods in Statistics**
Spring. 3 credits. Prerequisite: OR&IE 670 or Mathematics 574. Not offered 1989–90.
Large-sample behavior of MLEs and other estimates; chi-square, likelihood ratio, and related tests; Pitman and Bahadur efficiency; LAN families and LAM estimates; statistical applications of Edgeworth expansions; adaptive estimation and semiparametric inference.]

**680 Simulation**
Spring. 3 credits. Prerequisite: permission of instructor.
3 lecs.
An advanced version of OR&IE 580, intended for Ph.D.-level students.

**728–729 Selected Topics in Applied Operations Research**
Fall, spring. Credit to be arranged.
Current research topics dealing with applications of operations research.

**738–739 Selected Topics in Mathematical Programming**
Fall, spring. Credit to be arranged.
Current research topics in mathematical programming.

**768–769 Selected Topics in Applied Probability**
Fall, spring. Credit to be arranged.
Topics are chosen from current literature and research areas of the staff.

**778–779 Selected Topics in Applied Statistics**
Fall, spring. Credit to be arranged.
Topics chosen from current literature and research of the staff.

**790 Special Investigations**
Fall, spring. Credit to be arranged.
For individuals or small groups. Study of special topics or problems.

**799 Thesis Research**
Fall, spring. Credit to be arranged.
For individuals doing thesis research for master's or doctoral degrees.

**891 Operations Research Graduate Colloquium**
Fall, spring. 1 credit.
A weekly 1-1/2 hour meeting devoted to presentations by distinguished visitors, by faculty members, and by advanced graduate students on topics of current research in the field of operations research.

**893–894 Applied OR&IE Colloquium (894 also M&AE 594)**
893, fall; 894, spring. 1 credit each term.
A weekly meeting for Master of Engineering students. Discussion of various topics on manufacturing with faculty members and outside speakers.

# THEORETICAL AND APPLIED MECHANICS

## Basics in Engineering Mathematics and Mechanics

**123 Sensors and Actuators (also Engr 123)**
Fall. 3 credits.
2 lecs, 1 lab.
For description see Engineering Common Courses.

**202 Mechanics of Solids (also Engr 202)**
Fall, spring. 3 credits. Prerequisite: coregistration in Mathematics 293.
2 lecs, 1 rec, 4 labs each semester, evening exams.
For description see Engineering Common Courses.

**203 Dynamics (also Engr 203)**
Fall, spring. 3 credits. Prerequisite: coregistration in Mathematics 294.
2 lecs, 1 rec, 4 labs each semester, evening exams.
For description see Engineering Common Courses.

**293 Engineering Mathematics**
Fall, spring. 4 credits. Prerequisite: Mathematics 192 or 194.
2 lecs, 1 rec, 4 labs during semester, evening exams.
Partial derivatives and multiple integrals; first- and second-order ordinary differential equations with applications in the physical and engineering sciences. Includes microcomputer experiments using computer algebra to solve problems.

**294 Engineering Mathematics**
Fall, spring. 4 credits. Prerequisite: Mathematics 293.
2 lecs, 1 rec, 4 labs during semester, evening exams.
Vector spaces and linear algebra, matrices, eigenvalue problems, and applications to systems of linear differential equations. Vector calculus. Boundary-value problems and introduction to Fourier series. Includes microcomputer experiments using computer algebra to solve problems.

## Engineering Mathematics

**310 Advanced Engineering Analysis I**
Fall, spring. 3 credits. Prerequisite: Mathematics 294 or equivalent.
2 lecs, 1 rec.
Ordinary differential equations as applied in engineering context. Analytical and numerical methods. Special functions, initial value, boundary value, and eigenvalue problems in linear partial differential equations; introduction to nonlinear ordinary differential equations. Use of computer algebra and MACSYMA to solve problems.

**311 Advanced Engineering Analysis II**
Spring. 3 credits. Prerequisite: T&AM 310 or equivalent.
Functions of several variables, introduction to complex variables, analytic functions, conformal mapping, method of residues. Application to the solution of Laplace's equation, and transform inversion techniques. Examples drawn from fluid mechanics, heat transfer, electromagnetics, and elasticity.

**610 Methods of Applied Mathematics I**
Fall. 3 credits. Intended for beginning graduate students in engineering and science. An intensive course, requiring more time than is normally available to undergraduates (see T&AM 310–311) but open to exceptional undergraduates with permission of instructor.
3 lecs.
Emphasis is on applications. Linear algebra, calculus of several variables, vector analysis, series, ordinary differential equations, complex variables.

**611 Methods of Applied Mathematics II**
Spring. 3 credits. Prerequisite: T&AM 610 or equivalent.
3 lecs.
Emphasis on applications. Partial differential equations, transform techniques, tensor analysis, calculus of variations.

**612 Methods of Applied Mathematics III**
Fall. 3 credits. Prerequisite: T&AM 610 or 611 or equivalent. First of a 6-credit sequence (T&AM 612 and 613) that develops advanced mathematical techniques for engineers and applied physicists.
Review of complex variable theory, conformal mapping, special functions, integral transform, Wiener-Hopf technique, and singular integral equations. Problems drawn from electromagnetics, elasticity, fluid mechanics, heat transfer, and acoustics.

**613 Methods of Applied Mathematics IV**
Spring. 3 credits. Prerequisite: T&AM 612 or equivalent.
Topics include asymptotic behavior of solutions of linear and nonlinear ODE (e.g., the WKB and multiple-scale methods), asymptotic expansion of integrals (method of steepest descent, stationary phase and Laplace methods). Regular and singular perturbation methods for PDE (e.g., method of composite expansions). Other topics (depending on instructor) may include normal forms, center manifolds, Liapunov-Schmidt reductors, Stokes phenomenon. The course may also include computer algebra (MACSYMA) exercises at the option of the instructor.

## Continuum Mechanics

**555 Composite Materials (also M&AE 615 and MS&E 615)**
Spring. 4 credits. Prerequisite: graduate standing or permission of instructor.
3 lecs. S. L. Phoenix.
Brief history of composite materials; types, geometries, fiber types, and structures; polymer matrices and deformation properties; orthotropic elasticity; stress-strain analysis of lamina and laminates; micromechanics of deformation and stress transfer, effective moduli, theories of strength and fatigue, nondestructive testing and inspection, applications of composites, environmental effects.

**[569 Sensors**
Fall. 3 credits. Not offered 1989–90.
3 lecs a week, 4 labs a semester.
This course deals with the general properties of sensors and actuators used in measurement and process-control applications involving thermal and mechanical quantities. Considered are sensors and actuators based on a broad range of physical transduction phenomena. Attention is given to the development of sensor models and criteria for evaluating the general performance characteristics of a sensor, including its transduction characteristics and its measurement field. Also studied are algorithms for processing sensor signals to recover the characteristics of the sensor or to remove its effect in a specific measurement application. An integral part of the course is the Sensors Laboratory, which provides students with hands-on opportunities for measuring the characteristics and operational parameters of a broad range of thermo-mechanical sensors.]

**[640 Experimental Mechanics**
Fall. 3 credits. Not offered 1989–90.
1 lec, 1 rec, 1 lab.
This course introduces students to the principles of measurement and experimentation in mechanics, acquaints them with some of the techniques for measuring fundamental mechanical quantities, and permits them to explore experimental topics such as the elastic, viscoelastic, and plastic response of materials; the linear and nonlinear vibration of discrete and continuous systems; and acoustic and elastic wave propagation and scattering phenomena.]

**663 Solid Mechanics I**
Fall. 4 credits. Corequisite: Mathematics 610.
3 lecs, 1 lab. J. T. Jenkins, W. Sachse.
Rigorous introduction to small-strain solid mechanics with emphasis on linear elasticity: stress, strain, tensors, balance laws, energy principles, general theory of linear elasticity, solutions of elementary boundary value problems.

**664 Solid Mechanics II**
Spring. 4 credits. Prerequisites: Mathematics 610 and T&AM 663, or equivalent.
3 lecs, 1 lab.
Preparation for advanced courses in solid mechanics. Singular solutions in linear elasticity, large deformations, nonlinear elasticity, linear visco-elasticity, mechanics of defects (cracks and dislocations), classical plasticity, and constitutive relations.

**[666 Fundamentals of Acoustics**
Spring. 3 credits. Not offered 1988–89.
3 lecs, biweekly labs.
Introduction to the principles and theories of acoustics. The vibrations of strings, bars, membranes, and plates; plane and spherical acoustic waves; transmission phenomena; resonators and filters; waves in solids and fluids. Application is made to sonic and ultrasonic transducers, music and noise, and architectural acoustics, and an introduction is given to the digital processing of acoustic signals. Laboratory work is required. At the level of *Fundamentals of Acoustics*, by Kinsler, Frey, Coppens, and Sanders.]

**751 Continuum Mechanics and Thermodynamics**
Fall. 3 credits. Prerequisites: T&AM 610 and 611; and 663 and 664 or equivalents. Offered alternate years.
3 lecs. T. Healey.
Kinematics, conservation laws, the entropy inequality, constitutive equations, frame indifference, material symmetry. Rate-dependent materials and materials with internal variables.

**[752 Nonlinear Elasticity**
Fall. 3 credits. Prerequisites: T&AM 610 and 611; and 663 and 664 or equivalents. Offered alternate years. Not offered 1989–90.
3 lecs. T. Healey.
Review of kinematics and constitutive theory appropriate for large deformations of nonlinearly elastic bodies. The basic field equations of nonlinear elastostatics and elastodynamics. Exact solutions of special problems. Linearization and stability. Nonlinear theories of thin structural members and their relationship to the three-dimensional theory. Introduction to static bifurcation theory with applications to strings, rods, plates, and shells.]

**[753 Fracture**
Spring. 3 credits. Prerequisites: T&AM 610 or 611; and 663 and 664 or equivalents. Offered alternate years. Not offered 1989–90.
3 lecs.
Topics will be selected from (1) elastic fracture mechanics: K, small-scale yielding, solutions of elastic crack problems; (2) nonlinear rate-independent, small-deformation fracture mechanics: plastic fracture, J-integral, small-scale yielding; (3) rate-dependent fracture mechanics: dynamic fracture, creep fracture; (4) mechanics of failure in polymers, ceramics, composites, and metals: void growth, load transfer between fibers, crazing.]

**757 Inelasticity**
Spring. 3 credits. Prerequisites: T&AM 610 and 611; and 663 and 664 or equivalents. Offered alternate years.
3 lecs.
Inelasticity; plasticity, visco-elasticity, and modern nonlinear theories. Plasticity: general principles, limit analysis, and boundary value problems. Visco-elasticity: general principles and solution of boundary value problems. Modern state variable theories: their relation to classical theories, their phenomenology, and use in solving boundary value problems.

**[759 Computational Methods**
Fall. 4 credits. Prerequisites: T&AM 610 and 611; and 663 and 664 or equivalents. Offered alternate years. Not offered 1989–90.
3 lecs. S. Mukherjee.
The aim of this course is to survey a wide range of applications of the boundary element method (BEM) and finite element method (FEM) in solid mechanics. The boundary element method will be introduced and then be used in problems in linear elasticity, diffusion, wave propagation, and problems with material and/or geometric nonlinearities. Finite-element applications will emphasize nonlinear problems in solid mechanics.]

**768 Elastic Waves**
Fall. 3 credits. Prerequisites: T&AM 610 or 611; and 663 and 574 or equivalents. Offered alternate years.
3 lecs.
An advanced course on dynamic stress analysis and wave propagation in elastic solids. Theory of elastodynamics. Waves in isotropic and anisotropic media. Reflection and refraction. Surface waves and waves in layered media. Transient waves and methods of Lamb-Cagniard-Pakeris. Thick-plate theories. Vibration of spheres. Scattering of waves and dynamic stress concentration.

**770 Research Topics in Solid Mechanics**
Spring. 1–3 credits. Prerequisites: T&AM 610 or 611; and 663 and 664 or equivalents.
3 lecs. 1–3 faculty members.
Three topics of current research interest to faculty will be presented. The topics for each year will be posted in the late fall. Students may register for one, two, or three credits.

## Dynamics and Space Mechanics

**570 Intermediate Dynamics**
Fall. 3 credits.
Two 1 1/4-hour lecs.
Vector and matrix methods for kinematics, Lagrangian and Newtonian mechanics for particles and rigid bodies, Euler's equations for rotating bodies, central-force motion. Small vibrations and stability. Application to robotics, gyroscopes, orbital and spacecraft dynamics.

**574 Vibrations and Waves in Elastic Systems**
Spring. 4 credits. Prerequisites: T&AM 570 and 610.
3 lecs, 1 lab.
Dynamics of elastic continua, including strings, membranes, and beams. Hamilton's principle, balance laws, characteristics, dispersion, phase, and group velocities.

**[671 Advanced Dynamics**
Spring. 3 credits. Prerequisite: T&AM 570 or equivalent. Offered alternate years. Not offered 1989–90.
Review of Lagrangian mechanics; Hamilton's principle, the principle of least action, and related topics from the calculus of variations; Hamilton's canonical equations; approximate methods for two-degrees-of-freedom systems (Lie transforms); canonical transformations and Hamilton-Jacobi theory; KAM theory.]

**[672 Celestial Mechanics (also Astronomy 579)**
Spring. 3 credits. Offered alternate years. Not offered 1989–90.
Two 1 1/4-hour lecs.
Description of orbits; 2-body, 3-body, and n-body problems; Hill curves, libration points and their stability; capture problems; virial theorem. Osculating elements, perturbation equations; effects of gravitational potentials, atmospheric drag, and solar radiation forces on satellite orbits; secular perturbations, resonances, mechanics of planetary rings.]

**[673 Mechanics of the Solar System (also Astronomy 571)**
Spring. 3 credits. Prerequisite: an undergraduate course in dynamics. Offered alternate years. Not offered 1989–90.
Two 1 1/4-hour lecs.
Gravitational potentials, planetary gravity fields. Free and forced rotations. Chandler wobble, polar wander, damping of nutation. Equilibrium tidal theory, tidal heating. Orbital evolution of natural satellites, resonances, spin-orbit coupling, Cassini states. Long-term variations in planetary orbits. Dust dynamics. Dynamics of ring systems. Physics of interiors, seismic waves, free oscillations. Illustrative examples are drawn from contemporary research.]

**675 Nonlinear Vibrations**
Fall. 3 credits. Prerequisite: T&AM 574 or equivalent. Offered alternate years.
Review of linear systems, free and forced vibrations. Nonlinear systems, phase plane methods, method of isoclines. Conservative systems. General autonomous systems, equilibrium and periodic solutions, linearization and Lyapunov stability criteria, Poincaré-Bendixson theorem. Quantitative analysis of weakly nonlinear systems in free and forced vibrations, perturbation methods, Krylov-Bogoliubov method. Applications to problems in mechanics.

**776 Qualitative Theory of Dynamical Systems**
Spring. 3 credits. Suggested prerequisite: T&AM 675, Mathematics 517, or equivalent. Offered alternate years.
Review of planar (single–degree-of-freedom) systems. Local and global analysis. Structural stability and bifurcations in planar systems. Center manifolds and normal forms. The averaging theorem and perturbation methods. Melnikov's method. Discrete dynamical systems, maps and difference equations, homoclinic and heteroclinic motions, the Smale Horseshoe and other complex invariant sets. Global bifurcations, strange attractors and chaos in free and forced oscillator equations. Applications to problems in solid and fluid mechanics.

## Special Courses, Projects, and Thesis Research

**[400 Science, Risk, and Public Policy (also Engr 400 and Economics 358)**
Fall. 3 credits. Not offered 1989–90.
For description see Engineering Common Courses.]

**491–492 Project in Engineering Science**
491, fall; 492, spring. 1–4 credits, as arranged.
Projects for undergraduates under the guidance of a faculty member.

**796–800 Topics in Theoretical and Applied Mechanics**
Fall, spring. 1–3 credits, as arranged.
Special lectures or seminars on subjects of current interest. Topics are announced when the course is offered.

**890 Master's Degree Research in Theoretical and Applied Mechanics**
Fall, spring. 1–6 credits, as arranged. S-U grades optional.
Thesis or independent research at the M.S. level on a subject of theoretical and applied mechanics. Research is under the guidance of a faculty member.

**990 Doctoral Research in Theoretical and Applied Mechanics**
Fall, spring. 1–9 credits, as arranged. S-U grades optional.
Thesis or independent research at the Ph.D. level on a subject of theoretical and applied mechanics. Research is under the guidance of a faculty member.

## FACULTY ROSTER

Abel, John F., Ph.D., U. of California at Berkeley. Prof., Civil and Environmental Engineering
Albright, Louis D., Ph.D., Cornell U. Assoc. Prof., Agricultural and Biological Engineering
Allmendinger, Richard, Ph.D., Stanford U. Asst. Prof., Geological Sciences
Anantharam, Venkatachalam, Ph.D., U. of California at Berkeley. Asst. Prof., Electrical Engineering
Aneshansley, Daniel J., Ph.D., Cornell U. Assoc. Prof., Agricultural and Biological Engineering
Anton, A. Brad, Ph.D., California Inst. of Technology. Asst. Prof., Chemical Engineering
Ast, Dieter G., Ph.D., Cornell U. Prof., Materials Science and Engineering
Auer, Peter L., Ph.D., California Inst. of Technology. Prof., Mechanical and Aerospace Engineering
Avedisian, C. Thomas, Ph.D., Princeton U. Assoc. Prof., Mechanical and Aerospace Engineering
Ballantyne, Joseph M., Ph.D., Massachusetts Inst. of Technology. Prof., Electrical Engineering
Barazangi, Muawia, Ph.D., Columbia U. Senior Scientist, Geological Sciences
Bartel, Donald L., Ph.D., U. of Iowa. Prof., Mechanical and Aerospace Engineering
Bartsch, James A., Ph.D., Purdue U. Asst. Prof., Agricultural and Biological Engineering
Bassett, William A., Ph.D., Columbia U. Prof., Geological Sciences
Batterman, Boris W., Ph.D., Massachusetts Inst. of Technology. Prof., Applied and Engineering Physics
Berger, Toby, Ph.D., Harvard U. J. Preston Levis Professor of Engineering, Electrical Engineering
Bilardi, Gianfranco, Ph.D., U. of Illinois. Asst. Prof., Computer Science
Billera, Louis J., Ph.D., City U. of New York. Prof., Operations Research and Industrial Engineering
Bird, John M., Ph.D., Rensselaer Polytechnic Inst. Prof., Geological Sciences
Birman, Kenneth P., Ph.D., U. of California at Berkeley. Asst. Prof., Computer Science
Bisogni, James J., Ph.D., Cornell U. Assoc. Prof., Civil and Environmental Engineering
Blakely, John M., Ph.D., Glasgow U. (Scotland). Prof., Materials Science and Engineering
Bland, Robert G., Ph.D., Cornell U. Prof., Operations Research and Industrial Engineering
Bloom, Arthur L., Ph.D., Yale U. Prof., Geological Sciences
Bojanczyk, Adam W., Ph.D., U. of Warsaw (Poland). Asst. Prof., Electrical Engineering.
Bolgiano, Ralph, Jr., Ph.D., Cornell U. Prof., Electrical Engineering
Booker, John F., Ph.D., Cornell U. Prof., Mechanical and Aerospace Engineering
Brock, Joel D. Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Applied and Engineering Physics
Brown, Geoffrey M., Ph.D., U. of Texas. Asst. Prof., Electrical Engineering
Brown, Larry D., Ph.D., Cornell U. Assoc. Prof., Geological Sciences
Brutsaert, Wilfried H., Ph.D., U. of California at Davis. Prof., Civil and Environmental Engineering
Buhrman, Robert A., Ph.D., Johns Hopkins U. Prof., Applied and Engineering Physics
Burns, Joseph A., Ph.D., Cornell U. Prof., Theoretical and Applied Mechanics
Cady, K. Bingham, Ph.D., Massachusetts Inst. of Technology. Prof., Nuclear Science and Engineering
Capranica, Robert R., Ph.D., Massachusetts Inst. of Technology. Prof., Electrical Engineering.
Carter, C. Barry, Ph.D., Oxford U. (England). Prof., Materials Science and Engineering
Cathles, Lawrence M. III, Ph.D., Princeton U. Prof., Geological Sciences
Caughey, David A., Ph.D., Princeton U. Prof., Mechanical and Aerospace Engineering
Chiang, Hsiao-Dong, Ph.D., U. of California at Berkeley. Asst. Prof., Electrical Engineering
Cisne, John L., Ph.D., U. of Chicago. Prof., Geological Sciences
Clancy, Paulette, Ph.D., Oxford U. (England). Asst. Prof., Chemical Engineering
Clark, David D., Ph.D., U. of California at Berkeley. Prof., Nuclear Science and Engineering
Clark, Peter A., Ph.D., Carnegie-Mellon U. Asst. Prof., Chemical Engineering
Cohen, Claude, Ph.D., Princeton U. Prof., Chemical Engineering
Coleman, Thomas F., Ph.D., U. of Waterloo. Assoc. Prof., Computer Science
Compton, Richard C., Ph.D., California Inst. of Technology. Asst. Prof., Electrical Engineering
Constable, Robert L., Ph.D., U. of Wisconsin. Prof., Computer Science
Cooke, J. Robert, Ph.D., North Carolina State U. Prof., Agricultural and Biological Engineering
Cool, Terrill A., Ph.D., California Inst. of Technology. Prof., Applied and Engineering Physics
Craighead, Harold G., Ph.D., Cornell U. Prof., Applied and Engineering Physics, and Electrical Engineering
Datta, Ashim K., Ph.D., U. of Florida. Asst. Prof., Agricultural and Biological Engineering
Dawson, Paul R., Ph.D., Colorado State U. Assoc. Prof., Mechanical and Aerospace Engineering
deBoer, P. Tobias, Ph.D., U. of Maryland. Prof., Mechanical and Aerospace Engineering
Deierlein, Gregory G., Ph.D., U. of Texas at Austin. Asst. Prof., Civil and Environmental Engineering
Delchamps, David F., Ph.D., Harvard U. Asst. Prof., Electrical Engineering
Derksen, Richard C., Ph.D., U. of Illinois. Asst. Prof., Agricultural and Biological Engineering
Dick, Richard I., Ph.D., U. of Illinois. Joseph P. Ripley Professor of Engineering, Civil and Environmental Engineering
Dieckmann, Rudiger, Ph.D., Technical U. of Clausthal. Prof., Materials Science and Engineering
Donald, Bruce, Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Computer Science
Eastman, Lester F., Ph.D., Cornell U. Given Foundation Professor of Engineering, Electrical Engineering
Farley, Donald T., Ph.D., Cornell U. Prof., Electrical Engineering
Fine, Terrence L., Ph.D., Harvard U. Prof., Electrical Engineering
Finn, Robert K., Ph.D., U. of Minnesota. Prof., Chemical Engineering
Fisher, Gordon P., Dr.E., Johns Hopkins U. Prof., Civil and Environmental Engineering
Fleischmann, Hans H., Ph.D., Technische Hoch., München (Germany). Prof., Applied and Engineering Physics
Furry, Ronald B., Ph.D., Iowa State U. Prof., Agricultural and Biological Engineering
Gebremedhin, Kifle G., Ph.D., U. of Wisconsin. Asst. Prof., Agricultural and Biological Engineering
George, Albert R., Ph.D., Princeton U. Prof., Mechanical and Aerospace Engineering
Gergely, Peter, Ph.D., U. of Illinois. Prof., Civil and Environmental Engineering
Giannelis, Emmanuel, Ph.D., Michigan State U. Asst. Prof., Materials Science and Engineering
Gossett, James M., Ph.D., Stanford U. Assoc. Prof., Civil and Environmental Engineering
Gouldin, Frederick C., Ph.D., Princeton U. Prof., Mechanical and Aerospace Engineering
Greenberg, Donald P., Ph.D., Cornell U. Professor at Large, Engineering
Gries, David J., Ph.D., Technische Hoch., München (Germany). Prof., Computer Science
Grigoriu, Mircea D., Ph.D., Massachusetts Inst. of Technology. Prof., Civil and Environmental Engineering
Grover, Lov K., Ph. D., Stanford U. Asst. Prof., Electrical Engineering
Grubb, David T., Ph.D., Oxford U. (England). Assoc. Prof., Materials Science and Engineering
Gubbins, Keith E., Ph.D., U. of London (England). Thomas R. Briggs Professor of Engineering, Chemical Engineering
Gunkel, Wesley W., Ph.D., Michigan State U. Prof., Agricultural and Biological Engineering
Hagfors, Tor, Ph.D., U. of Oslo (Norway). Prof., Electrical Engineering
Haith, Douglas A., Ph.D., Cornell U. Prof., Agricultural and Biological Engineering
Hammer, Daniel A., Ph.D., U. of Pennsylvania. Asst. Prof., Chemical Engineering
Hammer, David A., Ph.D., Cornell U. Prof., Nuclear Science and Engineering
Harriott, Peter, Sc.D., Massachusetts Inst. of Technology. Fred H. Rhodes Professor of Chemical Engineering
Hartmanis, Juris, Ph.D., California Inst. of Technology. Walter R. Read Professor of Computer Science
Hauser, Max W., Ph.D., U. of California at Berkeley. Asst. Prof., Electrical Engineering
Healey, Timothy J., Ph.D., U. of Maryland. Asst. Prof., Theoretical and Applied Mechanics
Heath, David C., Ph.D., U. of Illinois. Prof., Operations Research and Industrial Engineering
Heegard, Chris, Ph.D., Stanford U. Assoc. Prof., Electrical Engineering
Hillman, Lloyd W., Ph.D., U. of Rochester. Asst. Prof., Electrical Engineering
Holmes, Philip J., Ph.D., Southampton U. (England). Prof., Theoretical and Applied Mechanics
Hopcroft, John E., Ph.D., Stanford U. Prof., Computer Science
Hover, Kenneth C., Ph.D., Cornell U. Assoc. Prof., Civil and Environmental Engineering
Howe, Douglas J., Ph.D. Cornell U. Asst. Prof., Computer Science
Hui, Chung Y., Ph.D., Harvard U. Assoc. Prof., Theoretical and Applied Mechanics

Hunter, Jean B., Ph.D., Columbia U. Asst. Prof., Agricultural and Biological Engineering
Huttenlocher, Daniel, Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Computer Science
Ingraffea, Anthony R., Ph.D., U. of Colorado. Prof., Civil and Environmental Engineering
Irwin, Lynne H., Ph.D., Texas A & M U. Assoc. Prof., Agricultural and Biological Engineering
Isaacson, Michael S., Ph.D., U. of Chicago. Prof., Applied and Engineering Physics
Isacks, Bryan L., Ph.D., Columbia U. Prof., Geological Sciences
Jackson, Peter L., Ph.D., Stanford U. Assoc. Prof., Operations Research and Industrial Engineering
Jenkins, James T., Ph.D., Johns Hopkins U. Prof., Theoretical and Applied Mechanics
Jewell, William J., Ph.D., Stanford U. Prof., Agricultural and Biological Engineering
Jirka, Gerhard H., Ph.D., Massachusetts Inst. of Technology. Prof., Civil and Environmental Engineering
Johnson, C. Richard, Jr., Ph.D., Stanford U. Assoc. Prof., Electrical Engineering
Johnson, Herbert H., Ph.D., Case Inst. of Technology. Prof., Materials Science and Engineering
Jordan, Teresa, Ph.D., Stanford U. Asst. Prof., Geological Sciences
Karig, Daniel E., Ph.D., U. of California at San Diego. Prof., Geological Sciences
Kaufman, Sidney, Ph.D., Cornell U. Acting Prof., Geological Sciences
Kay, Robert W., Ph.D., Columbia U. Prof., Geological Sciences
Kelley, Michael C., Ph.D., U. of California at Berkeley. Prof., Electrical Engineering
Kintner, Paul M., Ph.D., U. of Minnesota. Assoc. Prof., Electrical Engineering
Kline, Ronald R., Ph.D., U. of Wisconsin. Asst. Prof., Electrical Engineering (History of Technology)
Koch, Donald L., Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Chemical Engineering
Kohlstedt, David, Ph.D., U. of Illinois. Prof., Materials Science and Engineering
Kostroun, Vaclav O., Ph.D., U. of Oregon. Assoc. Prof., Nuclear Science and Engineering
Kozen, Dexter, Ph.D., Cornell U. Assoc. Prof., Computer Science
Kramer, Edward J., Ph.D., Carnegie Inst. of Technology. Prof., Materials Science and Engineering
Krusius, J. Peter, Ph.D., Helsinki U. of Technology (Finland). Prof., Electrical Engineering
Kulhawy, Fred H., Ph.D., U. of California at Berkeley. Prof., Civil and Environmental Engineering
Kusse, Bruce R., Ph.D., Massachusetts Inst. of Technology. Prof., Applied and Engineering Physics
Lance, Richard H., Ph.D., Brown U. Prof., Theoretical and Applied Mechanics
Landsberger, Samuel E., Sc.D., Massachusetts Inst. of Technology. Asst. Prof., Mechanical and Aerospace Engineering
Lee, Charles A., Ph.D., Columbia U. Prof., Electrical Engineering
Lee, Soo-Young, Ph.D., U. of Texas. Asst. Prof., Electrical Engineering
Leeser, Miriam E., Ph.D., U. of Cambridge, England. Asst. Prof., Electrical Engineering
Leibovich, Sidney, Ph.D., Cornell U. Prof., Mechanical and Aerospace Engineering
Li, Che-Yu, Ph.D., Cornell U. Prof., Materials Science and Engineering
Liboff, Richard L., Ph.D., New York U. Prof., Electrical Engineering
Liggett, James A., Ph.D., Stanford U. Prof., Civil and Environmental Engineering
Lion, Leonard W., Ph.D., Stanford U. Assoc. Prof., Civil and Environmental Engineering
Liu, Philip L.-F., Sc.D., Massachusetts Inst. of Technology. Prof., Civil and Environmental Engineering
Loucks, Daniel P., Ph.D., Cornell U. Prof., Civil and Environmental Engineering
Louge, Michel Y., Ph.D., Stanford U. Asst. Prof., Mechanical and Aerospace Engineering
Lovelace, Richard V. E., Ph.D., Cornell U. Prof., Applied and Engineering Physics
Ludington, David C., Ph.D., Purdue U. Prof., Agricultural and Biological Engineering
Luk, Franklin T.-C., Ph.D., Stanford U. Prof., Electrical Engineering
Lumley, John L., Ph.D., Johns Hopkins U. Willis H. Carrier Professor of Engineering, Mechanical and Aerospace Engineering
Lynn, Walter R., Ph.D., Northwestern U. Prof., Civil and Environmental Engineering
MacDonald, Noel C., Ph.D., U. of California at Berkeley. Prof., Electrical Engineering
McIsaac, Paul R., Ph.D., U. of Michigan. Prof., Electrical Engineering
MacMillan, Ernest H., Ph.D., U. of Minnesota. Asst. Prof., Theoretical and Applied Mechanics
Marzullo, Keith A., Ph.D., Stanford U. Asst. Prof., Computer Science
Maxwell, William L., Ph.D., Cornell U. Prof., Operations Research and Industrial Engineering
Mayer, James W., Ph.D., Purdue U. Francis Norwood Bard Professor of Materials Science and Engineering
Merrill, Robert P., Sc.D., Massachusetts Inst. of Technology. Herbert Fisk Johnson Professor of Industrial Chemistry, Chemical Engineering
Meyburg, Arnim H., Ph.D., Northwestern U. Prof., Civil and Environmental Engineering
Mitchell, Joseph S., Ph.D., Stanford U. Asst. Prof., Operations Research and Industrial Engineering
Moon, Francis C., Ph.D., Cornell U. Prof., Mechanical and Aerospace Engineering
Moore, Franklin K., Ph.D., Cornell U. John C. Ford Professor of Mechanical Engineering, Mechanical and Aerospace Engineering
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Mukherjee, Subrata, Ph.D., Stanford U. Prof., Theoretical and Applied Mechanics
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Nelkin, Mark S., Ph.D., Cornell U. Prof., Applied and Engineering Physics
Nilson, Arthur H., Ph.D., U. of California at Berkeley. Prof., Civil and Environmental Engineering
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Olbricht, William L., Ph.D., California Inst. of Technology. Assoc. Prof., Chemical Engineering
Oliver, Jack E., Ph.D., Columbia U. Irving Porter Church Professor of Engineering, Geological Sciences
Orloff, Neil, J.D., Columbia U. Prof., Civil and Environmental Engineering/Program on Science, Technology, and Society
O'Rourke, Thomas D., Ph.D., U. of Illinois. Prof., Civil and Environmental Engineering
Otani, Niels F., Ph.D., U. of California at Berkeley. Asst. Prof., Electrical Engineering
Panagiotopoulos, Athanassios, Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Chemical Engineering
Panangaden, Prakash, Ph.D., U. of Wisconsin at Milwaukee. Asst. Prof., Computer Science
Pao, Yih-Hsing, Ph.D., Columbia U. Prof., Theoretical and Applied Mechanics
Parks, Thomas W., Ph.D., Cornell U. Prof., Electrical Engineering
Parlange, Jean-Yves, Ph.D., Brown U. Prof., Agricultural and Biological Engineering
Peköz, Teoman, Ph.D., Cornell U. Prof., Civil and Environmental Engineering
Philipson, Warren R., Ph.D., Cornell U. Prof., Civil and Environmental Engineering and Agronomy
Philpot, William D., Ph.D., U. of Delaware. Asst. Prof., Civil and Environmental Engineering
Phoenix, S. Leigh, Ph.D., Cornell U. Prof., Mechanical and Aerospace Engineering
Pingali, Keshav K., Ph.D., Massachusetts Inst. of Technology. Asst. Prof., Computer Science
Pitt, Ronald E., Ph.D., Cornell U. Assoc. Prof., Agricultural and Biological Engineering
Pollock, Clifford R., Ph.D., Rice U. Assoc. Prof., Electrical Engineering
Pope, Stephen B., Ph.D., Imperial College of Science and Technology (England). Prof., Mechanical and Aerospace Engineering
Pottle, Christopher, Ph.D., U. of Illinois. Prof., Electrical Engineering
Prabhu, Narahari U., M.Sc., Manchester U. (England). Prof., Operations Research and Industrial Engineering
Psiaki, Mark L., M.A., Princeton U. Asst. Prof., Mechanical and Aerospace Engineering
Raj, Rishi, Ph.D., Harvard U. Prof., Materials Science and Engineering
Rand, Richard H., Sc.D., Columbia U. Prof., Theoretical and Applied Mechanics
Reeves, Anthony P., Ph.D., U. of Kent at Canterbury (England). Assoc. Prof., Electrical Engineering
Rehkugler, Gerald E., Ph.D., Iowa State U. Prof., Agricultural and Biological Engineering
Renegar, James, Ph.D., U. of California at Berkeley. Asst. Prof., Operations Research and Industrial Engineering
Resler, Edwin L., Jr., Ph.D., Cornell U. Joseph Newton Pew, Jr., Professor of Engineering, Mechanical and Aerospace Engineering
Resnick, Sidney, Ph.D., Purdue U. Prof., Operations Research and Industrial Engineering
Rhodes, Frank H. T., Ph.D., U. of Birmingham (England). Prof., Geological Sciences
Rhodin, Thor N., Ph.D., Princeton U. Prof., Applied and Engineering Physics
Rodriguez, Ferdinand, Ph.D., Cornell U. Prof., Chemical Engineering
Rosakis, Phoebus, Ph.D., California Inst. of Technology. Asst. Prof., Theoretical and Applied Mechanics
Roundy, Robin, Ph.D., Stanford U. Asst. Prof., Operations Research and Industrial Engineering
Ruina, Andy L., Ph.D., Brown U. Assoc. Prof., Theoretical and Applied Mechanics
Ruoff, Arthur L., Ph.D., U. of Utah. Class of 1912 Professor, Materials Science and Engineering

Ruppert, David, Ph.D., Michigan State U. Prof., Operations Research and Industrial Engineering
Sachse, Wolfgang H., Ph.D., Johns Hopkins U. Prof., Theoretical and Applied Mechanics
Salton, Gerard, Ph.D., Harvard U. Prof., Computer Science
Samorodnitsky, Gennady, D.S., Technion-Israel Inst. of Technology. Asst. Prof., Operations Research and Industrial Engineering
Sansalone, Mary J., Ph.D., Cornell U. Asst. Prof., Civil and Environmental Engineering
Santner, Thomas J., Ph.D., Purdue U. Prof., Operations Research and Industrial Engineering
Sass, Stephen L., Ph.D., Northwestern U. Prof., Materials Science and Engineering
Scheele, George F., Ph.D., U. of Illinois. Prof., Chemical Engineering
Schneider, Fred B., Ph.D., SUNY at Stony Brook. Assoc. Prof., Computer Science
Schruben, Lee W., Ph.D., Yale U. Assoc. Prof., Operations Research and Industrial Engineering
Schuler, Richard E., Ph.D., Brown U. Prof., Civil and Environmental Engineering/Economics
Scott, Norman R., Ph.D., Cornell U. Prof., Agricultural and Biological Engineering
Segre, Alberto M., Ph.D., U. of Illinois. Asst. Prof., Computer Science
Seyler, Charles E., Jr., Ph.D., U. of Iowa. Assoc. Prof., Electrical Engineering
Shealy, J. Richard, Ph.D., Cornell U. Asst. Prof., Electrical Engineering
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Teitelbaum, Ray T., Ph.D., Carnegie-Mellon U. Assoc. Prof., Computer Science
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Thorp, James S., Ph.D., Cornell U. Prof., Electrical Engineering
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Todd, Michael J., Ph.D., Yale U. Prof., Operations Research and Industrial Engineering
Torng, Hwa-Chung, Ph.D., Cornell U. Prof., Electrical Engineering
Torrance, Kenneth E., Ph.D., U. of Minnesota. Prof., Mechanical and Aerospace Engineering
Toueg, Sam, Ph.D., Princeton U. Assoc. Prof., Computer Science
Travers, William B., Ph.D., Princeton U. Prof., Geological Sciences
Trotter, Leslie E., Ph.D., Cornell U. Prof., Operations Research and Industrial Engineering
Turcotte, Donald L., Ph.D., California Inst. of Technology. Prof., Geological Sciences
Turnbull, Bruce W., Ph.D., Cornell U. Prof., Operations Research and Industrial Engineering
Turnquist, Mark A., Ph.D., Massachusetts Inst. of Technology. Prof., Civil and Environmental Engineering
Van Loan, Charles F., Ph.D., U. of Michigan. Prof., Computer Science
Vavasis, Stephen A., Ph.D., Bombay U. (India). Asst. Prof., Computer Science
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White, Richard N., Ph.D., U. of Wisconsin. James A. Friend Family Distinguished Professor of Engineering, Civil and Environmental Engineering
White, William M., Ph.D., U. of Rhode Island. Assoc. Prof., Geological Sciences
Wise, Frank W., Ph.D. Cornell U. Asst. Prof., Applied and Engineering Physics
Wolf, Edward D., Ph.D., Iowa State U. Prof., Electrical Engineering
Wolga, George J., Ph.D., Massachusetts Inst. of Technology. Prof., Electrical Engineering
Zehnder, Alan, Ph.D., California Inst. of Technology. Asst. Prof., Theoretical and Applied Mechanics
Zollweg, John A., Ph.D., Cornell U. Assoc. Prof., Chemical Engineering

# GRADUATE SCHOOL

## ADMINISTRATION

Alison P. Casarett, dean

Eleanor M. Cox, assistant dean

Benjamin Ginsberg, secretary of the graduate faculty

Graduate study at Cornell is pursued through the Graduate School, which administers the many graduate fields of study, or through the various graduate professional schools and colleges.

Programs leading to the degrees of Doctor of Law (J.D.), Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), and Master of Business Administration (M.B.A.) are not administered by the Graduate School. Information on those programs can be obtained from the Law School, the Medical College (New York City), the College of Veterinary Medicine, and the Johnson Graduate School of Management respectively.

## GRADUATE SCHOOL

The graduate program at Cornell permits an unusual degree of accommodation to the needs and interests of the individual student. Degree requirements are kept to a minimum. There are no specific course or credit requirements for the advanced general degrees of Master of Arts, Master of Science, and Doctor of Philosophy, but only such general requirements that best accomplish the aim of graduate study: a period of study in residence, the mastery of one subject, adequate knowledge of allied subjects, oral examinations to establish competency for presentation of a dissertation or thesis, and a satisfactory dissertation or thesis. Certain advanced professional degree programs have specific course or credit requirements that are determined by the faculty of the professional school or college in which the degrees are offered.

A close working relationship between the student and faculty members is essential to the graduate program at Cornell. Under the Special Committee system the student is guided by, and works with, at least two or three faculty members chosen by the student to represent his or her major and minor subjects. The major subject representative is the chair of the Special Committee and usually has the primary responsibility for directing the student's thesis research.

Students who want to use the university's facilities for intensive specialized training only and who do not want to become degree candidates may apply for admission as non-degree students.

## REQUIREMENTS FOR ADMISSION

To be admitted to the Graduate School, an applicant should:

1) hold a baccalaureate degree or its equivalent, granted by a faculty or university of recognized standing;
2) have adequate preparation for graduate study in the chosen field of instruction;
3) have fluent command of the English language;
4) present evidence of promise in advanced study and research; and
5) take the Graduate Record Examinations General Test for those fields that require the GREs.

Before admission can be final, all applicants whose native language is not English must provide proof of competency in the English language. Acceptable proof could be

1) a Test of English as a Foreign Language (TOEFL) score of 550 or higher;
2) a degree from a college or university in a country where the native language is English; or
3) two or more years of study in an undergraduate or graduate program in a country where the native language is English.

Information on times and places for the TOEFL examination and Graduate Record Examinations and application forms may be obtained from the Educational Testing Service, Princeton, New Jersey 08540, U.S.A.

Applications for admission to the Graduate School may be submitted at any time during the year. Many fields, however, require that applicants for fall admission submit their completed applications by January 15.

Applicants who are also applying for Cornell Graduate School fellowship consideration *must* submit their completed applications and supporting credentials by January 15.

Inquiries regarding admission and fellowships should be addressed to the Graduate School Admissions Office, Cornell University, Sage Graduate Center, Ithaca, New York 14853-6201.

Information concerning admission requirements and courses of study for degrees not administered by the Graduate School may be obtained from the several schools and colleges that administer them (see "Administration," above).

Inquiries regarding facilities for advanced study and research in a given field, special requirements for such study and research, and opportunities for teaching and research assistantships should be addressed to the graduate faculty representative in the particular field.

More detailed information may be obtained from the following publications: the catalog *Cornell University Graduate School*, available from Cornell University Catalogs, Building 7, Research Park, Ithaca, NY 14850-1247, and the application *Graduate Study at Cornell University*, available from the Graduate School, Cornell University, Sage Graduate Center, Ithaca, New York 14853-6201.

# SCHOOL OF HOTEL ADMINISTRATION

## ADMINISTRATION

John J. Clark, Jr., dean

David C. Dunn, associate dean for academic affairs

Normand L. Peckenpaugh, assistant dean for finance and administration

William N. Chernish, assistant dean for executive education

John E. H. Sherry, graduate faculty representative

Melinda Codd, director of the M.P.S. program

Cheryl S. Farrell, director of admissions and financial aid

Hans P. Weishaupt, managing director of the Statler Hotel and J. Willard Marriott Executive Education Center

Harry R. Keller, director of alumni affairs

Fred H. Antil, director of placement and corporate relations

Jim Dunston, director of the Binenkorb Video and Computer Center

Mary K. Milks, registrar

Katherine S. Laurence, librarian

Shelley S. Semmler, director of development

Glenn Withiam, executive editor of the *Cornell Hotel and Restaurant Administration Quarterly*

## DEGREE PROGRAMS

| | *Degree* |
|---|---|
| Hotel and Restaurant Administration | |
| | B.S. |
| | M.P.S. |
| | M.S. |
| | Ph.D. |

## FACILITIES

**Statler Hall.** Statler Hall is a unique building designed expressly to meet the needs of the faculty and students of the School of Hotel Administration. The totally renovated building, which serves both practical and theoretical instruction, houses classrooms, lecture rooms, laboratories, a library, a video and computer center, a beverage-management center, an auditorium, and the Statler Hotel and J. Willard Marriott Executive Education Center. The improved Statler Hall and new Statler Hotel were designed expressly for the school's revamped academic and executive-education programs, and provide students with training and work experience in facilities similar to those in which they will work after graduation.

**The School of Hotel Administration Library,** the largest of its kind, provides a comprehensive collection of publications on hotel and restaurant operation, business, and related subjects. The library's resources allow students to search numerous computerized bibliographic databases, including the hospitality industry's most extensive database containing current bibliographic information on the periodical literature of the industry. Among the library's special features are the Herndon and Vehling collections, which contain numerous rare materials.

**Statler Hotel and J. Willard Marriott Executive Education Center.** The all-new hotel comprises 150 guest rooms, an executive-education center, restaurants, lounges, and the university's faculty and staff club. It is an industry showcase, one that demonstrates the very finest in hospitality and hospitality-education practices. The Statler Hotel is an independent, self-sustaining teaching hotel that provides quality food, beverage, meeting, and lodging services to the Cornell community and campus visitors, including parents and those who visit Cornell as part of the application process. In addition, the Statler Hotel is a practice-management facility for certain classes, internships, and for independent-study projects. It offers part-time jobs to approximately 200 students each semester; preference is given to students in the hotel school.

## CURRICULUM

The School of Hotel Administration offers training in the numerous disciplines required for modern management, including accounting, finance, marketing, operations, communication, properties management, MIS/computers, law, and human-resources management. The school's graduates hold executive positions in a variety of industries, but are especially well represented in the management of hospitality-related enterprises, including the lodging, food-service, and travel industries.

Students are encouraged to pursue a broad range of courses, including those in the humanities, as preparation for assuming positions in the business community. Included in the basic curriculum are courses in financial management, food and beverage operations, administration, and physical-plant management.

To satisfy degree requirements, every undergraduate enrolled in the School of Hotel Administration must complete a minimum of two periods of ten weeks each (or the equivalent) of full-time, supervised, relevant employment and file acceptable reports for each work period. Most students complete this requirement during the summer.

The basic program leading to the undergraduate degree in hotel administration, as set forth below, is enriched by a broad selection of free and distributive elective courses offered by the school and elsewhere in the university.

The school's programs for advanced degrees include those of Master of Professional Studies, Master of Science, and Doctor of Philosophy. For more complete information about undergraduate program requirements, see the school's admissions catalog (available in room 174 Statler Hall). For further information on graduate programs, consult the school's graduate catalog (available in room 172 Statler Hall); contact Professor John E. H. Sherry, the school's graduate faculty representative; or see the university's *Announcement of the Graduate School.*

### Requirements for Graduation

The requirements for graduation outlined below are the result of an extensive revision of the school's curricula that was completed in 1988. Regularly enrolled students in the School of Hotel Administration are candidates for the degree of Bachelor of Science. The requirements for that degree are:

1) completion of eight terms in residence;*†
2) completion, with a minimum average of 2.0, of 120 required and elective credits, as set forth in the table below;

*Students who plan to attend summer school at Cornell or elsewhere should keep in mind the degree requirement of a minimum of two periods of ten weeks each (or the equivalent) of full-time, supervised, relevant employment.

†Students transferring from other colleges and universities may be allowed appropriate credit against the residence requirement at the time of admission. Transfer students must complete a minimum of five semesters in the program.

3) completion of two units of practice credit prior to the last term of residence, as defined below;
4) completion of the university requirement in physical education during the first two terms of residence;
5) attainment of a grade-point average of at least 2.0 in the final semester.

*Suggested* course programs also appear on the following pages. The core courses account for 67 of the 120 credits needed for graduation, the selected subject concentration accounts for 12 credits, and 18 credits are allotted for distributive electives. The remaining 23 credits may be earned in courses chosen from the offerings of any college of the university, provided that the customary requirements for admission to such courses are met.

Students in the School of Hotel Administration who plan to attend summer school at Cornell or elsewhere or who propose to attend any other university, with the expectation that the credit earned will be counted toward the Cornell degree in hotel administration, must obtain the approval of the school in advance. Without advance approval, such credit may not count toward the degree.

Credit earned in military science, aerospace studies, or naval-science courses may be counted in the 23-credit group of free electives.

All students are required by the university to take two courses in physical education, but no credit toward the academic degree is allowed for these courses.

### Grading System

Letter grades ranging from A+ to F are given to indicate academic performance in each course. These letter grades are assigned a numerical value for each term average as follows: A is equivalent to 4.0; B to 3.0; C to 2.0; D to 1.0; F to 0. For good standing, the student must maintain a minimum average of 2.0. To graduate, a cumulative average of 2.0 and a final-term average of 2.0 are required as minimums. Of the *free*-elective courses, a maximum of 4 credits each term may be taken on a "satisfactory-unsatisfactory" (S-U) basis.

Students whose term averages are at least 3.3 and who took at least 12 credits of letter grades with no unsatisfactory or incomplete grades are honored by being placed on the Dean's List.

### Practice-Credit Requirement

As part of degree requirements, each undergraduate enrolled in the School of Hotel Administration must complete a specific set of practice-credit requirements. These requirements are set forth in the Practice Credit Work Handbook for Undergraduates in the School of Hotel Administration. The school registrar distributes copies of this document upon request to enrolled students.

A limited number of upperclass students are encouraged to enroll in management-intern programs that entail six to eight months of on-the-job managerial instruction and experience. For the details on these programs, see the section "Directed Study" on the following pages.

### Course Requirements for Graduation

| *Required courses* | *Credits* |
|---|---|
| Organization Management: Hotel Administration 103, 303, 403 | 9 |
| Human-Resources Management: Hotel Administration 211, 212 | 6 |
| Financial Management: Hotel Administration 225, 226, 325 | 10 |
| Food and Beverage Management: Hotel Administration 135, 235, 335 | 12 |
| Marketing and Tourism: Hotel Administration 243 | 3 |
| Properties Management: Hotel Administration 255, 355 | 6 |
| Communication: Hotel Administration 165, 365 | 6 |
| MIS/Computers: Hotel Administration 174 | 3 |
| Law: Hotel Administration 387 | 3 |
| Quantitative Methods: Hotel Administration 191 | 3 |
| Economics: Economics 101,102 | 6 |
| *Specifically required credits* | 67 |
| *Concentration* | 12 |
| *Distributive electives* | 18 |
| *Free electives* | 23 |
| **Total credits required for graduation** | **120** |

## UNDERGRADUATE PROGRAM OF STUDY

*The undergraduate curriculum of the School of Hotel Administration is continually being revised and expanded. In some cases, the numbers of old and new courses overlap. Students are reminded that the most accurate information regarding courses offered during any given semester—including meeting times—may be found in the supplement issued for that semester by the school's registrar (255-4990).*

### Typical Course Sequences

The following arrangements of courses tend to be more fixed in the freshman and sophomore years, with a greater degree of flexibility characterizing the upperclass years.

#### Freshman Year

Typically, a freshman schedule will consist of 14 to 16 credits each term, to include the following:

| *Required courses* | *Credits* |
|---|---|
| H Adm 103, Principles of Management | 3 |
| H Adm 135, Culinary Theory and Practice | 4 |
| H Adm 165, Managerial Communication: Writing Principles and Process | 3 |
| H Adm 174, Information Systems | 3 |
| H Adm 191, Quantitative Methods | 3 |
| Econ 101, Microeconomics | 3 |
| Econ 102, Macroeconomics | 3 |
| Distributive electives | 6 |
| Free electives | 0–4 |
| | 28–32 |

#### Sophomore Year

| *Required courses* | *Credits* |
|---|---|
| H Adm 211, The Management of Personnel | 3 |
| H Adm 212, Human Relations | 3 |
| H Adm 225, Financial Accounting | 3 |
| H Adm 226, Financial Management | 4 |
| H Adm 235, Food and Beverage Management | 4 |
| H Adm 243, Principles of Marketing | 3 |
| H Adm 255, Facilities Development and Planning | 3 |
| Distributive electives | 3–6 |
| Free electives | 3–6 |
| | 29–35 |

#### Junior Year

| *Required courses* | *Credits* |
|---|---|
| H Adm 303, Organizational Management | 3 |
| H Adm 325, Hospitality Financial Management | 3 |
| H Adm 335, Restaurant Management | 4 |
| H Adm 355, Hospitality Facilities Construction and Operation | 3 |
| H Adm 365, Managerial Communication: Interpersonal Relationships in Organizations | 3 |
| H Adm 387, Business and Hospitality Law | 3 |
| Concentration | 6 |
| Free electives | 3–6 |
| | 28–31 |

#### Senior Year

| *Required courses* | *Credits* |
|---|---|
| H Adm 403, Integrative Senior Requirement | 3 |
| Concentration | 6 |
| Free electives | 15–26 |
| | 24–35 |

### Programs in Special Areas

While completing the required courses leading to the bachelor's degree, undergraduates in the school must also select a concentration: 12 elective credits in a major area of instruction. These include organization management, human-resources management, financial management, food and beverage management, marketing, and properties management.

When the student selects one of these major fields of concentration, he or she should consult the coordinator of instruction in that area during the sophomore year to plan the sequence of elective courses that will best fit his or her program.

A list of elective courses offered in the school's special areas of instruction is provided below.

### Elective Courses in Hotel Administration

The following is a list of courses currently offered within the School of Hotel Administration that may, as appropriate, be used in partial or full satisfaction of the free-elective allocation or the requirements for the specified area of concentration.

The first digit of the course number is in general indicative of the level of the course; the second digit indicates the curricular area, according to the following scheme:

*First digit*

1—freshman/introductory

2—sophomore

3—junior

4—senior

5—provisional course offering

6—undergraduate independent study

7—graduate

*Second digit*

0—organization management

1—human-resources management

2—financial management

3—food and beverage management

4—marketing and tourism

5—properties management

6—communication

7— MIS/computers

8—law

9—other

| *Organization Management* | *Credits* |
|---|---|
| H Adm 102, Distinguished Management Lectures | 1 |
| H Adm 203, Club Management | 2 |
| H Adm 304, Rooms-Division Management—Front Office and Reservations | 2 |
| H Adm 305, Resort and Condominium Management | 3 |
| H Adm 306, Franchising in the Hospitality Industry | 2 |
| H Adm 401, Seminar in Management Principles | 2 |
| H Adm 402, Hospitality-Management Seminar | 1 |
| H Adm 404, Management Organization of the Small Business | 3 |
| H Adm 405, Management Planning for the Hospitality Industry | 3 |
| H Adm 406, Integrated Studies in the Hospitality Industry | 3 |
| H Adm 407, Seminar in Hotel Operations | 2 |
| H Adm 408, Casino Management | 2 |
| H Adm 501, Creative Management for Organizational Change | 3 |
| H Adm 502, Airline Management | 3 |
| H Adm 600, Undergraduate Independent Study—Organization Management | V* |
| H Adm 601, Management Intern Program I—Operations | 6 |
| H Adm 602, Management Intern Program II—Academic | 6 |
| H Adm 603, Hotel Ezra Cornell | V* |
| H Adm 700, Graduate Independent Research—Organization Management | V* |

| *Human Resources Management* | *Credits* |
|---|---|
| H Adm 313, Training for the Hospitality Industry | 3 |
| H Adm 414, Organizational Behavior and Small-Group Processes | 3 |
| H Adm 416, Special Studies in the Management of Human Resources | 3 |
| H Adm 511, Contemporary Employee Management Issues | 2 |
| H Adm 512, Managing Organizational Change and Productivity | 3 |
| H Adm 513, Situational Leadership and Organizational Behavior | 2 |
| H Adm 610, Undergraduate Independent Study—Human Resources Management | V* |
| H Adm 710, Graduate Independent Research—Human Resources Management | V* |
| H Adm 711, Negotiations in the Service Industry | 3 |

| *Financial Management* | *Credits* |
|---|---|
| H Adm 120, Survey of Financial Management | 2 |
| H Adm 123, Financial Accounting Principles | 3 |
| H Adm 321, Hospitality Management Contracts | 1 |
| H Adm 322, Investment Management | 2 |
| H Adm 323, Real-Estate Finance | 3 |
| H Adm 326, Corporate Finance | 3 |
| H Adm 328, Advanced Hospitality Managerial Accounting | 3 |
| H Adm 421, Internal Control in Hotels | 2 |
| H Adm 422, Taxation and Management Decisions | 3 |
| H Adm 620, Undergraduate Independent Study—Financial Management | V* |
| H Adm 720, Graduate Independent Research—Financial Management | V* |
| H Adm 724, Analysis and Interpretation of Financial Statements | 3 |
| H Adm 729, Hospitality Revenue Management | 3 |

| *Food and Beverage Management* | *Credits* |
|---|---|
| H Adm 336, Principles of Nutrition | 3 |
| H Adm 337, Food Composition and Properties: Chemical and Microbiological Aspects | 4 |
| H Adm 338, Nutrition and Fitness in the Resort, Hotel, and Spa Industry | 3 |
| H Adm 339, Airline Food-Service Management | 3 |
| H Adm 430, Introduction to Wine and Spirits | 2 |
| H Adm 431, Seminar in Independent Restaurant Operations Management | 3 |
| H Adm 433, Food-Service Management in Business, Industry, and Health Care Facilities | 3 |
| H Adm 434, Dessert Merchandising | 3 |
| H Adm 435, Selection, Procurement, and Supply Management | 3 |
| H Adm 436, Beverage Management | 2 |
| H Adm 437, Cultural Cuisines | 3 |
| H Adm 530, Seminar on the Restaurant in Society | 3 |
| H Adm 532, Seminar on Chain-Restaurant Operations | 3 |
| H Adm 533, Current Issues in Food Safety and Sanitation | 3 |
| H Adm 538, Gastronomy—Understanding Food-and-Wine-Pairing Principles | 2 |
| H Adm 539, Development and Management of Wellness in Business Organizations | 3 |
| H Adm 630, Undergraduate Independent Study—Food and Beverage Management | V* |
| H Adm 730, Graduate Independent Research—Food and Beverage Management | V* |

| *Marketing and Tourism* | *Credits* |
|---|---|
| H Adm 244, Tourism I | 3 |
| H Adm 245, Hotel Sales Management | 2 |
| H Adm 441, Advertising Strategies | 3 |
| H Adm 444, Tourism II | 3 |
| H Adm 449, International Marketing in the Hospitality Industry | 3 |
| H Adm 541, Marketing Communications Strategy | 3 |
| H Adm 542, Marketing Communications Media | 3 |
| H Adm 543, Marketing Research | 3 |
| H Adm 544, Services Marketing | 3 |
| H Adm 548, Marketing Practices in the Casino Industry | 2 |
| H Adm 640, Undergraduate Independent Study—Marketing and Tourism | V* |
| H Adm 740, Graduate Independent Research—Marketing and Tourism | V* |
| H Adm 742, Strategic Marketing Planning in the Hospitality Industry | 3 |

| *Properties Management* | *Credits* |
|---|---|
| H Adm 256, Insurance and Risk Management | 3 |
| H Adm 350, Principles of Real Estate | 3 |
| H Adm 351, Hospitality Facilities Design and Analysis | 3 |
| H Adm 352, Hotel Planning and Interior Design | 3 |
| H Adm 353, Introductory Food-Service Facilities Design | 3 |
| H Adm 356, Hospitality Risk Management | 3 |
| H Adm 358, Hospitality-Industry Real Estate | 3 |
| H Adm 451, Seminar in Properties Management | 1 |
| H Adm 453, Advanced Food-Service Facilities Planning and Design | 3 |
| H Adm 454, Restaurant Planning | 3 |
| H Adm 456, Hospitality Facilities Management | 3 |
| H Adm 457, Advanced Development and Construction | 3 |
| H Adm 554, Mixed-Use Development | 2 |
| H Adm 650, Undergraduate Independent Study—Properties Management | V* |
| H Adm 750, Graduate Independent Research—Properties Management | V* |

| *Management Support—Communications* | *Credits* |
|---|---|
| H Adm 266, Intermediate French: Le Français de l'Hotellerie | 3 |
| H Adm 267, Intermediate Spanish: Español de Hotelería | 3 |
| H Adm 364, Advanced Business Writing | 2 |
| H Adm 562, Seminar in Management Communication | V* |

| | |
|---|---|
| H Adm 660, Undergraduate Independent Study—Communications | V* |
| H Adm 760, Graduate Independent Research—Communications | V* |
| H Adm 761, Organizational Communication for Managers | 3 |
| *Management Support—MIS/Computers* | *Credits* |
| H Adm 170, Macintosh Tools | 3 |
| H Adm 171, Keyboarding for Managers on the Macintosh | 2 |
| H Adm 274, Hotel Computing Applications | 3 |
| H Adm 374, End-User Business Computing | 3 |
| H Adm 571, Analysis and Design of Information Systems | 3 |
| H Adm 572, Development of Decision Support Systems | 3 |
| H Adm 670, Undergraduate Independent Study—MIS/Computers | V* |
| H Adm 770, Graduate Independent Research—MIS/Computers | V* |
| *Management Support—Law* | *Credits* |
| H Adm 283, Law of Securities Regulation | 1 |
| H Adm 385, Law of Business | 3 |
| H Adm 486, Historical Development of the Right to Travel (summer only) | 3 |
| H Adm 487, Real-Estate Law | 2 |
| H Adm 680, Undergraduate Independent Study—Law | V* |
| H Adm 780, Graduate Independent Research—Law | V* |
| *Management Support—Other* | *Credits* |
| H Adm 490, Housing and Feeding the Homeless | 4 |
| H Adm 690, Undergraduate Independent Study—Management Support (Other) | V* |
| H Adm 790, Graduate Independent Research—Management Support (Other) | V* |

*Variable.

### Foreign Languages

Mastery of a foreign language is particularly desirable for students who are planning careers in the hotel or restaurant industries. Foreign language study at Cornell is characterized by small classes and emphasis on the spoken language. Students supplement their course work with study in a well-equipped language laboratory.

Further information on foreign language courses at Cornell, and placement in language courses, may be found in this book in the College of Arts and Sciences program description under the Modern Languages, Literature, and Linguistics section and also under the section Advanced Placement for Freshmen.

## GRADUATE CURRICULUM

Candidates for the Master of Science or Doctor of Philosophy degrees should refer to the admission and degree requirements set forth in the *Announcement of the Graduate School*. The student's program is developed with the aid and direction of a special committee chosen by the student from members of the Graduate Faculty. This committee also approves the thesis project.

Candidates for the Master of Professional Studies (M.P.S.) degree pursue one of four tracks in their graduate studies. Students whose undergraduate degrees are in areas other than hotel administration follow track I, for which the required two-year program is set forth below.

The curricula for M .P.S. tracks II and III are specifically designed for each student, based on previous experience and career goals. Students who hold four-year degrees in hotel administration from an institution other than Cornell qualify for the track II curriculum. A minimum of three residence units and 48 credits is required to complete track II . Track II students must take 12 credits in a concentration, 6 credits of monograph, 16 elective credits, and any required courses not yet completed prior to their arrival.

Track III is for students who hold a Bachelor of Science degree in hotel administration from Cornell. Two residence units and 32 credits are required to complete track III. Track III students must take 12 credits in a concentration, 6 credits of monograph, and 14 elective credits.

Track IV is for students who hold a master's degree and have no prior degrees in hotel administration. Three residence units and a minimum of 48 credits are required (if no required courses are exempted, 50 credits may be necessary to complete the program). Track IV students must take 12 credits in a concentration, 6 credits of monograph, prerequisites, and any required courses not yet completed.

All students are required to designate an area of concentration before their next-to-last term.

Each student also writes an investigative report or monograph, under the guidance of an adviser, to meet requirements for the M.P.S degree.

### Required Program for M.P.S. Track I Students

| *Required courses* | *Credit* |
|---|---|
| H Adm 705, Business Policy | 3 |
| H Adm 718, Advanced Human-Resources Management | 3 |
| H Adm 725, Graduate Managerial Accounting in the Hospitality Industry | 3 |
| H Adm 726, Graduate Corporate Finance | 3 |
| H Adm 731, Graduate Food and Beverage Management | 3 |
| H Adm 732, Graduate Operational Food-Production Systems | 3 |
| H Adm 741, Marketing Management | 3 |
| H Adm 751, Project Development and Construction | 3 |
| H Adm 774, Information Systems for Hospitality Managers | 3 |
| H Adm 791, Quantitative Methods | 3 |
| H Adm 805, M.P.S. Monograph 1 | 3 |
| H Adm 806, M.P.S. Monograph 2 | 3 |
| *Specifically required credits* | 36 |
| *Concentration credits* | 12 |
| *Free elective credits* | 16 |
| **Total credits required for M.P.S. Track I students** | **64** |

## DIRECTED STUDY

### Independent Research

Students may conduct independent research (directed study) projects in any academic area of the school under the direction of a faculty member. Credit is arranged on an individual basis. Only the first 3 credits of directed study may be credited against concentration credits during the undergraduate years. Additional directed study is credited against free electives. To enroll in an independent research project, students must obtain written permission from the school before course registration.

### Management-Intern Program

This program is open only to upperclass students. Students accepted into the program earn 12 credits, which can be applied as hotel electives or as free electives. With faculty approval some credits might be applied toward a concentration. Students enrolled in this program have an opportunity to combine managerial readings and previous course work with challenging work experience. Application for admission should be made one semester in advance. Guidance is provided by school staff members under the direction of a faculty committee. Management-intern positions are available at many locations worldwide, including several on the Cornell campus. Students receive both academic credit and practice credit, and appropriate financial remuneration for the period of the program. The student is charged reduced tuition.

### Study Abroad

Programs providing an opportunity to study in a foreign country and develop an awareness of the international component of the hospitality industry can contribute to each student's total educational experience. Students in recent years have studied in Italy, Spain, France, and England. Information on the many study-abroad programs operating during the summer and academic year is available at the University Career Center (in Sage Hall).

Students should discuss their plans with the school's study-abroad representative, Professor William Kaven, so that all petition and credit-evaluation procedures are followed.

# ORGANIZATION MANAGEMENT COURSES

**102 Distinguished Management Lectures**
Fall. 1 credit. Limited to hotel school students except by written permission. Elective.
Lec 01. F 1:25. Dean J. J. Clark.
A series of lectures given by nonresident speakers prominent in the hotel and restaurant industries and allied fields. Topics include career ladders, company profiles, and business-policy formulation.

**103 Principles of Management**
Fall. 3 credits. Limited to hotel school freshmen. Required.
Lec 01. T R 9:05; labs TBA. T. Cullen.
A systems approach to understanding the nature of management in the hotel and restaurant industry.

**103S Principles of Management**
Fall. 3 credits. Limited to DUS students, non-hotel school students, and transfer students. Required for transfer students.
Lec 01. T R 9:05; labs TBA. R. M. Chase.
A systems approach to understanding the nature of management in the hotel and restaurant industry.

**203 Club Management**
Fall, 7 weeks only. 2 credits. Elective.
Lec 01. M 2:30–6. R. James.
The private-membership club and how it differs from other forms of business in the hospitality industry. Topics include constitution and by-laws issues, administration and interface with board of directors and committees, recreation management, labor management, and marketing of major tournaments.

**303 Organizational Management**
Fall or spring. 3 credits. Limited to 65 students. Required.
C. Lundberg.
This course focuses on the design, development, and appropriateness of organizational systems, processes, and structures from a managerial perspective. Students will become familiar with alternative hospitality organizations through readings, case studies, and field experiences.

**304 Rooms-Division Management—Front Office and Reservations**
Fall, second 7 weeks only. 2 credits. Elective.
Lec 01. F 1:25–5. S. Weisz and visiting lecturers.
An introductory course concentrating on the fundamentals of rooms-division management. Areas of concentration include front-desk operations and the reservations, housekeeping, and telephone departments. Particular emphasis on selling strategies, forecasting, rate efficiencies, labor management, and guest relations.

**305 Resort and Condominium Management**
Fall. 3 credits. Not open to freshmen. Elective.
Lec 01. T R 10:10–11:25. M. A. Noden.
A lecture course in the operation of resort hotels and condominiums. Resorts of various types, seasons, and economic levels are considered. Emphasis is on the promotion of business, the provision of facilities, services, and guest entertainment. Contract and noncontract relationships with the travel industry are reviewed. Terminology, rental-pool agreements, S.E.C. regulations, state statutory requirements, developer-management-owner contracts, and relationships in condominiums are reviewed. Tax implications of both condominium ownership and management are fully considered.

**306 Franchising in the Hospitality Industry**
Spring, weeks 1–7. 2 credits. Elective.
Lec 01. M 1:25–5. D. E. Whitehead.
Relationships between franchisor and franchisee, advantages and disadvantages of franchising, structure and services offered by franchisors. Case studies of leading motor-inn and restaurant companies currently offering franchises will be discussed. Guest speakers from the franchising industry.

**401 Seminar in Management Principles**
On demand (see the registrar at the hotel school). 2 credits. Limited to 20 seniors and graduate students. Elective.
Faculty.
This course uses the case-study approach, and each student prepares a comprehensive analytical report, based on previous work, for class discussion and analysis. Sufficient time is given during the first few weeks of the course to review management principles and concepts and thus give the student an understanding of the type of report he or she is to prepare and of the analysis required during the discussion period.

**402 Hospitality-Management Seminar**
Fall. 1 credit. Limited to 20 seniors and graduate students. Elective.
Dean J. J. Clark and guest speakers.
A weekly meeting with the H Adm 102 speaker of the week. The subject matter varies from week to week, depending on the area of expertise of the speaker. The class is relatively unstructured, and students are expected to ask questions and enter into discussion.

**403 Integrative Senior Requirement**
Fall or spring. Required.
Faculty.
The Integrative Senior Requirement ensures that hotel students have an interdisciplinary overview of hospitality-industry operations prior to graduation. Courses 404, 405, 406, 407, and 431 provide this overview, and any one of them will satisfy the course requirement. The credit earned by the student is the credit assigned to the course selected.

**404 Management Organization of the Small Business**
Fall or spring. 3 credits. Limited to 20 juniors, seniors, and graduate students. Prerequisite: H Adm 325 or equivalent. Elective.
Lec 01. T 2:30–4:25, R 2:30.
P. Rainsford.
The course focuses on the entrepreneur and the decisions made in planning, financing, developing, and operating a new business venture. Case studies and guest speakers will be used. There will be one major term project, which will require the application of the course material to a field consulting project that will result in written and oral reports to the owner of the business and the Small Business Administration.

**405 Management Planning for the Hospitality Industry**
Spring. 3 credits. Limited to 25 hotel school students. Prerequisites: all required undergraduate courses at the 100, 200, and 300 levels. Elective.
Lec 01. T R 10:10–11:25. T. Cullen.
The integration and application of management concepts, theories, and practices to actual business situations. The focus is on management planning in a competitive hotel-industry environment.

**406 Integrated Studies in the Hospitality Industry**
Fall or spring, weeks 1–7. 3 credits. Limited to 18 seniors and graduate students. Elective.
Lec 01. T R 10:10, W 7–9 p.m.
R. M. Chase.
Analysis of case studies involving issues of business strategy, human relations, administration, marketing, and finance. Students will apply course principles through participation in a restaurant-management simulation exercise. Student groups will make presentations to guest critics.

**407 Seminar in Hotel Operations**
Spring. 2 credits. Limited to 30 seniors and graduate students. Estimated cost of field trip, $100. Elective.
Lec 01. W 11:15, F 11:15–1:10.
L. Weaver, D. Jameson.
Management theory and practice of hotel operations. How to inquire carefully into real hotel situations will be a major focus of this course. Students will be actively involved in writing and discussing cases on current operations issues.

**408 Casino Management**
Fall or spring, weeks 1–7. 2 credits. Limited to 45 hotel school students. Prerequisite: H Adm 325. Estimated cost of field trip, $150. Elective.
Lec 01. M 7:30–10 p.m. D. Whitehead.
Topics include the importance of casino operations with a casino hotel and the communication network between the casino and all other departments of the hotel. A field trip to an Atlantic City casino is required.

**[501 Creative Management for Organizational Change**
Spring. 3 credits. Limited to 24 students. Not offered 1989–90. Elective.
Faculty.
Through lectures, exercises, and group problem-solving sessions participants will analyze the characteristics of creative people and organizations, obtain an inventory of their own creative ability, examine blocks to creativity and ways to overcome them, discuss methods for leading creative problem-solving meetings, analyze strategies for producing organizational change, and apply creativity techniques to actual work problems.]

**[502 Airline Management**
Spring. 3 credits. Prerequisites: H Adm 211 and 212 or written permission of instructor. Not offered 1989–90. Elective.
M. Noden.
This course focuses on the airline industry and explores both pre- and post-regulatory climates. Emphasis is on dynamic organizational change in response to fluctuating economic and legal conditions. Topics include business organization, comparative corporate strategies, marketing and distribution networks, operation and service management, union relations, finance, government regulation, and air transport. Case studies will be used and guest lecturers will provide additional insights into the dynamics of airline management. Using the computer-based management simulation called AIRLINE, student teams will manage a regional carrier.]

**601 Management Intern Program I—Operations**
Fall, spring, or summer. 6 credits. Must be taken in conjunction with H Adm 602. Independent research. Elective.

**602 Management Intern Program II—Academic**
Fall, spring, or summer. 6 credits. Must be taken in conjunction with H Adm 601. Independent research. Elective.

**603 Hotel Ezra Cornell**
Fall or spring. Variable credit (maximum, 3). Prerequisite: written permission. Independent research. Elective.
Faculty.
Elected board members of Hotel Ezra Cornell may receive credit for developing, organizing, and managing the April "hotel-for-a-weekend."

**705 Business Policy**
Spring. 3 credits. M.P.S. requirement.
Lec 01. T R 1–2:15. T. Cullen.
The integration and application of management concepts, theories, and practices to actual business situations. The course focuses on strategic planning and on strategy and policy implementation in the hotel and restaurant industry.

## HUMAN-RESOURCES MANAGEMENT COURSES

**211 Human-Resources Management**
Fall or spring. 3 credits. Limited to 100 hotel school students, no freshmen or graduate students. Labs limited to 18 students each. Prerequisite: H Adm 103. Required.
Lec 01. M W 10:10–11:25. R. Eder.
An introduction to and survey of the personnel function and the human-resources-management function. How organizations plan, staff, motivate, evaluate, and develop employees to enhance productivity, advance the quality of work life, and ensure legal compliance in the management of employee relations. Topics include human-resource planning, job analysis, recruitment, selection, administration, and labor relations.

**211S Human-Resources Management**
Fall or spring. 3 credits. Limited to 100 non-hotel school students, no freshmen. Elective.
Lec 01. M W 8:40–9:55; labs TBA.
M. Eller.
An introduction to and survey of the personnel function and the human-resources management function. How organizations plan, staff, motivate, evaluate, and develop employees to enhance productivity, advance the quality of work life, and ensure legal compliance in the management of employee relations. Topics include human-resource planning, job analysis, recruitment, selection, administration, and labor relations.

**212 Human-Relations Skills**
Fall or spring. 3 credits. Limited to 100 students, no freshmen. Required.
Lec 01. M 7–10 p.m. H. Kramer.
Discussion and practice of human-relations skills necessary for managing people. Topics include supervising, motivating, and communicating with employees; leading effective meetings; conducting creative problem-solving sessions; and time and stress management. Analysis of individual leadership skills and interpersonal and intergroup process skills will be emphasized.

**313 Training for the Hospitality Industry**
Spring. 3 credits. Limited to 24 students. Prerequisite: H Adm 211. Elective.
Lec 01. T R 8:40–9:55. Faculty.
Training is a fundamental responsibility of hospitality managers and a primary solution to human-resource management problems. The training function within the hospitality industry will be analyzed, and a training and employee development model will be presented. Related subjects such as learning theories, task analysis, the writing of objectives, training methods, and program evaluation will be covered at both the conceptual and experiential levels. Students will gain experience designing and implementing a training program for a hospitality organization.

**414 Organizational Behavior and Small-Group Processes**
Fall or spring. 3 credits. Limited to 30 hotel school juniors, seniors, and graduate students by written permission of the instructor. Elective.
Lec 01. 7–10 p.m. R. Morano.
Applications of organizational behavior principles will be explored through lectures, case studies, and management games and exercises. Students will participate in experiential laboratories aimed at enhancing their effectiveness as members or leaders of groups. Topics that will be studied include leadership, decision making, motivation, power, and organizational change.

**416 Special Studies in the Management of Human Resources**
Spring. 3 credits. Limited to seniors and graduate students, and others with permission of instructor. Prerequisite: H Adm 211. Elective.
Lec 01. T 2:30–5. Faculty.
This course surveys broad, comprehensive human-resources management policy areas (employee relations, staffing, reward systems, and work-system design) from the strategic perspective of the general manager. Case studies and industry guest speakers are utilized. In addition to diagnosing and formulating strategic management-action plans, current trends, essential competencies, and related research developments are examined.

**511 Contemporary Employee Management Issues**
Fall. 2 credits. Elective.
Lec 01. W 12:20–5:30. A. Formicola.
A seminar course addressing issues affecting industry in general, but with particular emphasis on the service industry. Topics range from wage systems to sexual harassment. The course is for undergraduate students with management career goals who wish to understand the issues facing management in a constantly changing work force and environment.

**512 Managing Organizational Change and Productivity**
Spring. 3 credits. Limited to juniors, seniors, and graduate students. Elective.
C. Lundberg.
The critical issue facing managers today is how to cope with the endless barrage of socio-technological changes that confront them daily. Effective leaders must be able to plan and implement strategies that will enable changes to be realized in organizational development processes. This course will emphasize managerial and consulting techniques to identify and bring about changes in organizations and will provide hands-on practice in the design of an improvement program as a mechanism for organizational development.

**513 Situational Leadership and Organizational Behavior**
Spring. 2 credits. Limited to juniors, seniors, and graduate students. Elective.
Faculty.
How managers can successfully accomplish the goals of the organization through the efforts of employees. Emphasis will be on recent theories of motivation, behavior, and leadership, with direct application to the hospitality industry. Students will learn the basics of situational leadership and be able to apply this knowledge to managerial positions.

**711 Negotiations in the Service Industry**
Fall or spring. 3 credits. Limited to 40 juniors, seniors, and graduate students. Elective.
Lec 01. T R 8:40–9:55. E. Brooks.
The course examines the roles of managers as negotiators, both within the organization and for the organization. There will be discussion of planning and preparations, tactics, strategies, trends, power, timing, persuasion, the win-win concept, and developing alternatives. Cases are used and there will be opportunity for participation in both individual and team negotiations.

**718 Advanced Human-Resources Management**
Fall. 3 credits. Limited to 30 hotel school students, and non-hotel school graduate students as space permits, or by permission of instructor. Prerequisite: H Adm 211, an I/O psychology course, or equivalent. Required.
Lec 01. M W 1–2:15. C. Lundberg, R. Eder.
The focus will be on development of human-resource management skills and exploration of the dilemmas and responsibilities of leadership. Students will gain insight into their patterns of management behavior by integrating conceptual material with management games and simulations, interaction analysis, and constructive feedback. Industry executives will evaluate students' management skills in a student-designed assessment center.

## FINANCIAL MANAGEMENT COURSES

**120 Survey of Financial Management**
Fall or spring. 2 credits. Limited to students outside the hotel school. Elective..
Lec 01. 2:30–4:25. Faculty.
A survey of accounting principles, financial statements, cash forecasting, and cash budgeting, and an introduction to financial analysis. Intended for students who desire a general knowledge of the language of business and finance.

**123 Financial Accounting Principles**
Fall or spring. 3 credits. Limited to students outside the hotel school. Elective.
Lec 01. T R 2:30–4:25. Faculty.
An introduction to the basic principles of accounting, involving transaction analysis, flow of accounting data to the financial statements, and careful consideration of accounting for revenues, expenses, assets, liabilities, and owner's equity.

**125 Finance**
Fall or spring. 3 credits. Limited to students outside the hotel school.
Lec 01. M W 1:25. Faculty.
An objective study of the financial function in a profit-oriented enterprise. Important concepts include cash flow, the time value of money, and capital budgeting. Emphasis is on the analysis of accounting information, problem solving, and decision making.

**225 Financial Accounting**
Fall. 3 credits. Limited to hotel school students. Required.
Lec 01. T R 12:20; labs TBA.
D. H. Ferguson.
The basic principles of accounting, including transaction analysis, flow of accounting data to the financial statements, and careful consideration of accounting for revenues, expenses, assets, liabilities, and owner's equity.

**226 Financial Management**
Spring. 4 credits. Limited to hotel school undergraduates. Limited to 50 students per lab. Prerequisite: H Adm 225 or equivalent. Required.
Lec 01. T R 2:30–4:25; labs TBA.
S. A. Carvell, A. N. Geller.
The course will facilitate a broad understanding of both managerial accounting and finance. The overall objective is to develop skill in using accounting information for managerial planning, control, and evaluation and to learn to incorporate accounting knowledge into a framework for short-term and long-term financial decision making. Topics will include budgeting, current asset management, financing, capital budgeting, cost of capital, and problems in international finance and accounting.

**321 Hospitality Management Contracts**
Spring, last 7 weeks. 1 credit. Elective.
Lec 01. R 10:10–12:05. J. Eyster and guest lecturers.
The negotiation and administration of hospitality management contracts are discussed with major emphasis on contract concerns of owners and operators, financial assessment of owner and operator returns, development of negotiation strategies, and alternative forms of operating agreements.

**322 Investment Management**
Fall or spring. 2 credits. Limited to juniors, seniors, and graduate students. Elective.
Lec 01. R 2:30–4:25. A. Arbel.
The course covers institutional and analytical aspects of security analysis and investment management: securities markets, sources of investment information, bonds and stocks valuation, risk-return analysis, behavior of security prices, portfolio analysis, and portfolio management. The course also covers the capital asset pricing theory, the generic stock investment strategy, and the screen-to-profile approach and their practical implications for security analysis and investment management. Computer-assisted analysis is discussed and applied in a realistic manner, using large databases and interactive screening computer packages. No previous knowledge of computers is required. Students are required to participate in an investment game in which they select and manage large portfolios under real-life conditions.

**323 Real-Estate Finance**
Spring. 3 credits. Prerequisite: H Adm 325 or equivalent. Elective.
Lec 01. M W 12:20–2:15. J. Eyster.
Methods of analyzing real-estate returns for both owners and lenders and various equity and debt structures, to include: joint ventures; limited partnerships; syndications; construction mortgages; "permanent" debt financing vehicles, to include participating, convertible, seller-financial, and government-assisted loans and mortgages; work-out strategies for distressed properties; and analysis of various forms of operating agreements, to include management contracts, leases, franchises, and referral agreements. Presentations by hospitality-industry real estate practitioners will tie course material to current industry practices.

**325 Hospitality Financial Management**
Fall. 3 credits. Required.
Lec 01. T R 8:40–9:55. J. Eyster.
The course integrates the areas of financial accounting, managerial accounting, and finance and applies the interpretive and analytical skills of each to hospitality-industry situations. Specific topics include uniform system of accounts, revenue and expense tracking and internal control, accounting systems, ratio and comparative analysis, capital budgeting decision making, equity and debt-financing structures, and operating agreement forms. Students analyze hospitality operations and projects using the above techniques and present their findings in management report form.

**326 Corporate Finance**
Fall. 3 credits. Limited to juniors and seniors. Prerequisite: H Adm 222 or equivalent. Elective (concentration requirement).
S. A. Carvell.
In-depth analysis of corporate financial management, including financing alternatives and capital structure decisions, cash management, capital budgeting decisions, risk analysis, and working-capital management.

**328 Advanced Hospitality Managerial Accounting**
Spring. 3 credits. Prerequisite: H Adm 225 and 226 or equivalent. Elective.
Lec 01. M W 10:10–11:25.
D. H. Ferguson.
Emphasis is on the use of accounting information for managerial planning, control, analysis, and evaluation. The coverage will include the principles of managerial accounting, cost allocation, management control, models for decision making, and the special topics of joint products and by-products, transfer pricing, responsibility accounting, and performance measurement. The course explores the application of managerial accounting concepts to the hospitality industry. Case studies will be used.

**421 Internal Control in Hotels**
Spring. 2 credits. Limited to 30 juniors, seniors, graduate students, and others who have permission of the instructor. Prerequisite: H Adm 325 or 725, or equivalent. Elective.
Lec 01. T R 12:20. A. N. Geller.
Discussion of problems encountered in distributing the accounting and clerical work in hotels and restaurants so as to provide a good system of internal control. Study of many actual cases of the failure of internal control and the analysis of the causes of the failure. Practical problems and actual techniques of functioning systems of internal control are examined.

**422 Taxation and Management Decisions**
Fall. 3 credits. Limited to 50 juniors, seniors, and graduate students. Elective.
A. J. Sciarabba.
An introduction to tax advantages and disadvantages of various organizational structures, including corporations, partnerships, and Subchapter S corporations; financial-information reporting to tax authorities and shareholders and how they differ; use of depreciation methods to achieve tax reductions; syndication techniques; and the role tax laws play in promoting private investment and development.

**724 Analysis and Interpretation of Financial Statements**
Fall. 3 credits. Limited to seniors and M.P.S. students. Elective.
A. N. Geller.
The course covers the financial accounting issues that are encountered in reporting the results of operations for corporate enterprises. Accounting principles as well as future extensions will be explored and discussed. Emphasis will be on the components of financial statements, how and why they are reported, and their impact on the overall financial position of the firm and its acceptance in capital markets. The underlying objective of the financial statement expertise will be to analyze a firm as a whole and interpret that analysis. Emphasis will be on both outsiders' views of the company and decision making through interpretation of the statements.

**725 Graduate Managerial Accounting in the Hospitality Industry**
Fall. 3 credits. M.P.S. requirement.
A. N. Geller.
Hotel and restaurant accounting systems that provide decision-making information to management are reviewed. Methods of operational analysis for hospitality properties are evaluated and utilized to include ratio, comparative, and cost-volume-profit analyses. Other topics include internal control, operational budgeting, and the use of feasibility studies in long-term capital-budgeting decisions. The student's ability to communicate analytical results through the use of management letters is emphasized.

**726 Graduate Corporate Finance**
Spring. 3 credits. Limited to graduate students. Prerequisite: H Adm 726. Recommended: knowledge of algebraic techniques and elementary statistics (students who have not recently had a statistics course are urged to study review books in mathematics and elementary statistics). M.P.S. requirement.
Lec 01. T R 10:10–12:05. A. Arbel.
An introduction to the principles and practices of business finance, including the development of theory and its application in real-life projects. Topics include risk analysis, valuation concepts, capital budgeting, cost of capital, capital structure, dividend policy, long-term financing, financial planning, short- and intermediate-term financial management, and mergers and consolidations. Computer-assisted decision support models are applied in a realistic manner using interactive packages. The course assumes knowledge of quantitative techniques and basic statistics.

**729 Hospitality Revenue Management**
Fall. 3 credits. Limited to graduate students and a limited number of undergraduates with written permission of instructor. Prerequisite: a background in economics and marketing or finance. Elective.
A. Arbel.
New techniques in hotel and restaurant pricing policies, which include pricing theory as applied to the service industry, the ideal pricing system, and the concept of revenue management. Also included is the implementation of revenue management: the diagnostic system, the cost side, the demand side, the simultaneous solution, multi-pricing systems, market segmentation, product differentiation, price discrimination, the feedback mechanism, and update and control. New computer programs for revenue and yield management will be critically evaluated.

## FOOD AND BEVERAGE MANAGEMENT COURSES

**135 Culinary Theory and Practice**
Fall or spring. 4 credits. Required.
Lec 01. M 2:30–3:45, F 8:40–9:55; labs TBA. T. Neuhaus, T. O'Connor, B. Richmond.
This course is designed to introduce the student to food and beverage operations through three major components: fundamental food composition and properties, food products and preparation, and food-service sanitation. Students will research recipes, prepare menus and production schedules, and evaluate the quality of final products. The course also presents food and beverage operation types, their associated menus, and dishes and preparation techniques that distinguish them.

**235 Food and Beverage Management**
Fall or spring. 4 credits. Limited to hotel school students. Prerequisite: H Adm 135. Required.
Lec 01. W F 10:10–12:05; secs TBA. D. Romm.
An introduction to the principles of food and beverage management, beginning with an overview of the food and beverage industry at large. Attention is focused on major industry segments and current trends. The applicability of service management concepts is examined. Subsequently, detailed consideration is given to the components of the food-service delivery system: marketing, menu planning, logistical support, production, service, controls, and quality assurance. Product and systems differentiation in various industry segments are emphasized throughout.

**335 Restaurant Management**
Fall or spring. 4 credits. Prerequisites: H Adm 135 and 235. Approximate cost of utensils and manual, $60. Required.
Lec 01. M 10:10–12:05; labs TBA. T. Kelly, R. White, G. Pezzotti.
A restaurant-management course in which each student participates as a manager of a fine-dining operation. Lectures cover the general management function of restaurant operations, including such topics as restaurant analysis, the consumer's view of the dining experience, and computer applications in the restaurant environment. Case studies dealing with actual restaurant issues will require the student to draw on the materials learned in previous courses. All aspects of production and service in a fine-dining setting will be demonstrated, discussed, and, to a great extent, experienced. The laboratory includes an extensive hands-on managerial experience as well as providing an opportunity for the student to become familiar with the various line positions in the restaurant. As manager, the student is required to prepare a complete planning and summary report. Students are required to provide their own French knife, paring knife, corkscrew (screwpull or captain's), and meat thermometer, as well as portions of the service-production uniforms.

**336 Principles of Nutrition**
Fall. 3 credits. Prerequisites: H Adm 135 and 235, and corequisite 337, or permission of instructor. Elective.
M. Tabacchi.
Designed especially for students interested in the nutritional aspects of the restaurant industry, particularly health spas and hotels that emphasize nutrition and fitness. The nutrient composition of fresh and processed foods, nutrient handbooks, recommended daily allowances, dietary goals as related to restaurants, nutrition labeling, additives, special diets, fad diets, and weight control are studied. The laboratory sessions emphasize creative production of high-quality, nutritious food. The uses of nutrients and nutrient interactions are emphasized. An excellent elective for upper class and graduate students.

**337 Food Composition and Properties: Chemical and Microbiological Aspects**
Fall or spring. 4 credits. Prerequisites: H Adm 135 and 235 (may be taken as a corequisite). Elective.
T. Neuhaus, B. Richmond.
A study of the chemical and microbial properties of raw and cooked foods used and served in the food-service industry. Lectures cover the chemistry of water, carbohydrates, fats, and proteins in relation to food groups. Labs provide the opportunity to produce menu items and to relate food-production techniques to material presented during lectures. Emphasis is placed on development of the student's sensitivity to flavor, texture, aroma, and appearance, and on awareness of food safety. The course ends with a study of convenience foods and the additives used to prolong shelf life and improve handling.

**338 Nutrition and Fitness in the Resort, Hotel, and Spa Industry**
Spring. 3 credits. Limited to juniors, seniors, and graduate students. A previous course in nutrition or food science is helpful but not required. Elective.
Lec 01. M W 9:05; labs TBA.
M. Tabacchi.
Especially designed for students who are interested in the fitness and nutrition trend in private restaurants, resorts, and hotels. This course will also include the benefits of exercise, fitness, and nutrition as they affect the individual. Nutritious menu design and the design of fitness programs, equipment, and facilities will be emphasized. Personnel required and legal, medical, and managerial implications will be discussed. Guest speakers from various spas, wellness centers, and fitness centers will be included.

**339 Airline Food-Service Management**
Fall. 3 credits. Prerequisite: H Adm 235, or coregistration in H Adm 235 and 437, or permission of instructor. Field trip expenses, $250 maximum. Elective.
M. Tabacchi.
This course provides students with industry-specific information for career-planning purposes. Case studies are included. A field trip to an airline's hub city enables students to visit a flight kitchen, a vendor, an airline company, and a distributor. Guest speakers representing various sectors of the industry (airline food and beverage managers, entrepreneurs who provide goods and services to the industry, and in-flight feeding and catering companies) are included.

**430 Introduction to Wine and Spirits**
Fall or spring. 2 credits. Limited to hotel school juniors and seniors, and seniors and graduate students in all other colleges. All students must be 21 years old. S-U grades only. Elective.
Lec 01. W 2:30–4:25. S. A. Mutkoski, C. Muller, B. Lang.
An introduction to the major wine-producing regions of the world and what the consumer needs to know to purchase wine, spirits, and beers at retail outlets and in a restaurant setting. Lecture topics will include flavor components in wine, pairing wine and food, responsible drinking, selecting quality and value wine, and wine etiquette. Samples from a variety of countries, regions, and vineyards will be evaluated.

(Preregistered students who do not attend the first class and fail to notify the course secretary of their absence are automatically dropped from the instructors' records. The student must then follow the normal drop procedure in his or her school.)

**431 Seminar in Independent Restaurant Operations Management**
Fall or spring. 3 credits. Limited to 12 students. Prerequisite: written permission of instructor. Five field trips required; maximum total cost, $250. Elective.
T. J. Kelly.
The course is designed for students who have a strong interest in food and beverage operations and who may be considering a career as an entrepreneur. Under the supervision of the instructor, and using student-developed case studies, the students will visit and analyze various independently owned restaurant operations. Analysis will cover, but will not be limited to, the restaurant's concept and market, organization, ownership, management, physical structure, staff, front-of-the-house operations, back-of-the-house operations, and fiscal integrity. Readings relevant to current topics in the restaurant industry will be required. Classes will alternate weekly between field trips and seminar/case presentations.

**433 Food-Service Management in Business, Industry, and Health Care Facilities**
Spring. 3 credits. Limited to 25 students. Prerequisite: H Adm 235 or equivalent. Elective.
Lec 01. W F 10:10–11:40. T. O'Connor.
This course is designed to explore and analyze the food-service management in business, industry, and health-care facilities, such as in office and industrial complexes, airline catering, educational institutions, contract companies, and hospital and extended-care facilities. Characteristics of organizational structures, human-resource needs, controls, systems design, specialty equipment, and government regulations will be presented. Course work involves readings, small investigative projects, discussions, and local site visits.

**434 Dessert Merchandising**
Spring. 3 credits. Prerequisite: H Adm 135. Elective.
Lec 01. R 9:05; lab R 12:20–5:30.
T. Neuhaus.
A hands-on course providing exposure to a variety of breads, pastries, cakes, and other desserts. The student develops production skills and an appreciation of quality and, by the end of the course, should be able to estimate the resources and time required for producing a particular recipe.

**435 Selection, Procurement, and Supply Management**
Fall or spring. 3 credits. Limited to 30 students. Prerequisite: H Adm 235 or 731. Elective.
Lec 01. T 10:10–12:05; lab 01 R 10:10–12:05; lab 02 W 2:30–4:25.
G. Norkus, R. Spies.
The objectives of this course are to assist the student in developing, understanding, and applying concepts of purchasing and supply management, and to show how to establish and professionally manage such a system.

**436 Beverage Management**
Spring. 2 credits. Limited to 30 hotel school students. Prerequisite: H Adm 430. Elective (concentration requirement).
Lec 01. W 10:10–12:05. S. A. Mutkoski, C. Muller, B. Lang.
This course is designed to meet the needs of upperclass students interested in food and beverage management, specifically dealing with the current responsibilities of the service of alcoholic beverages. Lectures will develop skills and awareness of Dram shop; staff training and responsible customer control; beverage pricing; food and wine pairings; wine-list development; purchasing, storage, and service; wine regions; cost controls and loss prevention; and creative beverage merchandising. Numerous guest lecturers will highlight industry trends and outlooks. Advanced tastings will be conducted during class.

**437 Cultural Cuisines**
Fall. 3 credits. Limited to 20 students. Prerequisite: H Adm 135, 165, or equivalent. Elective.
T. O'Connor.
This seminar will explore various cuisines in terms of history, life-style, and foods peculiar to a culture. Through readings, research, and meal preparation, students will explore various cuisines in depth. The goal of the course is to develop an awareness of several international cuisines, enabling students to make comparisons and draw relationships among foods of different cultures. Each student will be involved in research reports, oral presentations, and designing and orchestrating the preparation of menus.

**530 Seminar on the Restaurant in Society**
Spring. 3 credits. Elective.
Lec 01. M W 10:10–11:25. D. Romm.
This seminar looks at the restaurant from a broad social perspective. Topics addressed will be the historical development of the restaurant; cultural, social, and psychological factors affecting the customer and server; the social world of the restaurant; and the place of the restaurant in contemporary society. Relevant implications for both management and consumer are also discussed. Students will undertake research projects as part of their participation in the course.

**532 Seminar on Chain-Restaurant Operations**
Fall. 3 credits. Prerequisite: H Adm 235 or permission of instructor. Additional cost for field trips. Elective.
D. Romm.
Chain restaurants account for 40 percent of food-service industry sales and 50 percent of customer traffic. After reviewing the history and development of chain restaurants, the course will concentrate on service and operations-management issues. Strategies of marketing, expansion, and diversification are discussed. Chains from different industry segments will be compared. Topics include corporate versus unit-level priorities and responsibilities, marketing, site selection, menu planning, product development, production planning, facility and equipment design, and recruitment and training. Students will conduct research projects on individual chains and report back to the class. The course will include field trips.

**533 Current Issues in Food Safety and Sanitation**
Spring. 3 credits. Limited to juniors, seniors, and graduate students. Prerequisite: H Adm 135, 235, 731, 173, or permission of instructor. Elective.
Lec 01. W 12:20, F 11:15–1:10.
B. Richmond.
A study of current issues in food safety and sanitation procedures and regulations that affect managerial decisions in food service and hospitality operations. Topics include risk assessment and hazard analysis; legal responsibilities related to food, food handlers, and equipment and facilities; food-borne illness and other public-health concerns; and certification and training. Preparation for NIFI/NRA certification and the Food Protection (ETS) certification exam is offered with this course. The exam is optional.

**538 Gastronomy—Understanding Food-and-Wine-Pairing Principles**
Spring. 2 credits. Limited to 20 hotel school seniors and graduate students. Elective.
Lec 01. T 7–9 p.m. B. Lang.
A hands-on class enabling students to study and taste regional varietal wines and to understand wine-and-food-pairing principles. Topics include an overview of the present wine industry's response to current and pending legislation, the necessity of marketing wine (via wine lists) through its relationship with food, creative theme dinners, and on-premise merchandising. Students design, organize, and present a wine and food tasting; develop wine and food promotional events; and critique a restaurant's wine list and menu.

**539 Development and Management of Wellness in Business Organizations**
Spring. 3 credits. Limited to juniors, seniors, and graduate students. Elective.
Lec 01. T R 8:40–9:55. M. Tabacchi.
The course encourages future business professionals to emphasize and manage wellness and preventive medicine in the work place. Students learn how to design, implement, and evaluate a comprehensive wellness program in an organization. Case studies and guest speakers from the industry address the issues of diagnosing the employee population, sustaining employee participation, evaluating the cost/benefit aspects of a wellness program, and choosing alternative health-insurance strategies. The stressors that may cause illness in the work place, as well as lifestyle factors affecting health, are also examined.

**731 Graduate Food and Beverage Management**
Fall. 3 credits. Limited to hotel school graduate students. Estimated cost of field trip, $150. M.P.S. requirement.
S. A. Mutkoski, C. Muller.
The technical, managerial, and human-resources skills needed to be successful in food-service management. Topics such as market analysis, concept development, menu planning, operations management, and marketing are addressed in a seminar format.

**732 Graduate Operational Food-Production Systems**
Fall or spring. 3 credits. Limited to hotel school students. Prerequisite: H Adm 731. Estimated expense for clothing and utensils, $95. M.P.S. requirement.
Prod. lab F 2:30–closing; Tech. lab R 2:30–5:30. D. Romm, R. Spies.
A food and beverage management course in which the class operates a fine-dining restaurant. The production lab allows students to rotate through the various line positions of a restaurant operation. In turn, each student serves as the manager with responsibilities for menu planning, marketing, pricing, scheduling, and profit-and-loss analysis. In the techniques lab, students are introduced to selected topics in applied food and beverage management. These include wines and wine service; basic culinary procedures; handling and carving meats and fowl; seafood; pasta; and pizza.

## MARKETING AND TOURISM COURSES

**243 Principles of Marketing**
Fall or spring. 3 credits. Not open to freshmen. Required.
Lec 01. T R 10:10–11:25. W. H. Kaven.
This course is intended to provide the undergraduate hotel administration student with an overview of the discipline of marketing as it applies to the hospitality industry. The primary aim is to understand how a marketing strategy is devised, especially the interrelationship of company objectives, internal resources, and the external operating environment. A second aim is to show how the special nature of services affects the development of marketing strategies in the hospitality industry.

**244 Tourism I**
Fall. 3 credits. Not open to freshmen. Elective.
M. A. Noden.
An introductory course in the study of tourism. The origins and evolution of contemporary tourism will be carefully examined. Students will be familiarized with the various supply components of the tourism industrial base and their integration on an international scale. The effects of mass-volume tourist demand upon destination development will be explored through the use of selected limited case studies. A series of guest lectures by well-known experts from the travel industry will highlight the economic operations and effects of tourism in both the public and private sectors. This course is open to all students in the university and will serve as the principal prerequisite for the advanced course.

**245 Hotel Sales Management**
Fall or spring. 2 credits. Elective.
Lec 01. F 1–5. Faculty.
The course emphasizes understanding and managing the sales function in hotels. Topics include market-plan development, sales strategies, market purchase behavior, allocation of resources, and evaluation of results.

**441 Advertising Strategies**
Spring, weeks 1–7. 3 credits. Limited to 50 seniors and graduate students. Prerequisites: 3 credits each of psychology and marketing, or permission of instructor. Elective.
P. Yesawich.
The development of effective advertising strategies for consumer goods and hospitality services. Lectures will focus on principles drawn from psychology, communication theory, and marketing.

**444 Tourism II**
Spring. 3 credits. Limited to juniors, seniors, and graduate students. Prerequisites: H Adm 244 plus six credits in economics and/or marketing, or equivalents, or written permission of instructor. Elective.
Lec 01. T R 11:55–1:10. M. A. Noden.
An advanced course in the study of tourism. Emphasis will be placed on the development of the tourism industrial base and development and financing of superstructure and infrastructure. Econometric model development for demand predictions will be examined and analyzed. Students will be expected to engage in a wide range of discussion and analysis of the effects of tourism on various environments in social and economic terms. Case studies of various tourism-generating areas will be used. Occasional guest lectures will be given by experts in both public and private sectors.

**449 International Marketing in the Hospitality Industry**
Fall. 3 credits. Prerequisites: H Adm 281 and 282. Elective.
W. H. Kaven.
This course will develop students' understanding of international marketing with emphasis on hospitality-industry applications. It will focus on (1) the similarities and differences that exist between domestic and international marketing and (2) the conduct of international marketing in various segments of the world.

**541 Marketing Communications Strategy**
Fall. 3 credits. Limited to juniors, seniors, and graduate students. Prerequisite: a previous marketing course. Elective.
W. H. Kaven.
Students will learn about the key variables in marketing communication and their proper application in situation analysis; determination of objectives and budgets; analysis of media resources; message creation; and organization, coordination, and evaluation of the promotional program. The course will use text material, case studies, readings, lectures, and key speakers. Upon completion of the course the student should be able to develop, organize, and produce a credible promotion strategy and plan of action.

**542 Marketing Communications Media**
Spring. 3 credits. Elective.
Lec 01. M 1:25–4, W 1:25–2:15. C. Dev.
The management of external communication programs for firms in the hospitality industry. Topics include advertising, public relations, sales promotion, direct mail, and telemarketing.

**543 Marketing Research**
Fall or spring. 3 credits. Limited to 35 students. Limited to hotel school graduate students. Prerequisites: previous marketing course and 3 credits of statistics or H Adm 791. Elective.
Lec 01. M W 11:55–1:10.
L. M. Renaghan.
The nature and use of marketing research in the hospitality industry. The emphasis is on the management of the process rather than technical aspects of research methodology. Students will have extensive opportunity to critique methodology, analyze data, present results, and make management recommendations.

**544 Services Marketing**
Spring. 3 credits. Limited to graduate students. Prerequisite: a previous marketing course. Elective.
Lec 01. M W 8:40–9:55. L. M. Renaghan.
Marketing principles applicable across the entire service sector. The marketing strategies of many service-industry firms are evaluated . New marketing approaches uniquely applicable to services are considered, as well as the reformulation of traditional principles from consumer- and industrial-goods marketing.

**548 Marketing Practices in the Casino Industry**
Fall. 2 credits. Limited to 25 juniors, seniors, and graduate students. Prerequisite: H Adm 243. Elective.
Lec 01. M 1:25–5. D. Whitehead.
An overview of the history and scope of casino marketing practices and the behavior patterns of casino players. All market segments are analyzed to determine specific marketing mixes, and appropriate strategies for individual casinos will be evaluated. During a field trip to Atlantic City students analyze the market and determine each hotel's market position. Students research an assigned casino to formulate data for a marketing plan.

**741 Marketing Management**
Fall. 3 credits. M.P.S. requirement.
C. Dev.
The management of the corporate marketing function, with emphasis on firms in the hospitality industry. The emphasis is on developing the student's organizational, analytical, and decision-making capabilities through involvement in case experiences. No prior marketing knowledge is assumed.

**742 Strategic Market Planning in the Hospitality Industry**
Spring. 3 credits. Elective.
Lec 01. T R 8:40–9:55. C. Dev.
The application of strategic management concepts and principles to marketing in the hospitality industry through lectures, discussions, and the development of case studies.

## PROPERTIES MANAGEMENT COURSES

**255 Hospitality-Facilities Development and Planning**
Spring. 3 credits. Required.
Lec 01. M W F 12:20; labs TBA.
M. H. Redlin.
An introduction to and management overview of the problems and opportunities inherent in the development and planning of hospitality facilities. Course components include the project-development sequence; conceptual and space planning; architectural, engineering, and construction criteria; and the interpretation of architectural and consultant drawings. The emphasis is on setting appropriate requirements, understanding industry practice, and implementing decisions within a balanced design, operations, and financial framework.

**256 Insurance and Risk Management**
Fall. 3 credits. Elective.
Lec 01. M 7–9:30 p.m. D. Ferris.
A comprehensive look at risk management within a general business or institutional environment. Topics to be reviewed include the risk-management process; the role of loss-exposure identification; loss-control options, including insurance and non-insurance solutions; and the general legal environment that creates a potential for loss. Students will analyze and discuss business situations from a risk-management viewpoint.

**350 Principles of Real Estate**
Fall or spring. 3 credits. Elective.
Lec 01. T R 2:30–3:45. J. Corgel.
An introduction to real estate from four perspectives: legal, economic, financial, and business. Understanding these perspectives will enable students to make better investment decisions, to use real-estate resources wisely, to understand public-policy issues, and to be prepared for advanced courses in real-estate investment, finance, and development.

**351 Hospitality Facilities Design and Analysis**
Fall. 3 credits. Prerequisite: H Adm 255 or 751 or permission of instructor. Elective (concentration requirement).
Lec 01. F 11:15; labs TBA. M. H. Redlin.
A lecture-studio course dealing with property development, planning, and design by focusing on the interpretation and analysis of restaurant and hotel plans. Students learn basic graphics techniques and apply them to planning problems for hospitality facilities. The course features one-day field trips to nearby hotels and restaurants, some under construction, and includes a final project dealing with the design or analysis of a lodging or restaurant facility.

**[352 Hotel Planning and Interior Design**
Spring. 3 credits. Prerequisite: H Adm 351. Minimum cost of required field trip, $200. Elective.
R. H. Penner.
A project course concerned with hotel planning, interior design, and renovation. Students will establish the operator's criteria for the design of hotel guest rooms and public areas, prepare budgets, and develop preliminary conceptual designs leading to a substantial graphic presentation at the end of the term. Drawing ability is essential.]

**353 Introductory Food-Service Facilities Design**
Spring. 3 credits. Limited to 15 students. Prerequisites: H Adm 351 and 335 for undergraduate students, H Adm 732 for graduate students; coregistration in H Adm 335 or 732 is acceptable; all others by written permission of instructor. Elective.
Lec 01. M W 9:05; lab 01 R 10:10–12:05; lab 02 R 2:30–4:25. M. H. Redlin.
The course reviews basic concepts of food-service facilities design and planning, including space allocation, work flow, and equipment selection. Students plan, design, prepare drawings, and write specifications for a medium-size restaurant kitchen.

**355 Hospitality Facilities Construction and Operation**
Fall. 3 credits. Required.
Lec 01. M W F 12:20; labs TBA.
D. M. Stipanuk.
The construction process, including costs, project management, scheduling, and contracts. An overview of building mechanical and electrical systems and the responsibilities of the engineering-maintenance department. Will also review the renovation process for hospitality facilities.

**356 Hospitality Risk Management**
Spring. 3 credits. Elective.
Lec 01. M 7–9 p.m., labs TBA.
D. M. Stipanuk.
The identification and management of risk associated with fire, security, and safety problems. Topics include design, equipment, staffing, employee training, emergency preparedness, and basic elements of insurance coverage.

**358 Hospitality-Industry Real Estate**
Spring. 3 credits. Prerequisite: H Adm 350. Elective.
Lec 01. M W 2:30–4:25. J. Corgel.
Real estate as a capital investment in the hospitality industry. Lectures will cover the relationship of real estate to the marketing strategy of a company and its investment decisions, the marketing and merchandising of real estate, the financing of real estate, and the effects of existing real-estate financing on a company's overall corporate financial structure and on its ability to raise funds for future expansion. A field trip and case studies will deal with the application of these topics to existing situations.

**451 Seminar in Properties Management**
Fall. 1 credit. Elective (concentration requirement).
Lec 01. F 2:30. Faculty.
A course in which faculty, graduate students, and invited speakers present and discuss issues in facilities design, development, and operation.

**453 Advanced Food-Service Facilities Planning and Design**
Fall. 3 credits. Limited to 12 students. Prerequisite: H Adm 353. Elective.
M. H. Redlin.
The course reviews the application of basic concepts of food-service facilities design and planning for a hotel project. Emphasis is on preparing a program, developing equipment layouts, and making presentations to clients.

**454 Restaurant Planning**
Spring. 3 credits. Prerequisite: H Adm 355 or 751. Elective.
J. deRoos.
Development, design, and construction of restaurants. Topics include market analysis, site selection, menu development, space allocation, trade practices, regulations, equipment and furnishings, cost estimations, financial analysis, and management responsibilities.

**456 Hospitality Facilities Management**
Spring. 3 credits. Elective.
Lec 01. T R 10:10–11:25.
D. M. Stipanuk.
Management of the physical plant of hospitality buildings. Basic building-systems design and operation, physical-plant maintenance, planning, and budget development; and management of energy programs. Case studies of hospitality facilities.

**457 Advanced Development and Construction**
Fall. 3 credits. Prerequisite: H Adm 355 or 751. Elective.
Lec 01. T R 8:40–9:55; labs TBA.
J. deRoos.
The treatment of development as a process, as viewed from the perspective of the owner. Topics include feasibility-study analysis, budgeting, scheduling, construction administration, value engineering, and issues related to site zoning and codes.

**[554 Mixed-Use Development**
Fall. 2 credits. Prerequisite: a course in finance, real estate, or development. Anticipated cost of field trip, $200. Not offered 1989–90. Elective.
Faculty.
The basic characteristics of mixed-use developments, including their design, financing, marketing, and operational management. The role of hotels and food-service facilities in such developments is emphasized. Guest lecturers, case studies, and field trip will supplement lectures.]

**751 Project Development and Construction**
Fall. 3 credits. Minimum cost of field trip, $200. M.P.S. requirement.
Lec 01. W F 8:40–9:55; lab 01 W 10:10; lab 02 W 11:15. M. H. Redlin.
The major elements of the project-development, hotel-planning, and construction process. Topics include the role of the development team, feasibility studies, functional planning and design, architectural and engineering criteria, construction contracts, project scheduling, interpretation of architectural drawings, and building construction. A group project is included and a field trip is required.

## COMMUNICATION COURSES

**165 Managerial Communication: Writing Principles and Process**
Fall or spring. 3 credits. Each lecture limited to 20 students. (Because of the strict class-size limitation, a student who chooses to drop this course should notify the instructor no later than the end of the first week of class so another student can fill the opening.) Must be completed in the student's first or second semester after registering in the hotel school or upon being sponsored by the hotel school to the Division of Unclassified Students. Required.
Lec 01. M W F 10:10; lec 02 M W F 10:10; lec 03 M W F 11:15, lec 04 M W F 1:25; lec 05 M W F 1:25; lec 06 T R 8:25–9:55. D. Jameson, D. Flash, J. Lumley, J. Brownell, E. Huettman, S. Kiner.
An introduction to written communication within a business context. Students learn how to conceive, plan, and develop those written materials that provide much of the information that people in business need to form judgments and make decisions. Focusing on the specific principles, needs, and responsibilities of business communication, the course introduces students to the writing process: analyzing; organizing; using research sources; developing substance; and writing in a clear, precise style. Students write a variety of reports requiring different analytical approaches.

**266 Intermediate French: Le Français de l'Hôtellerie**
Spring. 3 credits. Limited to 12 students in each recitation section. Prerequisite: French 123 or equivalent or written permission of instructor. Elective.
Lec 01. M W F 12:20, plus 1 hour TBA. A. Grandjean-Levy.
This course offers continuing study of the French language, in the context of business affairs, with specific emphasis on the hospitality industry. Presentation of material will consider cultural, geographic, economic, historical, political, and social contexts within which the business functions. The course will be conducted in French, emphasizing a conversational approach. Specialized situations and vocabulary will be used in building general competence in practical usage. Students with a special interest in the hospitality industry will be given priority for admission to the course.

**267 Intermediate Spanish: Español de Hotelería**
Spring. 3 credits. Prerequisite: Spanish 123 or equivalent (CPT score of 560 or above) or permission of instructor. Limited to 12 students. Elective.
Lec 01. M W F 12:20. E. Dozier.
An intermediate-level Spanish course with emphasis on vocabulary related to the hospitality industry. Oral practice will take place in specific context dialogues and by presentations on cultural, geographic, historic, economic, political, and touristic characteristics of Latin American countries and Spain. The written part of the course will consist of practice in correspondence relating to diverse aspects of the industry. Students with a special interest in the hospitality industry will be given priority for admission to the course.

**364 Advanced Business Writing**
Fall or spring. 2 credits. Limited to 15 juniors, seniors, and graduate students. Prerequisite for undergraduates: H Adm 165 or completion of student's freshman writing requirement. Elective.
Lec 01. W 2:30–4:25; lec 02 T 12:20–2:15. Faculty.
This course focuses on the written communications that demand special persuasiveness and control of tone. Writing assignments will give students a chance to apply the theories of communication, semantics, and human relations covered in the course. The kinds of communications that will be analyzed, evaluated, and written include persuasive messages to subordinates and superiors in an organization; sales letters and other promotion materials; and negative messages such as refusals, rejections, and responses to complaints. One major topic covered is the planning and executing of a job-hunting campaign, for which students prepare résumés, letters of application, and follow-up messages adapted to their individual needs.

**365 Managerial Communication: Interpersonal Relationships in Organizations**
Fall or spring. 3 credits. Limited to 24 juniors and seniors per lecture. (Because of the strict class-size limitation, a student who chooses to drop this course should notify the instructor no later than the end of the first week of class so another student can fill the opening.) Prerequisite: H Adm 165 or completion of student's freshman writing requirement. Required.
Lec 01. T R 10:10–11:40; lec 02 T R 12:20–1:50; lec 03 T R 10:10–11:40; lec 04 2:30–4. J. Brownell, A. Simon, D. Jameson.
A broad study of communication in a management context. This course emphasizes the significant role of communication in developing work relationships that enable managers to achieve their goals. It presents the theories and principles of communication that underlie effective interpersonal interaction. Students increase their individual communication abilities by applying these concepts in a variety of managerial contexts, including interacting one-to-one, working in groups, and formally developing and presenting ideas to larger audiences.

**562 Seminar in Management Communication**
Fall or spring. Variable (1–3) credits. Limited to juniors, seniors, and graduate students. Elective.
Lec 01. T R 2:30–4. D. Jameson, A. Simon, J. Brownell.
A "special topics" course, with the theme selected each semester on the basis of student and industry needs as well as faculty expertise. Most recent offering: "Intercultural Communication in Business" (3 credits). See school registrar or communication-area faculty coordinator for details about current topic.

**761 Organizational Communication for Managers**
Fall or spring. 3 credits. Limited to 15 graduate students; recommended for second- or third-semester M.P.S. students. Elective.
D. Jameson, J. Brownell.
A course in organizational communication focusing on the complex interactions that occur when people communicate in corporations and other organizations. Using business cases and examples, the course highlights such topics as the political, sociological, ethical, and psychological dimensions of business communication; analysis of communication problems and barriers; and design of organizational strategies to communicate effectively, whether one-to-one, in small groups, or with larger audiences. Each case is linked with an application exercise that helps students perfect their abilities to write, give oral presentations, or interact effectively with others in a professional, managerial context.

## MIS/COMPUTERS COURSES

**170 Macintosh Tools**
Spring. 3 credits. Limited to 25 students outside the hotel school. Elective.
Lec 01. M W F 9:05. B. David.
An introduction to business information systems and computer tools. Students learn basic business computing concepts such as system integrity and the user interface. Finally, the course introduces the student to the personal computer, using electronic spreadsheet, graphics, and word-processing applications. Work is carried out on a Macintosh computer using Microsoft Word and Microsoft Excel.

**171 Keyboarding on the Macintosh**
Fall, spring, or summer. 2 credits. Limited to 25 students per section. Elective.
Lec 01. M W F 10:10; lec 02 M W F 11:15; lec 03 M W F 12:20. B. David.
An introduction to the Macintosh computer and a beginning course in alphanumeric and numeric keyboarding. Students will learn word-processing skills during the second half of the course.

**174 Information Systems**
Fall. 3 credits. Limited to hotel school freshmen or others with permission of the instructors. Required.
Lec 01 M W F 8; lec 02 M W F 9:05; lec 03 M W F 10:10; lec 04 11:15; lec 05 12:20. R. Alvarez, B. David.
An introduction to micro-computing to develop functional computer fluency. Students will develop their skills in five generic areas: text, graphics, spreadsheet, list, and communications processing. The course is entirely lab oriented and students work on Macintosh personal computers.

**274 Hotel Computing Applications**
Fall or spring. 3 credits. Prerequisite: H Adm 174 or equivalent. Elective.
Lec 01. M W 11:15; lab TBA. R. Moore.
An introduction to management information systems as they are currently used in the hospitality industry. Specific topics include property management systems, reservation systems, communication networks, database structures, point-of-sale systems, methods of system selection, and cost justification. Computer laboratories provide hands-on experience with systems widely used in the hospitality industry and help to develop IBM PC/DOS skills.

**374 End-User Business Computing Tools**
Fall or spring. 3 credits. Prerequisite: H Adm 174 or equivalent. Elective.
Lec 01. T R 10:10–11; lec 02 T R 11:15–12:05; labs TBA. R. Alvarez.
This course explores the personal computer as a managerial tool for the hospitality industry. Concepts of modeling, database, and end-user computing are covered. Students learn to use specific software applications programs to solve original problems. All work is done on the IBM PC.

**571 Analysis and Design of Information Systems**
Fall. 3 credits. Limited to 15 students. Elective.
Lec 01. M W F 10:10; lab TBA. R. Alvarez.
For students who may become involved with the analysis and design of computer-based information systems (CBIS). The course is intended to develop competence and confidence in the participants' ability to plan for CBIS, specify their functional design, manage a systems adoption project, deal with system vendors, and function as organizational consultants on CBIS. The course assumes an elementary working knowledge of MIS and basic business. The course is pragmatic and requires participant teams to analyze and design (and possibly build and test) a software application system.

**572 Development of Decision Support Systems**
Spring. 3 credits. Prerequisite: H Adm 174 or equivalent. Elective.
Lec 01. M W 12:20–2:15; lab F 1:25–3:05. R. Alvarez.
The use of computer-based systems to assist human decision makers by supporting their information requirements. The design, implementation, and use of such systems is one of today's fastest growing areas within information systems. The course's perspective is one of design—effective design both requires and enhances understanding. All work will be done on a Macintosh personal computer using Hypercard.

**774 Information Systems for Hospitality Managers**
Spring. 3 credits. Limited to 35 students. M.P.S. Requirement.
Lec 01. T R F 9:05. R. Moore.
The physical and technical computing environments in a multi-unit hospitality corporation. Information systems (IS) are viewed from various perspectives, i.e., as data-processing systems (DP), management information systems (MIS), and decision support systems (DSS). The role of IS in a strategic planning framework is explored. Organizational and infrastructural issues that enhance or detract from system success are explained.

## LAW COURSES

**283 Law of Securities Regulation**
Fall, weeks 1–7. 1 credit. Elective.
Faculty.
For students interested in the financing of new or expanding hotel and restaurant businesses through the sale of stocks and bonds, and the obligations of publicly owned hospitality companies and their officers and directors. The course covers fundamental aspects of the federal securities laws as applicable to the hospitality industry. Problems will be drawn from hotels, restaurants, and related businesses.

**385 Law of Business**
Fall. 3 credits. Limited to juniors, seniors, and graduate students outside the hotel school, and hotel school students with permission of instructor. Elective.
J. Sherry.
This course is designed to enable the student to acquire a basic understanding of law and legal relationships in a business context. A variety of subjects are covered, all intended to aid a person in making decisions as an executive charged with managerial responsibilities.

**387 Business and Hospitality Law**
Fall or spring. 3 credits. Limited to juniors, seniors, and graduate students. Required.
Lec 01. M W 9:05; lab 01 F 9:05; lab 02 F 10:10. J. Sherry.
An integrated chronological presentation of contract, agency, and tort concepts as they apply to the legal aspects of hospitality management. Appropriate federal, state, and local cases, statutes, and other materials will be examined. The overall objective is to recognize, analyze, and evaluate legal issues for the purpose of making and articulating appropriate decisions.

**486 Historical Development of the Right to Travel and Its Impact on American Society**
Summer. 3 credits. Elective.
J. Sherry.
An overview of the development of the legal rights of persons to travel and to have access to public accommodations. Historical sources focus upon the English common law, the United States Constitution, and federal and state civil rights legislation. The aim of the course is to review and examine changing American social attitudes toward travel and public accommodations and their influence upon travelers' legal rights and responsibilities. Comparative international legal developments will be noted.

**487 Real-Estate Law**
Offered on demand. 2 credits. Limited to juniors, seniors, and graduate students. Elective.
J. Sherry.
Laws governing the acquisition, ownership, and transfer of real estate, beginning with the purchase and sale of a family residence and leading to more-complex transactions involving hotels, motels, condominiums, cooperatives, syndications, and real-estate trusts. Financing aspects, including construction and building loans, mortgages, and mortgage foreclosures are treated from the viewpoint of lender and borrower. The legal relations of landlord and tenant are given special attention, and typical hotel and motel leases are dissected and scrutinized. Applicable tax considerations are focused on all transactions.

## OTHER COMMUNICATION, MIS, AND LAW COURSES

**191 Quantitative Methods**
Spring. 3 credits. Required.
Lec 01. T R 10:10; lec 02 M W 1:25. S. Kimes.
Procedures for collecting, classifying, summarizing, and presenting quantitative facts. Students should get an intuitive grasp of descriptive and inferential statistics. The how, when, and why of statistical applications in a variety of managerial situations, with emphasis on interpretation, not mathematical proofs.

**490 Housing and Feeding the Homeless**
Fall or spring. 4 credits. Limited to 21 students. Prerequisites: H Adm 325 and 303, or HSS 292 and HSS 375, or permission of instructor. Estimated cost of field work, $50. Elective.
Lec 01. T R 8:40–9:55. Faculty.
The course explores the economic, social, and political issues of our country's growing problem of homelessness, as well as the existing and proposed housing and feeding policies and delivery systems that attempt to deal with the issue. Students study the history of homelessness and strategies to alleviate the problem and spend approximately six days at a housing or feeding project (within a one-hour drive from Ithaca) to analyze the project and resolve a managerial problem.

**791 Graduate Quantitative Methods**
Fall. 3 credits. M.P.S. requirement.
Lec 01. M W 10:10–11:25. S. Kimes.
An introduction to management-science models and statistical techniques applicable to the hospitality industry. The application of specific quantitative methods to decision making in the hospitality industry. Topics include forecasting, decision analysis, linear programming, probability, and queuing. Computer software packages will be used to facilitate the decision-making process.

## INDEPENDENT RESEARCH COURSES

**600-690 Undergraduate Independent Study**
Fall or spring. Variable credit. Prerequisite: written permission. Only the first three credits of directed study may count as hotel school electives during a student's undergraduate academic career. Additional directed study, if taken, is applied toward free electives, except for the Management Intern Program (12 credits). *Permission in writing is required before course enrollment. Students should obtain a permission form from the hotel school's registrar.* (Occasionally an independent research project can be added after the three-week deadline with support of the faculty sponsor *and* by formal petition.) Elective.
Faculty.
Students pursue independent research projects under the direction of a faculty member.

**600 Organization Management**

**601 Management Intern Program I—Operations**
6 credits.

**602 Management Intern Program II—Academic**
6 credits.

**603 Hotel Ezra Cornell**

**610 Human-Resources Management**

**620 Financial Management**

**630 Food and Beverage Management**

**640 Marketing and Tourism**

**650 Properties Management**

**660 Communication**

**670 MIS/Computers**

**680 Law**

**690 Other**

**700–900 Graduate Independent Research**
Fall or spring. Variable credit. Limited to graduate students. Prerequisite: written permission of instructor. *Students should obtain a permission form from the hotel school's graduate office.*
Faculty.
As appropriate, graduate students enroll in these courses for thesis or monograph research or for other independent directed study. Students must have in mind a project and obtain agreement from a faculty member to oversee and direct the study.

**700 Organization Management**

**710 Human-Resources Management**

**720 Financial Management**

**730 Food and Beverage Management**

**740 Marketing and Tourism**

**750 Properties Management**

**760 Communication**

**770 MIS/Computers**

**780 Law**

**790 Other**

**802 Master of Science Thesis Research**

**803 Graduate Teaching Internship**

**805 M.P.S. Monograph I**

**806 M.P.S. Monograph II**

**900 Doctoral Thesis Research**

## FACULTY ROSTER

### Professorial

Arbel, Avner, Ph.D., New York U. Prof.
Berger, Florence, Ph.D., Cornell U. Assoc. Prof.
Brownell, Judith, Ph.D., Syracuse U. Asst. Prof.
Carvell, Stephen A., Ph.D., SUNY Binghamton. Asst. Prof.
Chase, Robert M., M.B.A., Cornell U. Prof.
Clark, John J., Jr., Ph.D., Cornell U. Dean and E. M. Statler Professor
Corgel, John B., Ph.D., U. of Georgia. Assoc. Prof.
Cullen, Thomas, Ph.D., Cornell U. Assoc. Prof.
deRoos, Jan A., M.S., Cornell U. Asst. Prof.
Dev, Chekitan S., Ph.D., Virginia Polytechnic. Asst. Prof.
Dunn, David C., Ph.D., Cornell U. Assoc. Dean and Assoc. Prof.
Eder, Robert W., D.B.A., U. of Colorado. Assoc. Prof.
Eyster, James J., Ph.D., Cornell U. Prof.
Ferguson, Dennis H., Ph.D., Cornell U. Assoc. Prof.
Geller, A. Neal, Ph.D., Syracuse U. Prof.
Jameson, Daphne A., Ph.D., U. of Illinois. Assoc. Prof.
Kaven, William H., Ph.D., Cornell U. Prof.
Kelly, Thomas J., M.S., Cornell U. Assoc. Prof.
Kimes, Sheryl E., Ph.D., U. of Texas. Asst. Prof.
Lundberg, Craig C., Ph.D., Cornell U. Blanchard Professor of Human-Resources Management
Moore, Richard G., M.B.A., Cornell U. Assoc. Prof.
Mutkoski, Stephen A., Ph.D., Cornell U. Banfi Vintners Professor of Wine Education and Management
Penner, Richard H., M.S., Cornell U. Prof.
Rainsford, Peter, Ph.D., Cornell U. Assoc. Prof.
Redlin, Michael H., Ph.D., Cornell U. Prof.
Renaghan, Leo M., Ph.D., Pennsylvania State U. Assoc. Prof
Romm, David L., M.P.S., Cornell U. Asst. Prof.
Sherry, John E. H., LL. M ., New York U. Prof. and Graduate Faculty Representative
Simon, Augusta, Ph.D., Ohio State U. Asst. Prof.
Stipanuk, David M., M.S., U. of Wisconsin. Asst. Prof.
Tabacchi, Mary H., Ph.D., Purdue U. Assoc. Prof.

### Adjunct, Visiting, and Other Teaching Staff

Alvarez, Roy, M.Ed., Lecturer
Blanchard, Kenneth, Ph.D., Visiting Assoc. Prof.
Bley, Jane S., B.A., Teaching Support Specialist
Brooks, Earl, M.A., Professor Emeritus
D'Aprix, David, B. A., Lecturer
David, Betty B., Lecturer
Ferris, J. David, M.A., Visiting Lecturer
Flash, Dora G., A.B., Senior Lecturer
Hales, E. Ann, Ph.D., Lecturer
Huettman, Elizabeth, M.A., Visiting Lecturer
James, Robert, M.B.A., Visiting Lecturer
Kiner, Susan W., M.A., Lecturer
Lang, Barbara, B.S., Visiting Lecturer
Lumley, Jane, M.A., Senior Lecturer
Mathew, Mary E., B.S., Teaching Support Specialist
Morano, Richard A., D.Ed., Visiting Lecturer
Muller, Christopher C., M.P.S., Lecturer
Neuhaus, Thomas W., M.S., Lecturer
Noden, Malcolm A., Senior Lecturer
Norkus, Gregory X., M.S., Senior Lecturer
O'Connor, Therese A., M.S., Senior Lecturer
Pezzotti, Giuseppe G. B., B.S., Lecturer
Richmond, Bonnie S., M.S., Senior Lecturer
Sciarabba, Andrew, B.B.A., Visiting Lecturer
Spies, Rupert, Studienassessor, Lecturer
Weaver, Loren E., B.S., Teaching Support Specialist
Weishaupt, Hans P., B.S., Robert A. Beck Chair of Applied Hotel Management
Weisz, Stephen, B.S., Visiting Lecturer
White, Robert, A.O.S., Teaching Support Specialist
Whitehead, Donald E., B.S., Visiting Lecturer
Yesawich, Peter C., Ph.D., Visiting Assoc. Prof.

# NEW YORK STATE COLLEGE OF HUMAN ECOLOGY

## ADMINISTRATION

Francille Firebaugh, dean

Jean Robinson, associate dean; assistant director, Cornell University Agricultural Experiment Station

Lucinda A. Noble, associate dean; director of Cornell Cooperative Extension

Carol L. Anderson, assistant dean; associate director of Cornell Cooperative Extension

Brenda Bricker, director, admissions

Joyce McAllister, registrar

Lynne M. Wiley, director, student services

## FACILITIES

The College of Human Ecology, through its teaching, research, and extension programs, seeks to understand and improve the relations of people to their environments, especially to those settings most critical for growth and development—home, school, work, and leisure. Faculty and students examine individuals in relation to their family, neighborhood, workplace, and community, seeking a balance between theory and practice that will improve the quality of everyday life.

The college is housed in Martha Van Rensselaer Hall. The Division of Nutritional Sciences, an intercollege division supported jointly by this college and the College of Agriculture and Life Sciences, has space in Savage Hall and in Martha Van Rensselaer Hall.

The buildings include administrative and faculty offices, classrooms, auditoriums, and lecture halls; wet chemistry and biochemistry laboratories for nutrition, food science, and textile science; experimental food laboratories; design studios; woodworking shops; experimental observation rooms with one-way vision screens and sound-recording equipment; educational television studios; and a printing and reproduction facility. Also included are learning resource centers for career planning and academic study, a historical costume collection, a human metabolic research unit, a research animal facility, cold rooms, a constant temperature and humidity laboratory, and an experimental nursery school.

Specialized equipment for teaching and research includes biochemical and chemical instruments for spectroscopy, chromatography, radioisotope analysis, electrophoresis, microscopy, and ultracentrifugation; physical testing equipment; and cameras, videotape, and sound recording equipment.

## DEGREE PROGRAMS

| | *Degree* |
|---|---|
| Biology and Society | B.S. |
| Consumer Economics and Housing | B.S. |
| Design and Environmental Analysis | B.S. |
| Human Development and Family Studies | B.S. |
| Human Service Studies | B.S. |
| Nutritional Sciences | B.S. |
| Policy Analysis | B.S. |
| Textiles and Apparel | B.S. |
| Individual Curriculum | B.S. |

## DIVISION OF STUDENT SERVICES

B. Bricker, director of admissions

W. Graham, director of institutional studies

J. McAllister, college registrar

L. Wiley, director of student services

Persons interested in undergraduate study in human ecology should contact the Office of Admissions, 172 Martha Van Rensselaer Hall. Those interested in graduate study should contact the graduate field representative identified among the faculty of each department. Department faculty are listed on subsequent pages at the beginning of the course descriptions for each department.

Matriculated students can find assistance with matters of academic credit and graduation requirements in the Office of the College Registrar, 146 Martha Van Rensselaer Hall Assistance with academic advising, career planning and placement, and personal counseling may be obtained from the Office of Student Services, N101 Martha Van Rensselaer Hall.

### The Students

The College of Human Ecology undergraduate enrollment is 1,286 with 54 percent in the upper division. About 320 students are graduated each year, and last year 239 freshmen and 144 transfer students matriculated. One hundred faculty members serve as advisers for undergraduates.

The college's undergraduate admissions committee selects applicants who are academically well prepared and appear most likely to profit from the college's various curricula. Admission is selective. In 1988 three out of four freshman were in the top 10 percent of their high school graduating classes. Fifty-five percent had verbal Scholastic Aptitude Test (SAT) scores over 600 and 80 percent had math scores of 600 or better.

Approximately 75 percent of the student body comes from New York State, with the remainder from other parts of the United States and abroad. Eighteen percent were identified as members of minority groups in 1988.

Approximately 185 graduate students have members of the college's faculty chairing their special committees. The college awards 41 master's degrees and 20 doctorates each year.

## ACADEMIC PROGRAMS

### Majors

Each department offers a major, and within most departmental majors there are specific options. The college also offers two interdepartmental majors. Selecting a major means choosing one option in one department. Although a student may satisfy the requirements of more than one major option, he or she is officially certified to graduate under only one. (The college urges students who satisfy more than one major or option to make note of this in the credentials they file in the Career Center and to seek recommendations from faculty associated with the options completed.) Majors include the following options.

*Consumer Economics and Housing (CEH):* The department supervises the department major and the policy analysis major.

*Design and Environmental Analysis (DEA):* interior design facility planning and management. human environment relations.

*Human Development and Family Studies (HDFS):* does not have separate options. Courses focus on cognitive, personality, and social development; infant through adult development; atypical development; and family studies.

*Human Service Studies (HSS):* does not have separate options. Courses focus on three content clusters: human-service environments, programs, and processes. A professional internship and senior seminar are required. Students may meet the requirements of an accredited bachelor's degree program in social work.

*Nutritional Sciences (NS):* experimental and consumer food studies, nutrition, nutritional biochemistry, clinical nutrition, community nutrition. (By careful planning, students may also meet the minimum academic requirements of The American Dietetic Association.)

*Textiles and Apparel (TXA):* apparel design, apparel-textile management, textile science.

*Interdepartmental Major in Biology and Society (ID-BS).*

*Interdepartmental Major in Policy Analysis.*

*Individual Curriculum.* It is possible to develop an individual program of study if none of the above programs fits particular educational and career objectives.

### Changing Majors

Because any student's interests and goals may change as new options emerge, the college provides ways for students to change their majors. When a declared major no longer seems to meet a student's educational goals, a counselor or faculty adviser may be able to point out alternatives. If the student decides to make a change, a change-of-major form (available from the Office of the College Registrar, 146 Van Rensselaer Hall) ensures that the change is sent to the department in which the student wishes to major, so an adviser can be assigned to the student.

### Students of Mature Status

The college recognizes that students who interrupted their formal education and are returning to school have needs different from those of the average undergraduate. To facilitate the education of mature students, defined as those twenty-four years old or older at matriculation, the college has adopted certain procedures specifically for that group.

Mature students are permitted to enroll for as few as 6 credits without petitioning and are also permitted to extend their residency beyond the normal eight terms.

It is highly recommended that mature students contact Judith Eger, the director of the Continuing Education Information Center, B12 Ives Hall, for information on services available through that office.

### Special Students

Students eligible for special status are those visiting from other institutions and interested in particular programs in the college; those with a bachelor's degree preparing for graduate study or jobs and careers in human ecology–related fields; or those who have interrupted their education and are considering completing degree programs. Students accepted in the non-degree status of special student may enroll for a maximum of two semesters. During the second semester of attendance, a special student must either apply for admission as a transfer or plan to terminate studies in the college at the end of the semester.

Special students are expected to take a minimum of 12 credits each semester and to take one-half to two-thirds of their work in the state divisions of the university. Work taken while a person is classified as a special student may be counted toward the requirements of the bachelor's degree.

### Empire State Students

Occasionally a student who is completing requirements for a degree through the Empire State College Program is interested in taking a human ecology course. This can be done by registering through the Division of Summer Session, Extramural Study, and Related Programs, B12 Ives Hall. All rules of the extramural division apply, and registrations will be accepted only on a space-available basis and with the written approval of the course instructor.

At the time of registration, Empire State College students provide the extramural division with a completed copy of Empire State College's notification of cross-registration form number, SA-22, F-031, to verify enrollment in Empire State College. Such students will be charged 25 percent of the standard extramural tuition per credit.

## CONSUMER ECONOMICS AND HOUSING

The behavior of people as consumers and family members and their interactions with the private and public sectors of the economy have become increasingly important as the United States shifts to a service-based economy. One result has been an increasing demand from business and government for trained individuals who understand consumers and families, how they interact with private markets, and how public policies affect those markets, and through them, consumers. The demand has been sufficient to elevate salaries for well-trained individuals.

The consumer economics and housing (CEH) major provides such training. The major combines economics with statistics, sociology, and political science. CEH majors study how consumer markets work; how firms and consumers behave; what role government plays in protecting consumers; how functions shift between household and marketplace as prices, incomes, social values, and legislation change; and how changes in the family impact on consumer markets. Students interact with the faculty and with each other both in the classroom and in field-based learning experiences in the Ithaca area, New York City, Washington, and elsewhere. Students can specialize within the major in a number of areas, including consumer affairs and policy, housing, and financial advising.

Graduates in CEH are prepared for a wide variety of consumer-related positions in business and in government. The major also provides an excellent foundation for further studies in economics, law, business administration, and policy analysis.

## DESIGN AND ENVIRONMENTAL ANALYSIS

The Department of Design and Environmental Analysis (DEA) is concerned with planning, designing, and managing interior environments to satisfy human needs. Most people spend over 90 percent of their lives inside buildings. Those settings have substantial and far-reaching effects on the quality of our lives. The processes for creating and maintaining the built environment face enormous challenges. These include frequent social and organizational change, technological advances, new building methods, and finite resources. The program in DEA is dedicated to preparing professionals who can meet these challenges.

Diverse faculty backgrounds and teaching approaches help students to develop their multidisciplinary problem-solving and creative abilities, aesthetic judgment, and analytical thinking. Excellent laboratory, shop, studio, and computer facilities permit exploration of innovative concepts for the design and management of interior environments. The relationship between people and their physical surroundings is explored through a combination of academic courses, field experience, and applied research. Examples of student class projects and faculty work are frequently on display in the department's gallery. The DEA Resource Center includes books, journals, newsletters, and materials samples for student use.

### Options

The department offers undergraduate education in three professional areas: interior design, facility planning and management, and human-environment relations. The interior design option is accredited by the Foundation for Interior Design Education Research (FIDER).

To take full advantage of the course sequences and electives, it is important to select an option as early as possible. This is particularly true in the interior design option. Transfer students in the interior design option may need one or two extra semesters to complete the program.

#### Option I: Interior Design

The interior design option prepares students for professional careers in the planning and design of interior spaces and associated products. The program emphasizes a problem-solving approach based upon knowledge of buildings and their associated systems, furnishings and interior products, human-environment relations, and design principles. Some students combine this program with one of the other options.

Careers are available in interior design and space planning, interior architecture, facility planning, interior product design, and housing. This program also serves as an excellent preparation for graduate study in interior design, facility management, architecture, and product design.

#### Option II: Facility Planning and Management

This option is designed to prepare students for professional careers in facility management. The program focuses on the planning, design, and management of facilities for large, complex organizations such as corporations, health-care institutions, research and development laboratories, and universities. Facility planning and management is a basic management function that coordinates and integrates information and expertise from areas such as planning and design, real estate and business administration with human factors, ergonomics, environmental psychology, telecommunications, and building operations for the purpose of developing and managing facilities that support individual and organizational effectiveness.

Excellent career opportunities exist in the facility management divisions of private companies, institutions, and the health-care industry. The program is also a good preparation for graduate study in business, planning, or one of the design disciplines and for advanced study in facility planning and management.

#### Option III: Human-Environment Relations

Human-environment relations focuses on the interaction between people and their physical surroundings. This option seeks to expand understanding of how the environment affects human perception, cognition, motivation, performance, health, safety, and social behavior. The effect of human capabilities or characteristics such as family structure, lifestyle, social class, and stage in life cycle on environmental needs and requirements is also a focus of the program. Human-environment relations is good preparation for graduate study leading to a Ph.D. degree in the social sciences and a career in academic or other research-oriented settings in either the public or private sector. It can also serve as the basis for graduate study in an environmental planning or design discipline such as architecture, facility planning and management, interior design, landscape architecture, or city and regional planning. Electives in the social sciences and in research methods and statistics are encouraged.

### Academic Advising

All DEA majors are matched with a faculty adviser during their first semester by advising coordinator Michael Boyd, in E410 Martha Van Rensselaer Hall.

Consultation with faculty advisers about future goals, departmental requirements, sequences of courses, and electives inside or outside the college to meet special needs helps students develop their programs. Students majoring in interior design, especially, must begin early to plan and collect materials for a portfolio of their work, which is necessary for many positions and for application to graduate schools. Faculty advisers can make recommendations on what to include. Students are free to change advisers. Although advisers must sign the schedule card during course enrollment each term, it is the student's responsibility to keep track of his or her courses and to make sure that the program meets graduation requirements for the major and the college.

### Ownership and Exhibition of Student Work

All design work done in studios as part of an academic program is the property of the department until it has been released by the instructor. The department is not responsible for loss or theft of student work.

## HUMAN DEVELOPMENT AND FAMILY STUDIES

The programs of the Department of Human Development and Family Studies (HDFS) are concerned with how people develop throughout the life course. Of equal interest is the family as a context for individual development and as a part of the larger structure of society. An ecological perspective—the person in interaction with complex biological, situational, and environmental conditions of everyday life—is featured in many departmental courses.

Major social science disciplines concerned with the development of individuals and with the structure and function of families are represented among faculty members with backgrounds in psychology, sociology, history, and education. The department's programs of instruction, extension, and research provide diverse opportunities for students to prepare for career development or to acquire the bases for graduate study. Many of the department's majors are interested in medicine, law, counseling, clinical psychology, special education, or university teaching and research, which require some graduate study. Others may take bachelor's-level positions as youth counselors, day-care workers, personnel assistants, research technicians, social program assistants, etc.

### Academic Advising

Every HDFS major is assigned a faculty adviser from the department, and advising conferences are required at least twice a year. An adviser helps plan the course work and can also help students find special opportunities for individual study or for experience outside the classroom. Although advisers must sign green course schedule cards, it is the student's responsibility to keep track of his or her courses and to make sure that the program meets graduation requirements for the major and the college. Students who need an adviser or who want to change advisers to match changing academic interests should check with the department office, in NG14 Martha Van Rensselaer Hall.

### Curriculum

HDFS majors usually combine a broad liberal education with a more specialized focus on either a problem of human concern or a substantive area of concentration. Areas of specialization available within HDFS include infant, child, adolescent, and adult development; abnormal development; family studies; and social-personality and cognitive development. Some students combine an HDFS major with premedical or prelaw training or with specialized work in an area outside the department, such as communication arts, nutrition, business, or government.

During their first two years, students are expected to combine a variety of liberal arts courses with HDFS core courses HDFS 115 (Human Development: Infancy and Childhood); HDFS 150 (Families in Modern Society); HDFS 216 (Human Development: Adolescence and Youth); and HDFS 218 (Human Development: Adulthood and Aging). This encourages diversity yet ensures a common base for upper-level courses in the major. Courses within the department vary from lectures and discussions to research and independent study.

All students are encouraged to participate in an experiential learning course in their particular area of interest. The course may focus on a naturalistic or laboratory setting (e.g., nursery school, youth detention center, retirement home) or on a research setting (e.g., interviewing, administering tests, observing behavior).

An HDFS major also takes upper-level courses in areas to be selected. Additional information is available in the HDFS Office of Undergraduate Education, NG14 Martha Van Rensselaer Hall.

### Teaching Certification Option

The cooperative Cornell HDFS–State University of New York at Cortland education program is designed to meet New York State certification requirements for teaching grades N–6 and grades N–9. The program requires that the student spend three years at Cornell and the senior year and part of two summers registered in absentia at SUNY Cortland.

This highly selective undergraduate program offers an alternative to the option of seeking a master's degree in early education after the undergraduate studies at Cornell have been completed. Students interested in the program should discuss the merits of each option with their advisers.

Course work at Cornell must be carefully planned. Elective options will be somewhat limited because it will be necessary to consider thirty-seven Cortland credits and an additional five to nine education courses at Cornell as electives. More information is available in the HDFS Office, NG14 Martha Van Rensselaer Hall.

### Honors Program

The honors program leading to a Bachelor of Science degree with honors in HDFS is designed to provide in-depth research experience for students interested in graduate school and to challenge students who enjoy research. Interested students should notify the coordinator of the honors program as early as possible in their academic career, preferably before their junior year.

A grade-point average of 3.3 is recommended for entry into the program, although promising students who lack the grade-point average also may apply if they can otherwise demonstrate their potential for honors work. Honors students must take a course in research design, preferably in the sophomore or junior year.

Students spend part of their junior and senior year working on a thesis under faculty supervision, completing the project before March 15 of the senior year, when the student's oral examination is held. More information is available in the department's Office of Undergraduate Education, NG14 Martha Van Rensselaer Hall.

### Foreign Language Requirement

The Department of Human Development and Family Studies begins this year a two-year phasing in of the foreign language requirement described below. Students entering in fall semester, 1989, or spring semester, 1990, are strongly encouraged, but not required, to complete the language requirement. Students entering in fall semester, 1990, and thereafter will be required to complete the language requirement prior to graduation.

#### Language Requirement

The HDFS faculty believe that competence in a foreign language is an essential liberal arts goal for the educated HDFS student. Such exposure opens another culture for exploration at both the instrumental and expressive levels, helps students understand language itself, and encourages knowledge of language as a fundamental intellectual tool and as an essential communicative asset with potential applied benefits. Work toward the foreign language requirement should be undertaken in the freshman and sophomore years.

The following departments teach foreign languages or literature or both in the College of Art and Sciences: Africana Studies and Research Center, Asian Studies, Classics, German Literature, Modern Languages and Linguistics, Near Eastern Studies, Romance Studies, and Russian Literature.

The language requirement may be satisfied in one or two ways:

1) by attaining PROFICIENCY in one language or
2) by attaining QUALIFICATION in two languages.

### Proficiency

PROFICIENCY is attained by passing a 200-level course at Cornell (or Chinese or Japanese 161) or by equivalent achievement, to be determined by examination; see below under "Advanced Standing Credit."

### Qualification

QUALIFICATION may be attained in any of the following four ways:

1) Three credits of secondary school study or passing NYS Regents Exam in any one language give QUALIFICATION in that language. This route to QUALIFICATION does not guarantee entrance into a 200-level course. The students who want to continue in this language to seek PROFICIENCY must be placed by examination.
2) Passing the requisite course: 102, 123, or 134 in languages taught by the Department of Modern Languages and Linguistics; Chinese or Japanese 160; Near Eastern Studies 102 or 122 in Hebrew, 112 in elementary classical Arabic, or 114 in Egyptian Arabic; Classics 103 or 104 in Greek; Classics 106 or 107 in Latin; Classics 112 in modern Greek; AS & RC 134 in Swahili.
3) A score of 560 or better on the College Placement Test (CPT).
4) Placement in a 200-level course by special examination (in cases where no CPT is available).

A student may submit a 560 CPT score at the end of a course numbered 122, thus attaining qualification without taking 123. This procedure is optional; the student with a score of 560 or better may want to take 123 to be better prepared for the 200-level courses.

Note: Completion of 131–132 language course sequence does not constitute QUALIFICATION.

Speakers of languages other than English may be awarded credit for their bilingual ability. Their English achievement is measured by the Test of English as a Foreign Language (TOEFL), a requirement for matriculation. Their performance in one other language learned outside the academic environment is measured by examination, and evidence of abilities in reading and writing, as well as speaking, is required. A maximum of 6 advanced placement credits are granted to students who demonstrate PROFICIENCY equivalent to course work at the 200 level or above at Cornell. Students may not earn credit both for PROFICIENCY in their native language and for studying English as a second language at Cornell.

### Language Course Placement and Credit

Students who have had two or more years of high school study in a language may not register in any course in that language without being placed by examination. Nor can transfer students register without examination, even though they may have been given credit for language work elsewhere.

The type of examination depends on the language course and the level of achievement:

1) French, German, Italian, Russian, and Spanish courses: the standardized College Placement Test (CPT). Entering students who have not taken the CPT in high school and who want to continue their language study must take the CPT at Cornell during orientation week. Students may retake this examination at Cornell if they have studied the language a year or more since last taking the test. To do this, students register with the Academic and Career Counseling services, 203 Barnes Hall, and pay a fee of $10.
2) Latin (all courses except 105 and 107): departmental examination.
3) Greek (all courses except 101, 104, and 111): departmental examination.
4) Arabic: departmental examination.
5) Hebrew: departmental examination.
6) Other languages: special examinations: see the professor in charge.
7) High achievement (students with a CPT score of 650 or better in French, German, Hebrew, Italian, Russian, and Spanish): the Cornell Advanced Standing Examination (CASE).

An entering or continuing student with high achievement scores should take the Cornell Advanced Standing Examination (CASE); even if the student does not want to do any further work in the language, the CASE may provide proficiency status for the language requirement and it may provide up to 6 hours of advanced standing credit. Students who do not have high achievement scores are eligible for the courses listed in the charts below, depending on their scores. For other languages, or for special problems, student should see the professor in charge.

### French

| *CPT Reading Scores* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 121 | |
| 450-559 | 123 | |
| 560-649 | 203 | 200<br>201<br>211 |
| 650 and above or AP 4 or 5 in language | Apply for the Cornell Advanced Standing Examination (CASE) | |

### German

| *CPT Reading Scores* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 121 | |
| 450-559 | 123 | |
| 560-649 | 203 | 201 |
| 650 and above or AP 4 or 5 in language | Apply for the Cornell Advanced Standing Examination (CASE) | |

### Italian

| *CPT Reading Scores* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 121 | |
| 450-559 | 123 | |
| 560-649 | 203 | 201 |
| 650 and above | Apply for the Cornell Advanced Standing Examination (CASE) | |

### Russian

| *CPT Reading Scores* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 101 or 121 | |
| 450-559 | 102 or 123 | |
| 560-649 | 203 | 201 |
| 650 and above | Apply for the Cornell Advanced Standing Examination (CASE) | |

### Spanish

| *CPT Reading Scores* | *Language Courses* | *Literature Courses* |
|---|---|---|
| Below 450 | 121 | |
| 450-559 | 123 | |
| 560-649 | 203 or 211 | 201 |
| 650 and above AP 4 or 5 in language | Apply for the Cornell Advanced Standing Examination (CASE) | |

### Latin

Placement by departmental examination.

### Arabic

Placement by departmental examination.

### Hebrew

Placement by departmental examination.

### Advanced Standing Credit

Advanced standing credit may be entered on a student's record as follows.

Credit may be granted for high school work for the equivalent of language courses numbered 203, 204. The amount of credit is based on performance of one or more of the following examinations:

a) CPT Advanced Placement Examination. French, Spanish, and German: A score of 4 or 5 yields 3 credits on the French, Spanish, or German language examinations and literature examinations.

**Hebrew:** Up to 6 credits may be granted, depending on the student's score on the departmental examination.

**Latin:** Students should consult the Department of Classics, 120A Goldwin Smith Hall. Students must take the department's own placement examination during orientation week. A student who is permitted to register in a 300-level course will be given 6 advanced standing credits.

**Greek:** For information concerning advanced placement, students should consult the chairman of the Department of Classics, 120A Goldwin Smith Hall.

b) Cornell Advanced Standing Examination (CASE). To be eligible for this examination the student must have achieved a score of 650 on the CPT. For details on registration, see "Language Course Placement and Credit" above. The maximum amount of credit is 6 hours.

c) Special examinations are given for languages where no CPT exists.

## HUMAN SERVICE STUDIES

Faculty in the Department of Human Service Studies (HSS) prepare students for a variety of careers in programs that serve individuals, families, and the community. HSS graduates work in schools, social services, Cooperative Extension, health and mental health programs, and community development agencies.

They are employed in such positions as counselors, school teachers, social workers, community educators, planners, and researchers. Many HSS graduates pursue graduate study in law, education, medicine, social work, health, and a variety of social sciences. HSS majors come from diverse backgrounds, but they share a common goal of wanting to serve the needs of others.

HSS is unique in that it integrates a broad spectrum of courses offered by several departments and colleges and focuses them for professional practice in the human services. All HSS students take courses that provide a knowledge base in three content clusters:

1. Human service environments – course choices provide students with knowledge about the working context within which the human service provider functions, including a base in social psychology, group and organizational behavior, social system perspectives, power and leadership.
2. Human service programs – courses for this requirement are selected to provide the student an introduction to historical and current program models, barriers to service delivery, developments in health, education and social welfare—all in the context of both the client and the work done by the human service professional.
3. Human service processes – courses for this requirement are designed to provide students with methods to work effectively in human service programs and environments. Courses include planning and development content, program delivery modes, decision-making processes, basic social planning methods, and program evaluation.

All students take a professional internship and an integrative senior seminar. Regardless of their specific career goals, students acquire a broad understanding of human services and the ways they can collaborate to improve the human condition. In addition, students specialize in an area of concentration such as health, education, social welfare, policy, planning, or evaluation.

### Academic Advising

It is important for a student who is interested in majoring in Human Service Studies to declare that major as early as possible. Once that is done, students work with their assigned faculty advisers to plan course work and related educational activities. Students are free to change advisers. Although faculty advisers must sign the schedule card during course enrollment each term, it is the student's responsibility to keep track of courses and make sure that the program meets graduation requirements of the major and the college.

### Social Work Program

The undergraduate social work major at Cornell has as its principal educational objective the preparation of students for beginning professional social work practice. In addition, the major prepares students for graduate education in social work and contributes to the enrichment of a college education by helping students understand social welfare needs, services, and issues.

The social work major is accredited by the Council on Social Work Education. Students who complete all requirements are eligible to apply for advanced standing in a graduate school of social work or for beginning-level employment as professional social workers.

## TEXTILES AND APPAREL

The Department of Textiles and Apparel (TXA) focuses on the use of textiles and fibrous materials for apparel, durable and nondurable household goods, composites, geotechnical, and biomedical applications. Programs in the department, in keeping with the overall mission of the college, emphasize the use of materials to meet human needs. The curriculum includes the application of design principles, physical and materials science, economics and marketing, government policy/regulation, management of products and their delivery, and technological development.

Practical problem-solving skills are developed in the department's laboratories and studios. Academic course work is further enhanced by field and international experiences. Gallery space provides the setting to display design work. In addition, the Cornell University Costume Collection, housed in the department, provides a valuable resource; items from the collection are made available to students for classroom and special-study use.

### Academic Advising

All TXA majors are matched with a faculty adviser by the advising coordinator, S. Kay Obendorf (208 Martha Van Rensselaer Hall). Students are strongly urged to discuss their goals, course selection and sequence, electives, and career plans with their faculty adviser. Students in apparel design must begin early to work with their advisers to develop a professional portfolio of their work. Students are free to change advisers; changes must be recorded with the advising coordinator. Although advisers must sign the schedule card during course enrollment each term, it is the student's responsibility to keep track of his or her courses and to make sure that the program meets graduation requirements for the major and the college.

### Ownership and Exhibition of Student Work

All apparel design work done as part of the academic program is the property of the department until it has been released by the instructor. Certain exceptional work may be retained by the department to exhibit for academic purposes. The department is not responsible for loss or theft of student work.

### Course Fees

No grade will be given in a course unless the course fee has been paid by the last week of classes.

### Options

Students may select options in apparel design, apparel-textile management, or textile science. The curriculum is based on manipulation of form, color, and the physical characteristics and structures of fabric to solve functional and aesthetic apparel problems; the application of economic and marketing principles to consumer and industry problems in the textile-apparel sector; and the study of chemical, physical, and engineering properties of fibrous structures and polymers. Depending on previous course work, transfer students may need one or two extra semesters to fulfill the requirements of the major.

#### Option I: Apparel Design

The study of apparel design includes both functional and aesthetic considerations in the design of body coverings. The program emphasizes a problem-solving approach that enables the student to bring a background in apparel, textiles, and human factors to the design process.

#### Option II: Apparel-Textile Management

Apparel and textile management combines the fields of apparel and textile with those of economics, business management, and organizational policy. Students combine theory with case studies to find solutions to everyday problems. Course work is drawn from many interrelated disciplines, including textiles, apparel, economics, business management, and communication arts, as well as practical field experiences. This provides students with the experience of working with professionals from a wide variety of disciplines. Students often combine this option with either Option I (Apparel Design) or III (Textile Science).

#### Option III: Textile Science

Applications for textile structures include advanced engineering composites, protective clothing for industrial and military environments, and biomedical materials, as well as the more traditional applications found in apparel and home furnishings. The textile science option provides a strong base in mathematics and the physical sciences combined with supporting courses in engineering, consumer economics, and the social sciences.

### Career Opportunities

Graduates of programs in the Department of Textiles and Apparel have found challenging employment within the textile and apparel sector, in independent and government-sponsored research, and in community organizations. Recent graduates are working in the fields of new product development, design, management, engineering, communications, and marketing. In addition, the program prepares students for graduate or professional study in fiber and polymer science, textile marketing, apparel design, textiles, or business and management.

## INTERDEPARTMENTAL MAJOR IN BIOLOGY AND SOCIETY

Biology and society is a multidisciplinary program for students with special interests in such problems as genetic engineering, environmental quality, food and population, the right to medical care, and the relation between biology, society, and ethics and/or public policy, as well as for students who plan postgraduate study in management, health, medicine, law, or other related fields.

Because the biology and society major is multidisciplinary, students must attain a basic understanding of each of the several disciplines it comprises, by including introductory courses in the fields of biochemistry, chemistry, mathematics, genetics, ecology, ethics, and history. In addition, majors are required to take core courses in biology and society, a set of electives, and a special senior seminar.

Course work in the College of Human Ecology must be taken in two of the following three concentrations: human development and the environment, health, or social policy and human services. The other basic requirements of the college must also be met. Programs incorporating those required courses are designed in consultation with a faculty adviser to accommodate each student's individual goals and interests. For further information on the major, including courses of related interest, specific course requirements, and application procedures, see the human ecology *Student Guide.*

## INTERDEPARTMENTAL MAJOR IN POLICY ANALYSIS

Advanced technology, increased wealth, and other social changes have caused interactions between government and individuals and between government and business to become more numerous and complex. This phenomenon has occurred at all levels of government and has generated a pronounced need—in both the public and private sectors—for specialists skilled in developing and analyzing public policy. Organized and managed by the Department of Consumer Economics and Housing, the policy analysis major uses the resources of the college and the rest of the university to build the knowledge and the analytical skills required to understand the process by which public policies are developed and to evaluate the impacts and desirability of these policies.

The policy analysis major gives students a basic understanding of the economic and political roles governments play along with the program-analysis and evaluation skills necessary to comprehend the quantitative and qualitative importance of governmental influence. In addition, students make in-depth studies of two policy areas (e.g., health policy, consumer policy, environmental policy, and foreign policy) of their choice. Because experience in legislative, regulatory, and public administration activities is very helpful, involvement in field study, Cornell-in-Washington, and Cornell Abroad programs is encouraged. The specific requirements for the policy analysis major are listed under the interdepartmental majors.

Graduates in policy analysis are attractive to businesses and industries as well as to governmental agencies because of their economics and political science background and their analytical skills. Students also use the major to prepare for further work in policy studies, law, and business administration.

The policy analysis major is flexible and allows individual program planning. All students majoring in policy analysis are assigned a faculty adviser by the advising coordinator. The earlier a student decides to major in the department, the greater the opportunity to develop a program that will meet individual educational or career goals. Transfer students are urged to discuss their plans with a faculty adviser as soon as possible.

An appointment to talk with either an adviser or the advising coordinator, James Reschovsky, may be made directly.

## INDIVIDUAL CURRICULUM

A student who has educational and professional objectives that cannot be met satisfactorily within the framework of existing majors in the College of Human Ecology may petition to develop an individual curriculum. To be approved, the curriculum must be within the focus of the college and be interdisciplinary in design, include at least 40 credits in human ecology courses, and not exceed the normal number of credits allowed in the endowed divisions. A student develops an individual curriculum in consultation with faculty advisers from at least two subject-matter fields and the program coordinator.

Such a program of study should encompass a substantial part of the student's undergraduate education and must include at least three semesters. For this reason, a request to follow an individual curriculum should be made as early as possible and must be made before the second semester of the junior year.

If an individual curriculum seems advisable, Patti Papapietro, in the Office of Student Services, will provide direction in formally developing a program of study. Although the individual curriculum coordinator must sign the course enrollment schedule during course enrollment each term, it is a student's responsibility to follow the curriculum as planned or to have any necessary revision approved in writing by his or her advisers and the program coordinator in advance of the program change.

## SPECIAL OPPORTUNITIES

Several special programs allow students to receive academic credit for fieldwork and internship experience, to study in absentia, or to enter particular graduate programs after the junior year.

### Teacher Certification in Home Economics

Students can combine any major in the college with additional course work that leads to a certificate of qualification for teaching home economics (kindergarten through twelfth grade) in New York State and a number of other states.

### Human Ecology Field and International Study

#### Field Study

Field study enables students to learn from participation in a community and organizational setting and from reflection on that experience through discussion, reading, and writing. This process of integrating theory with practice distinguishes field study from work experience and provides the rationale for granting academic credit.

The Human Ecology Field and International Study Office, 159 Martha Van Rensselaer Hall, offers interdepartmental, prefield preparation and field-based courses with an interdisciplinary problem-solving approach to social issues. Field placements are located in the Ithaca area, New York City, Albany, Washington, D.C., Boston, and elsewhere. Courses are open to registration by all Cornell students.

#### International Study

Study abroad provides students with an opportunity to add an international dimension to their human ecology program through course work focusing on international problems and intercultural understanding and through sponsored programs of study abroad for which credit is available. Course work in a foreign institution will, in general, be planned to increase knowledge of the people and institutions of the country concerned; fieldwork may provide guided experience in family, community, or agency situations of the country concerned and in an area related to individual student interest in human ecology.

Opportunities for study abroad are available for human ecology students in several ways: through Cornell Abroad, through U.S. college-sponsored programs abroad, and through direct enrollment in a foreign university. In each case, students will remain registered at Cornell during the overseas study, and their study abroad will be credited as part of their Cornell degree program. Applications for study abroad should be submitted to the study-abroad adviser in the Field and International Study Office.

### University Programs

#### Africana Studies and Research Center

Courses taken in the Africana Studies and Research Center (ASRC) may be used to meet some of the distribution requirements of the college. Up to two courses or 8 credits of such courses may be applied toward the 12 additional credits in natural and social sciences (section I-C of the graduation requirements) or toward the 9 additional credits in communication, analysis, and the humanities (section II-B). This allowance is in addition to the freshman writing seminar credits that may be taken in ASRC. Other courses taken in the center count as endowed division electives.

A list of ASRC courses approved to meet distribution requirements or as electives is available in the Office of Student Services and in the Office of the College Registrar.

### Double-Registration Programs

#### Johnson Graduate School of Management

A limited number of highly qualified students from Cornell undergraduate divisions, including human ecology, may be accepted by

the Johnson Graduate School of Management after the junior year. Students need the approval of the admissions office and the registrar in the College of Human Ecology. Accepted students should be aware that if the management course work taken in the senior year is in excess of the 21 additional credits allowed in the Cornell endowed divisions, they will be charged for the additional credits on a per-credit basis. Students entering this program must also complete requirements for the degree and major in Human Ecology.

#### Law School

A small number of highly qualified applicants may be admitted to the Cornell Law School after only three years of undergraduate education. The requirements for admission under these circumstances are more stringent than for acceptance after four years of undergraduate study. Applicants must present outstanding qualifications and strong professional motivation. The junior-year applicant follows the ordinary application procedures for Cornell Law School admission. Interested students should contact the Law School director of admissions to discuss the extraordinary admissions criteria. Since students accepted to this program will be spending their senior year in the Cornell Law School, they need to plan ahead to ensure that distribution requirements for the B.S. degree from the College of Human Ecology will be met. Successful applicants need the approval of the college registrar.

#### Cornell Medical College

A limited number of highly qualified students from three Cornell divisions, including the College of Human Ecology, may be accepted by the Cornell Medical College after the junior year. To be considered for this program, the student must have completed 105 credits toward graduation by the end of the junior year. Students also need to plan ahead to ensure that distribution requirements for the bachelor of science degree will be met. Accepted students receive 15 credits toward the B.S. degree from their first year of study at the College of Medicine. Interested students should contact the Health Careers Program office in 203 Barnes Hall.

### Off-Campus Programs

#### New York State Assembly Internships

A limited number of session internships with the New York State Assembly are available in spring semester to students of sophomore status and above who are enrolled in New York State colleges or universities. Human ecology students apply to the program through the student's major department. The New York State Assembly also sponsors a summer internship. Further information about internship programs may be obtained through the Field and International Study Office, 170 Martha Van Rensselaer Hall.

#### Ithaca College

Full-time undergraduate students at Cornell may petition to enroll in courses at Ithaca College. Students pay regular tuition to Cornell and only special fees to Ithaca College, if any are charged. Students are allowed to register for one course a term and may take no more than 12 credits in four years. Exceptions will be granted to Cornell students enrolled in methods and practice-teaching courses at Ithaca College.

Cornell students are eligible to register only in Ithaca College courses that are relevant to their program and that do not duplicate Cornell courses. Acceptance of Cornell students into Ithaca College courses is on a space-available basis. Participation in this program is not guaranteed, and Ithaca College has the right to accept or reject students for any reason it deems appropriate. The program is available only during the fall and spring semesters.

For further information students should contact the college registrar, 146 Martha Van Rensselaer Hall.

## PLANNING A PROGRAM OF STUDY

### Academic Advising

When students decide to major in a particular department, they are assigned to a faculty adviser by the advising coordinator in that department. The advising coordinator can help match the student's needs with the special interests of a faculty member. Students are free to change advisers as their own interests change and should see the advising coordinator to discuss such a change. Faculty advisers and counselors in the Office of Student Services are available to discuss course requirements and sequences, and electives inside or outside the college, as well as future goals and career opportunities. Although advisers must sign the course enrollment schedule card during course enrollment each term, it is the student's responsibility to keep track of his or her courses and to make sure that the program meets graduation requirements for the major and the college. Advising coordinators in each department are happy to answer questions about the advising system and the undergraduate major. Students who are exploring alternative majors should work closely with college counselors who are available for planning and referral to department resource faculty.

### Completing Graduation Requirements

A summary of record is kept for each student in the Office of the College Registrar. At fall registration each continuing student receives a copy showing which major and graduation requirements have already been met. It is important to check this summary and to bring any questions to the attention of staff members in the Office of the College Registrar. Although a student may complete the requirements of more than one major, he or she is officially certified to graduate under only one.

### Electives

Students have individual objectives in choosing courses beyond the minimum requirements of the major. The university is diverse; the departments, centers, and special programs numerous; the fields of study almost unlimited. Counselors and department advisers are available to discuss which courses may interest students and round out their educations.

Students should consult the index of this Announcement for information on where different subjects are taught in the university. Some subjects are taught in more than one division of the university.

### Foreign Language Study and Placement

Students who studied a foreign language before coming to Cornell and who want to continue must take either the College Entrance Examination Board (CEEB) achievement test in that language or a departmental language placement test. The latter is given during orientation week in September and again in December, January, and May. Students in human ecology who plan to work with non-English-speaking people in this country or overseas often find it necessary to be proficient in another language. Students who wish to study abroad may find that many study-abroad programs in non-English-speaking countries require the equivalent of two years of college-level language study. For more detailed information, see the section "Advanced Placement of Freshmen."

## GRADUATION REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

### General

Students applying as undergraduates who do not have the required academic unit in biology, chemistry, or physics are required to show evidence of having met this deficiency before matriculation in the college.

Freshmen and sophomores are required to enroll in at least one human ecology course per semester.

To graduate, students need to

1) meet college credit and distribution requirements,
2) complete requirements for a major,
3) achieve a cumulative average of 1.7 (C–) or better,
4) fulfill residency requirements, and
5) complete two terms of physical education within the first two semesters.

### College Requirements

These are the general areas of study and specific courses and credits required of every student in the college. The major you choose may require specific courses listed below or may leave you free to choose among certain courses listed there.

**I. Natural and Social Sciences** (24 credits)

A. *Natural sciences* (6 credits) selected from Biological Sciences 101–103,102–104,105–106, 109–110; Chemistry 103–104, 207–208, 215–216; and Physics 101–102,112, 201 or 202, 207–208. Biological sciences courses must be taken sequentially.

B. *Social sciences* (6 credits) selected from economics (including CEH 110,111 but excluding Agricultural Economics 221 and 310); psychology (including Education 110, 311, 317; DEA 150; HDFS 115, 216, 217, 218, 219); sociology (including rural sociology, CEH 148, and HDFS 150). Do not take both Economics 101 *and* CEH 110; Economics 102 *and* CEH 111; Psychology 275 *and* HDFS 360; Rural Sociology 101 *and* Sociology 101; or Sociology 243 *and* HDFS 150; they are equivalent courses.

C. *Additional credits* (12 credits) selected from any subjects listed above or from courses in anthropology (except archaeology); Astronomy 101 or 102; biochemistry; microbiology; genetics and development; Geological Sciences 101; and government.

**II. Communication, Analysis, and the Humanities** (15 credits)

A. *Freshman writing seminars* (6 credits) selected from courses listed in the freshman writing seminar brochure.

B. *Additional credits* (9 credits) selected from art; communication; comparative literature; computer science; drawing; English; ancient or modern foreign languages; history; history of art; history of architecture; mathematics; music; Natural Resources 407; philosophy; statistics (students should not take both Industrial and Labor Relations 210 and Agricultural Economics 310, since the courses are substantially the same); theatre arts; DEA 101,111, or 115; HSS 292; TXA 125, 375; and selected ASRC courses (list available in the Counseling Office, N101 Martha Van Rensselaer Hall).

**III. Human Ecology** (40 credits)

A. *Requirements for the major* (the number of credits required varies by major and option).

B. *Fifteen credits to include course work in at least two departments outside the major* with two courses totaling 6 credits minimum in one department and one 3-credit course in a second department. Not more than 3 credits of the15 may be in special studies 400, 401, 402, either departmental or FIS (Field and International Study). HE 100 cannot be used to fulfill this requirement, nor can an undergraduate teaching assistantship designated "403."

**IV. Additional Credits** (41 credits)

A. *Requirements for the major* (number of credits varies from 0 to 15 credits).

B. *Electives* (number of credits varies from 26 to 41 credits).

Credit requirements in this section are met through courses in the *state divisions of Cornell:*

- College of Human Ecology (in addition to courses in sections I, II, and III)
- College of Agriculture and Life Sciences
- School of Industrial and Labor Relations
- College of Veterinary Medicine

and through courses in the *endowed divisions of Cornell:*

- Africana Studies and Research Center
- College of Architecture, Art, and Planning
- College of Arts and Sciences
- College of Engineering
- School of Hotel Administration
- Johnson Graduate School of Management

*Courses in the endowed divisions in this section may not exceed a total of 21 credits.*

**V. Physical Education** (2 credits)

Students who have successfully fulfilled these requirements should have completed at least two terms of physical education in their freshman year.

### Related Policies

**College course requirement.** Freshmen and sophomores are required to enroll in at least one course in the College of Human Ecology a semester. Students who fail to comply with this requirement will be reviewed by the Committee on Academic Status for appropriate action.

**Section II.** Students who score 4 or 5 on the Princeton AP Exam are awarded 3 credits in English. In addition, students who score 5 on the Princeton Exam are exempt from one freshman writing seminar in addition to the 3 English credits awarded.

**In sections I, II, and III**, the required credits listed are the minimums; credits taken in excess of those minimums (section I, 24 credits; section II 15 credits and section III, 40 credits) count toward electives (section IV, 41 credits).

**In sections I and II**, courses specified by the major to meet the requirements in the sections may either be used as meeting the credit requirements in those sections or be applied toward the additional credits in section IV.

**Section IV.** *There is no limit to the number of credits that may be taken in the state divisions of Cornell,* and therefore students may choose to take additional state credits and graduate with *more than* 120 credits.

*Credits in the endowed divisions in this section may not exceed 21.* Any course taken in an endowed division for which a grade of F or U is received will be counted *against* the 21 endowed credits allowed.

Elective credits earned in Cornell's endowed divisions during summer session, in absentia credits, and transfer credits are counted as credits earned in the state divisions and therefore do not count against the 21 credits allowed in the endowed divisions in meeting the requirements of this section.

Not more than 21 credits in section IV may be taken in the endowed divisions of the university except under *both* of the following conditions:

1) The students must have senior status (must be in the final two semesters prior to graduation);

2) Payment must be made for each credit taken in excess of the 21 allowed, *whether or not the courses are passed*. For the precise fee per credit, students should call the Office of the Bursar.

### Related Policies for Transfer Students

**Section I-A.** Transfers who are entering human ecology programs in consumer economics and housing, design and environmental analysis, human service studies (with the exception of the social work program), and policy analysis can satisfy the College of Human Ecology's natural science graduation requirements with any course(s) taken to meet a former college's natural science requirements as long as the course(s) transferred dealt with matter, energy, and their interrelationships and transformations. Courses in areas such as psychology and mathematics are not included, even though courses in these areas may have been taken to meet a former institution's natural science requirement.

**Section II-A.** Transfer students should have taken at least 6 credits in courses in English composition or in courses requiring substantial writing and offering instruction in writing equivalent to that offered in the freshmen writing seminar program at Cornell. Students who have not fulfilled this requirement before transferring must fulfill it after matriculation.

**Section III-B.** External transfer students can meet the requirement for course work outside the major in the College of Human Ecology by completion of:

1) 15 credits of work, outside their department, comprised of transfer credit and credit earned in the college,

or

2) credits all taken in this college (no transfer credit is allowed to meet this requirement), on the basis of the status of the student's matriculation and prorated as follows:

| *Status at Matriculation* | *Cornell Human Ecology Credits to Satisfy Work outside the Major* |
|---|---|
| Freshman (1-25 transfer credits) | 15 |
| Sophomore (26-55 transfer credits) | 12 |
| Junior (56-85 transfer credits) | 9 |
| Senior (86-120 transfer credits) | 9 |

In both options, the courses must be in at least two departments outside the major with two courses comprising 6 credits in one department and at least one 3-credit course in a second department. Transfer students from other Cornell divisions are required to take the full 15 credits outside the major.

Note that transfer students are still responsible for completing a total of 40 human ecology credits under section III.

**Section IV.** Transferred credits for courses applied toward electives do not reduce the 21 Cornell endowed credits that students are allowed. Courses with a passing grade below C– will not transfer to meet human ecology degree requirements.

**Section V.** Transfer students who have had the equivalent of two semesters of college (and therefore enter as sophomores) are not required to take physical education at Cornell, regardless of whether they took physical education at their first college. Exemption or postponement for medical reasons must be cleared by Gannett Health Center. For further information about exemption from, or postponement of, physical education, students should consult the college registrar, Joyce McAllister, in 146 Martha Van Rensselaer Hall.

#### Related Policies for Freshmen

**Section V.** Freshmen are required to take two semesters of physical education during their freshman year. Freshman transfer students entering with 12 or more credits have their physical education requirement reduced to one term.

#### Residency Requirements

All college curricula are planned to fit within an eight-semester program. An average schedule of 15 credits a semester (in addition to physical education) is considered standard, and if pursued for eight semesters will provide the credits needed for graduation. If the student completes all the requirements—for the major, for distribution, for total credits, and for cumulative average—in fewer than eight semesters, the degree may be conferred at the end of the semester in which the last requirements are met. Students who plan to receive their degrees early should notify the registrar at the beginning of the semester so that their names can be placed on the list of degree candidates.

Sometimes a student (particularly a transfer student) may need an additional semester to complete a program. To register for a semester beyond the eighth, the student submits a petition to the college registrar. The petition should detail the reasons for wanting to enroll for the extra semester and include a list of courses planned for the additional semester. Such requests are usually granted when there appears to be no feasible way for the student to complete the professional curriculum or the degree requirements without the extra semester.

Freshmen entering the college with 15 transfer credits have seven semesters in which to complete the degree. Transfer students must complete at least 60 credits at Cornell.

**Mature students** (those at least twenty-four years old at the time of matriculation) are not required to petition the college registrar for approval to study beyond the usual eight semesters.

### Exemptions from Requirements

Students who want an exemption from a specific graduation or major requirement may petition, and approval may be given under certain circumstances. Full information about the petition process is given in the human ecology *Student Guide*. Petition forms are available in the Office of Student Services, N101 Martha Van Rensselaer Hall.

## PROCEDURES

### Course Enrollment

Students are expected to complete course enrollment during a designated period each semester. Failure to do so carries a $10 penalty, which can be waived only if circumstances are completely beyond the student's control. It is the student's responsibility to find out the dates of course enrollment.

Before or during course enrollment, students talk to a department adviser or college counselor, or both about their program plans. Students must have their course enrollment schedule signed by their departmental major faculty adviser or by a college counselor if they have not declared a major. A listing of course changes plus directions for course enrollment is issued by the Office of the College Registrar before the start of course enrollment. Last-minute course changes are posted in that office as well as in the Counseling Office, N101 Martha Van Rensselaer Hall. Students will also need the *Course and Time Roster*, issued by the Office of the University Registrar each semester before course enrollment.

Since new students starting at midyear do not have an opportunity to enroll in courses until after they arrive on campus, the college tries to reserve places for them in human ecology courses. A specified time for enrolling in such courses is listed on the orientation schedule given to all new students. For the first three weeks of the term, new students have an opportunity to add courses in other divisions of the university as well as in human ecology.

Freshmen and transfer students registering for the first time in the university in the fall term enroll in their courses during the summer before they arrive on campus.

Continuing students enroll for courses for fall semester in March or April; for spring semester in October or November preceding the beginning of the term. Course enrollment materials are mailed to each new student; continuing students are notified of course enrollment dates by posters and notices in the Cornell Daily Sun. Course enrollment materials are available from the Office of Student Services and must be completed and filed in the Office of the College Registrar by the announced deadline.

#### Permission of the Instructor

Certain courses may be taken only with the permission of the instructor, as indicated in the course descriptions. The instructor's permission must be obtained before the student enrolls in the course. After giving permission, the instructor initials the course-enrollment schedule or signs the course-enrollment form, which can be obtained from the Office of the College Registrar or the Office of Student Services.

Students interested in taking a course in the Department of Art in the College of Architecture, Art, and Planning are required to register with the departmental secretary before enrolling in the course. Seniors who want to take an elective course in the Johnson Graduate School of Management are required to obtain permission of the instructor on a course authorization form that the student then files with that school's registrar in 312 Malott Hall.

#### Special Studies Courses

Each department in the College of Human Ecology (CEH, DEA, HDFS, HSS, DNS, and TXA as well as the Field and International Study Program) offers special studies courses that provide an opportunity for students to do independent work not available in regular courses. One of those courses, designated 300, Special Studies for Undergraduates, is intended primarily for students who have transferred from another institution and need to make up certain course work.

The other special studies courses are 400, Directed Readings; 401, Empirical Research; and 402, Supervised Fieldwork. Those courses are normally taken by upperclass students, and work is supervised on an individual basis by a faculty member in the department in which the course is offered. It is important to enroll in the appropriate course number (300,400,401, or 402) for a special project.

Students who want to take a special studies course must talk with the faculty member under whose supervision the study would be done and then prepare a plan of work. If the faculty member agrees to supervise the study, a multicopy special studies form must be filled out, describing the study to be pursued. Signatures of the instructor and the department chair as well as the student's departmental adviser must be on the form before it is taken to the Office of the College Registrar, where the student will officially register for the course by filling out a course-registration form. Forms and instructions are available in the Office of Student Services.

To register in a special studies course taught in a department outside the college, students should follow the procedures established for that department.

#### Course Loads

The normal course load in the college ranges from 12 to 18 credits. *During the course enrollment period no student may enroll for more than 15 credits or five courses, whichever is greater, without special permission from the college registrar.* To receive permission, a student attaches a note to the green course schedule, citing reason(s) for carrying a heavier load, before handing it in to the Office of the College Registrar.

*Credits beyond 15 may be added during the change-of-registration period at the beginning of the semester without special permission.*

Students should avoid planning excessive work loads; the time required to keep abreast of courses tends to increase as the semester progresses. *Courses cannot be dropped after the seventh week of classes without petitioning,* so students should try to avoid the need to drop courses.

Except for those with mature-student status, students must carry at least 12 credits (exclusive of physical education). In special cases, a student may petition to carry between 8 and 12 credits. Forms for petitioning and advice on how to proceed are available from the Office of Student Services.

Except for mature students, it is seldom possible to have tuition prorated if a student carries fewer than 12 credits during a semester. (See the college registrar for more information.)

Students of mature status may carry 6 to 12 credits without petitioning and may have their tuition prorated. However, at the beginning of each term, mature students planning to take a light course load should pick up a proration of tuition form from the Office of the College Registrar, fill it out, have it signed by the college registrar, and return it to the bursar's office in Day Hall.

#### Oversubscribed Courses

Enrollment in many human ecology courses is limited. When a course is over enrolled, students are generally assigned on the basis of seniority. Student's professional goals may be considered. Those students not admitted to a course may be placed on a waiting list and will find a note to that effect attached to the course enrollment printout.

#### Late Course Enrollment

Students who fail to enroll in courses by a deadline must normally wait until the beginning of a semester to enroll and must pay a $10 fee. Extensions are sometimes granted if requested from the college registrar before the end of course enrollment. In general, such extensions are only granted for medical reasons supported by a doctor's statement. Students who fail to meet the deadline for any reason should see the college registrar as soon as possible. In some cases, if the delay was absolutely unavoidable, the student may be allowed to enroll in courses late, and it is sometimes possible to have the fee waived.

## University Registration

The time and place of university registration is announced by the Office of the University Registrar. At registration, students fill out and return materials that are given to them, and their IDs are validated.

Students also receive a printout of courses for which they are officially enrolled. It is the student's responsibility to check the listing for accuracy of course numbers, credits, and other data. If there are errors, they should be corrected immediately. Procedures for making changes because of errors in the printout, as well as for other reasons, are described below.

During university registration for the fall semester, each continuing student receives a copy of his or her summary of record from the Office of the College Registrar. The summary shows which graduation and major requirements have been completed. Students who have any questions about the summary's accuracy should see an appropriate person in the Office of the College Registrar.

**Late university registration.** A student who fails to pay his bursar's bill by the announced time will have finance charges added to that bill during the first three weeks of the term. Starting with the fourth week of the term there will be an $85 late charge, which will increase by $10 a week for weeks five and six. Starting with the seventh week of the term an additional $25-a week charge is added until the end of the term. After completing late university registration, students must take their college registration cards to the Office of the College Registrar, where they will then receive computer printouts of the courses for which they are officially registered. Students who fail to register by the seventh week of the term will be withdrawn from the university by the Office of the College Registrar. Students who want to return must reapply through the Admissions Committee.

## Course Enrollment Changes

#### Deadlines

- During the first three weeks of the term, courses may be added or dropped without charge.
- From the fourth through the seventh week of the term, course changes may be made with the permission of the instructor and payment of a $10 processing fee.
- After the seventh week of the term, no course change may be made without petitioning for approval. Petitions are usually granted only in circumstances beyond a student's control (for example, illness). A student petitioning for medical reasons should provide substantiating medical evidence with the petition.
- Also, a student submitting a petition after the seventh week of the term requesting permission to drop a course must have his or her faculty advisor write a statement to accompany that petition indicating whether or not the advisor supports the request.
- After the eighth week of the term, any student granted permission to drop a course after petitioning will automatically receive a grade of W (Withdrawn), and the course will remain on the official transcript.
- After the third week of the term, instructors have the right to consider students' requests for course changes on an individual basis or to announce at the beginning of the term a specific date between the fourth and seventh weeks beyond which they will no longer approve course changes.

#### Procedures

Students who need to make course enrollment changes should make them as soon as possible. It is to the student's advantage to add the desired courses as soon as possible, and it is helpful to other students if unwanted courses are dropped promptly. Students should assess their work loads carefully at the beginning of each term. If in the first week or two the instructors do not discuss the amount of material to be covered and the extent of assignments, students are advised to ask about course requirements.

Some of the same procedures are required for course enrollment changes as were necessary for course enrollment—for example, permission of the instructor must be obtained for a course requiring it, and the same forms must be filled out for special studies courses. In addition to the procedures listed below for course enrollment changes, all course change forms for nutritional sciences majors must be signed by the departmental faculty adviser.

Specific procedures for making course changes during the change-of-enrollment period (first three weeks of classes) are listed below. The student should:

1) Obtain a course-change form from the Office of the College Registrar or from the Office of Student Services.
2) Fill the form out and take it to the appropriate office for signature: for human ecology courses, the forms should be taken to the Office of the College Registrar; for courses outside the college, the forms should be taken to the appropriate departmental offices.
3) Ask the person handling the class lists to add the student's name to the list of enrolled students for a course being added or to remove his or her name from the class list for a course being dropped. That person should sign the course-change form in the appropriate place.
4) Turn all signed forms in to the Office of the College Registrar, including the forms for out-of-college courses. Enrollment cannot be officially changed until the signed forms are filed in the registrar's office. For example, students who fail to "cancel" a course they are no longer attending are in danger of receiving an F in the course, because they are still officially enrolled. There is no charge for course changes during the first three weeks of classes.
5) Receive carbon copies of each course-change form at the time it is turned in. These copies are stamped with the date of receipt. It is important to keep these copies in case they are needed to verify later that the forms were filed.

A student who wants to have his or her name placed on a waiting list for a human ecology course should be aware that such lists are compiled during the change-of-course-enrollment period on a first-come–first served basis, without regard to seniority or other factors. Students must check their status on the waiting lists in person every forty-eight hours, and if space has not opened up, request that their names be kept on the list. Names are automatically dropped if they are not updated.

If a student is enrolled in a human ecology course with a limited enrollment and has not attended the first two class sessions, he or she will be dropped from the course unless circumstances have prevented him or her from attending class and the instructor has been notified.

After the third week and through the seventh week of a term, the procedures outlined above for changes made during the first three weeks of a semester are followed, except that the instructor must sign the course-change form for human ecology courses, and a $10 fee must be paid.

After the seventh week of classes, a student may not make course changes without petitioning for approval. Students should realize that they are expected to attend classes and do assigned work until a petition has been formally approved.

## Study In Absentia

Under certain conditions, credit toward a Cornell degree may be given for study in absentia, that is, study a student undertakes at an accredited institution away from Cornell, after entering the College of Human Ecology. To be eligible for credit for such study, a student must be in good academic standing and must receive permission in advance from the college registrar. Students not in good standing may study in absentia but will not receive transcript credit until they return to good standing.

In absentia petition forms are available in the Office of Student Services. The petition form should be filled out and catalog descriptions attached for the courses the student wants to take, and then it should be filed in the Office of the College Registrar.

Students whose petitions are granted receive a letter giving them permission from the college registrar to study in absentia. Credit may be granted for study in absentia after the work has been done, but there is no guarantee that such credit will be awarded if permission has not been obtained in advance.

A $15 fee is charged to bind a student's in absentia registration. If the in absentia study is undertaken during the summer, the $15 fee is charged only if the summer study is for more than 8 credits. A form is included with the letter sent to the student, giving permission to study. This form must be completed and returned to the Office of the College Registrar, 146 Martha Van Rensselaer Hall, along with a check for $15, before the student is officially registered in absentia.

Up to 15 credits may be taken in absentia as long as the work done does not duplicate courses already taken and the study is relevant to the student's program and the requirements of the college. More than 15 credits of work in absentia may be allowed under the following conditions: (1) the work taken represents a special educational opportunity not available at Cornell, (2) it relates to the student's particular professional goals, and (3) that goal is consistent with the focus of the college. To take more than 15 credits in absentia, a student must also have the petition approved by the college registrar, who will evaluate the proposed program. (Forms are available in the Office of Student Services.)

If part of the work for which credit is sought is to be applied to requirements of the major, the petition will be sent to the appropriate department for approval. If credit is sought for work to be done in a modern foreign language that the student has previously studied, the approval of the Department of Modern Languages and Linguistics in the College of Arts and Sciences must be obtained.

Students are responsible for having the registrar of the institution where they study in absentia send transcripts of grades to the Office of the College Registrar at the College of Human Ecology. Credit can then be officially assessed and applied toward the Cornell degree. Only credits (not course names and grades) for study in absentia appear on the Cornell University transcript.

A student who holds a Regents' or Children of Deceased or Disabled Veterans Scholarship may claim that scholarship for study in absentia if the study is done in a college in New York State and if it is for a maximum of 15 credits acceptable to the College of Human Ecology.

The rules regarding study in absentia apply to transfer students with the additional stipulation that at least 60 credits must be taken at Cornell. At least 40 of the 60 credits must be in the College of Human Ecology at Cornell unless the student has transferred equivalent human ecology credit. (No more than 20 credits of equivalent credit may be applied to the 40 credits required in human ecology course work.)

### Leaves of Absence

Students may request a leave of absence before the beginning of the semester for which a leave is desired or during the first seven weeks of the semester. A leave may be extended for a second semester by requesting an extension in writing from the Office of the College Registrar. Students who are contemplating taking a leave of absence are urged to discuss plans with a counselor. If the student decides to take a leave of absence, a counselor will provide the necessary forms to complete, which should be taken to the Office of the College Registrar, where the official leave will be processed.

Requests for a leave of absence received after the first seven weeks of the semester, or requests for a leave of absence from students who have already had two semesters' leave of absence, will be referred for action to the Committee on Academic Status. The committee may grant or deny such requests, attaching conditions as it deems necessary. Leaves of absence after the first seven weeks are generally granted only when there are compelling reasons why a student is unable to complete the semester, such as extended illness.

If a leave of absence is requested after the first seven weeks, students are advised to attend classes until action is taken on their petitions. A student whose petition for a leave of absence is denied may choose to withdraw or to complete the semester.

The academic records of all students who are granted a leave of absence are subject to review, and the Committee on Academic Status may request grades and other information from faculty members to determine whether the student should return under warning or severe warning or in good academic standing.

### Withdrawal

A withdrawal is a termination of student status at the university. Students may voluntarily withdraw at any time by notifying a counselor and the Office of the College Registrar. Students contemplating such an action are urged to discuss their plans with a counselor.

There are instances in which a student may be given a withdrawal by the Office of the College Registrar. If a student leaves the college without an approved leave of absence or does not return after the leave has expired, the student will be given a withdrawal after the seventh week of the term in which he or she failed to register.

A student who has withdrawn from the college or who has been given a withdrawal by the Office of the College Registrar and who wishes to return at a later date must reapply through the Committee on Admissions for consideration along with all other applicants for admission. If the student was in academic difficulty at the time of the withdrawal, the request for readmission will be referred to the Committee on Academic Status for consideration, and that committee may stipulate criteria under which the student may be readmitted to the college.

### Petition Process

There are two kinds of petition forms: the general petition form, which is multicopied, and the in absentia petition form, which is a single sheet and has no copies attached. Both types of forms are available from the Office of Student Services, N101 Martha Van Rensselaer Hall.

**The use of the general petition form is described** in the human ecology *Student Guide*. After completing them, students should file general petition forms in 146 Martha Van Rensselaer Hall. They will find out if a petition has been granted or denied by checking their mail folders in the foyer.

**The in absentia petition form is** used when a student wishes to study at another institution. (See the human ecology *Student Guide* for regulations concerning in absentia study.) Catalog descriptions of the courses the student wishes to take at the other institution must be attached to the petition form. After completing the petition, the student should file the in absentia petition form in 146 Martha Van Rensselaer Hall. A letter in the mail will inform the student of the decision.

It should be noted that although many kinds of requests are petitionable in the college, some kinds of situations are governed by college faculty legislation and cannot be altered by filing a petition. If a student is in doubt about whether a request could be considered by petition, he or she may discuss the problem with the college registrar.

## GRADES

See the "Grading Guidelines" section for information on the official university grading policies.

### S-U Grades

Some courses in the college and in other academic units at Cornell are offered on an S-U basis; that fact is indicated in the course description. University regulations concerning the S-U system require that a grade of S be given for work equivalent to a C– or better; for work below that level, a U must be given. No grade-point assignment is given to S, and S or U grades are not included in the computation of semester or cumulative averages. A course in which a student receives an S is, however, counted for credit. No credit is received for a U. Both the S and U grades appear on a student's record. A student who is attempting to qualify for the Dean's List must take at least 12 credits for the usual A–F grades.

Only juniors and seniors may take an S-U grade in courses in which the grade of S or U is optional; however, sophomores may take courses in which *only* the grade of S or U is offered. A student may take no more than four courses (or 12 credits) on an S-U basis during his or her college career; however, more than one S-U course can be taken in one semester. S-U courses may be taken only as electives or in the 15 credits required in the college outside the major unless the requirements for a specific major indicate otherwise. Freshmen enrolled in English 137 and 138 (offered for S-U grades only) are permitted to apply those courses to the freshman writing seminar requirement.

To take a course for an S or U, a student must first make sure, by checking the course description, that the course is offered on that basis, then obtain the permission of the instructor and file a special S-U form with the instructor's signature and the add/drop/change form in the Office of the College

Registrar before the end of the third week of the term. After the third week of the term, students must petition the college registrar to change S-U grading status, but such petitions may not be granted. Forms are available in the Office of the College Registrar and in the Office of Student Services.

### Grades of Incomplete

A grade of incomplete is given when a student does not complete the work for a course on time but when, in the instructor's judgment, there was a valid reason. A student with such a reason should discuss the matter with the instructor and request a grade of incomplete.

Beginning fall 1984, a grade of incomplete may remain on a student's official transcript for a maximum of two semesters and one summer after the grade is given, or until the awarding of a degree, whichever is the shorter period of time. The instructor has the option of setting a shorter time limit for completing the course work.

If the work is completed within the designated time period, the grade of incomplete will be changed to a regular grade on the student's official transcript. If the work is not completed within the designated time period, the grade of incomplete will be automatically converted to an F.

When a student wants to receive a grade of incomplete, a conference should be arranged with the instructor (preferably before classes end and the study period begins) to work out the agreement. A form, called *explanation for reporting a final grade of* **F** *or incomplete,* which has been signed by both the instructor and the student, must be submitted by the instructor. This form is submitted with the final grade sheets whenever a grade of incomplete is given.

This form is for the student's protection, particularly in the event that a faculty member with whom a course is being completed leaves campus without leaving a record of the work completed in the course.

If circumstances prevent a student from being present to consult the instructor, the instructor may, if requested by the student, initiate the process by filling out and signing part of the form and turning it in to the Office of the College Registrar with the grade sheet. Before a student will be allowed to register for succeeding semesters, he or she must go to the Office of the College Registrar to fill out and sign the remainder of the form.

If the work is satisfactorily completed within the required time, the course appears on the student's official transcript, with an asterisk and the final grade received, for the semester in which the student was registered for the course.

A student who completes the work in the required time and expects to receive a grade must take the responsibility for checking with the Office of the College Registrar (about two weeks after the work has been handed in) to make sure that the grade has been received. Any questions should be discussed with the course instructor.

## ACADEMIC HONORS

The college encourages high academic achievement and recognizes outstanding students in several ways.

**Dean's List.** Excellence in academic achievement is recognized each semester by placing on the Dean's List the names of students who have completed satisfactorily at least 12 credits with letter grades other than S or U and who have a semester grade-point average of 3.5 or above. No student who has received an F or U in an academic course will be eligible.

**Omicron Nu** seeks to promote graduate study and research and to stimulate scholarship and leadership toward the well-being of individuals and families. As a chapter of a national honor society in the New York State College of Human Ecology, it stimulates and encourages scholarly inquiry and action on significant problems of living—at home, in the community, and throughout the world.

Students are eligible for membership if they have attained junior status and have a cumulative average of not less than B. Transfer students are eligible after completing one year in this institution with a B average.

Current members of Omicron Nu elect new members. Not more than 10 percent of the junior class may be elected to membership and not more than 20 percent of the senior class may be elected. Graduate students nominated by faculty members may be elected.

**Bachelor of Science with honors** recognizes outstanding scholastic achievement in an academic field. Programs leading to a degree with honors are offered to selected students by the Department of Human Development and Family Studies and the Division of Nutritional Sciences. Information about admission to the programs and their requirements may be obtained from the appropriate department or division.

**Bachelor of Science with distinction** recognizes outstanding scholastic achievement. Consideration will be given to seniors whose academic standing at the end of seven semesters is in the top 10 percent of the graduating class. The honor is conferred on those seniors who are in the top 5 percent of the class after grade-point averages have been adjusted by including grades for transfer work and after grades earned in the fifth, sixth, and seventh terms have been given double weighting in the final average. The graduating class includes students who will complete requirements for Bachelor of Science degrees in January, May, or August of the same calendar year.

To be eligible for consideration, transfer students must have completed 45 credits at Cornell. In determining the academic standing of a transfer student, previous work taken at another institution is included in the computation of the student's academic average. Names of seniors who meet these requirements are presented to the faculty of the college for approval.

## NONDEPARTMENTAL COURSE

**100 Critical Reading and Thinking**
Fall, spring, or summer. 2 credits. Enrollment limited. Priority is given to freshmen and sophomores; juniors and seniors are admitted with permission of the instructor. S-U grades only.

Fall and spring: sec, T R 10:10 or 11:15, plus two 1-hour labs to be arranged. H. Selco.

The objective of this course is to enable students to increase critical reading and thinking abilities. Theory and research associated with a wide range of reading, thinking, and learning skills are examined. Emphasis is placed on developing and applying analytical and evaluative skills. Laboratory instruction is individualized and provides the opportunity to focus intensively on increasing comprehension, reading rate, and vocabulary.

## INTERDEPARTMENTAL COURSES

### Field and International Study Program

S. Beck, director; R. Bounous, D. Giles, J. Kugelmass, F. McCarthy, K. Reardon

#### Field Study

Field study enables students to learn from participation in a community and organizational setting and from critical reflection on that experience through discussion, reading, and writing. This process of integrating theory with practice distinguishes experiential education. Students earn credit by participating in internships and community-based research.

The Field and International Study Program (159 Martha Van Rensselaer Hall) offers courses in pre-field preparation and field-based courses with an interdisciplinary problem-solving approach to social issues. Field study programs are located in the Ithaca area, New York City, and Washington, D.C., with other opportunities possible through arrangements with Field and International Study Program faculty. Courses are open to registration by all Cornell students.

#### International Study

Study abroad provides students with an opportunity to add an international dimension to their human ecology program through course work focusing on international problems and intercultural understanding and through sponsored programs of study abroad for which credit may be earned. Course work in a foreign institution will, in general, be planned to increase knowledge of the people and institutions of the country concerned; fieldwork may provide guided experience in family, community, or agency situtions of the country concerned and in an area related to individual student interest in human ecology.

Opportunities for study abroad are available for human ecology students in several ways: through Cornell Abroad, through U.S. college-sponsored programs abroad, and through direct enrollment in a foreign university. Information and applications for study abroad are available in the Field and International Study Program office (MVR 159).

**100 Skills for Learning in the Field**
Fall or spring. 2 credits. Prerequisite: permission of instructor.

First 7 weeks of semester; W 1:30–4:25. J. Kugelmass, fall; D. Giles, spring.

This course trains students to become more effective field learners and enables them to understand and cope with the complex demands of a field placement. Topics include experiential learning, cross-cultural communication, ethnocentricism and cultural relativism, participant observation, investigative interviewing, critical thinking, understanding nonverbal communication, identifying sources of information in the community, and analyzing verbal presentations. All of the concepts are applied through work assignments.

**200 Preparation for Fieldwork: Perspectives in Human Ecology**
Fall or spring. 4 credits. Limited to 25 students per section. Prerequisite: permission of instructor. Required of all students planning to do FIS 400-level field study or research.

T R 10:10–12:05 or 2:30–4:25. D. Giles, fall; J. Kugelmass, spring.

Introduces students to skills essential for field study, internships, community research, and other experiential learning courses. This course focuses on the structures and processes that generate and change sociocultural structures and relations, small groups, organizational productions, and communities, that students will encounter during field study. Through a cycle of active learning and reflection, students gain experience in analysis of assumptions and biases, participant observation and interviewing skills, self-directed learning skills, effective verbal and nonverbal communication, and group dynamics. Working in small task groups, students apply and synthesize these skills in real-world community-based projects. Previous semesters' projects included "Collegetown Redevelopment," "Human Services and Ithaca's African American Community," "The Culture of Ithaca," and "Long-Term Health Care." FIS 210 may be substituted for FIS 200 with permission of instructor.

**210 Preparation for International and Cross-Cultural Experience**
Fall or spring. 3 credits. Not open to freshmen. Prerequisite: permission of instructor; preference given to students planning to study abroad or participate in international internships.

T R 12:20–1:40. F. McCarthy.

The course has two main objectives. One is to prepare students for international and cross-cultural experience through the application of observation and interviewing skills, analysis of social and cultural factors in selected countries, and consideration of key issues such as poverty, inequality, industrialization, and class and gender exploitation; the second is to link social factors to the use and distribution of natural resources and provide a framework for understanding the social control of resources and its effects on the life chances and experience of people. Class activities include discussion, lectures, field experiences, skill development, and a small-group presentation. Students will develop interviewing and observation skills through projects that will focus on the countries in which they intend to study or intern. Strongly recommended for students planning to study abroad, to do international internships, or to take FIS 410. FIS 210 may be substituted for FIS 200 with permission of instructor.

**400 Directed Readings**
For study that predominantly involves library research and independent reading.

**401 Empirical Research**
For study that predominantly involves data collection and analysis.

**402 Supervised Fieldwork**
Fall, spring, or summer. 3–15 credits. Limited to 20 students. Prerequisite: FIS 200. Enrollment by permission of instructor. Applications due in the Field and International Study Office during the preceding semester's course enrollment period.

Hours to be arranged. Staff.

Supervised field study involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice. Credit is variable to allow for combined departmental and interdepartmental sponsorship and supervision.

Information on placement opportunities is available in the Field Study Office, 159 Martha Van Rensselaer Hall. Students should begin planning at least a semester in advance for field study.

**403 Teaching Apprenticeship**
For study that includes assisting faculty with instruction.

**406 Sponsored Field Learning or Internships**
Fall or spring. 6–15 credits. Limited to 15 students; intended for juniors and seniors. Prerequisite: FIS 200. Enrollment by permission of instructor. Applications are due in the Field and International Study Office during the preceding semester's course enrollment period.

Hours to be arranged. Staff.

A course for students seeking interdepartmental sponsorship and supervision of participation in structured, off-campus field experiences or internships operated by non-Cornell or non-credit-granting institutions or agencies. Completion of course requirements is signified by a formal presentation to the college community upon return to Cornell (graduating seniors may make special arrangements). Credit is variable to allow students to arrange for combined interdepartmental and departmental sponsorship and supervision.

Information on course enrollment and internship opportunities is available in the Field Study Office, 159 Martha Van Rensselaer Hall. Students should begin planning more than one full semester before leaving campus for an internship.

**407 Field Experience in Community Problem Solving**
Fall or spring. 6–15 credits. Limited to 25 students; intended for juniors or seniors. Prerequisite: FIS 200. Enrollment by permission of instructor. Applications due in the Field and International Study Office during the preceding semester's course enrollment period.

Sem, R 1:30–4:25; hours in the field to be arranged. J. Kugelmass, fall; D. Giles, spring.

A course designed to provide students with a structured, closely supervised field experience encompassing an ecological approach to human problem solving. Interdepartmental teams of up to fifteen students will contract with community businesses, agencies, and organizations as special-projects staff members delegated primary responsibility for problem solving in a designated area of agency need. Students spend twenty hours each week working directly on the projects, three hours each week in seminar, and additional time completing seminar readings and assignments. The seminar is aimed at assisting students in systematically analyzing the complex factors that affect the implementation of new programs, policies, or projects in upstate community settings. Set in this context, the field placement is viewed as a case study in the ecology of organizational decision making.

Supervision of all projects is provided jointly by the course instructor and appropriate agency personnel. In addition, each project is subject to review twice during the semester by an oversight committee composed of community and faculty representatives with relevant expertise. Completion of the course is signified by formal presentation of project results to the contracting organization's staff, board of directors, or other appropriate administrative units and to members of the oversight committee, together with submission of an academic analysis of the implementation process to the course instructor.

Credit is variable to allow students to arrange for combined interdepartmental and departmental sponsorship and supervision.

Information on projects is available during course enrollment in the Field and International Study Office, 159 Martha Van Rensselaer Hall. Students may assist in the planning and project-identification process by making their interests known to the office a full semester before intended enrollment in the course.

**408 The Ecology of Urban Organizations: New York City Field Experience**
Fall or spring. 9–15 credits. Limited to 25 students; intended for juniors and first-semester seniors. Prerequisites: FIS 200 and permission of instructor. Applications due in the Field and International Study Office during the preceding semester's course enrollment period. Students may enroll in FIS 408 for up to 11 FIS credits and for 0 to 4 CEH 402 credits, depending on departmental regulations. Information on these policies and on placements is available in 159 Martha Van Rensselaer Hall. Students should begin planning at least one semester before they apply to this course.

K. Reardon/R. Avery—CEH.

A course designed to enhance students' understanding of organizational behavior and decision making through a program that integrates internship experience with classroom learning. Students, participating as interns in a variety of New York City agencies and firms, are challenged to examine interpersonal, institutional, interorganizational, and environmental factors that shape professional practice and human problem solving in formal organizations. From an ecological perspective, students explore how such factors as employee motivation, organizational culture, formal structure, communication patterns, leadership style, technology, demographics, politics, and regional economics influence patterns of staff interactions, management policy, and organizational initiatives. Student placements

exist in advertising, communication, fashion design, financial services, government, health care, human services, retailing, and many other fields. Weekly seminars include lectures, discussions, simulations, speakers, cultural events, and field trips to neighborhoods and organizations throughout the New York metropolitan area.

**409 The Ecology of Organizations in the Upstate Region: Ithaca-Area Field Experience**

Fall or spring. 4–15 credits. Limited to 25 students. Prerequisites: FIS 200 and permission of instructor. Applications are due in the Field and International Study Office during the preceding semester's course enrollment period.

Sem, T 1:30–4:25; hours in the field to be arranged. J. Kugelmass.

A variable-credit course designed to give students an in-depth understanding of contemporary organizations and the forces that shape and influence them. The course combines participation in a community setting within commuting distance of the Cornell campus with a weekly seminar that provides the skills, concepts, and theories necessary for understanding organizations and the critical issues they face. Students can arrange for combined interdepartmental and departmental sponsorship and supervision.

Information on placement opportunities is available in the Field and International Study Office, 159 Martha Van Rensselaer Hall. Students should begin planning at least a semester in advance for field study.

**410 Advanced Seminar: Analysis of International Experience**

Fall or spring. 3 credits. Prerequisites: experience abroad and permission of instructor.

T R 2:30–4. F. McCarthy.

This course provides a context for the integration and interpretation of cross-cultural experience for students returning to the United States after extended periods abroad. Building on an understanding of international processes shaping and directing an interdependent world, the course relates personal experience to socioeconomic factors structuring living situations at home and abroad. Among the issues to be pursued are reentry and (re)acculturation, patterns and conditions of work, relationships and patterns of exchange, ideology and social explanation, personal autonomy and institutional contexts, power and authority, gender exploitation and oppression, and forms of response. The course will feature readings, special projects, presentations, and discussions encouraging and facilitating the analysis and understanding of individual cross-cultural experience. The purpose of the course is to encourage the analysis and integration of cross-cultural experience in relation to international processes, academic interests, and personal concerns of students.

## CONSUMER ECONOMICS AND HOUSING COURSES

W. K. Bryant, chair; R. Heck, graduate faculty representative; P. Chi, J. Reschovsky, undergraduate advising coordinators; R. Avery, H. B. Biesdorf, W. K. Bryant, P. Chi, M. Coughlan, J. Gerner, L. Gosse, R. Heck, J. Hogarth, L. Jacobsen, R. Key, E. S. Maynes, D. Mont, P. Pollak, J. Reschovsky, N. C. Saltford, J. Swanson, E. Trzcinski, S. White-Means, P. Zorn.

**110 Introduction to Consumer Economics**

Fall. 3 credits. S-U grades optional. Students who have taken Economics 101 or another introductory microeconomics course should not register for this course.

M W F 9:05; sec. to be arranged. P. Zorn.

Principles of microeconomics with an emphasis on applicability to consumers. The course acquaints students with the basic economic models of household and firm behavior and their interaction in markets. The goal is to provide students with the ability to analyze the economic implications of consumer decisions and public policies.

**111 Introduction to Consumer Economics II**

Spring. 3 credits. S-U grades optional. Students who have taken Economics 102 or another introductory macroeconomics course should not register for this course.

M W F 11:15. Two evening prelims. Staff.

Principles of macroeconomics with an emphasis on the relevance of economic policies to consumers and households. Topics include national income accounting, aggregate demand and aggregate supply, the role of monetary and fiscal policy in confronting the problems of inflation and unemployment, and international economics.

**148 Sociological Perspectives on Households**

Fall. 3 credits. S-U grades optional.

T R 10:10–11:25; sec. to be arranged. L. Jacobsen.

An introductory sociology course analyzing the composition and distribution of families and households in the United States. Students focus on the social, economic, and demographic processes underlying changes in family and household structure as well as on the effects of those changes on basic social institutions. Topics include trends in marriage, divorce, and childbearing; the interactions between household structure and labor supply, living arrangements, and housing consumption; social stratification and inequality; poverty; population growth and geographic distribution; and trends in the age and sex structure of U.S. society.

**233 Marketing and the Consumer**

Spring. 3 credits. Prerequisite: CEH 110 or equivalent.

T R 8:40–9:55. E. S. Maynes.

This course introduces students to marketing—the processes and institutions by which products are conceived, tested, priced, advertised, distributed, and evaluated. Case studies and outside lecturers are used to impart reality to the course. Emphasis is given to the viewpoint of both the seller and the consumer. Students are required to undertake a paper involving a marketing problem.

**247 Housing and Society**

Spring. 3 credits. S-U grades optional.

M W F 11:15. Two evening prelims. P. Chi.

A survey of contemporary American housing issues as related to the individual, the family, and the community. The course focuses on the current problems of the individual housing consumer, the resulting implications for housing the American population, and governmental actions to alleviate housing problems.

**300 Special Studies for Undergraduates**

Fall or spring. Credits to be arranged.

Hours to be arranged. Staff.

Special arrangement for course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they want to undertake, on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the head of the department, is filed at course registration or during the change-of-registration period.

**301 Special Studies for Undergraduates**

Fall or spring. 1 credit. Prerequisite: a course in introductory microeconomics and coregistration in a CEH 300- or higher-level course. S-U grades only.

Six 1-1/2 hour lecs, weeks 2–4 of term. Hours to be arranged. Staff.

Topics covered will be utility maximization, marginal analyses, derivation of demand curves, price and income effects, present value, and other relevant topics.

**310 Intermediate Microeconomics**

Fall. 4 credits. Prerequisite: CEH 110 or equivalent. Class notes for sale at Campus Store.

Lecs, M W F 10:10 or 11:15; disc, W 2:30 or 3:35 or R 2:30 or 3:35. Two evening prelims. L. Gosse.

Theory of demand and consumer behavior including classical and indifference curve analyses; theories of production and cost; models for the following markets—competitive, monopoly, monopolistic competition, oligopoly, and inputs; general equilibrium; welfare economics; public goods; risk.

**312 Family Resource Management**

Spring. 3 credits. Not open to freshmen. S-U grades optional. Class notes for sale at Kinko's.

M W F 2:30. R. Key.

An introduction to management concepts and theories of efficient resource utilization from a social systems perspective. The focus is on the family's use of resources to attain goals and meet demands. A systems framework is used to analyze family managerial behavior throughout the life-cycle and specific situations such as single-parent, blended, and low-income families.

**315 Personal Financial Management**
Fall or spring. 3 credits. Preference given to human ecology students; limit 200; not open to freshmen. S-U grades optional.
M W F 10:10. Evening prelim. Fall: J. Robinson; spring: R. Heck.
The study of personal financial management at various income levels and during different stages of the family life cycle. Topics include the use of budgets and record keeping in achieving family economic goals, the role of credit and the need for financial counseling, economic risks and available protection, and alternative forms of saving and investment.

**325 Economic Organization of the Household**
Spring. 3 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional. Class notes for sale at the Campus Store.
M W F 9:05. Evening prelims.
W. K. Bryant.
Theories and empirical evidence about how households spend their resources are used to investigate the ways they alter the amounts and proportions of time and money spent in various activities, their size, and their form in response to changing economic forces.

**332 Consumer Decision Making**
Fall. 3 credits. Prerequisite: CEH 110 or permission of instructor.
M W F 10:10. E. S. Maynes.
This course is designed to help individuals make more effective choices as consumers. In pursuit of this goal, the course introduces the student to relevant concepts, theories, and research from economics, consumer economics, marketing, and statistics. Topics covered include informationally imperfect markets, assessing consumer information, seeking redress, bargaining, dealing with inflation, decision-making rules, the concept and measurement of quality, and consumerism. Students prepare price-quality maps of local consumer markets. A second part of the course introduces the student to the concept of consumer sovereignty and assesses the performance of markets as critiqued by economists and consumerists.

**341 Fundamentals of Housing Economics**
Fall. 3 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional.
T R 1–2:15. P. Zorn.
This course is designed to provide students with the economic skills required to understand housing markets, problems, and policies. Microeconomic theory will be used to develop a model of household and firm behavior. This model provides the framework for an analysis of empirical studies by housing economists. Topics will include the tenure-mobility decision, estimation of the supply and demand for housing, the effects of inflation and the income tax system on the housing market, and the treatment of housing as a heterogeneous durable good.

**355 Wealth and Income**
Fall. 3 credits. Open to sophomores, juniors, and seniors; graduate students may elect to audit and write a research paper for 1 to 2 credits under CEH 600. Prerequisites: CEH 110–111 or equivalent. S-U grades optional.
T R 9:05; sec. J. Gerner.
The wealth and income positions of American households are defined and described and their economic determinants discussed along with the impacts of tax and expenditure policies and the economics of the political positions for and against such policies.

**356 The Economics of Welfare Policy**
Spring. 3 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional.
M W F 9:05. D. Mont.
Using the tools of economics, this course examines welfare policy. Included are an examination of which populations are affected, what behavior various policies are likely to engender, and how much income redistribution occurs as a result of various welfare policies. Also evaluated are various proposals for welfare reform.

**400–401–402 Special Studies for Undergraduates**
Fall and spring. Credits to be arranged. S-U grades optional.
Hours to be arranged. Staff.
For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of CEH not otherwise provided through course work in the department or elsewhere at the university. Students prepare a multicopy description of the study they want to undertake, on a form available from the Counseling Office. This form must be signed by the instructor directing the study and the department chair and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period, early submission of the special studies form to the department chair is necessary. Students, in consultation with their faculty supervisor, should register for one of the following subdivisions of independent study.

**400 Directed Readings**
For study that predominantly involves library research and independent reading.

**401 Empirical Research**
For study that predominantly involves data collection and analysis.

**402 Supervised Fieldwork**
For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.

**411 Time as a Human Resource**
Spring. 3 credits. Prerequisite: one course in sociology. Recommended: one course in microeconomics. S-U grades optional. Class notes for sale at Kinko's.
T R 10:10–11:25. R. Key.
A set of historical and contemporary readings examining time management concepts and applications. Investigates changes in time use of family members in relation to social change. Explores meanings of market work, household work, and leisure in the context of family choices at different stages of the life cycle. Investigates current research concerning time allocations made by family members to household and market work. Examines use of time as a measure of household production.

**415 Financial and Human Capital Investments**
Spring. 3 credits. Prerequisites: CEH 110 or 111; CEH 315.
T R 10:10–11:25. R. Heck.
This course approaches investment decisions from the viewpoint of the individual consumer and/or household. Investigates a broad array of investment choices including: human capital investments in one's self and other family members; real estate investments; small businesses; and the traditional financial investments such as bonds, stocks, and mutual funds. Analyzes each investment choice within a general cost/benefit framework using basic economic principles or concepts of imputed values/costs; time costs; after-tax values; expected values (risk); present and future values, and in light of the goals and financial plan of the household.

**430 The Economics of Consumer Policy**
Fall. 3 credits. Open to juniors, seniors, and graduate students. Prerequisites: CEH 110–111 or permission of instructor. Class packets on sale at Campus Store.
T R 10:10–11:25. W. Putsis.
Students are acquainted with the basic approaches to consumer policy and perform economic analyses of specific consumer policy issues. Three specific areas of policy intervention are addressed: externalities and public goods; anti-trust and regulation of "Natural" monopolies; and markets characterized by imperfect information. Policy discussions are reinforced through the use of specific real-world examples. Students are required to submit a research paper focusing on one specific area of policy intervention discussed in class.

**431 Consumer Behavior**
Fall. 3 credits. Open to seniors and graduate students. Prerequisite: CEH 110 or equivalent.
T R 12:20–2:15. E. S. Maynes.
This course applies the concepts, models, and research techniques of the behavioral sciences to the explanation and prediction of consumer behavior. The student is exposed to representative theories, models, problems, and research techniques. Special efforts are made to ensure that students encounter problems approached from both seller and consumer viewpoints as well as from the disciplines of economics and social psychology. Once a week graduate students and undergraduates meet in separate sessions to review and appraise representative pieces of consumer behavior research.

**433 Consumerism and the Consumer Affairs Professional**
Fall. 3 credits. Prerequisite: junior or senior status. Offered alternate years.
T R 2:30–3:45. S. Brobeck
This course is intended for students who in the future might become part of or come into contact with (1) consumerism, (2) the consumer movement, and (3) the consumer affairs profession. The course analyzes interactions among consumers, the consumer movement, and consumer representatives in business and government. The history, present state, and probable future and function of consumerism and the field of consumer affairs will be treated. Extensive use will be made of presentations by consumer affairs professionals from corporations, consumer organizations, and government.

**434 Financial and Credit Markets and Policy**
Spring. 3 credits. Prerequisite: CEH 111. S-U grades optional.
T R 8:40–9:55. R. Avery.
This course will look at the structure of financial markets in the United States. A number of different markets and institutions will be examined including: banks, savings and loans, insurance companies, pension funds, government bond markets, credit unions, and finance companies. The

principles underlying government regulation of these institutions will be explored, as well as management problems and concerns. The emphasis will be on learning the institutional environment, not on personal finance.

**438 Demographic Analysis in Consumer Economics and Housing**
Spring. 3 credits. Not open to freshmen: open to sophomores with permission of the instructor. S-U grades optional.
T R 12:20–1:35. L. Jacobsen.
This course provides an introduction to the methods, measures, and data used in the analysis of human populations, with applications to consumer demand and market trends. Topics include demographic rates, standardization and decomposition of differences in rates, life-table analysis, cohort analysis, sources and quality of demographic data, population estimation and projection, and stable population models. Special data sources and methodological issues pertaining to population dynamics and to changes in families and households are also considered.

**[444 Housing for the Elderly**
Spring. 3 credits. Prerequisite: CEH 247 or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90. Next offered 1990–91.
T R 2:30–3:45. P. Chi.
This course focuses on the housing needs of the elderly, their current housing conditions—living arrangements, tenure patterns, housing quality and housing expense burden—and socioeconomic and psychological aspects of the housing environment of the elderly. Attention is also given to government housing programs for the elderly, integrating housing and related social service activities, and options for alternative housing.]

**445 Housing, Neighborhood, and Community**
Spring. 3 credits. Prerequisite: CEH 247 or permission of instructor. S-U grades optional. Offered alternate years.
T R 2:30–3:45. P. Chi.
A study of interrelationships between housing conditions, neighborhood transition, and community development. Both theoretical and empirical perspectives on residential patterns, neighborhood change, and community power will be examined. Special attention is also given to government policies that deal with fair housing, residential segregation, neighborhood revitalization, and community development.

**448 Housing Programs and Policy**
Fall. 3 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional.
M W F 9:05. J. Reschovsky.
An analysis of government tax, regulatory, and expenditure programs that affect the housing market. Programs and policies at the federal, state, and local levels will be investigated. Detailed consideration will be given to assisted housing programs, community development activities, tax policies, housing finance, fair housing, zoning, and other governmental activities that deal with housing. Economic theory will be used to evaluate these policies.

**[450 Economics of Health, Health-care Expenditures, and Health Policy**
Fall. 3 credits. Prerequisite: CEH 110 or equivalent. Not offered 1989–90.
T R 1–2:15. S. White-Means.
A study of the health-care market as distinguished from other markets by consumers' relative information disadvantage. Topics include a theoretical and institutional analysis of the health-care system and its role in the consumer decision-making process, conflicts of interest between institutional objectives of health-care providers and public and private health-care insurers as they relate to inefficient provision of medical services, and the role of government intervention and alternative systems of medical care provision in reducing medical costs and increasing accessibility.]

**465 Economics of Consumer Law**
Spring. 3 credits. Prerequisite: CEH 110 or equivalent. S-U grades optional.
M W 1:25; sec to be arranged. J. Gerner.
Economic analysis of the roles played both by the courts and by federal and state regulatory legislation in altering consumer markets, consumer behavior, and consumer welfare. Topics include economic analyses of contract law, products liability, and accident law, as well as of the activities of such agencies as the Federal Trade Commission, the Food and Drug Administration, and the Consumer Product Safety Commission.

**485 Evaluation of Public Policies**
Fall. 3 credits. Prerequisites: CEH 110 or equivalent and an introductory statistics course. Recommended: CEH 310 or equivalent.
M W F 10:10. J. Reschovsky.
This course provides an introduction to the techniques used to evaluate public policies and programs. It will begin with a review of basic concepts in evaluative research: causal inference, validity, and experimental and quasi-experimental designs. The remainder of the course will concentrate on the tools of cost benefit analysis as a device for evaluating the effectiveness of government programs. Discussions of the techniques, issues, and problems of cost benefit analysis will be highlighted by examples of its use in a variety of public policy areas. Economic analysis and statistical techniques will be emphasized.

**600 Special Problems for Graduate Students**
Fall and spring. S-U grades optional.
Hours to be arranged. Staff.
Independent advanced work by graduate students recommended by their chair and approved by the head of the department and the instructor.

**601 Research Workshop in Consumer Economics and Housing**
Fall and spring. 1–3 credits. S-U grades only.
W 12:20. Staff.
Research seminar designed to provide a forum for graduate students in consumer economics and housing to present their own thesis research at an early stage and to provide critical input for other graduate students.

**602 Family Resource Management Concepts**
Fall. 3 credits. Prerequisite: graduate standing. Class notes for sale at Kinko's.
T R 2:30–3:45. R. Key.
Introduction at the graduate level to theories and empirical research on family resource allocation behavior. Particular attention is paid to problems associated with the modeling and measurement of theoretical concepts.

**603 Economics of Consumer Demand**
Spring. 3 credits. Prerequisite: CEH 310, or Economics 311 or 313 or concurrent enrollment in one of the three. S-U grades optional.
T R 10:10–11:25. J. Gerner.
Introduction at the graduate level to theory and empirical research on household demand, consumption, and savings. Particular attention is paid to problems associated with the demand for consumer durables, with applications to housing.

**604 Economics of Household Behavior**
Fall. 3 credits. Prerequisite: Economics 311. S-U grades optional.
M W F 1:25. W. K. Bryant.
Examination of theoretical and empirical literature concerning market work, human capital formation, household production, and family formation.

**605 Information and Regulation**
Spring. 3 credits. Prerequisite: CEH 603. Class packets on sale at Campus Store.
T R 12:20–1:35. W. Putsis
A survey of the problems and policies accompanying informational failures and other market failures with regard to consumer well-being. Governmental regulation of products, of producers, of consumers, and of prices is examined. Antitrust activity, disclosure requirements, advertising restrictions, and regulatory agencies are examined in terms of their ability to serve the public interest or to serve special interests. Economic analysis, rather than institutional structure, is emphasized.

**606 Teaching Seminar**
Fall or spring. 1 credit. Required of and limited to graduate students in the Field of Consumer Economics and Housing during their first semester of a teaching assistantship.
Hours to be arranged. J. Gerner, N. Yaglian.
A series of workshops focusing on development of teaching skills for guiding classroom learning in lecture and discussion settings. Preparation of content, presentation techniques, interaction strategies, and evaluation methods are emphasized in relation to the student's specific teaching assignment. Videotape simulations provide opportunity for practice, analysis, and improvement of teaching behaviors.

**607 Econometric Topics**
Fall. 3 credits. S-U grades only. Prerequisite: Ag Econ 710 or equivalent.
M W 2:30–3:45. R. Avery.
An advanced econometric course consisting of two separate modules. The first module will cover household survey methodology including sample design, questionnaire development, data weighing, and imputation. The second module will focus on limited dependent variable models. Linear probability, logistic probit, and tobit models will be examined as well as problems of sample section bias.

**[640 Fundamentals of Housing**
Fall. 3 credits. Prerequisite: graduate standing or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90. Next offered 1990–91.
M W 2:30–3:45. P. Chi.
An introductory survey of housing as a field of graduate study. Consideration of the spatial context and institutional setting of housing, the structure and performance of the housing market, housing finance, the house-building

industry, the nature and impact of government housing programs, and the social and economic effects of housing regulations.]

**[714 Readings in Family Decision Making**
Fall and spring. 3 credits. Recommended: a course in family management (preferably CEH 602) and a course in family sociology. S-U grades only. Not offered 1989–90.
Hours to be arranged. Staff.
Family decision making is studied from the perspective of decision processes, behavior of decision makers, and decision context. The relationship of decision making to family management is also explored.]

**715 Family Financial Management**
Spring. 3 credits. Prerequisites: an introductory statistics course, CEH 315 or equivalent, and CEH 602. S-U grades optional. Offered alternate years.
W 2–4:25. R. Heck.
The study of management theory applied to the financial dimension of the household. Resource use is examined, emphasizing financial resources such as income, expenditures, savings, credit, and investments. A critical examination of current theories in the area of management and a survey of literature in the fields are included.

**726 Consumption and Demand Analysis**
Spring. 3 credits. Prerequisite: intermediate microeconomics, CEH 603, and CEH 604; or permission of instructor. S-U grades optional. Offered alternate years.
T R 10:10–11:25. P. Zorn.
Major developments in the theory of household behavior with applications to consumption, saving, demand, and expenditure behavior of households. Complete demand systems are surveyed along with theoretically justified specifications of price, income, and demographic variables. The empirical implications of household production for demand are examined. If time permits empirical implications for demand of bargaining models of the household are discussed.

**727 Family Economics**
Fall. 3 credits. Prerequisite: permission of instructor. Recommended but not required: CEH 411. S-U grades optional. Offered alternate years.
Hours to be arranged. D. Mont.
This course examines the public sector policies that influence family time-allocation decisions. Particular attention will be given to the time allocated by female family members to non-household activities and how these activities are influenced by outside economic forces and by internal family characteristics. Family demography is also examined.

**730 Consumer Policy**
Fall. 3 credits. Prerequisite: intermediate microeconomics. S-U grades optional. Offered alternate years.
W 1:25–4:25. J. Reschovsky.
An examination of consumer policy in the United States. An interdisciplinary approach will be used in which the theoretical rationale for consumer protection laws, the political processes that mold the shape of current consumer policy, and the administrative, legal, and organizational constraints under which consumer policies operate are explored. In addition, techniques for the economic evaluation of government programs and regulations will be taught and applied to current consumer-protection policies.

**748 Household and Family Demography**
Spring. 3 credits. Prerequisite: CEH 438 or equivalent. S-U grades optional. Offered alternate years.
T 3–5:25. L. Jacobsen.
This course examines the size and composition of households and families in the United States, variations in family and household structure among major subgroups, and changes in family and household structure over time and over the life cycle. The demographic processes underlying changes in families and households are examined separately, including marriage, fertility, mortality, and divorce. The determinants of changes in these underlying processes and in family and household structure are analyzed, along with the consequences of these changes for housing demand and consumption, women's labor force participation, household divisions of labor, living arrangements, and economic well-being and poverty.

**899 Master's Thesis and Research**
Fall and spring. Prerequisite: permission of the chair of graduate committee and instructor. S-U grades optional.
Graduate faculty.

**999 Doctoral Thesis and Research**
Fall and spring. Prerequisite: permission of the chair of graduate committee and instructor. S-U grades optional.
Graduate faculty.

## DESIGN AND ENVIRONMENTAL ANALYSIS COURSES

W. R. Sims, chair; F. D. Becker, graduate faculty representative; M. Boyd, undergraduate advising coordinator; A. Basinger, R. Beckman, A. Bushnell, S. Danko, P. Eshelman, C. E. Garner, A. Hedge, J. Laquatra, J. A. McCarty, G. C. Millican, E. R. Ostrander

**101 Design I: Fundamentals**
Fall or spring. 3 credits. Each section limited to 18 students. Permission of instructor required. Priority given to interior design majors. Option I majors must take DEA 101 in fall. Approximate cost of materials, $60.
Fall: M W 1:25–4:25, T R 10:10–1:10; spring: M W 1:25–4:25. M. Boyd.
A studio course introducing the fundamental vocabulary and principles of two-dimensional design. Students experiment with the development of form through problem-solving approaches.

**102 Design II: Fundamentals**
Spring. 3 credits. Each section limited to 18 students. Permission of instructor required. Priority given to Option I DEA majors. B– or higher in DEA 101 required to register for this course. Option I majors must take DEA 102 and 115 concurrently. Approximate cost of materials, $125; shop fee, $10.
T R 10:10–1:10. A. Bushnell.
A studio course in three-dimensional design with an interior design emphasis. Problems in spatial organization are explored through drawings and models.

**111 Introduction to Design**
Spring. 3 credits.
M W F 12:20. R. Beckman.
Introduction to the field of design for students in any academic area. The course reviews the spectrum of design activities, examining various movements in the visual arts and differences among designers in philosophical premises, social and functional roles, and cultural positions. Also examined are how requirements in the built environment are affected by the interaction of people, design, and materials. Lectures and visual material are presented by DEA faculty members and visiting design professionals.

**114 Drawing**
Fall. 3 credits. Each section limited to 18 students. Priority given to DEA majors. Minimum cost of materials, $50.
M W 10:10–1:10. M. Boyd.
A studio drawing course open to students without previous drawing experience. Focus is on descriptive, design-oriented drawing to improve abilities of visual analysis, develop visual communication skills, and enhance general visual awareness.

**115 Drawing for Interior Design**
Spring. 3 credits. Priority given to DEA majors. Option I majors must take DEA 102 and DEA 115 concurrently. Minimum cost of materials, $50.
T R 1:25–4:25. A. Bushnell.
A studio drawing course for interior designers. Discussion groups on drawing techniques are held to develop a visual understanding and vocabulary. Students are introduced to the functions of line, shape, and value. Perspective, spatial, and conceptual drawing are emphasized.

**117 Drawing the Clothed Figure**
Spring. 3 credits. Enrollment limited to 18 students. A basic drawing course is highly recommended. Priority given to TXA Option I students. S-U grades optional. Approximate cost of textbook, $30; minimum cost of supplies, $40.
M W 10:10–1:10. C. Garner.
To improve the student's ability to illustrate two-dimensionally the interaction of draped fabric and the human form and to develop awareness of clothing as a design medium. Emphasis is on development of techniques and skills in selected media necessary for the communication of design ideas.

**150 Introduction to Human-Environment Relations**
Fall. 3 credits.
M W F 12:20–1:10. F. Becker, A. Hedge, W. Sims.
Introduction to the influence of physical environment on human behavior. Topics include environmental influences on crowding, community, crime, and friendship; environmental needs associated with characteristics such as stages in life cycle, life styles, social class, family structures, and handicaps; person-environment fit for lighting, acoustics, indoor air quality and ventilation, and thermal comfort; introduction to human factors and systems analysis; effects of environment on perception-cognition; user-responsive design; participatory design programming; and post occupancy evaluation.

**201 Design III: Basic Interior Design**
Fall. 5 credits. Each section limited to 18 students. Prerequisites: DEA 101,102, and 115 (minimum grades of B–.) Recommended: DEA 111 and 150. Coregistration in DEA 203 is required. Minimum cost of materials, $120; shop fee, $10; optional field trip, approximately $60; diazo machine fee, $8.
M 1:25–3:20, W 1:25–4:25, and T R 10:10–1:10. A. Bushnell.
Beginning interior design studio. Focus is on development of basic proficiency in interior design skills. The course is structured around a series of elementary interior and interior-product design problems of 3 to 5 weeks in length.

**202 Design IV: Basic Interior Design**
Spring. 5 credits. Each section limited to 18 students. Prerequisites: DEA 201 and 203. Prerequisites or corequisites: DEA 111 and 204. Minimum cost of materials, $120; diazo machine fee, $8.
M 1:25–3:20 and T W R 1:25–4:25. P. Eshelman.
Second interior design studio. Emphasis of the course is on continued development of basic proficiency in design skills through exposure to a selected set of interior and interior-product design problems of limited complexity. Each problem of 3 to 5 weeks duration is structured to emphasize different aspects of the design process.

**203 Design Communications**
Fall. 1 credit. Priority given to DEA majors.
M 3:20–5:25. S. Danko.
Communication techniques for architectural and interior designers. Students study the various forms of communication used throughout the design process, from programming and conceptualization through construction documentation, and the most effective utilization of those forms. Both verbal and visual presentation methods are stressed.

**204 Introduction to Building Technology**
Spring. 1 credit.
M 3:20–5:20. W. Sims.
Introduction to building technology for interior designers and facility managers. Emphasis is placed on developing basic understanding of buildings and building systems and their implications for interior design and facility management. Covers basic building types; structural systems; construction materials and methods; HVAC systems; plumbing, electrical, lighting, fire, and security systems; and telephone, computer, and other communication systems.

**210 Responsive Design for the Elderly**
Spring. 2 credits. 7-week course. Prerequisite: DEA 150
T 1:25–2:15. E. Ostrander.
The course deals with the rationale, database, and design requirements for creating responsive designs that address elderly user's needs. The literature on conceptual models, theories, and research approaches used to create data-based design requirements and guidelines are investigated. This information should be understood by anyone who intends to design, plan, or manage physical environments that meet the needs of "old" people.

**250 The Environment and Social Behavior**
Fall. 3 credits. Prerequisite: DEA 150 or permission of instructor.
T R 3:35–5. F. Becker.
A combination seminar-and-lecture course for students interested in the social sciences, design, or facility management. Through projects and readings the influence of environmental form on social behaviors such as aggression, cooperation, communication, community, and crime is explored. Also covered are the influences of stage in life cycle, family structure, and social class on environmental needs and purposes. Implications for the planning, design, and management of complex environments such as offices, hospitals, schools, and housing are emphasized.

**251 Historic Design I: Furniture and Interior Design**
Spring. 3 credits. Prerequisites: DEA 101 and 111. Recommended sequence: DEA 251, 252, and 353.
M W F 9:05. G. C. Millican.
A study of the patterns of historical development and change in architecture, furniture, and interiors from people's earliest expressions to mid–eighteenth century as they reflect the changing cultural framework of Western civilization, excluding America.

**[252 Historic Design II: Furniture and Interior Design**
Fall. 3 credits. Prerequisite: DEA 101. Corequisite: DEA 111. Recommended sequence: DEA 251, 252, and 353. Not offered 1989–90.
M W F 9:05. G. C. Millican.
A study of the patterns of historical development and change as revealed through American architecture, furniture, and interiors, 1650–1885. Design forms are considered individually, collectively, and in their historical context as they express the efforts, values, and ideals of American civilization.]

**[261 Fundamentals of Interior Design**
Fall. 3 credits. Enrollment limited to 20 students. Intended for nonmajors but open to DEA majors. Minimum cost of materials, $30. Not offered 1989–90.
T R 1:25–4:25. G. C. Millican.
A studio course that emphasizes the fundamental principles of design applied to the planning of residential interiors and coordinated with family and individual needs. Studio problems explore choices of materials, space planning, and selection and arrangement of furniture, lighting, and color. Illustrated lectures, readings, and introductory drafting and rendering techniques are presented.]

**300 Special Studies for Undergraduates**
Fall or spring. Credit to be arranged.
Hours to be arranged. Department faculty.
Special arrangement for course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the head of the department, is filed at course registration or during the change-of-registration period.

**301 Design V: Intermediate Interior Design**
Fall. 5 credits. Prerequisites: DEA 111,150, 201, 202, 203, and 204. Corequisite: DEA 303. Recommended: DEA 459. Minimum cost of materials, $120; shop fee, $10; optional field trip, approximately $60; diazo machine fee, $8.
T R 10:10–1:10, M 1:25–3:20, or W 1:25–4:25. R. Beckman.
Intermediate-level interior design studio. The course is organized around a series of interior and interior-product design problems of intermediate-level complexity, 3 to 5 weeks in duration. Focus is on development of design skills and on understanding of a selected set of generic problem types.

**302 Design VI: Intermediate Interior Design**
Spring. 5 credits. Prerequisites: DEA 301 and 303. Corequisite: DEA 304. Minimum cost of materials, $120; shop fee, $10; diazo machine fee, $8.
T R 10:10–1:10, M 1:25–4:25, and W 1:25–3:25. S. Danko.
Second-semester, intermediate-level interior design studio. Continued emphasis on development of design skills and exposure to generic problem types with an emphasis on communication and construction detailing. National design competitions form the basis for studio projects.

**303 Introduction to Furnishings, Materials, and Finishes**
Fall. 1 credit.
W 3:30–5:25. P. Eshelman.
Basic understanding of furniture types and systems; interior products and equipment such as work-stations; window, wall, and floor coverings; ceiling and lighting systems; and materials and finishes. Emphasis is placed on criteria for selection of furnishings materials and finishes for typical interior design and facility management problems.

**304 Introduction to Professional Practice of Interior Design**
Spring. 1 credit.
W 3:30–5:25. A. Basinger.
Introduction to organizational and management principles for delivery of interior design and facility management services. Covers basic organizational structures and basic management functions within interior design and facility management organizations, work flow and scheduling, legal responsibilities and concerns, contracts, basic contract documents such as working drawings and specifications, supervision of construction and installation, and cost estimation.

**325 Human Factors: Ergonomics–Anthropometrics**
Spring. 3 credits. Recommended: A 3-credit statistics course and DEA 150.
T R 10:10–11:30. A. Hedge.
Implications of human physical and physiological characteristics and limitations on the design of settings, products, and tasks. An introduction to engineering anthropometry, biomechanics, control/display design, work physiology, and motor performance. Course includes practical exercises and field project work.

**[348 Environmental Graphics and Signing**
Spring. 3 credits. Recommended: design background. Limited to 20 students. Approximate cost of materials $50. Not offered 1989–90. Next offered 1990–91.
M W 10:10–1:10. M. Boyd.
A studio course dealing with both the functional and decorative aspects of environmental graphics. Includes projects in interior and exterior graphics, signing, and directional systems.]

**349 Graphic Design**
Spring. 3 credits. Enrollment limited to 20 students. Recommended: design background. Priority given to DEA majors. Approximate cost of materials, $50.
M W 10:10–1:10. M. Boyd.
The fundamentals of lettering, typography, layout, and presentation techniques. Printing processes and the application of photography and illustration are also covered. A series of projects explores problems typical of the graphic design field.

**350 Human Factors: The Ambient Environment**
Fall. 3 credits. Recommended: DEA 150.
T R 1:25–3. A. Hedge.
An introduction to human-factors considerations in lighting, acoustics, noise control, indoor air quality and ventilation, and the thermal environment. The ambient environment is viewed as a support system that should promote human efficiency, productivity, health, and safety. Emphasis is placed on the implications for planning, design, and management of settings and facilities. Course includes a field project.

**353 Historic Design III: Contemporary Design**
Spring. 3 credits. Recommended sequence: DEA 251, 252, and 353.
M W F 11:15–12:05. G. C. Millican.
A historical study of the emergence and development of contemporary design, 1885 to the present. Examines the social, economic, technical, and stylistic forces that shape the design forms of the present and includes a critical analysis of selected examples of architecture, interiors, and furniture.

**361 Residential Design**
Spring. 3 credits. Approximate cost of materials, $30.
T R 8–11. G. C. Millican.
An introduction to residential architectural design. While designing a solution for specific occupant needs, students consider site, orientation, climate, and materials. Drafting work consists of plans, elevations, perspectives, and presentation of solutions. Lectures, discussions, and required readings.

**400–401–402–403 Special Studies for Undergraduates**
Fall or spring. Credits to be arranged. S-U grades optional.
Hours to be arranged. Department faculty.
For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of DEA not otherwise provided through course work in the department or elsewhere at the university. Students prepare a multicopy description of the study they want to undertake on a form available from the Counseling Office. This form must be signed by the instructor directing the study and the department chair and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period, early submission of the special studies form to the department chair is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study.

**400 Directed Readings**
For study that predominantly involves library research and independent reading.

**401 Empirical Research**
For study that predominantly involves data collection and analysis, or laboratory or studio projects.

**402 Supervised Fieldwork**
For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.

**403 Teaching Apprenticeship**
For study that includes teaching methods in the field and assisting faculty with instruction. Students must have demonstrated a high level of performance in the subject to be taught and in the overall academic program.

**454 Facility Planning and Management Studio**
Spring. 4 credits. Prerequisite: DEA 459 or permission of instructor. Letter grades only. Minimum cost of materials, $100.
T R 2:30–5:30. W. Sims.
For advanced undergraduates interested in facility planning and management. Purpose is to provide basic tools, techniques, and concepts useful in planning, designing, and managing facilities for large, complex organizations. Covers strategic and tactical planning for facilities, space forecasting, space allocation policies, programming, site selection, building assessment, space planning and design, furniture specifications, and moves. Sociopsychological, organizational, financial, architectural, and legal factors are considered.

**455 Research Methods in Human–Environment Relations**
Spring. 3 credits. Prerequisites: DEA 150 or permission of instructor, and a statistics course.
M W F 9:05. E. Ostrander.
The course develops the student's understanding and competence in the use of research and analytical tools to study the relationship between the physical environment and human behavior. Emphasis is placed on selection of appropriate methods for specific problems and the policy implications derived from research. Topics include research design, unobtrusive and obtrusive data-collecting tools, the processing of qualitative and quantitative data, and effective communication of empirical research findings.

**[459 Programming Methods in Design**
Fall. 3 credits. Not offered 1989–90.
M W F 11:15. E. Ostrander.
Introduction to environmental programming. Emphasis on formulation of building requirements from user characteristics and limitations. Diverse methods for determining characteristics that will enable a particular environmental setting to support desired behaviors of users and operators. Methods include systems analysis, soft system, behavior circuit, behavior setting, and user characteristic approaches. Selection of appropriate methods to suit problems and creation of new methods or techniques are emphasized.]

**499 Design VII: Advanced Interior Design**
Fall and spring. 6 credits. Option I majors must take 6 credits of DEA 499. They are strongly encouraged to satisfy the basic 6-hour DEA 499 requirement in the fall semester and to continue with an additional studio in the spring semester. Prerequisites: DEA 301, 302, 303, and 304. DEA 302 and 499 may not be taken concurrently. Minimum cost of materials, $120; diazo machine fee, $8 per semester.
M T W R 1:25–4:25. Department faculty.
A comprehensive design–problem-solving experience involving completion of an advanced interior design problem selected by the student and approved by the instructor. The course consists of five phases of three to four weeks each: programming; schematic design and evaluation; design development, including material and finish selection; design detailing; and in-process documentation and the preparation of a professional quality design presentation.

**600 Special Problems for Graduate Students**
Fall or spring. Credit to be arranged. S-U grades optional.
Hours to be arranged. Department faculty.
Independent advanced work by graduate students recommended by their chair and approved by the head of the department and instructor.

**645 Design Process and Methods**
Spring. 3 credits. Limited to 15 graduate and advanced undergraduate students. Prerequisite for undergraduates: permission of instructor.
T R 8:30–9:55. S. Danko.
Focuses on thinking processes and techniques that support creative problem solving. Design methodologies of famous designers such as da Vinci, Ben Franklin, and Charles Eames will be examined through discussions and applications to short studio problems by the students. Topics include a historical overview of the design process and methods in both professional practice and education, creative problem solving in management and design, perceptual blocks to creativity, and the inherent merits and pitfalls in the four realms of thinking: analytical, intuitive, synthetic, and evaluative.

**648 Computer-Aided Space Planning and Design**
Fall. 3 credits. Limited to 12 graduate and advanced undergraduate students. Prerequisites for undergraduates: DEA 201 and 202 or permission of instructor.
Lec, T R 9:05; lab 1, T R 10:10–12:05; lab 2, TR 12:20–2:15. P. Eshelman.
Familiarizes students with computer applications in the planning and design of spaces. Lectures and readings cover needs assessment, furniture and equipment inventory, affinity diagramming, block diagramming, space layout, and specification and schedule preparation for furniture, equipment, and finishes. Laboratories involve the application of computer-aided processes in planning and designing a variety of spaces.

**[650 Programming Methods in Design**
Fall. 4 credits. Recommended: DEA 325, 350, and 455. Not offered 1989–90.
M W F 11:15 and an hour to be arranged. E. Ostrander.
A course intended for graduate students who want a more thorough introduction to environmental programming methods than is provided by DEA 459. Each student is required to attend DEA 459 lectures, meet with the instructor and other graduate students for an additional class each week, and do additional readings and projects.]

**651 Human Factors: Ergonomics-Anthropometrics**
Spring. 4 credits. Recommended: DEA 150.
T R 10:10–11:30 and an hour to be arranged. A. Hedge.
A course intended for graduate students who want a more thorough grounding in human factors than is provided by DEA 325. Each student is required to attend DEA 325 lectures, meet with the instructor and other graduate students for an additional class each week, and do additional readings and projects.

**652 Human Factors: The Ambient Environment**
Fall. 4 credits. Recommended: A 3-credit statistics course and DEA 150.
T R 2:30–4 and one hour to be arranged. A. Hedge.
A course intended for graduate students who want a more thorough grounding in human factors than is provided by DEA 350. Each student is required to attend DEA 350 lectures, meet with the instructor and other graduate students for an additional class each week, and do additional readings and projects.

**653 Psychology of Workplace Design**
Spring. 3 credits. Prerequisite: DEA 250/660 or permission of instructor.
M 7–10 p.m. F. Becker.
Intended for students interested in the planning, design, and management of facilities for complex organizations. The purpose of the course is to explore how characteristics of the workplace, including furniture and equipment and policies governing their use and allocation, affect individual and organizational effectiveness. Special topics, such as the human implications of new information technologies and work at home, are also covered.

**654 Facility Planning and Management Studio**
Spring. 4 credits. Prerequisite: permission of instructor. Letter grades only. Minimum cost of materials, $100.
T R 2:30–5:30 and a one-hour seminar to be arranged. W. Sims.
For graduates in facility planning and management. The purpose of the course is to provide basic tools, techniques, and concepts useful in the planning, design, and management of complex facilities. Covers strategic and tactical planning for facilities, space forecasting, space allocation policies, programming, site selection, building assessment, space planning and design, furniture specifications, and moves. Sociopsychological, organizational, financial, architectural, and legal factors are considered.

**656 Research Methods in Human-Environment Relations**
Spring. 4 credits. Prerequisites: DEA 150 or permission of instructor, and a statistics course. Letter grades only.
M W F 9:05, and an hour to be arranged. E. Ostrander.
The course develops the graduate student's understanding and competence in the use of research and analytical tools to study the relationship between the physical environment and human behavior. Students attend DEA 455 lectures but have more extensive readings and projects and meet an additional hour each week.

**659 Seminar on Facility Planning and Management**
Fall. 1 credit. For graduate students and advanced undergraduates interested in careers in facility planning and management. S-U grades only.
M 4:30–5:45. F. Becker.
Series of seminars led by Cornell faculty members and other professionals directly involved in facility planning and management. Topics include strategic space planning, space standards, office automation, project management, energy conservation, building systems, wire management, lighting, and acoustics.

**660 The Environment and Social Behavior**
Fall. 4 credits. Prerequisite: DEA 150 or permission of instructor.
T R 3:35–5, plus an hour to be arranged. F. Becker.
A combination seminar-and-lecture course for graduate students with interests in social sciences, facility management, or design. Graduate students attend DEA 250 lectures but have more-extensive readings and meet an additional hour each week.

**668 Design Theory Seminar**
Fall. 3 credits. Enrollment limited to 15 students.
T R 10:10–12:20. R. Beckman.
Directed toward advanced undergraduate and graduate students with interest in the theory of design. The purpose is to provide an understanding of major theoretical ideas underlying design movements of the twentieth century. Explores these ideas through readings, lectures by faculty and visitors, student presentations of research papers, and seminar discussions.

**899 Master's Thesis and Research**
Fall or spring. Credits to be arranged. Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.
Hours to be arranged. Department graduate faculty

## HUMAN DEVELOPMENT AND FAMILY STUDIES COURSES

G. Suci, chair; S. Cornelius, graduate faculty representative; P. Schoggen, undergraduate advising coordinator; H. T. M. Bayer, U. Bronfenbrenner, J. Brumberg, S. Ceci, M. Cochran, J. Condry, J. Doris, J. Eckenrode, S. Hamilton, C. Hazan, B. Koslowski, L. C. Lee, M. Lenzenweger, K. Lisseck, B. Lust, P. Moen, M. Potts, H. Ricciuti, S. Robertson, R. Savin-Williams, S. West, E. Wethington

**111 Observation**
Spring. 3 credits.
M W F 10:10. P. Schoggen.
An overview of methods of observing people and the settings in which they behave, in order to develop observational skills, increase understanding of behavior and its development, and acquaint students with basic methodological concepts underlying the scientific study of behavioral development with emphasis on children. Direct experience in applying observational methods in laboratory and real-life settings is emphasized. Discussion groups may accompany the observation experience.

**115 Human Development: Infancy and Childhood**
Fall or summer. 3 credits. S-U grades optional.
M W F 11:15. Staff.
Provides a broad overview of theories, research methods, and the status of scientific knowledge about human development from infancy through childhood. Attention is focused on the interplay of psychological factors in changing behavior and shaping individuals' perceptual, linguistic, neurophysiological, social, and cognitive development.

**150 Families in Modern Society**
Spring or summer. 3 credits. S-U grades optional. Students cannot receive credit for both HDFS 150 and Sociology 243.
M W F 1:25. Staff.
Contemporary family roles and functions are considered as they appear in U.S. history, as they change over the life course, and as they are influenced by cultural and economic forces that impinge on them.

**216 Human Development: Adolescence and Youth**
Spring or summer. 3 credits. Prerequisite: HDFS 115. S–U grades optional.
M W F 12:20. Staff.
Provides a broad overview of theories, issues, and research in the study of human development from early adolescence to early adulthood (youth). Attention is focused on the interplay of biological and cognitive factors, interpersonal relationships, social structure, and cultural values in shaping the individual's development. The role of adolescence in both the individual's life course and the evolution of the culture as a whole is also considered. Familial, peer group, educational, and work contexts for development are discussed.

**218 Human Development: Adulthood and Aging**
Fall. 3 credits: Prerequisite: HDFS 115. S-U grades optional.
M W F 2:30. Staff.
Provides a general introduction to theories and research in adult development and aging. Psychological, social, and biological changes from youth through late adulthood are discussed. Both individual development within generations and differences among generations are emphasized.

**242 Participation with Groups of Children in the Early Years**
Fall or spring. 4 credits (3 credits possible, but not recommended). Limited to 20 students (limit depends on availability of placements and of supervision). Prerequisites: HDFS 115 and permission of instructor. Recommended: HDFS 111 or Interdepartmental 100. S-U grades optional.
W 10:10–12:05, plus 2 half-days of field work (for 4 credits) or 1 half-day of fieldwork (for 3 credits). In morning or afternoon. S. West.
A field-based course designed to combine experience in child-care centers with theory and supervision, intended to develop the student's ability to understand and relate effectively to young children. Course structure integrates lectures and discussions, workshops, films, projects, reading, writing, and sharing of field experiences. Students are placed in local nursery schools, day-care centers, Head Start programs, and kindergartens.

**[243 Participation with Groups of Children Ages Six through Twelve**
Fall. 4 credits. Limited to 20 students (limit depends on availability of placements). Permission of instructor required. Prerequisites: HDFS 115. Recommended: HDFS 111. Not offered 1989–90.
R 10:10–12:05, plus 2 half-days of fieldwork. Staff.
A field-study course structured to integrate knowledge from practicum, lectures, discussions, and readings to provide a better understanding of child development in school settings. Each student will work in one classroom with an experienced teacher.]

**258 Historical Development of Women as Professionals, 1800–1980 (also Women's Studies 238 and Sociology 238)**
Spring. 3 credits. S-U grades optional. Human ecology students must register for HDFS 258.
T R 10:10–11:40. J. Brumberg.
The historical evolution of the female professions in America (midwifery, nursing, teaching, librarianship, home economics, and social work) as well as women's struggles to gain access to medicine, law, the clergy, and the academy. Consideration of history of women in medicine, broadcasting, and journalism as well. Lectures, reading, and discussion are geared to identifying the cultural patterns that fostered the conception of gender-specific work, and the particular historical circumstances that created these different work opportunities. The evolution of "professionalism" and the consequences of professionalism for women, family structures, and American society are also discussed.

**270 Abnormal Development**
Spring. 3 credits. Limited to sophomores, juniors, and seniors. Prerequisites: HDFS 115, Psychology 101, or Education 110; a course in statistics (e.g., Psych 350, Soc 301, Educ 352 or 353, Ag Ec 310 or equivalent); and an introductory biology course.
M W F 11:15. M. Lenzenweger.
An introduction to the cognitive, emotional, and biological aspects of abnormal development across the life span. The major mental illnesses will be covered, including schizophrenia, affective disorders, and personality disorders. The course also addresses problems in adjustment, such as delinquency, and abnormalities in intellectual development (e.g., mental retardation, attention deficit disorder, and learning disabilities). Emphasis will be placed on the developmental antecedents of maladaptation, current theories of etiology, and intervention strategies.

**300 Special Studies for Undergraduates**
Fall or spring. Credit to be arranged.
Hours to be arranged. Department faculty.
Special arrangement for course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the coordinator of undergraduate education, is filed at course registration or during the change-of registration period.

**[313 Problematic Behavior in Adolescence**
Fall. 3 credits. Prerequisite: HDFS 216. Offered alternate years. Not offered 1989–90.
M W F 9:05. Staff.
This course focuses on (1) various biological, psychological, and sociological theories that attempt to explain deviant behavior among adolescents; (2) research that addresses issues of problematic behavior; and (3) presentations by human services personnel and agencies concerning their programs and policies toward problematic adolescents. These will be integrated during class discussions.]

**[333 Cognitive Processes in Development**
Fall. 3 credits. Prerequisite: HDFS 115 or equivalent. Not offered 1989–90.
M W F 11:15. Staff.
A survey of theories and problems in the development of selected cognitive processes: attention, perception, mediation processes, and language. The focus is on the first two years of life.]

**344 Infant Behavior and Development**
Fall. 3 credits. Prerequisites: HDFS 115, a biology course, and a statistics course. Not open to freshmen.
T R 1:00–2:15. S. Robertson.
Behavior and development from conception through the first two years after birth will be examined in traditional areas (e.g., perception, cognition, socioemotional, language, motor). The fundamental interconnectedness of these aspects of development will be strongly emphasized (e.g., the functional significance of early behavior, the nature of continuity and change, the role of the environment in development). Conditions which put infants at risk for poor development (e.g., premature birth, exposure to environment toxins, maternal depression) and topics with current social, ethical, or political implications (e.g., infant day care, fetal rights, surrogate motherhood) will also be considered. An emphasis on research methodology in the study of early behavior and development will be maintained throughout the course.

**346 The Role and Meaning of Play**
Spring. 2 credits. Limited to 30 juniors and seniors. Prerequisite: HDFS 115. Recommended: HDFS 111.
W 7:30–9 p.m. K. Lisseck.
The aim of this course is to examine the play of children ages three through seven. Through seminar discussions, workshops, films, and individualized research, the student will explore the meanings and validity of play in the lives of young children, the different ways that children play and the value of each, and the effect of the environment in enhancing and supporting play.

**347 Human Growth and Development: Biological and Social Psychological Considerations (also Biology and Society 347 and Nutritional Sciences 347)**
Spring. 3 credits. Prerequisites: Biological Sciences 101 or 109 or equivalent, and HDFS 115 or Psychology 101. Offered alternate years.
M W F 1:25. J. Haas, S. Robertson.
A review of major patterns of physical growth from the fetal period through adolescence, with consideration given to biological and socioenvironmental determinants of growth, as well as to physical and psychological consequences of variations in growth patterns. Normal patterns of growth are examined; an analysis of major sources of variations in growth (normal and atypical) follows.

**348 Advanced Participation in Preschool Settings**
Fall or spring. 3 or 4 credits. Prerequisites: HDFS 242 and permission of instructor. Recommended: HDFS 346.
Two or 3 half-days' participation (morning or afternoon) and an hour group conference each week. Staff.
An advanced, supervised fieldwork experience with a focus on helping children build relationships to support learning and personal development. Students are expected to define their own goals and assess progress with supervising teacher and instructor; to keep a journal; and to plan, carry out, and evaluate weekly activities for children in a variety of curriculum areas.

**[352 Afro-American and Asian-American Families**
Fall. 3 credits. Limited to 25 students. Prerequisite: a sociology or a family-studies course. Not offered 1989–90.
M W F 1:25. Staff.
This course provides an introductory survey to the study of Afro-American and Asian-American family life. During the semester we will review and evaluate theories, methods, and findings commonly cited in discussions of minority family organization and functions.]

**[354 Families in Cross-cultural Perspective**
Fall. 3 credits. Prerequisites: HDFS 115 and HDFS 150 or Rural Sociology 100, or equivalent. S-U grades optional. Not offered 1989–90.
M W F 11:15. Staff.
The sociological study of families from a comparative perspective, looking at similarities and differences across cultures and across ethnic groups. A major focus is on the interdependence of the family system and social institutions.]

**359 American Families in Historical Perspective (also Sociology 359 and Women's Studies 357)**
Spring. 3 credits. Prerequisite: HDFS 150 or one 200-level social science or history course. S-U grades optional. Human ecology students must register for HDFS 359.
TR 2:30–4. J. Brumberg.
This course provides an introduction to and overview of problems and issues in the historical literature on American families and the family life cycle. Reading and lectures demonstrate the pattern of American family experience in the past, focusing on class, ethnicity, sex, and region as important variables. Analysis of the private world of the family deals with changing cultural conceptions of sexuality, sex roles, generational relationships, stages of life, and life events. Students are required to do a major research paper on the history of their family, covering at least two generations, and demonstrating their ability to integrate life-course development theory, data drawn from the social sciences, and historical circumstances.

**360 Personality Development in Childhood**
Spring. 3 credits. Prerequisites: HDFS 115 or Psychology 101, plus one other course in HDFS or psychology. Students cannot receive credit for both HDFS 360 and Psychology 275.
T R 12:20–2. C. Hazan.
Study of relevant theoretical approaches to, and empirical findings regarding, the development of the child's personality. The influence of parents and other environmental factors on the child are examined. Topics covered include attachment, autonomy, identification, moral development, and social behavior.

**[361 The Development of Social Behavior**
Spring. 3 credits. Limited to 100 students. Prerequisite: HDFS 115 or Psychology 128. Offered alternate years. Not offered 1989–90.
M W F 12:20. Staff.
Issues in the development of social behavior are viewed from the perspective of theory and research. An attempt is made to apply our understanding of social behavior to education, childbearing, and group behavior. Likely topics include bases of social behavior in early childhood, the role of peers, the development of aggressive behavior, the development and functioning of attitude and value systems, conformity and deviation, and the function and limits of experimental research in the study of social development.]

**362 Close Relationships across the Lifespan**
Fall. 3 credits. Prerequisite: HDFS 115 or equivalent. S-U grades optional.
T R 12:20–2. C. Hazan.
This course analyzes the nature and function of close relationships from infancy through adulthood. Special emphasis is given to the interplay between innate tendencies and social experience, and the effects of social cognitive development. The material presented is drawn from a wide variety of theoretical and empirical literatures. Topics include attachment in human infants, childhood relationships with parents and peers, interpersonal attraction, intimacy and commitment, marriage, divorce, and the role of close relationships in physical and mental health.

**364 The Psychology of Television**
Spring. 3 credits. Limited to 100 students. Preference given to juniors and seniors. Prerequisite: a developmental or psychology course; HDFS 115 or Psychology 101 preferred. S-U grades optional. Offered alternate years.
M W F 12:20. J. Condry.
This course offers a historical and topical survey of the research literature regarding the influence of television. Topics include (1) the introduction of television from 1950 to 1960 and its direct effects, (2) the audience for television, (3) the content of television, (4) behavioral mechanisms of influence: imitation, disinhibition, arousal/desensitization, (5) the psychological research of the 1960s and 1970s; cognitive mechanisms of influence; mainstreaming and resonance; formal features, comprehension, and perceived reality; current issues in research from 1980 on; the role of advertisements; government policies and advertisements; and television over the life span.

**372 Typical and Atypical Intellectual Development**
Spring. 3 credits. Prerequisites: HDFS 115, a course in statistics, and a course in biology.
T R 10:10–11:30. S. Ceci.
This course provides an intensive historical examination of both normal and abnormal intelligence, focusing on the antecedents of contemporary views of the heritability of intelligence, brain-behavior linkages, expertise, generality, and cognitive modifiability. It concludes with an examination of current theories, with an emphasis on the instructor's own bioecological theory.

**[397 Experimental Child Psychology**
Fall. 4 credits. Prerequisites: one course in statistics and permission of instructor. Intended primarily for students interested in entering graduate programs involving further research training. Not offered 1989–90.
T R 2:30–4; lab, hours to be arranged.
L. C. Lee.
A study of experimental methodology in research with children. Includes lectures, discussions, and practicum experiences covering general experimental design, statistics, and styles and strategies of working with children.]

**398 Junior Honors Seminar**
Fall. 2 credits. Permission of the coordinator of the honors program required for registration. Enrollment limited to students in the honors program.
Hours to be arranged. R. Savin-Williams.
Reports and discussion of research and selected thesis topics by faculty and honors students.

**400–401–402–403 Special Studies for Undergraduates**
Fall or spring. Credits to be arranged. Enrollment limited to juniors and seniors with a minimum 3.0 G.P.A. Permission required. Prerequisites: HDFS 115, 150, 216, 218 or an equivalent number of courses in pyschology or sociology. S-U grades optional.
Hours to be arranged. Department faculty.
For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of HDFS not otherwise provided through course work in the department or elsewhere at the university. Students prepare a multicopy description of the study they want to undertake, on a form available from the Student Services Office. This form must be signed by the instructor directing the study, the student's faculty adviser, and the coordinator of undergraduate education (NG21 Martha Van Rensselaer Hall) and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period, early submission of the special studies form to the Office of Undergraduate Education is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study (guidelines for each are available in NG14 Martha Van Rensselaer Hall):

**400 Directed Readings**
Prerequisites: In addition to those listed above, a statistics or methods course and at least one course directly linked to the area of study.
For study that predominantly involves library research and independent study.

**401 Empirical Research**
Prerequisites: In addition to those listed above, a statistics or methods course and at least one course directly linked to the area of study.
For study that predominantly involves data collection and analysis, or laboratory or studio projects.

**402 Supervised Fieldwork**
Prerequisites: In addition to those listed above, an observation or participation course.
For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.

**403 Teaching Apprenticeship**
Prerequisites: In addition to those listed above, must have taken the course or equivalent and received a grade of B+ or higher.
For study that includes assisting faculty with instruction.

**[414 Policies and Programs for Adolescents**
Spring. 3 credits. Prerequisite: HDFS 216, or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90.
T R 12:20–2:15. S. Hamilton.
Plans and practices intended to foster adolescent development are examined in the light of needs identified by theory and research. The key question is how societal and governmental institutions support or hinder the transition of adolescents to

adulthood. Current issues, especially secondary school reform and youth employment, provide focal points for examining actual and proposed policies and programs. The course also addresses the nature of social policy and its relation to social science.]

**431 Learning in Children**
Fall. 3 credits. Prerequisite: HDFS 115 or equivalent. Limited to 20 students.
T 10:10–12:05. Field experience to be individually arranged. M. Potts.
Examines diverse theories and models of learning and their differing implications for real-world situations that require learning or relearning. Considers the interrelations of learning and development and of learning and intelligence. Through fieldwork, application is made to the assessment of learning processes in the cognitive domain and to implementation of the variables which affect learning.

**432 Cognitive Development and Education**
Spring. 3 credits. Prerequisite: HDFS 115 or equivalent. Limited to 20 students.
T 10:10 12:05; field experience to be individually assigned. M. Potts.
This course defines basic cognitive processes that underlie education (for example, linguistic processes that underlie language comprehension and production; numerical processes that underlie mathematics; perceptual processes that underlie reading) and reviews research on the development and learning of these processes in children. A laboratory component focuses on assessment and facilitation of cognitive competencies as they bear on one educational subject.

**[434 The Growth of the Mind: A View from Piaget's Theory**
Spring. 4 credits. Open to undergraduate and graduate students. Prerequisites: A course in human experimental psychology, statistics, and HDFS 115 or equivalent; or permission of the instructor. S-U grades optional. Not offered 1989–90; 1990–91.
Lecs, M W F 1:25. B. Lust.
In this course the fundamental issues of cognition are introduced through the framework of Piaget's comprehensive theory of cognitive development. What is the nature of human intelligence? of logical and scientific reasoning? How are knowledge and understanding acquired and represented in the human mind? What is the nature of mental representation and how does it exist in the initial state? What are the cognitive characteristics of the initial state? What is the relation of the acquisition of knowledge and understanding to their final representation? In the study of those issues, how can epistemology and experimental psychology be related through the experimental method?

Basic issues of cognition are introduced and discussed throughout: for example, the roles of innateness and learning, the distinction between competence and performance, and the relation between induction and deduction in the acquisition of knowledge. Those psychological issues are set in a context of basic epistemological issues involving the tension between rationalism and empiricism.

Although the course will focus on Piaget's theory and experimental results, current research in cognitive development will be introduced and contrasted.]

**[436 Language Development (also Psychology 436 and Linguistics 436)**
Spring. 4 credits. Open to undergraduate and graduate students. Prerequisite: at least one course in developmental psychology, cognitive psychology, cognitive development, or linguistics. S-U grades optional. Offered alternate years. Not offered 1989–90.
T R 11:40–12:55. B. Lust.
This course is a survey of basic issues, methods, and research in the study of first-language acquisition. Major theoretical positions in the field are considered in the light of experimental studies in first-language acquisition of phonology, syntax, and semantics from infancy on. The fundamental issues of relationships between language and thought are discussed, as are the fundamental linguistic issues of Universal Grammar and the biological foundations for acquisition. The acquisition of communication systems in nonhuman species such as chimpanzees is addressed, but major emphasis is on the child.]

**438 Thinking and Reasoning**
Fall. 3 Credits. Prerequisite: HDFS 115.
W 2:30–5. B. Koslowski.
The course will examine the areas of logical thinking (in formal as well as real-world contexts), the process of making logical and "natural" inferences, causal reasoning, and scientific reasoning. Two general issues will run through the course: the extent to which children and adults approximate the sorts of reasoning that are described by various types of models, and the extent to which various models accurately describe the kind of thinking that is required by the types of problems and issues that arise and must be dealt with in the real world.

**440 Internship in Cornell Nursery School**
Fall or spring. 10–12 credits. Prerequisites: HDFS 115 and 242. Recommended: HDFS 346 and 348. Permission of instructor required.
M–F 8–1 or 10:30–4:30. Staff.
Opportunity to integrate theory with practice and to develop understanding of preschool children and their families. Placement as assistant teacher in the morning or afternoon program and participation in curriculum planning, evaluation, staff meetings, home visits, parent conferences, and parent meetings. Supervision by head teacher and director.

**[456 Families and Social Policy**
Fall. 3–4 credits. In Washington, D.C. Prerequisite: one course in the area of the family or in sociology. S-U grades optional. Not offered 1989–90.
Hours to be arranged. P. Moen.
An examination of the intended and unintended family consequences of governmental policies, using case studies in areas such as social welfare, day care, and employment. The policy implications of changes in the structure and composition of families are also considered.]

**464 Developmental Theory and Research on Homosexuality**
Fall. 4 credits. Permission of instructor required.
T R 3–4:25. R. Savin-Williams.
The course will address a sensitive and controversial subject in a scientific fashion. The theoretical and empirical literatures that focus on the development and maintenance of a homosexual identity, homosexual behavior, and cultural responses to homosexuality will be covered. Although the issue, homosexuality, is specific, it reflects the larger issues of sexual identity, personality/social development, and environmental and biological influences on human development. The time span considered is not limited to a specific developmental sequence; it reflects a life-course perspective. A major review paper on a topic selected by the student is required.

**481 Introduction to Ecological Psychology**
Fall. 3 credits. Limited to graduate and upper-division undergraduate students. Prerequisite: permission of instructor. Letter grades only.
T R 3–4:25. P. Schoggen.
A broad survey of the theory, concepts, methods, and empirical research in ecological psychology, the study of molar human behavior in relation to the naturally occurring molar environment of everyday life. The first part of the course examines the problem of observing, recording, and analyzing the continuous stream of individual behavior under natural conditions, with special concern for child behavior and development. The rest of the course is devoted to the study of behavior settings, the immediate environmental contexts of molar human behavior. We will be particularly concerned with the usefulness of behavior settings in empirical studies of person-environment interaction at all stages of the life course from infancy through old age. A course description with typical readings is available from the instructor.

**488 Development in Context (also Psychology 488)**
Spring. 4 credits. Open to juniors, seniors, and graduate students. Prerequisites: one course in statistics (which may be taken simultaneously) and two courses in social sciences, or one in human biology and one in social sciences.
T R 2:30–4:25. U. Bronfenbrenner.
The course examines highlights of what is known about human development in the actual settings in which human beings live and grow. The material presented reveals how development in its various aspects—cognitive, emotional, and social—occurs through the progressive interplay between the maturing capacities and characteristics of an active, exploring, thinking human organism and the changing situational, cultural, and historical contexts in which the person lives. Particular emphasis is given to the role of family, peer group, school, workplace, community, and social structure and belief systems of the larger society. Course work is carried out primarily through the analysis of selected studies that shed light on critical issues in development. The main focus is not on the specific findings but on key processes and principles of development to which the findings point. Students are offered guidance and experience in analyzing and evaluating research reports, with particular emphasis on the nature and intellectual excitement of the scientific process and on the implications of scientific knowledge for public policy and practice. The course is organized in terms of successive stages in the life course. At each stage the material presented will emphasize change and continuity in the two-way developmental processes taking place between a biologically maturing person and the progressively more complex environments into which the person moves through life.

**498 Senior Honors Seminar**
Fall and spring. 1 credit. Required for, and limited to, seniors in the HDFS honors program.
Hours to be arranged. R. Savin-Williams.
This seminar is devoted to discussion and presentation of honors theses being completed by the senior students.

**499 Senior Honors Thesis**
Fall or spring. Credit to be arranged. Prerequisite: permission of thesis adviser and coordinator of honors program. S-U grades optional.
Department faculty.

## Topics Courses

Fall or spring. 2–4 credits. Prerequisites and enrollment limits vary with topic being considered in any particular term. Permission of instructor required.
Hours to be arranged. Department faculty.
This series of courses provides an opportunity for advanced undergraduates to explore an issue, a theme, or research in the areas of departmental concentration. Topics vary each time the course is offered. Descriptions are available at the time of course registration. Although the courses are usually taught as seminars, a subject may occasionally lend itself to lecture, practicum, or other format.

**415 Topics in Adolescent Development**
**435 Topics in Cognitive Development**
**445 Topics in Early-Childhood Education and Development**
**455 Topics in Family Studies**
**465 Topics in Social and Personality Development**
**475 Topics in Atypical Development**
**485 Topics in the Ecology of Human Development**

## The Graduate Program

HDFS graduate courses are only open to undergraduates with instructor's permission.

### General Courses

**[617 Adolescence**
Spring. 3 credits. Not offered 1989–90.
Hours to be arranged. Staff.
Critical examination of some seminal theoretical writings on adolescent development, along with recent work relevant to intellectual development, ego development, and social development during early and late adolescence. Empirical research on specific questions chosen by students is considered in the light of these approaches.]

**631 Cognitive Development**
Spring. 3 credits. Letter grades only. Offered alternate years.
Hours to be arranged. Staff.
Faculty members involved in the course will present their area of specialization in cognitive development. These areas will include perception, attention, memory, language, thinking and reasoning, learning, creativity, and intelligence.

**640 Infancy**
Spring. 3 credits.
R 9–11:30. S. Robertson.
Critical review of major issues of contemporary concern in the field of infant behavior and development, based on readings of selected research papers and review articles. The overall intent is to develop an analytic understanding of where the field stands at present with respect to various topical issues and to identify directions for future research.

**641 Early-Childhood Education**
Fall. 3 credits.
M 12:20–2:50. M. Potts.
Survey of major issues in the theoretical and research literature of early-childhood education.

**650 Contemporary Family Theory and Research**
Fall. 3 credits.
T 9:30–12. Staff.
The uses of sociological theories and research in the study of the family are studied with particular reference to the relationship between the family and society and between the family and its individual members.

**660 Personality and Socialization**
Fall. 3 credits.
Hours to be arranged. J. Condry.
Major issues in personality development and socialization, with special emphasis on theoretical models and empirical issues.

**670 Abnormal Development**
Spring. 3 credits. Prerequisite: an undergraduate course in abnormal psychology or psychopathology.
Hours to be arranged. M. Lenzenweger.
Overview of current theories and empirical research on functional and organically based psychological disorders. Topic areas to be covered include autism, schizophrenia, neuroses, and personality disorders. Focus is on developmental aspects of abnormal behavior.

### Topical Seminars

Seminars offered irregularly, with changing topics and instructors. Content, hours, credit, and instructors to be announced. Seminars offer concentrated study of specific theoretical and research issues.

**618 Seminar in Adolescence**
Topics include peer relations, parent-teen relationships, self-esteem, youth and history, work, and moral development.

**633 Seminar on Language Development**
Topics include acquisition of meaning in infancy, precursors of language in early infancy, and atypical language development.

**635 Seminar in Cognitive Development**
Topics include early attention, perception, memory, and communication. Assessment and intervention in relation to these processes will be considered when possible.

**645 Seminar on Infancy**
Topics covered in depth include the role of emotions in early development, infant stimulation and early experience, and the assessment of infant developmental competencies.

**646 Seminar in Early-Childhood Education**
Topics include analysis of models and settings, design of assessment techniques, program evaluation, and early childhood in a cross-cultural context.

**655 Seminar in Family Studies**
Topics include the sociology of marital status, the single-parent family, work-family linkages, women and work, and families and social change.

**665 Seminar in Personality and Social Development**
Focuses on selected issues related to personality and social development. The issues selected vary each year according to current importance in the field and student interests.

**675 Seminar in Developmental Psychopathology**
Topics include learning disabilities, therapeutic interventions in atypical development, child abuse and maltreatment, family factors in the etiology of functional disorders, and cognitive characteristics of atypical groups.

**685 Seminar in Human Development and Family Studies**
Topics include development of self-concept, sex-role identity, observational methods, and interviews in developmental research.

**690 Seminar on Ecology of Human Development**
Topics include the institutional setting as a determinant of behavior, the poor family, and the identification and measurement of ecological variables.

### Individualized Special Instruction

**700–706 Special Studies for Graduate Students**
Fall or spring. Credits and hours to be arranged. S-U grades at discretion of instructor.
Department faculty.
Independent advanced work by graduate students recommended by their Special Committee chair with approval of the instructor.

**700 Directed Readings**
For study that predominantly involves library research and independent study.

**701 Empirical Research**
For study that predominantly involves collection and analysis of research data.

**702 Practicum**
For study that predominantly involves field experience in community settings.

**703 Teaching Assistantship**
For students assisting faculty with instruction. Does not apply to work for which students receive financial compensation.

**704 Research Assistantship**
For students assisting faculty with research. Does not apply to work for which students receive financial compensation.

**705 Extension Assistantship**
For students assisting faculty with extension activities. Does not apply to work for which students receive financial compensation.

**706 Supervised Teaching**
For advanced students who assume major responsibility for teaching a course. Supervision by a faculty member is required.

**899 Master's Thesis and Research**
Fall or spring. Credit to be arranged. S-U grades only. Prerequisite: permission of thesis adviser.
Department graduate faculty.

**999 Doctoral Thesis and Research**
Fall or spring. Credit to be arranged. S-U grades only. Prerequisite: permission of thesis adviser.
Department graduate faculty.

## HUMAN SERVICE STUDIES COURSES

J. Ford, chair; M. Minot, graduate faculty representative; C. Reed, undergraduate advising coordinator; J. Allen, R. J. Babcock, D. Barr, R. Battistella, R. Bounous, D. Brown, R. Buchanan, C. Crawford, J. Greene, A. Hahn, I. Lazar, C. McClintock, B. J. Mueller, L. A. Noble, A. Parrot, C. Shapiro, L. Street, D. Tobias, W. Trochim, B. L. Yerka, J. Ziegler

**101 Human Services in Contemporary Society**
Fall. 3 credits. Limited to freshmen and sophomores or permission of instructor.
M W 12:20. Secs to be arranged.
A. Parrot.
A lecture and discussion course designed as an introduction to the community base of services. Current and historical human services are examined. Emphasis is placed on social services, education, and health and mental health services. Barriers to service delivery are discussed, such as racism, sexism, classism, sexual preference, physical disability, and age. Issues that impact on service delivery will also be discussed, including civil rights, structure of the family, employment, and equal opportunity. Students will apply this knowledge and a theoretical framework to evaluate human service agencies in Tompkins County.

**203 Groups and Organizations**
Fall. 3 credits.
M W F 10:10. L. Street.
A basic course in the social psychology of small groups and human service organizations. Study of group processes includes self-perception and interpersonal perception of roles, norms, communication, power, and leadership. Students apply what has been learned about small groups to the study of issues in human service organizations (for example, goals, evaluation, structure, technology, relationships between organizations and clients, environment, and change).

**225 Education as a Human Service**
Fall. 3 credits.
M W F 11:15. M. Minot.
This course is concerned with the role of the educator as a professional provider of preventive and remedial intervention through knowledge that results in intentional changes in cognitive, affective, or psychomotor skills of individuals. Educators, in collaboration with other human service professionals, facilitate human growth and development. The course includes an overview of educational programs that use human ecology content in selected human services delivery systems and settings. Emphasis is placed upon the competencies and responsibilities of professionals assuming the educative role.

**246 Ecological Determinants of Behavior**
Fall. 3 credits. Prerequisites: introductory sociology and psychology and one course in human development.
M W F 2:30. J. Mueller.
Provides an interdisciplinary knowledge base for human service professionals. Examines social behavior in the human environment from ecological, ethological, historical, cultural, and social system perspectives. Applications are made to professional practice at the micro level (counseling with individuals and families or other small groups) and at the macro level (social planning for vulnerable groups in our society).

**280 Racism in American Society (also ASRC 280)**
Fall. 3 credits.
W 7:30–10 p.m. D. Barr, J. Turner.
The purpose of this course is to explore the historical, political, and sociological dimensions of racism in American society. A major goal will be to understand the presence and persistence of racial inequality and the relationship of human services to the problems of racism.

**292 Research Methods**
Fall. 3 credits.
W 7:30–10 p.m. C. McClintock.
Students will learn the logic and methods of social science research and develop skill in reading and evaluating research reports. Readings, written assignments, and in-class exercises focus on stating hypotheses, designing studies to test hypotheses, measuring variables, and interpreting findings.

**300 Special Studies for Undergraduates**
Fall or spring. Credit to be arranged.
Hours to be arranged. Department faculty.
Special arrangement for course work to establish equivalency for training in a previous major or institution. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services Office. This form, signed by both the instructor directing the study and the head of the department, should be filed at course registration during the change-of-registration period.

**315 Human Sexuality**
Spring. 3 credits. Limited to 400 students. Prerequisite: an introductory course in human development and family studies, psychology, or sociology (or equivalent social science course). Recommended: one course in biology. S-U grades optional.
W 7:30–10 p.m.; sec to be arranged.
A. Parrot.
The aim of this course is to provide students with an understanding of the interactions and interrelationships of human behavior that influence sexual development and behavior. There will be a social policy orientation focusing on the evolution of sexual norms, customs, and legislation within changing sociopolitical systems. Biological developmental components of human sexuality will also be addressed. An underlying issue is the influence of our social and cultural system on the development of sexual needs, standards, and values. Research and theory in human sexuality will be explored in an interdisciplinary approach drawing on human and organizational behavior, biology, history, communication arts, education, research theory, law, sociology, and psychology.

**325 Health-care Services and the Consumer**
Fall. 3 credits. Limited to 30 students. S-U grades optional. Offered alternate years.
Hours to be arranged. A. Parrot.
Developments in the health field that affect the availability and kinds of health services. Emphasis is placed on interrelationships between institutions and agencies and the part each can play in prevention, diagnosis, and treatment of disease and disability. Focus will include historical and current trends, quality health care, consumer issues, ethical issues, politics and policies, and the problems of health care.

**[330 Ecology and Epidemiology of Health**
Fall. 3 credits. Prerequisite: a statistics or research design course. Recommended: biology course. S-U grades optional. Offered alternate years. Next offered 1990–91.
Hours to be arranged. A. Parrot.
Ecological and epidemiological approaches to the problems of achieving human health within the physical, social, and mental environment. The course introduces epidemiological methods to the students and surveys the epidemiology of specific diseases such as AIDS, hepatitis, Legionnaires' disease, plague, cancer, herpes, and chlamydia. Application of epidemiology to health care will be discussed.]

**340 The Politics of Public Budgeting**
Spring. 3 credits.
T R 10:10–11:25. R. Buchanan.
The course examines the theory and practice that have developed to plan and control raising and spending public funds. The study of public budgeting includes the examination of techniques for controlling spending and methods for raising revenues. Because these fiscal decisions are made in a political environment, the course will take a multidisciplinary approach, synthesizing both the political and economic aspects of budgeting. Students will assume the roles of the different actors in the budgetary process to learn both the institutional dynamics of the process and the political constraints involved.

**360 Introduction to Program Planning and Development**
Fall and spring. 3 credits.
M W F 9:05. M. Minot.
The course provides an introduction to program planning and development in the delivery of human services. Models of program planning, development, and delivery will be analyzed in relation to practice. The processes of conceptualizing a program and the context of planning and development (political, organizational, economic, and social) will be examined. Basic tools and techniques available to planners will be identified and selected skills developed. Issues related to ethics, power/authority, confidentiality, and accountability will be included. Professional roles and competencies needed will be highlighted throughout the course. Students will apply the planning and development process to individual projects.

**370 Social Welfare as a Social Institution**
Fall. 3 credits.
M W F 9:05. J. Allen.
A philosophical and historical introduction to social welfare services. The course reviews the social contexts from which programs and the profession of social work have evolved. It discusses the political and ideological processes through which public policy is formed and how policies are translated into social welfare programs. Basic issues in welfare are discussed in the context of present program designs, public concerns, and the interrelationships and support of services in the community.

**400–401–403 Special Studies for Undergraduates**
Fall or spring. Credits to be arranged. S-U grades optional.
Hours to be arranged. Department faculty.
For independent study by an individual student in advanced work in a field of HSS not otherwise provided in the department or elsewhere at the university, or for study on an experimental basis with a group of students in advanced work not otherwise provided in the department or at the university. Students prepare a multicopy description of the study they want to undertake on a form available from the Counseling Office. This form must be signed by the instructor directing the study and the department chair and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period, early submission of the special-studies form to the chair is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study.

**400 Directed Readings**
For study that predominantly involves library research and independent readings.

**401 Empirical Research**
For study that predominantly involves data collection and analysis or laboratory or studio projects.

**403 Teaching Apprenticeship**
Prerequisite: Students must have taken the course (or equivalent) in which they will be assisting and have demonstrated a high level of performance. For study that includes assisting faculty with instruction.

**414 Professional Internship in Human Service Studies**
Fall, spring, or summer. 4–7 credits. Limited to juniors and seniors majoring in human service studies. Prerequisite: FIS 100 or permission of instructor. Pre-course enrollment is required.
TR 3–4:30. Placement hours to be arranged. R. Bounous.
Students intern for a minimum of 16 hours a week in a human service organization and attend a weekly seminar with a focus on integrating classroom and field-based learning. The course is structured as an opportunity for students to learn experientially and, at the same time, provide meaningful services to human service organizations. Interns are expected to take active roles in structuring, monitoring, and assessing their learning under the guidance of a faculty instructor.

**417 The Politics of Power in the Human Services**
Spring. 3 credits. Offered alternate years.
W 7:30–10 p.m. A. Hahn.
The framework of the course will take an analytical world view with some understanding of a capitalist political economy and the historically colonial relationship between the American ruling class and peoples of color, the poor, and the powerless. In addition, the course will analyze the effects of these structural and historical facts on people's lives today. The relationship between a classed, racist, and sexist society and the human services will also be included by exploring the nature of empowerment. The course will focus systematically on both micro and macro levels.

**[460 Human Service Planning Methods**
Spring. 3 credits. Prerequisite: HSS 292. Not offered 1989–90.
M W F 11:15. L. Street.
The course is designed to bridge theory-oriented social planning courses and practicums. It is intended to introduce undergraduates to basic tools and techniques that social planners use. Five modules are included that explain and provide experience in how social planners collect, analyze, and synthesize information and data in planning and policy development in the human services and that take into account the political and social contexts of the process.]

**465 Community Decision Making**
Fall. 3 credits. S-U grades optional.
T R 12:20–2:15. A. Hahn.
Identification and discussion of factors that influence the outcome of community issues. Topics include political participation, decision-making processes, the interests and resources of key decision makers, and community change. Concurrent participation in community activities is desirable but not required.

**471–472 Social Work Practice I and II**
Introduction to concepts and methods used in a generalist, task-centered model of social work practice. Examination of the values and ethics of professional practice. Students learn skills appropriate for working with individuals, groups, families, and communities. Class content is integrated with concurrent supervised fieldwork. Placements are made in social agencies in Tompkins and surrounding counties. Students are encouraged to provide their own transportation, but car pools will be arranged for those who cannot. The department reimburses transportation costs when funds are available, but students may have to pay their own expenses. A lab fee for field-related expenses will be charged to every student in the course. Each student must have a current driver's license.

**471 Social Work Practice I**
Fall. 9 credits. Limited to 25 social work students. Prerequisites: introductory psychology, introductory sociology, one course in human development, grades of C+ or better in HSS 246 and 370, and permission of instructor before registration.
Lecs, M W 10:10–12:05; fieldwork, T R for 8 hours each day. C. Shapiro, R. Bounous.

**472 Social Work Practice II**
Spring. 9 credits. Limited to 25 social work students. Prerequisites: grade of B– or better in HSS 471 and satisfactory performance in fieldwork.
Lecs, M W 10:10–12:05; fieldwork, T R for 8 hours each day. J. Mueller, R. Bounous.

**473 Section 01 Senior Seminar in Social Work**
Spring. 3 credits. Prerequisites: HSS 471–472. (HSS 472 may be taken concurrently).
M W 1:25–2:40. J. Mueller.
The course integrates and expands on learning from courses in human behavior, planning and policy analysis, and social work methods (individual and family counseling, group work, community organization) and examines recurring themes in professional practice.

**473 Section 02 Senior Seminar**
Fall and spring. 3 credits. Prerequisite: field work or permission of instructor. Limited to 18 junior and senior HSS majors.
Hours to be arranged. L. Street.
The course will focus on a particular problem, such as poverty, crime, illiteracy, teen pregnancy, and so forth. Solutions to the problem will be sought by applying an understanding of the areas of human service environments, programs, and processes. Specifically, those solutions will be sought via student analysis and definition of the problem, assessments of both current or existing and desired or ideal human services needed to address the problem, and identification of the desired outcomes of such services or of resolution of the problem. Through this process, students will also learn effective ways to create social changes. Work requirements include several individual short papers and a group project.

**475 Social Policy**
Spring. 3 credits. Prerequisite: HSS 370 or Government 111 or Sociology 141. S-U grades optional. Students should have field or work experience in a human-service program before or while taking this course.
M W 11:15–12:20. J. Allen.
An examination of the policy-making process and the significance of national policies as they affect the distribution of social services. Frameworks for analyzing social policy are used to evaluate existing social programs and service-delivery systems. Implications for change in policies at the national, state, and local levels are discussed.

**476 Housing and Feeding the Homeless (also Hotel Administration 490)**
Fall and spring. 4 credits. Limited to 20 students.
T R 8:40–9:55. J. Ford, J. Eyster, A. Hales
Through lectures, class discussion, and a field placement practicum, students will explore the economic, social, and political issues of our country's growing problem of homelessness and the existing and proposed housing and feeding policies and delivery systems that are attempting to deal with homelessness. Students will study the history of homelessness, the description of the subgroups of the homeless population, and strategies to prevent and alleviate the problem. The fieldwork involved in this course will require approximately six days spread over the semester at a project location. The estimated cost for food and travel associated with the fieldwork is $50 per student.

### Topical Seminars and Practicums

Seminars and practicums, offered periodically and reflecting faculty and student interest, with changing topics and instructors. Content, time, credits, and instructors to be announced. Seminars and practicums offer concentrated study in a specific human service area or in the education, planning, or evaluation processes within human services.

**600 Professional Ethics and Public Policy**
Fall. 3 credits. Limited to 16 students.
T. Hours to be arranged. J. Ziegler.
This seminar will explore current issues of ethics and public policy against a background of theories of ethical behavior. Questions of how public officials and managers of public and non-profit agencies and private enterprises act will be examined. How do standards of ethical behavior in the professions associated with the human services get established? Readings will be drawn from political philosophy, contemporary social science, and imaginative writing. Class participation is essential. This course will be exploratory in nature. If it succeeds, it will be presented to the Department of Human Services and the College of Human Ecology as a regular offering.

**613 Seminar in Health and Mental Health Services**
Spring. 3 credits. S-U grades only.
Hours to be arranged. I. Lazar.
Topics include the effects of new knowledge and problems on the organization and delivery of health and mental health services, developments in health and mental health policies and legislation, and the planning of community mental health services. Current challenges to the delivery of health services, including alcohol and drug problems, AIDS, stress-related disabilities, and depression, will be examined.

**669 Seminar in Program Planning and Development**
Topics include microlevel program planning, third-sector organizations, and intergovernmental influences on program planning, policy formation, program implementation, and mainstreaming. Two or more human services are examined.

**699 Seminar in Program Evaluation and Evaluative Research**
Spring.
W 12:20–1:10. J. Greene.
The seminar is topically organized according to student and faculty projects. Focuses on professional issues in evaluation practice, including consulting, ethics and standards, preparation of conference and publication materials, and various methodological issues.

## Continuing Education for Professionals

These courses are not a part of the department's regular graduate offerings but are designed to provide continuing education for professionals through the extramural division.

**507–508 Professional Improvement I and II**
Fall, spring, or summer. 3–6 credits. Enrollment is determined by various factors, including nature of content, funding, resources, facilities, and instructor. S-U grades optional. Intended for extramural (evening) and off-campus instruction. May be repeated with the permission of the instructor.
A series of special-problem seminars, classes, and activities designed for in-service and continuing education of practitioners in helping professions, such as home economics teachers, social workers, public health planners, and adult educators. Specific content of each course varies with group being served but includes work and class time appropriate to number of credits.

## The Graduate Program

Human service studies graduate courses are open to undergraduates only with the instructor's permission.

The courses listed below will be taught regularly (annually or in alternate years).

**600 Special Problems for Graduate Students**
Fall or spring. Credits to be arranged. For students recommended by their chair and approved by the instructor in charge for independent advanced work. S-U grades optional.
Department faculty.

**622 Health and Human Services Management**
Fall. 3 credits.
T R 12:20–2:15. D. Brown.
Designed as an integrating seminar for students interested in health and human services administration and consulting, the course focuses on the management process and attempts to develop students' problem-solving and decision-making skills through the analysis of cases. The case method is particularly suited to strengthen diagnostic, analytical, and conceptual processes as well as managerial skills by facilitating synthesis, integration, and the application of theory to actual situations. A number of major themes are explored, such as matrix organization, governance and corporate structure, professional relationships, organization culture, leadership and change, motivation, group processes, conflict management, and negotiation.

**627 Legal Aspects of Health-Services Delivery**
Spring. 3 credits.
M W 10:10–11:30. J. Ogden.
This course introduces principles of the law that are specifically applicable to health-services delivery. Topics considered include the liability of hospitals and their staff and personnel for injuries to patients; medical records and disclosure of information; consent to medical and surgical procedures; responsibility for patients' personal property; collection of bills; medical staff privileges; and confidential communications.

**628 Medical-Service Issues in Health Administration (also Biology and Society 428)**
Spring. 3 credits.
M W 2:15–3:30. V. Utermohlen.
A survey of the issues that affect interactions between the health-care consumer and the medical team, including disease processes (how disease occurs and progresses), the health-care team and illness, third-party payment and illness, and resource allocation.

**629 Strategic Planning and Marketing in Health Care**
Spring. 3 credits.
T R 12:20–2:15. D. Brown.
The course is designed for students interested in the strategic planning process who may be pursuing careers in health-care management, health planning, and management consulting. It attempts to integrate and apply students' knowledge, skills, and analytical abilities in the planning and implementation of health services at the institutional level. The strategic planning process is viewed as an essential part of corporate management, a dynamic endeavor that enables organizations to cope with change and meet community health-care needs in an increasingly competitive environment. Useful concepts and methods for assessing internal and external opportunities are stressed. Cases, visiting discussion leaders, and student reports help to focus and synthesize the course sessions and materials. The cases include analyses of organization and strategies for planning, environmental assessment, marketing approaches, political strategy formulation, diversification and corporate restructuring, and hospital systems.

**[630 Comparative Health-Care Systems: Canada, the United States, and Third World Countries**
Fall. 3 credits. Open to graduate students and seniors. Not offered 1989–90; next offered 1990–91.
An overview of health services is given within the larger context of the social and economic development policies of Canada, the United States, and third world countries. Sociocultural, economic, and managerial factors are stressed as keys to the formulation of realistic strategies. Resource allocations for health services are assessed against the backdrop of changing rates of economic growth. The relevance of high-technology solutions in developing countries is examined.]

**631 Primary Health-Care Services: Policy and Planning**
Spring. 3 credits. S-U grades optional.
W 7–10 p.m. R. Battistella.
Part one of the course concentrates on techniques for estimating supply requirements for personnel and facilities. In part two the consumer-behavior literature is reviewed with respect to the interpretation of disease and the exercise of choice in the initiation of first-contact medical care. The organization of primary health-care services is described in part three. Some of the topics include hospital outpatient services, private group practice, and health maintenance organizations. The remainder of the course provides a critique of community power structure theory and popular models for managing social change.

**632 Labor Relations in the Health Industry**
Spring. 1 credit.
W 4–6:30 (course meets for 5 sessions only). W. Abelow.
This course provides an overview of major topics and current issues concerning unionization in the health industry. It emphasizes a practical, direct approach to dealing with union organizing and elections, collective bargaining, strikes, and labor contract administration in the health industry. The history of unionization in the field and an analysis of applicable laws are covered. Particular emphasis is placed on the role of government and other regulatory agencies in the negotiation process. Students work with current actual cases and materials. Students have the option of taking a final examination or submitting a short research paper.

**633 HMO Development and Management**
Spring. 1 credit.
W 3:30–5:30 (course meets for 4 sessions only). F. Yanni.
The major goal of this course is to provide students with the conceptual framework for understanding the role of health maintenance organizations (HMOs) in today's health economy and to provide an introduction to the planning, development, and operation of HMOs.

**634 Health Care Organization—Providers and Reimbursement**
Fall. 3 credits. Limited to 30 students. Prerequisite: graduate standing or permission of the instructor.
T R 12:20–1:45. R. Buchanan.
The course will provide an introduction at the graduate level to the organization of health providers in the United States, the interrelationships of health services, and major sources and methods of paying for care. The course will describe how health services are structured in the United States and how these different services interrelate along the continuum of care. The course will describe and analyze the different sources of payments and how reimbursement policies affect the type and location of care provided. Innovations by the public and private sectors in the delivery and reimbursement of health care will also be presented.

**635 Field Studies in Health Administration and Planning**
Fall or spring. 1–4 credits.
Hours to be arranged. D. Brown.
Students interested in developing administrative and program-planning research skills are given an opportunity to evaluate an ongoing phase of health care agency activity in the light of sound administrative practice and principles of good medical care. In planning and carrying out the research, students work closely with a skilled practicing administrator and with members of the school's faculty.

**636 Financial Management of Health and Human Service Organizations**
Spring. 3 credits. Prerequisite: a financial accounting course or permission of instructor.
T R 12:20–2:15. R. Buchanan.
The objectives of the course are to provide students with a basic understanding of the financial environment surrounding health and human service administrators and to acquaint students with the financial tools necessary to manage health and human service organizations. The course presents an overview of the financial markets and the methods and techniques used in the financial management of health and human service organizations. It will focus mainly on health-care organizations, but the financial practices and approaches presented in the readings and class discussions will also be appropriate to other human service agencies. In addition to discussing acute-care hospitals, the course will present an understanding of the financial management of long-term-care facilities, HMOs, home health care, hospice programs, and other human-service programs.

**[652 Preparing Professionals in the Human Services**
Spring. 3 credits. S-U grades optional. Offered alternate years; next offered 1990–91.
T R 10:10–11:25. M. Minot.
Students analyze the assumptions and concepts that underlie preprofessional and continuing professional education for volunteers, paraprofessionals, and professionals in the human services (for example, adult and continuing education, health, home economics, and social work education). A variety of preservice and in-service programs will be analyzed in terms of goals, means of implementation, and evaluation. Factors that influence programs are examined, including educational setting, licensure, accreditation, legislation, evaluation of performance. Students have opportunities to participate in educational programs in human service professions and community education. Students may develop or modify a model for providing professional education at the preservice or in-service levels.]

**[655 Leadership in Human Services**
Spring. 3 credits. Limited to 20 students. S-U grades optional.
W 7:30–10 p.m. R. Babcock. Not offered 1989–90.
The course surveys some classic and contemporary leadership theories and their associated theories of personality and motivation. Human service organizations are examined in terms of their unique leadership needs and responses to various leadership styles. Through lectures, case analyses, visiting speakers, and student presentations, the relationships between leadership theories and the special features of human service organizations are explored. Translating leadership theory into practice is emphasized. Special leadership topics, such as gender and race, volunteerism, ethics, and working with boards of directors, will be considered, according to class interest.]

**660 Social Policy and Program Planning in Human Services**
Spring. 3 credits. S-U grades optional.
M W 11:15–12:20. J. Allen.
A review of the public policy process in education, health, and social welfare services as it pertains to program development. The course includes the history, definitions, and boundaries of the policy process; the relationships of the policy process to political economy, social structure, intergovernmental relations, and cultural values and beliefs; theories of planning and program development in human services; the role of evaluation in program planning and implementation, with special emphasis on monitoring and feedback of effects into the policy and planning process; selected current issues in policy and planning processes, such as regulatory and legislative constraints; the respective roles of clients or consumers and professional planners and providers; and problems and prospects in the coordination among the various human services.

**661 Designing and Implementing Health and Human Service Programs**
Spring. 3 credits. S-U grades optional.
M 4–7. I. Lazar.
The translation of legislation into programs will be described, and the major sources of support for health and human service agencies and projects will be examined. Students will learn to identify potential sources of program support and to develop applications and campaigns for such support. Grant-proposal writing, response to contract requests from governmental agencies, applications to foundations, and techniques of fund-raising will be described and practiced. Students will be expected to write several grant proposals under conditions and time constraints simulating the actual processes. As part of the simulation there will be no grades of incomplete or late papers accepted in this course.

**664 The Intergovernmental System and Human Service Program Planning**
Spring. 3 credits. Open to seniors who have had a course in American government. S-U grades optional.
T R 2:30–3:45. J. Ziegler.
An in-depth review of intergovernmental systems in America and their relevance to the formulation of human service policy and programs. Issues of decision making, fiscal arrangements, and public and private sector interactions are explored as they are affected by intergovernmental relationships. The course provides students with an analytic framework for understanding those and other issues that review the relationships within and between various governmental levels.

**665 Human Service Politics in the Local Arena**
Spring. 3 credits. Offered alternate years.
T R 10:10–11:25. A. Hahn.
This seminar investigates policy making in the local political arena, with special reference to human service programs and issues. (Graduate students who need an introduction to the local political arena should consider taking HSS 465 prior to this course.) Topics include community power; the behavior of local elected officials, administrative personnel, business leaders, state and federal governments, and other participants in local decision making; and citizen participation, with special reference to social movements and social movement organizations. Implications for both practice and research will be emphasized.

**670 Management in Public and Nonprofit Organizations**
Fall. 3 credits.
T 6:30–9 p.m. C. Crawford.
This course presents an overview of the distinctive characteristics of organizations in public and private nonprofit sectors and their implications for managing human service organizations. Through a mixture of theoretical and case-study literature students will become familiar with the major conceptual and managerial issues that confront the administrator in health and human service agencies in the public and nonprofit sector.

**671 Decision Tools for Administrators and Planners**
Spring. 3 credits.
W 3–5:30. C. Crawford.
This is a decision course that will familiarize students with a variety of tools that can be used to conceptualize problems, decision alternatives, criteria, and futures and to essentially improve the decision-making process. Students will acquire a basic understanding of how people cope with decisional conflicts and the sources of error in decision processes. They will also be introduced to techniques that can be applied in making decisions.

**672 Management Information Systems in Health and Human Services**
Spring. 3 credits.
T R 8:30–9:55. C. McClintock.
This course reviews how information systems can be developed and made useful for administrators and other professional staff in human services. Readings and assignments reflect a balance between technical and organizational or human aspects of information systems. Major topics include the organizational and managerial context for information systems in the human services, approaches to systems analysis and database development, data analysis for decision making, and presenting information for understanding programs and policies. Students will do computer assignments and case studies of management information systems issues in human service and other organizational settings.

**674 Organizational Behavior in Human Services**
Fall. 3 credits. Limited to 20 students. S-U optional.
W 7:30–10 p.m. R. Babcock.
The course surveys organizational behavior in human service organizations with emphasis on the micro dimensions. Similarities and differences among human service and other organizations are stressed. Individual behavior at the human service workplace is viewed in relation to topics such as personality, motivation, group dynamics, communication, leadership, power, and conflict. A seminar format is followed, including lectures, group discussions, student presentations, exercises, and case studies.

**685 Health and Welfare Policy**
Fall. 3 credits.
T R 10:10–11:25. R. Battistella.
Health and welfare issues are seen as reflecting alternate solutions to the broader institutional problems of allocation (economics), control (politics), and normative behavior (morality). A basic tenet is that health and welfare policy is deeply rooted in social values and the availability of economic resources. Health policy is interpreted from a multidisciplinary perspective in which change emanates from structural dynamics accompanying socioeconomic development.

**688 Long-Term Care and the Aged: Alternative Health and Social Service Delivery Systems**
Spring. 3 credits.
T R 10:10–11:25. R. Battistella.
Alternatives for the organization and delivery of long-term care services are examined within the context of public-financing constraints. Relevant experience from other highly developed countries is presented. Visiting speakers from the government and the private sector are featured, and field trips provide additional insights into the many challenges and opportunities in long-term care policy and management.

**690 Measurement for Program Evaluation and Research**
Fall. 3 credits.
T R 10:10–11:25. W. Trochim.
The course reviews measurement theory and its application to the evaluation of human service programs. Topics include validity; reliability; scaling methods; basic principles of instrument design; and methods of data collection, including interviewing strategies, testing, self-reports, observation and content analysis, and data coding. Attention is given to issues such as ethical and managerial concerns that arise in applied settings.

**691 Program Evaluation and Research Design**
Spring. 3 credits.
T R 2:30–3:45. W . Trochim.
This course reviews research design and its application to the evaluation of human service programs. Major topics include experimental, quasi-experimental, cross-sectional, and exploratory research designs; basic sampling theory; and use of qualitative and quantitative methods. Attention is given to issues that arise in the application of research designs to the evaluation of programs, including problems of randomization, causal inference, replication, and utilization of results. Skills covered include stating and testing hypotheses, critical analysis of research reports, use of computers in research, and development of a research proposal.

**692–693 Program Evaluation in Theory and Practice**
692, fall; 693, spring. 4 credits each semester. Prerequisites for HSS 692: 690 and 691 or 696, or permission of instructor. Prerequisite for HSS 693: 692. Students must register for both semesters. Offered alternate years.
Hours to be arranged. J. Greene.
This course constitutes a one- or two-semester practicum in which the class designs and conducts a program evaluation in the human services. Students are involved in all phases of the evaluation from design through the production and dissemination of a final report. Emphasis is on research methods in the social sciences. Application of knowledge developed in prerequisite courses is stressed (for example, planning and managing an evaluation, ethics, methods of data collection, data processing, and strategies for analysis and feedback of results).

**[695 Strategies for Policy and Program Evaluation**
Fall. 3 credits. Prerequisites: HSS 690 and 691 or 696, or equivalent. Offered alternate years; next offered 1990–91.
T R 2:30–3:45. J. Greene.
This course examines a wide range of approaches to the evaluation of policies and programs in the human services. The approaches are examined with respect to their purposes, key audiences, and methodologies, as well as their philosophical, political, and value frameworks. Analysis of commonalities and differences across evaluation approaches is used to judge the appropriateness of a given strategy for a particular context.]

**696 Qualitative Methods for Program Evaluation**
Spring. 3 credits. Prerequisites: HSS 690 and 691 or equivalent.
T R 1:25–2:40. W. Trochim.
This course presents a qualitative approach to applied research and the evaluation of human service programs. Topics include the epistemological assumptions underlying this approach, questions of entry into setting, methods for data collection and data analysis, reporting, confidentiality of participants, and the ethics of qualitative inquiry. The course aims to help students understand how, when, and why a qualitative approach to social inquiry can be used appropriately and effectively and how qualitative and quantitative approaches might be mixed effectively.

**704–705 Internship in Human Service Studies**
Fall, spring, or summer. 1–15 credits. S-U grades optional.
Hours to be arranged. Graduate faculty.
Internship placement in human services is determined by availability and students' academic and professional goals. Opportunities are available in public and private, human service organizations at the national, state, and local levels in positions consistent with students' needs and desires. The duration of an internship is negotiated between the student and the agency, while course credit and residence units are arranged between the student and the Special Committee.

**790 Advanced Seminar in Program Evaluation**
Spring. 3 credits. S-U grades optional. Prerequisite: permission of instructor.
T R 9–10:15. C. McClintock.
This course is intended for students with at least three courses in evaluation (HSS 690 series or equivalent) and statistics through multiple regression. The seminar focuses on analysis and appraisal of current literature on program evaluation and evaluative research, with emphasis on the links between program evaluation and program planning and administration. Attention is given to two or more service areas (education, health, social welfare) and to applications across those areas.

**899 Master's Thesis and Research**
Fall and spring. Credit to be arranged. Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.
Hours to be arranged. Department graduate faculty.

**999 Doctoral Thesis and Research**
Fall and spring. Credit to be arranged. Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.
Hours to be arranged. Department graduate faculty.

## TEXTILES AND APPAREL COURSES

S. K. Obendorf, chair and undergraduate advising coordinator; P. Schwartz, graduate faculty representative; G. Atkin, C. C. Chu, G. DeWeese, S. Hester, F. Kozen, A. T. Lemley, A. Netravali, S. Niezelski, A. Racine, N. Saltford, L. Wagenet, S. S. Watkins, B. Ziegert

**040 Apparel Studio**
Fall. 1 credit. Limited to 12 students; open to TXA majors or students transferring into TXA. Minimum cost of materials, $40; lab fee, $5.
Lec, F 8–9:55. A. Racine.
An introduction to the concepts of shaping, reinforcing, joining, and detailing textile materials in a variety of apparel forms. A remedial course to help students reach the level of proficiency in construction skills necessary for further study in apparel design.

**125 Art and Visual Thinking**
Fall. 3 credits.
Lecs, T R 3–4:25. S. Niezelski.
An introduction to the visual arts and design that explores aesthetic and cross-cultural dimensions of visual experience. Augmented by slide presentations and films, lectures emphasize relationships between visual forms and technology and social, political, and cultural interpretations that distinguish works of art from other man-made objects. Museum and gallery visits arranged when feasible.

**135 Introduction to Textiles**
Fall. 3 credits. Each lab limited to 15 students. Prerequisite or corequisite: Chemistry 103 or 207. Maximum cost of supplies and textbook, $40; lab fee, $10.
Lecs, T R 1:25–2:15; lab, T 2:30–4:25, or R 2:30–4:25. A. Netravali.
An introduction to the basic properties of textile materials, with consideration of their technology, consumer uses, and economic importance. Behavior of textile materials is observed in a variety of environmental conditions that influence aesthetics, comfort, and performance. This course is designed to provide a basis for further study in textiles, but it also contains sufficiently broad coverage of the subject to be used as an elective course.

**144 Introduction to Apparel Design**
Summer only. 3 credits. Limited to 20 students. Prerequisite: permission of the instructor. Cost of supplies and materials, $50.
A. Racine.
A studio course that focuses on designing apparel through the flat-pattern method. Students use original sketches as a basis for their designs and develop full-scale patterns for individual and group projects that are brought to various stages of completion. Emphasis is placed on creative expression and a thorough understanding of principles and techniques needed to produce apparel.

**145 Apparel Design I**
Spring. 4 credits. Limited to 15 students; priority given to TXA majors or students transferring into TXA. Prerequisite: TXA 040 or basic sewing skills. Recommended: an art or drawing course. Apparel design majors should take course during the first year. Minimum cost of materials, $100; lab fee, $10.
Lecs and labs, T R 1:25–4:25. A. Racine.
Intensive study of principles and processes of flat-pattern design and fitting techniques, with emphasis on development of creative expression in fashion apparel.

**146 Clothing: The Portable Environment**
Fall. 3 credits. Average cost of materials, $30; lab fee, $10.
Lec, T R 10:10–11:40. S. Watkins.
An introduction to the physical function of clothing for individuals of varying ages, for sports and recreation, for the physically handicapped, for a variety of occupations and climates, and for hazardous environments such as under water or outer space.

**238 Textiles for Interiors and Exteriors**
Fall. 3 credits. S-U grades optional.
M W F 9:05. F. Kozen.
This course reviews developments and trends in textiles for the home and for contract interiors. Consideration is given to end-use requirements, to performance and test method standards and specifications, and to the environments in which these textiles are used. Field trips are arranged when feasible.

**[241 Assessment of Product Quality**
Spring. 3 credits. Each section limited to 15 students. Not offered 1989–90.
Lec, M 2:30; sec, W 10:10–12:05 or R 10:10–12:05. A. Racine.
Lectures and discussions will focus on analyzing the quality of sewn products with a variety of end-uses such as apparel, accessories, and home furnishings. Students will review the overall process involved in manufacturing mass-produced items, develop an awareness of product construction, and become familiar with standards used in industry to determine quality.]

**242 Apparel Industry: Field Experience**
Spring-term break. 1 credit. S-U grades only. Approximate cost, $350–$400. $150 deposit required before spring semester begins; remainder required by February 15. Offered alternate years.
Staff.
A five-day field trip to a major apparel center such as New York City. Cost includes accommodation and museum visits. Tours cover fiber, fabric, and design firms; manufacturers; retailers; and promotion and media establishments of the multifaceted apparel and textile industry.

**245 Dress: A Reflection of American Women's Roles**
Fall and summer. 3 credits. Enrollment limited to 40 students. S-U grades optional.
M W 12:20–2:15. A. Racine.
Historical survey of changing patterns of American women's dress from the colonial period to the present day and of cultural, economic, and political forces that affected changes and women's development. Slides and film clips from the Cornell University Costume Collection will be used for lectures and discussion. Students will investigate various topics in fashion, etiquette, and the roles of women.

**264 Apparel Design II**
Fall. 4 credits. Each section limited to 10 students. Prerequisite: TXA 145. Recommended: two art or drawing courses. Apparel design majors should take TXA 264 and 367 in the same academic year, preferably during the sophomore year. Minimum cost of materials, $100; lab fee, $10.
M W 1:25–4:25. B. Ziegert.
This studio course examines two interrelated methods of apparel design. Through exercises, principles and processes of draping, fitting, and advanced flat pattern making are studied. Assigned problems require the students to make judgments regarding the design process, the nature of materials, body structure, function, and fashion.

**300 Special Studies for Undergraduates**
Fall or spring. Credit to be arranged.
Hours to be arranged. Department faculty.
Special arrangement for course work to establish equivalency for courses not transferred from a previous major or institution. Students prepare a multicopy description of the study they want to undertake on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the department chair, is filed at course registration or during the change-of-registration period.

**331 The Textile and Apparel Industries**
Fall. 4 credits. Prerequisites: Economics 101 and 102 or CEH 110 and 111 and an upper-division course in either apparel or textiles, excluding field experiences. Course fee, $12.
Lecs, T R 8:30–9:55; rec, W 3:35 or W 7:30–8:20 p.m. S. Hester.
A critical review of the textile and apparel industries, including structure and marketing practices, and government policies that affect industry decisions and operations in such areas as energy, safety, and the environment. The role of labor unions is examined as well as the effects of international trade of textile and apparel products.

**336 Fundamentals of Color and Dyeing**
Fall. 3 credits. Prerequisite: College Natural Science Requirements. Lab fee, $15.
Lecs, M W F 10:10–11; lab, M 1:25–4:25. C. C. Chu.
Color is an extremely important and useful factor in everybody's daily life, e.g., the clothes we wear, the food we eat, the house we live in. This course will emphasize theories and scientific principles of color, providing a framework for the use of colors in design, marketing, or research. How colorants are used on fabrics will be addressed. Although fabrics are chiefly used to illustrate color in the class, much of the information and knowledge will be useful to non-textile majors. Guest lecturers from industry will provide the practical aspects of color in business.

**337 Formation and Structure of Textile Fabrics**
Spring. 3 credits. Prerequisite: TXA 135. Recommended: college algebra.
Lecs, M W F 9:05. P. Schwartz.
This course covers (1) how fabrics are made (2) how the method of manufacture influences fabrics properties, and (3) how the method of manufacture limits potential applications of fabrics. The technical aspects of textile fabrics are covered in detail. Available production technologies are reviewed. Properties of woven, knitted, and nonconventional fabrics, methods of producing structural designs, and means of designing fabrics to specifications are covered.

**367 Apparel Design III**
Spring. 3 credits. Prerequisite: TXA 264. Recommended: 3 art or drawing courses. Apparel design majors should take TXA 264 and 367 in the same academic year, preferably during the sophomore year. Minimum cost of materials, $100; lab fee, $10.
M W 1:25–3:20. A. Racine.
Advanced apparel students prepared to challenge and refine their design skills will be presented with a variety of complex studio

problems in apparel design. The Cornell Costume Collection is used for illustration and inspiration.

**375 Visual Studies: Color and Surface Design**
Spring. 3 credits. Minimum cost of materials, $75; lab fee, $10.
T R 1:25–4:25. S. Niezelski.
This studio experience is augumented by slide presentations that demonstrate the use of decorative and repeat patterns as an applied textiles art form; lecture materials reference both the history and current trends in surface design and color. Projects explore design problem-solving skills, systems of color classification, and principles of two-dimensional form; portfolio presentation skills are emphasized.

**400–401–402–403 Special Independent Studies for Undergraduates**
Fall or spring. Credits to be arranged. S-U grades optional.
Hours to be arranged. Department faculty.
For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of TXA not otherwise provided through course work in the department or elsewhere at the university. Students prepare a multicopy description of the study they want to undertake on a form available from the Counseling Office. This form must be signed by the instructor directing the study and the department chair and filed at course registration or within the change-of-registration period after registration. To ensure review before the close of the course registration or change-of-registration period, early submission of the special-studies form to the department chair is necessary. Students, in consultation with their supervisor, should register for one of the following subdivisions of independent study.

**400 Directed Readings**
For study that predominantly involves library research and independent reading.

**401 Empirical Research**
For study that predominantly involves data collection and analysis, or laboratory or studio projects.

**402 Supervised Fieldwork**
For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.

**403 Teaching Apprenticeships**
Fall or spring. 2–4 credits. Prerequisites: student must have upperclass standing, have demonstrated a high level of performance in the subject to be taught and in the overall academic program, and have permission of the instructor and the department chair. S-U grades only.
Apprenticeship includes both a study of teaching methods in the field and assisting the faculty with instruction.

**425 Computer-Aided Apparel Design**
Fall. 3 credits. Prerequisites: TXA 367 and 3 art or drawing courses. Minimum cost of materials, $50. Lab fee, $10.
Lecs, TR 2:30–4:25; lab, F 12:20–2:15. A. Racine.
An advanced studio course that uses microcomputers and the AutoCAD software program for solving a variety of problems in apparel design. The computer is used in all stages of the design process from conception to presentation.

**[431 The Textile and Apparel Industries—Field Experiences**
Spring-term break. 1 credit. Prerequisite: TXA 331. S-U grades only. Offered alternate years. Students are responsible for trip expenses, approximately $400. Not offered 1989–90.
S. Hester.
A one-week field experience in the textile regions of the South. Students have the opportunity to see various textile processes, including fiber production, knitting, weaving, dyeing and finishing, and designing. In addition, seminars with executives of each participating firm relate theory to current practice.]

**432 Product Quality Assessment**
Spring. 3 credits. Prerequisites: TXA 337 and Statistics. Lab fee, $15.
Lecs, M W 1:25–2:15; lab, W 2:30–4:25. A. Netravali.
This course covers the testing and evaluation of textile fibers, yarns, fabrics, and garments, with emphases on the meaning and use of standards, the philosophy of testing, quality control, and statistical evaluation of test data. Common day-to-day tests done in textile and apparel industry will be reviewed and their significance discussed. Laboratory sections will be used to introduce students to various test methods and to generate data for analysis and evaluation.

**439 Biomedical Materials and Devices for Human Body Repair**
Spring. S-U grades optional. Prerequisites: College Natural Science Requirement (Chem. 103–104, or Biol. 101–103).
Lecs,T 3:35. C. C. Chu.
Survey of materials and devices for repair of injured, diseases, or aged human tissues/organs. It includes properties of synthetic and biological materials, wound healing processes, medical devices for repair of wounds, blood vessels, hearts, joints, bones, nerves, vision/hearing/voice, and drug control/release, and other external devices.

**446 Apparel Design: Intermediate Functional Clothing Design**
Spring. 3 credits. Prerequisites: TXA 146 and TXA 264 or permission of instructor. Not available to students who have taken DEA 445. 1 field trip, approximate cost $125; minimum cost of materials, $50; lab fee, $10.
Lecs,T R 10:10–11:40. S. Watkins.
Advanced physical theory concerned with the function of clothing. Special current topics in the field will be studied. Students will be engaged in individual, semester-long research projects that result in the design and development of an apparel item. A field trip to an industry site is planned.

**461 Issues in Management and Marketing**
Spring. 3 credits. Prerequisite: TXA 331 or permission of instructor. Course fee, $12.
Lecs, T R 1:25–2:55. S. Hester.
The course will focus on management and marketing issues of concern to the textile and apparel sector. Management topics will include labor and productivity issues, governmental interaction, adoption of technology, and the problem of foreign competition. Topics in distribution and marketing will address the importance of industry-consumer interaction, changes in the domestic and international marketplace, and the role of trade and consumer associations.

**465 Apparel Design: Product Development and Presentation**
Fall. 3 credits. Prerequisites: minimum of three drawing or art courses and TXA 367 or permission of instructor. Minimum cost, $100; lab fee, $10.
T R 1:25–4:25. B. Ziegert.
Through studio problems in apparel design, students examine the influence of manufacturing technology and cost on apparel products. Lines of garments are developed to various stages from sketches to finished samples.

**600 Special Problems for Graduate Students**
Fall or spring. Credit to be arranged. S-U grades optional.
Hours to be arranged. Department faculty.
Independent advanced work by graduate students recommended by their chair and approved by the department chair and instructor.

**620 Physical Properties of Fiber-Forming Polymers and Fibers**
Fall. 3 credits. Prerequisite: permission of instructor. Offered alternate years.
Lecs, M W 2:30–3:45. A. Netravali.
Formation and properties of fiber-forming polymers, rubbery, glassy, and crystalline states. Dynamics of network response. Fiber structure, relationship between chemical structure and physical properties of man-made and natural fibers. Mechanical, thermal, and viscoelastic properties of fibers and testing methods.

**621 Characterization of Fibrous Materials**
Spring. 3 credits. Prerequisite: TXA 620 or permission of instructor. S-U grades optional. Offered alternate years.
M W F 12:20. P. Schwartz.
A study of the principles of the major analytical characterization methods and the application of these methods to the study of fiber properties and structure. Topics include microscopy, x-ray diffraction, spectroscopy, magnetic resonance, and mass spectrometry. The student completing this course should be able to select methods and measurements that would best characterize a particular structural property.

**631 Textiles and Apparel: International Production and Trade**
Spring. 3 credits. Prerequisite: TXA 331, Econ 361, or permission of instructor. Offered alternate years. Course fee, $12.
T R 8:30–9:55. S. Hester.
The course will focus on worldwide patterns of production and trade in the textile and apparel industries. Reasons for international trade will be examined, as well as the international environment that underlies trade in those commodities. Other topics include the international organizations and agreements relevant to textiles and apparel and the resulting protective trade policies on the part of developed and developing nations.

**635 Special Topics in Textiles**
Spring. 1–3 credits. Prerequisite: permission of instructor.
M W F 10:10. C. C. Chu.
An in-depth study of one or more selected topics in polymers, fibers, or textiles. The course content will vary; consult instructor for more details.

**[636 Fiber Chemistry**
Fall. 3 credits. Offered alternate years. Not offered 1989–90. Prerequisite: permission of instructor.
Lecs, M W F 11:15. C. C. Chu.
An in-depth coverage of the important natural and synthetic fibers currently being used in industry, agriculture, medicine, apparel, and engineering. They include cellulose, silk, wool, polyesters, polyamides, polypropylenes, and acrylics. In each fiber, the synthesis of polymer, fiber formation, and structure, chemical and physical properties, and applications will be discussed.]

**637 Graduate Seminar in Textiles and Apparel**
Fall and spring. No credit.
R 12:20–1:10. K. Obendorf, fall; C. C. Chu, spring.
New developments, research, and topics of major concern to the field of textiles and apparel are discussed by faculty members, students, and speakers from industry, government, and academia.

**[639 Mechanics of Fibrous Structures**
Spring. 3 credits. Prerequisite: permission of instructor. Offered alternate years. Not offered 1989–90.
M W F 10:10. P. Schwartz.
A study of the mechanics of textile structures: creep phenomena and the dynamic properties of fibers and yarns; idealized yarn and fabric models and their relationship to research data; special topics in the deformation of yarns and fabrics in tensile, shear, and compression stress; fabric bending and buckling; and the mechanical behavior of nonwoven textile materials.]

**899 Master's Thesis and Research**
Fall or spring. Credits to be arranged. Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.
Hours to be arranged. Field graduate faculty.

**999 Doctoral Thesis and Research**
Fall or spring. Credit to be arranged. Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.
Hours to be arranged. Field graduate faculty.

## FACULTY ROSTER

Allen, Josephine A., Ph.D., U. of Michigan. Assoc. Prof., Human Service Studies
Anderson, Carol L., Ph.D., Iowa State U. Assoc. Prof., Human Development and Family Studies
Avery, Robert B., Ph.D., U. of Wisconsin. Assoc. Prof., Consumer Economics and Housing
Babcock, Robert J., Ed.D., Cornell U. Assoc. Prof., Human Service Studies
Barr, Donald J., Ph.D., Indiana U. Assoc. Prof., Human Service Studies
Battistella, Roger M., Ph.D., U. of Michigan. Prof., Human Service Studies
Bayer, Helen T., Ph.D., Cornell U. Prof., Human Development and Family Studies
Becker, Franklin D., Ph.D., U. of California at Davis. Prof., Design and Environmental Analysis
Beckman, Ronald H., M.S., Pratt Inst. Assoc. Prof., Design and Environmental Analysis
Biesdorf, Heinz B., Ph.D., U. of Innsbruck (Austria). Prof., Consumer Economics and Housing
Boegly, Carolyn O., M.S., U. of Wisconsin. Assoc. Prof., Cooperative Extension
Boyd, D. Michael, B.A., U. of North Iowa. Prof., Design and Environmental Analysis
Broadwell, George J., Ph.D., Cornell U. Assoc. Prof., Cooperative Extension
Bronfenbrenner, Urie, Ph.D., U. of Michigan. Jacob Gould Schurman Professor, Human Development and Family Studies
Brumberg, Joan J., Ph.D., U. of Virginia. Assoc. Prof., Human Development and Family Studies
Bryant, W. Keith, Ph.D., Michigan State U. Prof., Consumer Economics and Housing
Buchanan, Robert J., Ph.D., U. of Virginia. Asst. Prof., Human Service Studies
Bushnell, Allen R., M.F.A., Cranbrook Acad. of Art. Assoc. Prof., Design and Environmental Analysis
Ceci, Stephen J., Ph.D., U. of Exeter (England). Prof., Human Development and Family Studies
Chi, Peter S., Ph.D., Brown U. Prof., Consumer Economics and Housing
Chu, Chih-Chang, Ph.D., Florida State U. Assoc. Prof., Textiles and Apparel
Cochran, Moncrieff, Ph.D., U. of Michigan. Assoc. Prof., Human Development and Family Studies
Condry, John C., Ph.D., U. of California at Los Angeles. Prof., Human Development and Family Studies
Cornelius, Steven W., Ph.D., Pennsylvania State U. Assoc. Prof., Human Development and Family Studies
Crawford, Catherine M., Ph.D., SUNY at Albany, Asst. Prof., Human Service Studies
Danko, Sheila, M.I.D., Rhode Island School of Design. Asst. Prof., Design and Environmental Analysis
DeWeese, Gail, Ph.D., Virginia Polytechnic Institute and State U. Asst. Prof., Textiles and Apparel
Doris, John L., Ph.D., Yale U. Prof., Human Development and Family Studies
Eckenrode, John J., Ph.D., Tufts U. Asst. Prof., Human Development and Family Studies
Eshelman, Paul E., M.F.A., U. of Illinois. Assoc. Prof., Design and Environmental Analysis
Firebaugh, Francille M., Ph.D., Cornell U. Prof., Consumer Economics and Housing
Ford, John L., Ph.D., U. of Michigan. Assoc. Prof., Human Service Studies
Garner, Clark E., M.F.A., U. of Kansas. Assoc. Prof., Design and Environmental Analysis
Gerner Jennifer L., Ph.D., U. of Wisconsin. Assoc. Prof., Consumer Economics and Housing
Greene, Jennifer C., Ph.D., Stanford U. Asst. Prof., Human Service Studies
Hahn, Alan J., Ph.D., Indiana U. Assoc. Prof., Human Service Studies
Hamilton, Stephen F., Ed.D., Harvard U. Assoc. Prof., Human Development and Family Studies
Harding, John S., Ph.D., Harvard U. Prof., Human Development and Family Studies
Hazan, Cindy, Ph.D., U. of Denver. Asst. Prof., Human Development and Family Studies
Heck, Ramona K.Z., Ph.D., Purdue U. Assoc. Prof., Consumer Economics and Housing
Hedge, Alan, Ph.D., U. of Sheffield (England). Assoc. Prof., Design and Environmental Analysis
Hester, Susan B., Ph.D., Virginia Polytechnic Institute and State U. Asst. Prof., Textiles and Apparel
Hogarth, Jeanne M., Ph.D., Ohio State U. Assoc. Prof., Consumer Economics and Housing
Jacobsen, Linda A., Ph.D., U. of Wisconsin. Asst. Prof., Consumer Economics and Housing
Key, Rosemary J., Ph.D., Ohio State U. Asst. Prof., Consumer Economics and Housing
Koslowski, Barbara, Ed.D., Harvard U. Assoc. Prof., Human Development and Family Studies
LaQuatra, Joseph Jr., Ph.D., Cornell U. Asst. Prof., Design and Environmental Analysis
Lazar, Irving, Ph.D., Columbia U. Prof., Human Service Studies
Lee, Lee C., Ph.D., Ohio State U. Assoc. Prof., Human Development and Family Studies
Lemley, Ann T., Ph.D., Cornell U. Assoc. Prof., Textiles and Apparel
Lenzenweger, Mark. F., Ph.D. Yeshiva U. Asst. Prof., Human Development and Family Studies
Lust, Barbara C., Ph.D., City U. of New York. Assoc. Prof., Human Development and Family Studies
McClintock, Charles C., Ph.D., SUNY at Buffalo. Assoc. Prof., Human Service Studies
Maynes, E. Scott, Ph.D., U. of Michigan. Prof., Consumer Economics and Housing
Millican, G. Cory, M.F.A., U. of Florida. Assoc. Prof., Design and Environmental Analysis
Minot, Marion E., Ph.D., Cornell U. Prof., Human Service Studies
Moen, Phyllis, Ph.D., U. of Minnesota. Assoc. Prof., Human Development and Family Studies
Mueller, B. Jeanne, Ph.D., U. of Wisconsin. Prof., Human Service Studies
Netravali, Anil, Ph.D., North Carolina State U. Asst. Prof., Textiles and Apparel
Noble, Lucinda A., Ph.D., U. of North Carolina. Prof., Human Service Studies
Obendorf, Sharon K., Ph.D., Cornell U. Prof., Textiles and Apparel
Ostrander, Edward R., Ph.D., U. of Illinois. Assoc. Prof., Design and Environmental Analysis
Parrot, Andrea, Ph.D., Cornell U. Asst. Prof., Human Service Studies
Pollak, Patricia B., Ph.D., Syracuse U. Assoc. Prof., Consumer Economics and Housing
Potts, Marion H., Ph.D., Penn State U. Prof., Human Development and Family Studies

Reschovsky, James D., Ph.D., U. of Michigan. Asst. Prof., Consumer Economics and Housing
Ricciuti, Henry N., Ph.D., Fordham U. Prof. Emeritus, Human Development and Family Studies
Robertson, Steven S., Ph.D., Cornell U. Assoc. Prof., Human Development and Family Studies
Robinson, Jean R., Ph.D., Radcliffe C. Prof., Consumer Economics and Housing
Saltford, Nancy C., Ph.D., Purdue U. Prof., Textiles and Apparel
Savin-Williams, Richard C., Ph.D., U. of Chicago. Assoc. Prof., Human Development and Family Studies
Schoggen, Phil, Ph.D., U. of Kansas. Prof., Human Development and Family Studies
Schwartz, Peter, Ph.D., North Carolina State U. Assoc. Prof., Textiles and Apparel
Shapiro, Constance H., Ph.D., Cornell U. Assoc. Prof., Human Service Studies
Sims, William R., Ph.D., Massachusetts Inst. of Technology. Prof., Design and Environmental Analysis
Street, Lloyd C., Ph.D., U. of California at Berkeley. Assoc. Prof., Human Service Studies
Suci, George J., Ph.D., U. of Illinois. Prof., Human Development and Family Studies
Thornton, Michael C., Ph.D., U. of Michigan. Asst. Prof., Human Development and Family Studies
Trochim, William M. K., Ph.D., Northwestern U. Assoc. Prof., Human Service Studies
Watkins, Susan M., M.S., Pennsylvania State U. Prof., Textiles and Apparel
Wethington, Elaine, Ph.D., U. of Michigan. Asst. Prof., Human Development and Family Studies
White-Means, Shelley I., Ph.D., Northwestern U. Asst. Prof., Consumer Economics and Housing
Yerka, Bettie L., Ph.D., Syracuse U. Assoc. Prof., Human Service Studies
Ziegert, Beate I. E., M.A., Syracuse U. Asst. Prof., Textiles and Apparel
Ziegler, Jerome M., M.A., U. of Chicago. Prof., Human Service Studies
Zorn, Peter M., Ph.D., U. of California at Davis. Assoc. Prof., Consumer Economics and Housing

# NEW YORK STATE SCHOOL OF INDUSTRIAL AND LABOR RELATIONS

## ADMINISTRATION

David B. Lipsky, dean

Robert Smith, associate dean, academic affairs

Ronald L. Seeber, associate dean, extension and public affairs

Jonathon Levy, assistant dean, administration

James E. McPherson, assistant dean, Office of Student Services

Shirley Harper, librarian

Ronald G. Ehrenberg, director, research

Theodore Lindsley, director, school relations

Frances Benson, director, publications

Tom Herson, director of budget

Lawrence K. Williams, graduate faculty representative

John F. Burton, Jr., editor, *Industrial and Labor Relations Review*

## DEGREE PROGRAM

| | *Degree* |
|---|---|
| Industrial and Labor Relations | B.S. |

## THE SCHOOL

The School of Industrial and Labor Relations at Cornell (ILR) is a small school within a large university, and it tries to maintain the small-college atmosphere that would be expected of an institution that has about 630 undergraduates and approximately 100 graduate students.

The school is located in a unified complex of classroom buildings, library, and administrative and faculty offices clustered around two courtyards. Daily classroom activities and other school events provide opportunities for students and faculty to interact. ILR students are members of the larger Cornell community and participate fully in its programs.

Almost half of the school's typical freshman class comes from the greater New York City area. Another 30 percent live in other parts of New York State. Students from other states and a few from foreign countries make up the rest of the class. Women constitute about 50 percent of recent entering classes, and minority students comprise about 20 percent of new freshmen and transfer students.

Students enrolled in the School of Industrial and Labor Relations at Cornell may take a substantial number of courses in the other six undergraduate colleges and schools of the university, including the College of Arts and Sciences. Cornell students have access to all of the libraries and other services of the university.

The school operates in four areas: (1) resident instruction, (2) extension and public service, (3) research, and (4) publications. It provides instruction to undergraduates and graduate students who are preparing for careers in the field, as well as to men and women already engaged in industrial relations activities and the general public through its Extension and Public Service Division.

The school's Conference Center, part of the extension division, initiates and hosts conferences covering the full scope of industrial and labor relations. The center provides continuing education and information to practitioners and scholars.

The Research Division develops materials for resident and extension teaching and originates studies in industrial and labor relations. The Publications Division publishes and distributes the research results.

## DEPARTMENTS OF INSTRUCTION

Courses in the school are organized into six departments:

### Collective Bargaining, Labor Law, and Labor History

In the study of workers, employers, and the government policies affecting them, members of this faculty concentrate on subjects of industrial and labor relations best understood by reliance on the fields of administration, economics, history, and law. Courses explore subjects within the framework of American society, stress fundamental forces of change, and analyze texts and empirical data with methods drawn from the social sciences, the humanities, and the legal professions.

### Economic and Social Statistics

Economic and Social Statistics includes the principles of statistical reasoning, statistical methods, and the application of statistical tools of analysis.

### International and Comparative Labor Relations

International and Comparative Labor Relations is concerned with industrial and labor relations systems and labor markets in other parts of the world. Countries include those in Western Europe, as well as the newly industrializing countries in Asia and the Third World.

### Labor Economics

Labor Economics deals with labor markets: that is, the institutional arrangements, terms, and conditions under which workers supply their labor and under which firms demand their labor. Faculty members are especially concerned with understanding the workings of labor markets and the effects of various public policies. The topics dealt with in courses and research include the following: analysis of the labor force, employment and unemployment, wages and related terms of employment, income distribution, income security programs, health and safety in industry, retirement, pensions and social security, economic aspects of collective bargaining, and economic demography.

### Organizational Behavior

By studying individuals, groups, single organizations, and associations or organizations, persons in the field of Organizational Behavior understand human behavior within organizations as well as the actions of the organizations themselves. At the individual level of analysis, courses consider motivation, leadership, attitudes, personality, group processes, organizational change, and worker participation. At the organizational level, courses examine occupations, deviance in the work place, conflict, power, organizational design, public policy regarding organizations, and industrial conflict. The department also offers courses on research methods in organizational research and general survey courses in both psychological and sociological research.

### Personnel and Human Resource Studies

This department offers specialization in personnel management or human resource studies. Personnel management focuses on employer-employee relationships and deals with such topics as human-resource planning, staffing, computer applications to personnel, personnel information systems, training, management development, performance appraisal, compensation administration, organization development, and the sociological environment of personnel management. The study of human resource policy focuses on government efforts to enhance the population's ability to be employed. Although primarily concerned with governmental measures that influence the supply of labor (for example, training, education, health, mobility, and immigration), the subject area also includes policies in private industry that relate to the demands for labor.

A full list of required and elective courses is available from the Office of Student Services, 101 Ives Hall.

## RESIDENT INSTRUCTION

This division conducts the on-campus programs leading to the degrees of Bachelor of Science, Master of Industrial and Labor Relations, Master of Science, and Doctor of Philosophy from Cornell.

### Office of Student Services

Staff members from the Office of Student Services, 101 Ives Hall, work closely with faculty and faculty committees to administer degree programs for the school and many of the school's support services. The office's responsibilities include the admitting and orienting of new students, maintaining students' personal and academic records, and counseling students on personal and academic problems. The office also works closely with seniors who are planning graduate study.

### Counseling and Advising

New students will be provided advising on orientation, academic procedures, and course registration by counselors in the Office of Student Services.

Each of the school's academic departments names faculty members to serve as advisers for students who wish to consult with them regarding career possibilities in the field, postgraduate programs, or similar matters. Questions or issues related to graduation requirements, course registration, and related academic procedures should be raised with counselors in the Office of Student Services.

### Minority Programs

Cornell University administers a variety of special opportunity programs designed to provide financial assistance and other forms of assistance to (1) minority students and (2) low-income students meeting program guidelines. The purpose of these programs is to open access to a Cornell education for capable students who otherwise might not secure the admissions consideration, financial assistance, or supportive services necessary for their success at the university. The associate director for minority education in the Office of Student Services provides academic and personal counseling to all ILR minority students. ILR offers a variety of support services to enhance academic achievement. For details, prospective students should contact ILR Admissions.

## STUDY OPTIONS

Several study options are open to ILR undergraduates, making it possible to tailor a program to fit special circumstances.

One such option is the five-year ILR master's degree. With early planning, some students may earn the M.S. degree in the fifth year. Using another option, some ILR students arrange for dual registration in the Johnson Graduate School of Management, earning their bachelor's degree in ILR and a master's degree in the Johnson Graduate School of Management after five years of study.

Some students elect to spend a semester in New York City, Albany, or Washington, D.C., with a chance to observe actual labor problem solving as interns in congressional offices, labor organizations, personnel offices, and state and federal agencies. For more information, see "Special Academic Programs," below.

Study abroad options are also available at a number of foreign universities. Qualified students may spend a semester or a full year studying abroad.

A number of ILR courses deal directly with today's problems and involve fieldwork in the Ithaca area and elsewhere in New York State.

The ILR program allows juniors and seniors who want to conduct their own research to receive course credit for individually directed studies if the program is supervised by a faculty member.

### Study In Absentia

Registration in absentia enables a student to seek admission in another American institution for a semester or a year and transfer credit toward completion of the Cornell degree. This study option requires the development of a plan of study, a statement of appropriate reasons for study away from the university (e.g., availability of courses not offered at Cornell), good academic standing, approval of the plan by the director of student services, and payment of a special in absentia registration fee. Course work taken in absentia is usually not evaluated for transfer credit until the work has been completed and the student has returned to the school. Students then submit a course syllabus and other evidence of content to the chairman of the department that might have offered the respective course, or to a counselor in the Office of Student Services if the course is more appropriate as a general elective.

### Leave of Absence or Withdrawal

If a student desires to withdraw or to take a leave of absence from the university, an interview should be scheduled with a counselor in the Office of Student Services. Counselors will assist students in petitioning for approval of a leave of absence and in contacting the appropriate offices or departments of the university.

## REQUIREMENTS FOR GRADUATION

To earn the Cornell Bachelor of Science degree in industrial and labor relations, the student needs to successfully complete 120 credits. This requires eight terms for an average of 30 credits a year although some students accelerate their studies.

### Required Courses

(55 credits)

The curriculum prescribes the courses and subjects listed in the table below, to be taken in the terms indicated during the freshman, sophomore, and junior years. In the senior year, all courses will be electives.

| *Course or Subject* | *Credits* | *Term* |
|---|---|---|
| **Freshman Year** | | |
| Freshman Seminars* | 6 | Fall and spring |
| Econ 101–102, Micro-Macroeconomics* | 6 | Fall and spring |
| Psych 101, Introduction to Psychology* | 3 | Fall |
| ILRCB 100, United States Labor History in the Nineteenth Century | 3 | Fall |
| ILROB 120, Macro Organizational Behavior and Analysis | 3 | Fall |
| ILRST 210, Statistics I | 4 | Spring |
| Any *two* of the following: | 6 | Spring |
| ILRCB 101, United States Labor History in the Twentieth Century | | |
| ILRLE 140, Development of Economic Institutions | | |
| ILROB 121, Micro Organizational Behavior and Analysis | | |
| Physical education | 0 | Fall and spring |
| **Sophomore Year** | | |
| ILRCB 201, Labor Relations Law and Legislation | 3 | Fall |
| ILRLE 240, Economics of Wages and Employment | 3 | Fall |
| ILRST 211, Statistics II | 3 | Fall |
| ILRPR 260, Personnel Management | 3 | Fall or spring |
| ILRCB 200, Collective Bargaining | 3 | Spring |
| Ag Econ 221, Financial Accounting | 3 | Spring |
| ILRCB 101 or ILRLE 140 *or* ILROB 121 | 3 | Spring |
| **Junior Year** | | |
| ILRLE 340, Economic Security | 3 | Fall or spring |

*College of Arts and Sciences

### Elective Courses

(65 credits)

From the courses offered by the school, students must select a minimum of 27 credits of ILR elective courses. No more than 9 of these credits may be satisfied by I&LR 499, Directed Studies, or I&LR 497–498, Internships, or I&LR 495, Honors Program.

Undergraduates are required to select one course in the humanities and one intensive writing course (each for a minimum of three credits) from a list of designated courses to be completed during the sophomore, junior, or senior years.

The remaining 33 credits may be selected from the courses of any other college at Cornell, but a student who takes more than 33 credits in the endowed colleges (the College of Architecture, Art, and Planning; the College of Arts and Sciences; the Johnson Graduate School of Management; the College of Engineering; and the School of Hotel Administration) will be billed for the additional tuition at the current cost per credit.

The number of credits that may be taken in the endowed colleges at no additional cost to the student may be changed at any time by official action of the school.

## SCHEDULING AND ATTENDANCE

### Schedule Changes

Occasionally it may be necessary for a student to request changes in his or her course schedule either before a term begins or during the semester. Such requests *must be directed to the Office of Student Services* to avoid possible loss of academic credit.

### Class Attendance

It is each student's responsibility to attend all scheduled classes unless approved excuses have been given by the faculty. In some courses an instructor may permit a maximum number of class absences without a grade penalty or dismissal from the course. An explanation for absence from class may occasionally be secured from the Office of Student Services in advance of the expected absence. An approved absence may be warranted by:

1) participation in authorized university activities such as athletic events, dramatic productions, or debates;

2) medical problems supported by a record of clinic or infirmary treatment;

3) serious illness or death in the immediate family;

4) other circumstances beyond the student's control.

A request for explanation of an absence should, when possible, be made to the Office of Student Services *before the date of expected absence*. A reported and explained absence does not relieve a student from fulfillment of academic requirements during the period of absence. The course instructor has the authority to determine what work must be completed. The office can only confirm the explanation for absence. Students should inform the Office of Student Services of any problems they have meeting course requirements.

## ACADEMIC STANDING AND GRADES

### Academic Integrity

In 1987 the faculty of the School of Industrial and Labor Relations approved a revised code of academic integrity. This code, while based on the Cornell University code, varies somewhat.

Absolute integrity is expected of all Cornell students in all academic undertakings. They must in no way misrepresent their work, fraudulently or unfairly advance their academic status, or be a party to another student's failure to maintain academic integrity. The code specifically prohibits:

1) knowingly representing the work of others as one's own;

2) using or obtaining unauthorized assistance in any academic work;

3) fabricating data in laboratory or field work;

4) giving fraudulent assistance to others;

5) fabricating data in support of laboratory or field work.

Full details on the applications of those prohibitions to course work, term papers, examinations, and other situations are listed in the code. Copies are available from the Office of Student Services, 101 Ives Hall.

### Dean's List

A Dean's List is compiled for each of the four undergraduate classes each term on the seventh day following receipt of final grades from the registrar. Eligibility for the Dean's List is determined by applying all of the following criteria:

1) achievement of a term average for freshmen of 3.3 or better; for sophomores of 3.4 or better; and for juniors and seniors of 3.6 or better;

2) a minimum course load for the term of 12 letter-graded credits;

3) completion of all courses registered for at the beginning of the term;

4) satisfaction of all good-standing requirements.

### Academic Standing

Good standing requires that all of the following criteria be met at the end of each term:

1) an average of C– (1.7) for the semester's work, including a minimum of 8 completed and letter-graded credits;

2) no failing grades in any course, including physical education;

3) a cumulative average of C– (1.7) for all completed terms.

If at the end of any term a student fails to maintain good standing or if overall academic performance is so marginal as to endanger the possibility of meeting school and university degree requirements, his or her record is reviewed by the Committee on Academic Standards and Scholarships. The committee may issue a written warning to the student at that time. If a student does not improve after the written warning, he or she may be denied permission to register for the next term.

### Involuntary Separation from the School for Academic Reasons

A student may be denied permission to reregister at the end of any term when he or she has failed:

1) to establish good standing after a semester on warning;

2) to maintain an average of 1.7 in any term after a previous record of warning;

3) to achieve good standing after being on warning any two previous semesters;

4) two or more courses in one term or has a term average of 1.0 or below.

The Academic Standards and Scholarship Committee may decide to permit a student to remain on warning more than one semester if there has been significant improvement even though the cumulative average is still below 1.7.

### S-U Grading Policy

An undergraduate may register to receive a final grade of S (Satisfactory) or U (Unsatisfactory) in courses that offer this option—either in the school or in other divisions of the university—subject to the following conditions:

1) the S-U option may be used in ILR and in out-of-college course electives *only*, not in directed studies;

2) students are limited to registering in two S-U courses a term;

3) S-U registration is limited to 4 credits for each course;

4) students registering for S-U grades must be in good standing;

5) students must fulfill the graduation requirement of 105 letter-graded credits.

ILR faculty members assign a grade of U for any grade below C– and a grade of S for any grade of C– or better. A grade of U is considered equal to an F in determining a student's academic standing, although it is not included in the cumulative average.

No change of grading (from letter to S-U or from S-U to letter) may be made after the first three weeks of class. *There are no exceptions* to this restriction, and appeals will not be accepted.

### Grades of Incomplete

A grade of incomplete is assigned when the course has not been completed for reasons that are acceptable to the instructor. It is understood that the work may be completed later and credit given. Instructors may grant a grade of incomplete for a limited number of clearly valid reasons, but only to students with substantial equity in a course. A firm and definite agreement on the conditions under which it may be made up must be made with the instructor. The school's policy allows a maximum of two full terms of residence for removal of a grade of incomplete. If it is not made up within this time, the grade automatically becomes an F.

## SPECIAL ACADEMIC PROGRAMS

In order to meet the special academic objectives of some students, the school's faculty has established several special academic programs. For additional information, students should contact a counselor in the Office of Student Services. Counselors will explore the program with students to help them decide if it suits their interests.

### Dual Registration in the Johnson Graduate School of Management

Dual informal registration in the Johnson Graduate School of Management leads to a Bachelor of Science degree in industrial and labor relations and a master's degree in management after five years of study and is open to students who meet the requirements of the Johnson Graduate School of Management.

Early planning by each student, preferably in the sophomore year, is desirable to ensure that the expectations of the Johnson Graduate School of Management and ILR curriculum

requirements are fulfilled. Students interested in the very limited and selective program of the Johnson Graduate School of Management should contact the Admissions Office, 319 Malott Hall, and a counselor at the Office of Student Services.

## Five-Year Master of Science Degree Program

With early planning it is possible to earn the M.S. degree in a fifth year of study. This program is designed specifically for those who wish concentrated study in an area of specialization in the school for a Master of Science degree. Students considering this program should consult a counselor in the Office of Student Services after their freshman year.

## Internships

The Credit Internship Program has provided students with a vivid understanding of problems in labor and industrial relations through observation and participation in "real-life" labor problem solving. A number of selected students spend a term of the junior year in Albany, New York City, or Washington, D.C., in close contact with practitioners. Their activities include independent research under direction of ILR faculty members and seminars drawing on fieldwork experience with employers, labor organizations, and government agencies. More information about this program is available from the Office of Student Services.

## Honors Program

Undergraduates who are ranked in the top 20 percent of their class at the end of the junior year may propose a two-semester research project, an honors thesis, for review by the Committee on Academic Standards and Scholarships. When approved, the candidate for graduation with honors works for two semesters (for 3 credits in each term) to research, write, and then defend the thesis.

## Study Abroad

Cornell students with strong academic records and the necessary preparation in required and elective courses are encouraged to consider study abroad. The university currently has agreements with universities in Germany, Israel, England, and the Scandinavian countries that permit undergraduates to register for courses while maintaining Cornell registration and financial aid for a semester or a year. Information about those opportunities may be requested from Cornell Abroad, in the Center for International Studies, 130 Uris Hall.

Some study abroad programs require the development of language proficiency and preparation in appropriate courses at Cornell. Students should consult the Office of Student Services and Cornell Abroad in the freshman and sophomore years to be sure that they comply with the academic and procedural requirements for study abroad.

# COLLECTIVE BARGAINING, LABOR LAW, AND LABOR HISTORY

J. Burton, chair; G. Brooks, T. Crivens, D. Cullen, C. Daniel, I. DeVault, M. Gold, C. Gramm, J. Gross, H. Katz, G. Korman, R. Lieberwitz, S. Kuruvilla, D. Lipsky, P. Ross, N. Salvatore, R. Seeber, J. Windmuller

**100 Introduction to U.S. Labor History: Nineteenth Century**
Fall. 3 credits.
C. Daniel, I. DeVault, G. Korman, N. Salvatore.
This two-semester sequence covers the major changes in the nature of work, the workforce, and the institutions involved in industrial relations in the United States through the end of the nineteenth century.

**101 Introduction to U.S. Labor History: The Twentieth Century**
Spring. 3 credits.
C. Daniel, I. DeVault, G. Korman, N. Salvatore.
This two-semester sequence covers the major changes in the nature of work, the workforce, and the institutions involved in industrial relations in the United States from the end of the nineteenth century up to the present.

**200 Collective Bargaining**
Fall or spring. 3 credits.
D. Cullen, C. Gramm, H. Katz, D. Lipsky.
A comprehensive study of collective bargaining; the negotiation and scope of contracts; the day-to-day administration of contracts; the major substantive issues in bargaining, including their implication for public policy; and the problem of dealing with industrial conflict.

**201 Labor Relations Law and Legislation**
Fall, spring, or summer. 3 credits.
T. Crivens, M. Gold, J. Gross, R. Lieberwitz.
A survey of the law governing labor relations. The legal framework in which the collective bargaining relationship is established and bargaining takes place is analyzed. Problems of the administration and enforcement of collective agreements are considered, as are problems of protecting individual employee rights in the collective labor relations context. Also serves as an introduction to the legal system and method and to legal and constitutional problems of governmental regulation of industrial and labor relations.

**301 Labor Union Administration**
Fall. 3 credits. Prerequisites: ILRCB 100 and 201.
G. Brooks, R. Seeber
Study and analysis of the structure and operations of American unions, including the complicated internal life of the organizations: the varied environments in which unions develop and grow or decline; the relationship of national unions, local unions, and members in the many different aspects of internal union government; the ways in which unions are set up to handle organizing, collective bargaining, contract administration, and political activity; and the widespread movement toward merger and consolidation of unions that began in the sixties and continues today. All of these will involve a study of union constitutions and other primary documents, in addition to secondary readings. Attention will be given to relevant legislation, current problems of unions, and the eternal problems of attaining union democracy.

**303 Research Seminar in the Social History of American Workers**
Fall or spring. 4 credits. Limited to upperclass students who have demonstrated their ability to undertake independent work and who have received permission of the instructor.
G. Korman.
An examination of a different subject each year.

**304 Seminar in the History, Administration, and Theories of Industrial Relations in the United States**
Fall or spring. 4 credits. Prerequisite: permission of instructor.
C. Daniel, I. DeVault, G. Korman, N. Salvatore.
Designed to explore the social, economic and political background of industrial relations in the history of the United States. Examines a different subject each year.

**305 Labor in Industrializing America: 1865–1920**
Fall. 3 credits. Prerequisites: ILRCB 100 and 101.
N. Salvatore.
Examines the experience of working people in the years between the Civil War and World War I. It will explore both the workers themselves—their organization, diverse cultures, ethnic and racial traditions, and political activities—and the dramatic changes in industry that restructured American life during this period.

**381 Jewish Workers in Europe and America, 1835–1948**
Fall or spring. 4 credits. Open to sophomores, juniors, and seniors.
G. Korman.
This course in comparative history examines the complex experiences of the Yiddish-speaking immigrant workers and their families. A special subject of interest is the extraordinary history of the Jewish working classes between 1924 and 1948.

**382 American Business and Workers of the World Since 1840**
Fall or spring. 4 credits.
G. Korman.
This social history of economic affairs and institutions examines the subjects of work and labor from the perspective of American business. In particular, the course focuses upon corporate capitalists in their capacities as profit seekers, employers of segmented workers, managers of production and distribution, and citizens of the republic.

**384 Women and Unions**
Fall. 4 credits.
I. DeVault.
This seminar will explore women's participation in the United States labor movement in the nineteenth and twentieth centuries. Issues covered will include women workers' relations with male-dominated union movements, the role of cross-class alliances of women in organizing women workers, interactions with radical parties and organizations, problems faced by women union leaders and activities, and others.

**400 Union Organizing**
Spring, weeks 1–7. 2 credits.
2 meetings each week. D. Cullen, R. Donovan.
This course explores various aspects of unions' attempts to organize workers: why some workers join unions and others do not; the techniques used by both unions and employers during organizing campaigns; and the present law of organizing and proposed amendments to that law. Includes an examination.

**403 The Law of Workers' Compensation**
Fall, weeks 1–7. 2 credits. Prerequisite: ILRCB 201/501 or permission of instructor.
J. Burton.
A survey of legal aspects of workers' compensation, the program that provides cash benefits, medical care, and rehabilitation services to workers disabled by work-related injuries and diseases.

**404 Contract Administration**
Fall, weeks 1–7. 2 credits. Prerequisites: undergraduates, ILRCB 200 and 201; graduate students, ILRCB 500 and 501.
R. Seeber.
This course bridges the gap between ILRCB 200 (500), Collective Bargaining, and ILRCB 602, Arbitration. It focuses on various aspects of dispute settlement process prior to final resolution. The intent of the course is to expand the knowledge of students rather than to develop personal skills. It includes such topics as (1) the historical development of contractual grievance process, (2) the merits of various alternative processes that have been adopted by unions and managements in the United States, (3) the impact of external law on the behavior of the parties in the adjustment process, (4) a comparison of the U. S. system with systems in other industrialized economies, (5) current issues and problems in the systems, (6) nonunion grievance processes, and (7) ongoing experimental alternatives to the standard systems.

**406 History of the Black Worker in the United States**
Fall. 3 credits. Prerequisite: ILRCB 100.
J. Gross.
Intended to introduce the student to the history of the black worker in the United States through a review and analysis of the existing literature of black labor history and through source documents from the National Archives. Discussions will center around the black worker in agriculture, industry, and government; black worker migrations; black workers and organized labor; and black workers, discrimination, and the law.

**407 Contemporary Trade Union Movement**
Fall. 3 credits. Prerequisites: ILRCB 100 or 502, upperclass standing.
N. Salvatore.
An examination of contemporary trade union issues in the context of labor's history since World War II. Among the issues to be discussed are centralization of union power, union democracy, political action, and strategies of collective bargaining. A series of speakers from the union movement will address the class. Midterm, final, and term paper are required.

**484 Employment Discrimination and the Law**
Fall. 4 credits. Prerequisite: ILRCB 201 or 501 or equivalent.
T. Crivens, M. Gold.
An examination of legal problems involving employment discrimination based on race, color, religion, sex, national origin, or age. The impact of developing principles of law on preemployment inquiries and testing, seniority and promotions, and other personnel policies, practices, and procedures are discussed. The requirements of affirmative action under Executive Order 11246, as amended, are analyzed. Special attention is given to the role of state law in resolving employment discrimination claims and the procedural framework for raising and adjudicating such claims before administrative agencies and the courts.

**485 The Law of Occupational Safety and Health**
Fall, weeks 7–14. 2 credits. Prerequisite: ILRCB 201/501 or permission of instructor.
J. Burton.
Primary concern is legal developments concerning the Occupational Safety and Health Act of 1970. Limited attention to related legal issues such as arbitration of safety and health issues.

**488 Liberty and Justice for All**
Spring. 3 credits. Limited to 16 students.
M. Gold.
An examination of contemporary issues from the perspectives of philosophy, law, and the social sciences. Topics will be selected from among the following: affirmative action and reverse discrimination, the right to life (from abortion to capital punishment), comparable worth, and constitutional rights such as freedom of speech.

**495 Honors Program**
Fall and spring (yearlong course). 3 credits each term. Admission to the ILR senior honors program may be obtained under the following circumstances: (a) students must be in the upper 20 percent of their class at the end of their junior year; (b) an honors project, entailing research leading to completion of a thesis, must be proposed to an ILR faculty member who agrees to act as thesis supervisor; and (c) the project, endorsed by the proposed faculty sponsor, is submitted to the Committee on Academic Standards and Scholarships.

Accepted students embark on a two-semester sequence. The first semester consists of determining a research design, familiarization with germane scholarly literature, and preliminary data collection. The second semester involves completion of the data collection and preparation of the honors thesis. At the end of the second semester, the candidate is examined orally on the completed thesis by a committee consisting of the thesis supervisor, a second faculty member designated by the appropriate department chair, and a representative of the Academic Standards and Scholarship Committee.

**497–498 Internship**
Fall or spring. 497, 3 credits; 498, 6 credits.
Staff.
All requests for permission to register for an internship must be approved by the faculty member who will supervise the project and the chairman of the faculty member's academic department before submission for approval by the Committee on Academic Standards and Scholarship. Upon approval of the internship, the Office of Student Services will register each student for 497, for 3 credits graded A+ to F for individual research, and for 498, for 6 credits graded S-U, for completion of a professionally appropriate learning experience, which is graded by the faculty sponsor.

**499 Directed Studies**
Fall or spring. 3 credits.
For individual research, conducted under the direction of a member of the faculty, in a special area of labor relations not covered by regular course offerings. Registration is normally limited to seniors who have demonstrated ability to undertake independent work. Eligible students should consult a counselor in the Office of Student Services *at the time of course registration* to arrange for formal submission of their projects for approval by the Academic Standards and Scholarship Committee.

**500 Collective Bargaining**
Fall or spring. 3 credits. Open only to graduate students. Recommended: ILRCB 501 taken previously or concurrently.
D. Cullen. C. Gramm, H. Katz, D. Lipsky.
A comprehensive study of collective bargaining, with special emphasis on philosophy, structures, process of negotiations, and administration of agreements. Attention is also given to problems of handling and settling industrial controversy, the various substantive issues, and important developments and trends in collective bargaining.

**501 Labor Relations Law and Legislation**
Fall, spring, or summer. 3 credits.
T. Crivens, M. Gold, J. Gross, R. Lieberwitz.
A survey and analysis of the labor relations law that examines the extent to which the law protects and regulates concerted action by employees in the labor market. The legal framework within which the collective bargaining takes place is considered and analyzed. Problems of the administration and enforcement of the collective agreement are considered, as are problems of protecting the individual member-employee rights with the union.

**502 History of Industrial Relations in the United States since 1865**
Spring. 3 credits.
C. Daniel, I. DeVault, G. Korman, N. Salvatore.
This introductory survey course emphasizes historical developments in the twentieth century. Special studies include labor union struggles over organizational alternatives and such other topics as industrial conflicts, working-class life styles, radicalism, welfare capitalism, union democracy, and the expanding authority of the federal government.

**600 Advanced Seminar in Labor Arbitration**
Spring. 3 credits. Limited to juniors, seniors. and graduate students. Prerequisites: ILRCB 602 or equivalent and permission of instructor.
J. Gross.
An advanced seminar in labor arbitration emphasizing the practical aspects of current labor arbitration techniques and problems. Subjects considered range from laboratory exercises in the presentation of an arbitration case, the preparation of prehearing and posthearing briefs, and the writing of an arbitration opinion and award, to the investigation and evaluation of the experience of labor arbitrators, with selected case problems arising in state and federal employment and public education as well as in the private sector.

**601 The Bargaining Process: Theory and Practice**
Fall. 3 credits. Prerequisite: ILRCB 200/500.
D. Lipsky.
Focus is on theories of the bargaining process, including economic, behavioral, game-theoretic, political, and social-psychological approaches to the bargaining problem. Will consider union wage policy, particularly the formulation of union goals in bargaining. Union and management preparation for negotiations, bargaining strategies and tactics, and bargaining power are some of the facets of the bargaining process that will be discussed. Attempts at empirical verification of various bargaining theories will also be considered. Theoretical and analytical principles will be developed in assigned readings and class discussions. The application and practical relevance of these principles will be explored through mock negotiations and other exercises.

**602 Arbitration**
Fall or spring. 4 credits. Limited to 21 students. Prerequisites: undergraduates, ILRCB 200; graduate students, ILRCB 500; permission of instructor.
J. Gross.
A study of the place and function of arbitration in the field of labor-management relations, including an analysis of principles and practices, the law of arbitration, the handling of materials in briefs or oral presentation, the conduct of a mock arbitration hearing, and the preparation of arbitration opinions and post-hearing briefs.

**603 Governmental Adjustment of Labor Disputes**
Fall or spring. 3 or 4 credits. Prerequisites: undergraduates, ILRCB 200; graduate students, ILRCB 500.
D. Cullen.
An examination of the various governmental techniques for dealing with labor disputes in both the private and public sectors, including mediation, fact-finding arbitration (both voluntary and compulsory), the use of injunctions, and seizure. The course also examines the application of these techniques under the Railway Labor Act, Taft-Hartley Act, and various state acts.

**604 Readings in the Literature of American Radicalism and Dissent**
Fall or spring. 3 credits. Limited to seniors and graduate students.
N. Salvatore.
Each term, concentration is on a different historical aspect of American radicalism and dissent.

**605 Readings in the History of Industrial Relations in the United States**
Fall. 3 credits. Limited to seniors and graduate students.
C. Daniel, G. Korman, N. Salvatore.
A seminar covering, intensively, original printed sources and scholarly accounts for different periods in American history.

**606 Theories of Industrial Relations Systems**
Fall or spring. 3 credits. Limited to seniors and graduate students. Prerequisites: seniors, ILRCB 100, 101, 200; graduate students, ILRCB 500.
H. Katz.
This course will trace the evolution of theory and research on industrial relations. Topics include: theories of the labor movement, institutional models and evidence regarding what unions do, the origins of internal labor markets and their relationship with unionization, models of strikes, empirical assessments of arbitration, research on union decline, and empirical evidence of the impacts of new technology.

**607 Arbitration and Public Policy**
Spring. 3 credits. Limited to 10 ILR students and 10 law students. Prerequisites: ILRCB 201 and permission of instructor.
J. Gross.
Labor arbitration in the public and private sectors. Students will write research memoranda, briefs, and arbitral opinions on various substantive and procedural topics. Forty to fifty pages of written work will be expected. There will also be opportunity to participate in simulated arbitration proceedings.

**608 Special Topics in Collective Bargaining Labor Law, and Legislation**
Fall or spring. 3 credits. Prerequisites: undergraduates, ILRCB 201; graduate students, ILRCB 502.
Staff.
The areas of study are determined each semester by the instructor offering the seminar.

**609 Law of Workers' Compensation**
Fall. 3 or 4 credits. Prerequisite: ILRCB 201/501 or permission of instructor.
J. Burton.
A survey of legal aspects of workers' compensation, the program that provides cash benefits, medical care, and rehabilitation services to workers disabled by work-related injuries and diseases. Includes a brief introduction to the disability benefits provided by the Social Security program and to negligence suits by injured workers.

**650 Service Work and Workers in Historical Perspective**
Fall. 3 credits.
I. DeVault.
This course takes a historical perspective on the development of a service economy in the United States. Readings will include general and theoretical works, but the main focus will be recent historical scholarship on specific occupations and situations in the "nonproductive" workforce. Students will explore primary sources for research on the subject and write research papers.

**651 Industrial Relations in Transition**
Spring. 3 credits. Limited to seniors and graduate students.
H. Katz.
Considers whether recent developments such as concession bargaining, worker participation programs, and the growth of nonunion firms represent a fundamental transformation in industrial relations practice. Will review recent research and new theories arguing that such a transformation is occurring, including the work of Piore and Sabel, Bluestone and Harrison, and Kochan, McKersie, and Katz. Will also review the counterarguments and evidence put forth by those who believe no such transformation is under way. Course material will focus on industrial relations practice in the private sector in the United States, although some attention will be paid to developments in Western Europe, the United Kingdom, and Japan.

**655 Employment Law**
Spring. 3 credits. Prerequisites: undergraduates, ILRCB 201; graduate students, ILRCB 501.
M. Gold, C. Gramm, or J. Burton.
This course will examine a number of major federal and state laws designed to protect workers in their employment relationships. The historical and theoretical rationales; the major statutory, judicial, and administrative developments; and evidence of the effectiveness of each law will be examined. Where pertinent, consideration will also be given to current controversies surrounding the laws. The material covered will be selected from the following: the Fair Labor Standards Act, unemployment insurance, workers' compensation, the Occupational Safety and Health Act, the Employee Retirement Income Security Act, the doctrine of employment at will, Social Security, workers' right-to-know, plant closings, and protection of workers' privacy.

**680 Problems in Union Democracy**
Fall or spring. 3 credits.
M. Gold, P. Ross.
Unions are considered as an example of private government, and union democracy is examined by standards and customary practices in both public and private governments. Included are such elements as elections; self-government by majority; rights of minorities; the judicial process, including impartial review; local-national relationships; constituency and representation; the legislative process; and executive power and functions. The regulation of private government by the state will be considered.

**681 Selected Topics in Labor and Employment Law**
Fall or spring. 3 credits. Prerequisite: ILRCB 201/501 or equivalent.
M. Gold, R. Lieberwitz.
A survey of the law of employment discrimination, internal union democracy, public sector labor relations, and individual rights in the workplace such as privacy, free speech, and due process. Topics covered may vary with the instructor.

**682 Seminar in Labor Relations Law and Legislation**
Fall or spring. 3 credits. Limited enrollment. Prerequisite: permission of instructor.
R. Lieberwitz.
Legal problems in public employment and other areas of labor relations affecting the public interest.

**683 Research Seminar in the History of Industrial Relations**
Fall or spring. 3 credits. Prerequisites: undergraduates, ILRCB 100 and 101; graduate students, ILRCB 502.
G. Brooks, C. Daniel, I. DeVault, G. Korman, N. Salvatore.
The areas of study are determined each semester by the instructor offering the seminar.

**685 Collective Bargaining in Public Education**
Spring. 3 credits. Limited enrollment. Prerequisite: permission of instructor.
Staff.
The seminar consists of a study of the legal, financial, administrative, and educational problems raised by collective bargaining in the public schools. Major attention will be directed at existing statutes covering the employment arrangement for public school employees, the content and the administration of collective agreements, the ideological postures of teacher organizations, and the resolution of negotiating impasses. Individual and group research projects will be required.

**686 Collective Bargaining in the Public Sector**
Fall or spring. 3 credits. Prerequisites: undergraduates, ILRCB 200 and 201; graduate students, ILRCB 500 and 501.
J. Burton, H. Katz.
An examination of the development, practice, and extent of collective bargaining between federal, state, and local governments and their employees. The variety of legislative approaches to such matters as representation rights, unfair practices, scope of bargaining, impasse procedures, and the strike against government are considered along with implications of collective bargaining for public policy and its formulation.

**687 Current Issues in Collective Bargaining**
Fall or spring. 3 or 4 credits. Limited to 25 students. Prerequisites: ILRCB 200/500, and permission of instructor.
D. Cullen, D. Lipsky.
An intensive study of the most significant current issues and problems facing employers and unions in their relations with each other, with particular emphasis on the substantive matters in contract negotiations and administration of the provisions of collective bargaining agreements. A major research paper is usually required.

**688 The Political Economy of Collective Bargaining**
Fall. 3 credits. Prerequisites: undergraduates, ILRCB 200 and ILRLE 240; graduate students, ILRCB 500 and ILRLE 540, or permission of instructor.
Staff.
Focuses on both the economic analysis of unions and collective bargaining in our economy and on the economic forces that affect collective bargaining. The method is to identify and conceptualize the structural determinants of relative bargaining power. Examines both the economic outcomes of collective bargaining and current bargaining trends in a variety of industries. Topics include neoclassical and structural-institutionalist analyses of union power; the effect of unions on compensation, productivity, prices, and income inequality; union growth and strikes; pattern setting and bargaining structures; multinational and conglomerate corporate structures and collective bargaining; the decline of union bargaining power; unions and inflation; and concession bargaining. Approximately half the course is spent on case studies of collective bargaining in various industries (auto, steel, construction, etc.) in the private sector. A term paper is required. Topics are covered in a nonstatistical fashion.

**689 Constitutional Aspects of Labor Law**
Spring. 3 credits.
R. Lieberwitz.
In-depth analysis of the Supreme Court decisions that interpret the United States Constitution as it applies in the workplace. This study will focus on the First Amendment, Fifth Amendment, Fourteenth Amendment, and Commerce Clause, with issues including freedom of speech and association, equal protection, due process, and other issues in the area of political and civil rights. The course entails a high level of student participation in class discussion, and assignments include a research paper.

**703 Theory and Research in Collective Bargaining**
Spring. 3 credits. Open to graduate students who have had ILRCB 500 and ILROB 723 or their equivalents. Recommended: a statistics course beyond the level of ILRST 510.
C. Gramm, D. Lipsky.
This is a second-level course in collective bargaining that builds on the institutional research covered in ILRCB 500. The existing literature in the area of collective bargaining is appraised for its theoretical and empirical content. Efforts are made to explore the appropriate role for theory and empirical analysis in moving research in collective bargaining toward a more analytical perspective and to identify and appraise the underlying paradigms used to study collective bargaining-related issues.

**705 The Economics of Collective Bargaining**
Spring. 3 credits. Prerequisites: undergraduates, ILRCB 500; graduate students, ILRLE 540 (or their equivalents) and an understanding of multiple regression analysis; or permission of instructor.
H. Katz, D. Lipsky.
Focuses on both the economic analysis of unions and collective bargaining in our economy and on the economic forces that affect collective bargaining. The method is to identify and conceptualize the structural determinants of relative bargaining power. On this basis, the course examines both the economic outcomes of collective bargaining and current bargaining trends in a variety of industries. Tentative theoretical analyses of unionism (neoclassical, institutionalist) are compared. The statistical techniques and empirical results of research on the union effect on economic outcomes (wages, prices, inflation, profits, productibility, earnings inequality) are also evaluated. The effect of technology, corporate structures, and public policy on union bargaining power is outlined, and a number of case studies of collective bargaining in the private sector are reviewed. A term paper is required.

**784 Employment Discrimination and the Law**
Fall. 4 credits. Prerequisite: ILRCB 501 or equivalent.
T. Crivens, M. Gold.
An examination of legal problems involving employment discrimination based on race, color, religion, sex, national origin, or age. The impact of developing principles of law on preemployment inquiries and testing, seniority and promotions and other personnel policies, and practices and procedures are discussed. The requirements of affirmative action under Executive Order 11246, as amended, are analyzed. Special attention is given to the role of state law in resolving employment discrimination claims and the procedural framework for raising and adjudicating such claims before administrative agencies and the courts.

**798 Internship**
Fall or spring. 1–3 credits.
Designed to grant credit for individual research under direction of a faculty member by graduate students who have been selected for an internship. All requests for permission to register for ILRCB 798 must be approved by the faculty member who will supervise the project.

**799 Directed Studies**
Fall or spring. Credit to be arranged.
For individual research conducted under the direction of a member of the faculty.

**980 Workshop in Collective Bargaining, Labor Law, and Labor History**
Fall and spring. 2 credits. Enrollment limited to M.S. and Ph.D. candidates in the department. S-U grades only.
Staff.
This workshop is designed to provide a forum for the presentation of current research being undertaken by faculty members and graduate students in the Department of Collective Bargaining, Labor Law, and Labor History, and by invited guests. All M.S. and Ph.D. candidates in the department who are at work on their theses are strongly urged to enroll. Each student in the course will be expected to make at least one presentation during the year, focusing on the formulation, design, execution, and results of that student's thesis research.

## ECONOMIC AND SOCIAL STATISTICS

I. Blumen, chair; S. Beran-Ghosh, A. Hadi, P. McCarthy, P. Velleman, M. Wells.

**210 Statistical Reasoning I**
Fall or spring. 4 credits. Not open to engineering or graduate students. Attendance at the first discussion section of the term is essential.
An introduction to the basic concepts of statistics: measures of location and dispersion, estimation and confidence intervals, hypothesis tests, regression and correlation. Students are taught to use a computer at the beginning of the term and use it for weekly assignments.

**211 Statistical Reasoning II**
Fall or spring. 3 credits. Prerequisite: ILRST 210 or suitable introductory statistics course. Attendance at the first discussion section of the term is essential.
A continuation of ILRST 210. Application of statistical techniques to the social sciences. Topics include statistical inference, review of simple regression, multiple regression and correlation, applications of regression, elements of time series analysis, and the design of sample surveys. A computer is used throughout the course. (Students who have taken an introductory course in statistics without a computer will be expected to obtain brief instruction during the first few weeks of the semester.)

**310 Design of Sample Surveys**
Fall. 3 credits. Prerequisite: two terms of statistics.
M. Wells.
Application of statistical methods to the sampling of human populations. A thorough treatment of the concepts and problems of sample design with respect to cost, procedures of estimation, and measurement of sampling error. Analysis of nonsampling errors and their effects on survey results (for example, interviewer bias and response error). Illustrative materials are drawn from such fields as market research and attitude and opinion research.

**312 Applied Regression Methods**
Spring. 3 credits. Prerequisite: ILRST 211 or equivalent.
A. Hadi.
The course starts with a review of those parts of matrix algebra that provide the vocabulary and skill necessary to construct and manipulate linear regression models. The standard least-squares theory is then developed, and regression analysis techniques are applied to problems arising in economics, industry, government, and the social sciences. Computer packages are used as an aid to obtain problem solutions. Additional topics are deviation from assumptions, multicollinearity, variable selection methods, and analysis of variance.

**313 Graphical Methods for Data Analysis**
Fall. 3 credits. Prerequisite: ILRST 211 or equivalent.
P. Velleman.
Classical and recently developed graphical methods for analysis and display. Characteristics of effective and honest graphs with comparison of alternative methods for understanding data. Includes study of current computer programs and methods expected to be practical in the near future: graphing of univariate data, bivariate plots, multivariate data, graphical methods of data analysis; the specification, modification, and control of graphs; study of interaction between choice of display and underlying patterns.

**410 Techniques of Multivariate Analysis**
Fall. 3 credits. Prerequisite: two statistics courses or permission of instructor.
I. Blumen.
The techniques of multivariate statistical analysis, the associated assumptions, the rationale for choices among techniques, and illustrative applications. Some matrix algebra and related mathematics are introduced. Includes some regression; correlation; principle components; multivariate tests on means, variances, and covariances; relations between sets of variates; and discriminatory analysis.

**411 Statistical Analysis of Qualitative Data**
Spring. 3 credits. Prerequisite: two statistics courses or permission of instructor.
I. Blumen.
An advanced undergraduate and beginning graduate course. Includes treatment of association between qualitative variates, rank-order methods, and other nonparametric statistical techniques, including those related to chi-squared.

**499 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**510 Statistical Methods for the Social Sciences I**
Fall or spring. 4 credits.
A nonmathematical course for graduate students in the social sciences without previous training in statistical method. Emphasis is on discussion of technical aspects of statistical analysis and on initiative in selecting and applying statistical methods to research problems. The subjects ordinarily covered include analysis of frequency distributions, regression and correlation analysis, and selected topics from the area of statistical inference. Students are taught to use a computer at the beginning of the term and use it for weekly assignments.

**511 Statistical Methods for the Social Sciences II**
Fall or spring. 3 credits. Prerequisite: ILRST 510 or an equivalent introductory statistics course.
This is a second course in statistics for graduate students that emphasizes applications in the social sciences. Topics include review of simple linear regression, multiple regression (theory, model building, model violations), and analysis of variance. Statistical computing packages are used extensively. (Students who have taken an introductory course in statistics without a computer course will be expected to obtain brief instruction during the first few weeks of the semester.)

**610 Seminar in Modern Data Analysis**
Spring. 3 credits. Prerequisite: two statistics courses or permission of instructor.
P. Velleman.
An advanced survey of modern data analysis methods. Topics include exploratory data analysis, robust methods, regression methods, and diagnostics. Extensive outside readings cover recent and historical work. Participants should have some knowledge of multiple regression, including the use of matrices (ILRST 312 may be taken concurrently), and some experience using a computer.

**711 Sensitivity Analysis in Linear Regression**
Fall. 3 credits. Prerequisite: ILRST 312 or equivalent.
A. Hadi.
This course is an attempt to narrow the gap between the theory and practical application of the linear regression model. Classical and recently developed statistical procedures are discussed. Students will be expected to do extensive analysis of real-life data sets using computer-packaged programs. Topics include role of variables in a regression equation, regression diagnostics (outliers, leverage points, influential observations), generalized linear models, errors-in-variables, and multicollinearity.

**712 Theory of Sampling**
Fall. 3 credits. Prerequisite: calculus and at least one semester of mathematical statistics.
P. J. McCarthy.
A companion course to ILRST 310, Design of Sample Surveys, stressing the development of the fundamentals of sampling theory. Attention is paid to recent progress in the field. Occasional illustrative material is given to indicate the application of the theory.

**713 Empirical Processes with Statistical Applications**
Fall. 3 credits. Prerequisite: a course at the technical level of Math 572 and 574 or permission of instructor.
M. Wells.
The statistical analysis of life history data is playing an increasing role in the social, natural, and physical sciences. We will formulate and solve various practical problems in the statistical analysis of life history data using the modern theory of stochastic processes. We will examine the martingale dynamics for point processes relevant to life history data. Both parametric and nonparametric inference for multiplicative intensity models will be considered. The large sample properties of the proposed procedures will be discussed in detail using recent extensions of functional central limit theorems for martingales.

**799 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## INTERNATIONAL AND COMPARATIVE LABOR RELATIONS

G. Fields, chair; J. Bishop, G. Boyer, G. Korman, J. Windmuller

**330 Comparative Industrial Relations Systems: Western Europe**
Fall. 3 credits (1 additional credit may be arranged with the instructor). Open to juniors and seniors.
J. Windmuller.
An introduction to contemporary industrial relations in several Western industrialized countries, including Great Britain, France, West Germany, and Sweden. The emphasis will be on trade unions, employers and their associations, collective bargaining, the role of government, and current policy issues.

**331 Comparative Industrial Relations Systems: Non-Western Countries**
Spring. 3 credits (1 additional credit may be arranged with the instructor). Open to juniors and seniors.
J. Windmuller.
A study of the industrial relations systems of less-developed countries and industrialized non-Western countries, including Japan, the Soviet Union, Yugoslavia, India, and several others. Emphasis is on government labor policies, trade unions, and collective bargaining. Also included is a review of international organizations concerned with labor problems.

**332 Labor in Developing Economies**
Fall. 3 credits. Prerequisite: ILRLE 240, Economics 311, or permission of instructor.
G. Fields.
The economic problems of labor in less-developed nations. Among the subjects included are determinants of income and wage structures in less-developed countries; labor demand and unemployment; labor supply and migration; human resource policy; and development strategy and employment growth.

**334 Industrial Relations in Non-Western Countries**
Spring. 2 credits. 7 weeks.
J. Windmuller.
A review of the development and current state of industrial relations systems in Eastern Europe and selected countries in Africa, Asia, and Latin America. The review will concentrate on government labor policies, employment relations, and the role of trade unions.

**337 Special Topics in International and Comparative Labor Relations**
Fall. Second seven weeks. 2 credits.
D. Soskice.
The course will analyze the evidence and debates concerning the connection between industrial relations systems and economic performance of Western European countries. Topics include the influence of industrial relations and labor market institutions on unemployment and economic growth. The course also will assess the success of recent efforts across countries to modify industrial relations and labor market institutions and processes.

**381 Jewish Workers in Europe and America, 1835–1948**
Fall or spring. 4 credits. Open to sophomores, juniors, and seniors.
G. Korman.
For description, see the section Collective Bargaining, Labor Law, and Labor History.

**430 European Labor History**
Fall. 3 credits.
J. Windmuller.
The development of trade unions in Great Britain, France, and Germany between 1850 and 1950. Patterns of union organization, political party trade union links, the growth of industrial relations systems, and the evolution of public policies toward labor are emphasized.

**448 Topics in Twentieth Century Economic History: The Economics of Depression and the Rise of the Managed Economy**
Fall. 4 credits. Prerequisites: ILRLE 240 or Economics 312.
G. Boyer.
For description, see the section on Labor Economics.

**499 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**530 Comparative Industrial Relations Systems: Western Europe**
Fall. 3 credits. For graduate students.
J. Windmuller.
Students in this course attend the lectures in ILRIR 330 (see description for ILRIR 330). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in ILRIR 330 and related topics.

**531 Comparative Industrial Relations Systems: Non-Western Countries**
Spring. 3 credits. For graduate students. Not offered 1988–89.
J. Windmuller.
Students in this course will attend the lectures in ILRIR 331 (see description for ILRIR 331). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in ILRIR 331 and related topics.

**532 Labor in Developing Economies**
Spring. 3 credits. For graduate students.
G. Fields.
Students in this course attend the lectures in ILRIR 332 (see description for ILRIR 332). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in ILRIR 332 and additional topics.

**534 Industrial Relations in Non-Western Countries**
Spring. 2 credits. 7 weeks.
J. Windmuller.
Students in this course attend the lectures in ILRIR 334 (see description for ILRIR 334). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in ILRIR 334 and additional topics.

**630 Seminar in International and Comparative Labor Problems**
Spring. 3 credits.
J. Windmuller.
This seminar will be concerned with international aspects of labor organizations and industrial relations. Specific topics will include an examination of international labor movements, the role of the International Labor Organization, the international affairs interests of unions in the United States and other countries, and the labor relations policies of multinational corporations.

**698 International Human Resource Policies and Institutions**
Fall. 3 credits.
J. Bishop.
For description, see the section on Personnel and Human Resource Studies.

**799 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

## LABOR ECONOMICS

R. Hutchens, chair; J. Abowd, R. Aronson, G. Boyer, J. Burton, G. Clark, R. Ehrenberg, G. Fields, W. Galenson, G. Jakubson, O. Mitchell, R. Smith

**140 Development of Economic Institutions**
Spring. 3 credits. Prerequisite for non-ILR students: permission of instructor.
G. Boyer.
Provides students with an understanding of the historical roots of the economic system currently dominant in Western Europe and the United States. The course will focus on (a) the process of European economic growth prior to 1914, (b) the effect of industrialization on labor in Great Britain, and (c) the historical evolution of economic thought from Adam Smith to J. M. Keynes.

**240 Economics of Wages and Employment**
Fall, spring, or summer. 3 credits. Prerequisites: Economics 101–102 or equivalent.
Staff.
This course analyzes the characteristics and problems of the labor market by applying to them the theory and elementary tools of economics. Behavior on both the demand (employer) and supply (employee) sides of the market is analyzed to gain a deeper understanding of the effects of various government programs targeted at the labor market. Topics covered include education and training, fringe benefits and the structure of compensation, labor-force participation and its relationship to household production, issues regarding occupational choice, an analysis of migration, labor-market discrimination, and the effects of unions.

**332 Labor in Developing Economies**
Spring. 3 credits.
G. Fields.
For description, see the section International and Comparative Labor Relations.

**340 Economic Security**
Fall or spring. 3 credits.
J. Burton, R. Hutchens, G. Jakubson.
The economic and social effects of income security measures. Analysis of programs offering protection against economic loss due to industrial accident, temporary and permanent disability, illness, old age, premature death, and unemployment, as well as private efforts to provide security, and the problems of integrating public and private programs. An examination is made of proposals for amending or modifying economic security measures.

**343 Problems in Labor Economics**
Fall or spring. 3 or 4 credits.
Staff.
Devoted to new policy issues and to recent literature in the field. The specific content and emphasis varies in response to the interests of the faculty member teaching the course. A course will be offered in 1989–90 on social experiments and economic policy.

**[344 Comparative Economic Systems: Soviet Russia**
Fall. 4 credits. Not offered 1989–90.
A comparative analysis of the principles, structure, and performance of the economy of Soviet Russia. Special attention is devoted to industry and labor.]

**345 Corporate Finance and Labor Markets**
Spring. 4 credits.
J. Abowd.
The course covers the following topics (with emphasis on labor market applications and implications): (1) the concept of net present value, the valuation of real corporate assets, and the relations between risk and return; (2) capital budgeting decisions and the cost of capital; (3) investment financing decisions and the role of financial markets; (4) capital structure, the Modigliani-Miller propositions, and the relation between debt and equity financing; (5) valuation of corporate debt, options, and other financial assets; and (6) financial planning mergers, and portfolio management.

**348 The Economics of Unemployment**
Fall. 4 credits. Prerequisite: ILRLE 240/540 or permission of instructor.
R. Smith.
This course introduces students to several issues fundamental to an understanding of unemployment: the social costs; definitional questions and measurement problems; the patterns of unemployment; and the various types of unemployment, their causes, and the policies that can or have been pursued to alleviate unemployment. The course is designed for undergraduate and graduate students who have taken a survey course in labor economics or its equivalent.

**441 Income Distribution**
Fall. 4 credits. Open to upperclass and graduate students.
R. Hutchens.
Explores income distribution in the United States and the world. Topics to be covered include functional and size distributions of income, wage structure, income-generating functions and theories, discrimination, poverty, public policy and income distribution, and changing income distribution and growth.

**442 Economics of Employee Benefits**
Spring. 4 credits.
O. Mitchell.
An analysis and appraisal of private health, welfare, and pension plans. Consideration of the origin and development of employer, union, and joint programs and a critical examination of the financing, administration, and general effectiveness of the plans.

**446 Labor Market Discrimination**
Fall or spring. 4 credits.
O. Mitchell.
Examines differences in labor market rewards by gender, race, age, and other worker characteristics from both a theoretical and an empirical perspective. Economic modeling and statistical methodology (including computer analysis) are stressed. Students need some background in microeconomics and data analysis.

**447 Economic Policy toward the Aging**
Fall. 4 credits.
O. Mitchell.
Explores labor market and social policy concerning older workers and retirees. Topics to be covered include labor market trends of the elderly, labor market institutions affecting older people (e. g., mandatory retirement, unemployment, pensions), and government policies, Social Security, health insurance, and retirement income regulation. Cross-national perspectives will be addressed as well.

**448 Topics in Twentieth Century Economic History: The Economics of Depression and the Rise of the Managed Economy**
Fall. 4 credits. Prerequisites: ILRLE 240 or Economics 312.
G. Boyer.
Topics covered include: the causes of the Great Depression in the United States; the economics of the New Deal; the causes of high unemployment in interwar Great Britain; the rise of Keynesian economics and the development of demand management policies in Great Britain and the United States after 1945.

**495 Honors Program**
Fall and spring (yearlong course). 3 credits each term.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**497–498 Internship**
Fall or spring. 3 and 6 credits.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**499 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**532 Labor in Developing Economics**
Spring. 3 credits.
G. Fields.
For description, see the section International and Comparative Labor Relations.

**540 Labor Economics**
Fall or summer. 3 credits. Prerequisites: Economics 101–102 or equivalent. Required of graduate students majoring or minoring in labor economics and M.I.L.R. candidates.
Staff.
This course analyzes the characteristics and problems of the labor market by applying to them the theory and elementary tools of economics. Behavior on both the demand (employer) and supply (employee) sides of the market is analyzed to gain a deeper understanding of the effects of various government programs targeted at the labor market. Topics covered include education and training, fringe benefits and the structure of compensation, labor-force participation and its relationship to household production, issues regarding occupational choice, an analysis of migration, labor-market discrimination, and the effects of unions.

**541 Social Security and Protective Labor Legislation**
Spring. 3 credits. Prerequisite: ILRLE 540. Normally required of graduate students majoring or minoring in labor economics and required of M.I.L.R. candidates.
J. Burton, R. Hutchens, G. Jakubson.
The economic and social effects of income security measures. Analysis of programs offering protection against economic loss due to industrial accident, temporary and permanent disability, illness, old age, premature death, and unemployment, as well as private efforts to provide security, and the problems of integrating public and private programs. An examination is made of proposals for amending or modifying economic security measures.

**642 Work and Welfare: Interactions between Cash-Transfer Programs and the Labor Market**
Fall. 4 credits. Prerequisite: some familiarity with microeconomics.
R. Hutchens.
Emphasizes policy issues in analyzing the relationship between the labor market and cash-transfer programs such as social security, public assistance, and unemployment and wages in determining the level and distribution of cash transfers. Investigates the connection between cash transfers and labor supply. Topics include determinants of cash-transfer demand and supply, the negative income tax experiments, and program incentives for withdrawal from the labor force (for example, incentives for early retirement implicit in old-age insurance). A paper on a specific program is required.

**643 Problems in Labor Economics**
Fall or spring. 3 or 4 credits.
Staff.
Devoted to new policy issues and to recent literature in the field. The specific content and emphasis varies in response to the interests of the faculty member teaching the course. Courses offered in 1989–90 include economic policy toward the elderly, economics of collective bargaining, twentieth-century economic history, income maintenance policy, economics of discrimination, and models for limited dependent variables and panel data.

**644 The Economics of Occupational Safety and Health**
Spring. 4 credits.
R. Smith.
The course analyzes the problem of occupational injuries and illnesses in the United States. The first section concentrates on legal requirements, judicial interpretations, and legal implications of the Occupational Safety and Health Act, then shifts to such questions as the need for, and appropriate goals of, the act; the stringency of safety standards considered in a benefit-cost framework; the difficulties in enforcing the act; and estimates of the impact of the act.

**647 Evaluation of Social Programs**
Fall. 4 credits.
R. Ehrenberg.
An introduction to the methodologies used by economists to evaluate the impacts of social-action programs and legislation. General evaluation methodology, cost-benefit analysis, and econometrics are discussed. Case studies are considered to illustrate the uses of these techniques, to acquaint the student with major current government programs and legislation, and to estimate these programs' economic impacts. Throughout, the primary analytic framework used by the instructor is microeconomics.

**648 Economic Analysis of the University**
Spring. 4 credits.
R. Ehrenberg.
This course seeks to illustrate the complexity of decision making in a nonprofit organization and to show how microeconomic analysis in general, and labor market analysis in particular, can be usefully applied to analyze resource allocation decisions at universities. Among the topics covered are financial aid, tuition, admissions policies, endowment policies, faculty salary determination, the tenure system, mandatory retirement policies, merit pay, affirmative action, comparable worth, collective bargaining, resource allocation across and within departments, undergraduate versus graduate education, research costs, libraries, athletics, and "socially responsible" policies. Lectures and discussions of the extensive readings will be supplemented by presentations by Cornell administrators and outside speakers who have been engaged in university resource allocation decisions or have done research on the subject.

**741 Analysis of Longitudinal Data in the Social Sciences**
Spring. 4 credits.
G. Jakubson.
Considers methods for the analysis of longitudinal data, that is, data in which a set of individual units are followed over time. The focus will be on both estimation and specification testing of these models. The course will consider how these statistical models are linked to underlying theories in the social sciences. Course coverage will include panel data methods (including fixed vs. random effects models for both linear and non-linear systems) and, if time permits, duration analysis.

**742 Economics of Employee Benefits**
Spring. 3 credits.
O. Mitchell.
Students in this course attend the lectures in ILRLE 442 (see description for 442). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in 442 and additional topics.

**744 Seminar in Labor Economics**
Fall. 3 credits. ILRLE 744 and 745 constitute the Ph.D.-level sequence in labor economics.
R. Ehrenberg.
Reading and discussion of selected topics in labor economics. Applications of economic theory and econometrics to the labor market and human resource areas.

**745 Seminar in Labor Economics**
Spring. 3 credits.
R. Hutchens G. Jakubson.
Reading and discussion of selected topics in labor economics in the fields of theory, institutions, and policy.

**746 Labor Market Discrimination**
Fall or spring. 4 credits.
O. Mitchell.
Students in this course attend the lectures in ILRLE 446 (see description for ILRLE 446). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in ILRLE 446 and additional topics.

**747 Economic Policy toward the Aging**
Fall. 4 credits.
O. Mitchell.
Students in this course attend the lectures in ILRLE 447 (see description for 447). If enrollment warrants, they will also meet separately at a time to be arranged for discussion of topics in 447 and additional topics.

**798 Internship**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**799 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**940 Workshop in Labor Economics**
Fall or spring. 3 credits. Intended for Ph.D. students who have started to write their dissertations.
Focus is on the formulation, design, and execution of dissertations. Preliminary plans and portions of completed work are presented for discussion.

## ORGANIZATIONAL BEHAVIOR

T. Hammer, chair; S. Bacharach, S. Barley, L. Gruenfeld, J. Sniezek, R. Stern, P. Tolbert, H. Trice, L. Williams

**120 Introduction to Macro Organizational Behavior and Analysis**
Fall. 3 credits.
Staff.
The relationship between industry and the economy as a whole and its implications for other social institutions in American society (including stratification, politics, and American values) is discussed. The nature of industrial organizations and of complex organizations in general, emphasizing authority relations, goals, the division of labor, and bureaucracy.

**121 Introduction to Micro Organizational Behavior and Analysis**
Spring or summer. 3 credits.
Staff.
Deals with the relationship between the individual and the organization and such basic psychological processes as need satisfaction, perception, attitude formation, and decision making. The individual is described and examined as a formal and informal group member. Within this area, particular emphasis is placed on leadership, problem solving, and conflict resolution.

**222 Studies in Organizational Behavior: Regulating the Corporation**
Fall or summer. 3 credits.
R. Stern.
The course will examine public and private power from an organizational perspective. The resource-dependence approach to organization-environment relations provides a framework for interpreting government attempts at the regulation of corporate behavior. Topics cover the structure and functioning of government regulatory agencies and corporate responses to regulation, including corporate strategy, change, and political influence. The role of interest groups such as consumer or citizens organizations is also considered. Research and case materials focus on the implementation of environmental protection, occupational health and safety, equal opportunity, antitrust, and rate-setting regulations.

**320 The Psychology of Industrial Engineering**
Fall. 4 credits.
T. Hammer.
A study of the human factors in the industrial engineering of work, workplaces, tools, and machinery. The course examines the aspects of individual and social psychology that operate in the work setting and that should be taken into account in the design of jobs. These include limitations of the human sensory system; individual difference in skills, abilities, motives, and needs; group dynamics; intrinsic motivation; job satisfaction; conflict.

**322 Comparative Theories of Organizational Behavior and Social Character**
Fall. 3 credits.
L. Gruenfeld.
A comparative social-psychological approach is used to examine theories of work, authority, conflict, and change in employment organization.

**323 Introduction to the Study of Attitudes**
Fall. 4 credits. Open to juniors and seniors.
Staff.
Designed to acquaint the student with what is known about (1) origins of human attitudes, (2) the determinants of attitude change, and (3) the measurement of attitude differences. Studies employing clinical, experimental, and survey techniques are discussed. Each student designs, executes, and analyzes his or her own research study.

**324 Work Organizations, Troubled Employees, and Employee Assistance Programs**
Spring. 3 credits. Limited to 40 students. Prerequisite: one or more courses in sociology and psychology.
H. Trice.
Focus is on the relationship between organizational life and psychiatric-criminal behaviors. Covers (1) the nature and etiology of psychiatric disorders such as alcoholism, other drug and substance abuse, and the major neuroses; (2) corporate and white-collar criminal behavior; (3) the role of occupational and organizational risk factors in etiology; (4) various types of organizations that represent societal responses to troubled employees—mental hospitals, prisons, jails, halfway houses, shelter workshops, and self-help groups such as Alcoholics Anonymous. Puts differential emphasis on programs within work organizations that attempt to deal with troubled employees, job-based alcoholism, and employee assistance programs. Field format divides class into small groups for application in local relevant organizations. The development, strategies, and management of employee assistance programs will receive special attention.

**325 Organizations and Social Inequality**
Spring. 4 credits.
Examines the central role that organizations in industrial societies play in allocating income, status, and other resources to individuals. Marxist conceptions of class and Weberian conceptions of job authority will be examined to see what additional power they add to the explanation of social inequality, particularly in regard to income attainment. As the central unit of analysis in the course will be organizations, a historical section will be included that deals with the evolution of current control and compensation structures in large-scale organizations.

**326 Sociology of Occupations**
Fall or spring. 3 credits. Limited to 45 students. Prerequisite: one or more courses in sociology.
H. Trice.
Focuses on (1) the societal characteristics of occupations: division of labor, social stratification, mandate and license, occupational ideologies, stories, and tradition; (2) nature and expression of professionalization of occupations; (3) organizational characteristics of occupations: accommodation to formal organizations, occupational associations, and occupational mix; (4) social psychological characteristics of occupations: temperamental and intellectual role demands, occupational attraction, identity, and commitment, and occupational self-images; (5) relationship between occupational structure and organizational structure. Field format divides class into small groups for application among local occupational groups.

**327 Psychology of Industrial Conflict**
Fall. 4 credits.
Staff.
An application of frustration theory to the analysis of conflict and stress in organizations and society. Comparisons are made between industrial relations, race relations, international relations, and other settings. Readings include behavioral research findings from a variety of studies in industry. Relevant contributions from experimental, social, and clinical psychology are also considered.

**328 Cooperation, Competition, and Conflict Resolution**
Spring. 4 credits. Prerequisite: two courses in social psychology or equivalent.
An examination of theory and empirical evidence relating to the resolution of interpersonal, intergroup, and international conflict. Specific attention is devoted to studying factors that contribute to the development of cooperative or competitive bonds between parties to a conflict. The following topics are studied: the availability and use of threat; the credibility, intensity, and costs of threat; fractioning and escalating conflict. Personality and situational factors that regulate conflict intensification are stressed.

**329 Organizational Cultures**
Fall or spring. 3 credits. Limited to 45 students. Prerequisite: one or more courses in sociology.
H. Trice.
This course reviews the concept of culture as it has evolved in sociology and anthropology, applying it to formal organizations in workplaces such as corporations and unions. The course first examines the nature of ideologies as sense-making definitions of behavior, concentrating on the cultural forms that carry these cultural messages, rituals, symbols, myths, sagas, legends, and organizational stories. Considerable attention will be given to rites and ceremonials as a cultural form in organizational life that consolidates many of these expressive forms into one. The course will examine types of ceremonial behavior such as rites of passage, rites of enhancement, and rites of degradation, including the role of language gestures, physical settings, and artifacts in ceremonial behavior. The presence of subcultures and countercultures in organizational behavior will also receive attention, especially the part played by occupational subcultures in formal organizations. Emphasis will be placed on empirical examples from both the organizational behavior literature and the professor's field research. Field format divides class into small groups for application in local relevant organizations.

**370 The Study of Work Motivation**
Fall. 4 credits. Open to juniors and seniors with permission of instructor.
Staff.
Designed to acquaint the student with the basic concepts and theories of human motivation with implications for organizational change and job design. Focus is on theories of worker motivation and on research approaches and results as these apply to individuals and groups in formal organizations. Readings are predominantly from the field of organizational psychology, supplemented by relevant contributions from experimental, social, and clinical psychology. Each student will design, execute, and analyze a research study of his or her own.

**371 Individual Differences and Organizational Behavior**
Fall or summer. 4 credits. Recommended: some acquaintance with the substance and methods of behavioral or social science
L. Gruenfeld.
This course examines personality from a comparative psychodynamic point of view. Social behavior, authority relationships, and work motivation are used to illustrate how various theories could be applied to understand behavior and experience in organizations.

**372 Sociological Models of Organizations**
Spring. 3 credits. Prerequisites: ILROB 120 and 121 or equivalent.
P. Tolbert.
Introduces students to the basic issues involved in the sociological analysis of organizations. Traces organizational theory from Max Weber to the most recent research. Among the themes to be discussed are internal structure of organizations, communication in organizations, decentralization, organizational change, organizational technology, and organizational environment.

**373 Organizational Behavior Simulations**
Fall. 3 credits. Prerequisites: ILROB 120 and 121 or equivalent.
R. Stern.
Basic principles of organizational behavior are studied through readings and participation in four simulation games. The first game, The Organizational Game: Design, Change, and Development, by Miles and Randolph, simulates traditional organization, while the second, The Fuzzy Game, by Paton and Lockett, simulates a cooperative. A third game models executive decision making and a fourth, work organization. Organizational design, decision making, and conflict are the central topics of discussion. The contrasting bases of power in the organizations permits the study of the assumptions underlying organization structure and process.

**374 Technology and the Worker**
Fall. 3 credits.
S. Barley.
Examines theory and research pertaining to the social implications of technology and technological change for the work worlds of blue-collar, white-collar, and professional workers. At issue are alternate conceptions of technology as a social phenomenon, approaches to the study of technology in the workplace, the reactions of individuals and groups to technological change, the construction of a technology's social meaning, and the management of technological change. A broad range of technologies will be considered, but particular emphasis will be given to automation, electronic data processing, and sophisticated microelectronic technologies, including CAD-CAM systems, telecommunication networks, medical imaging technologies, artificial intelligence, and personal computers.

**420 Group Processes**
Fall. 4 credits.
L. Gruenfeld.
Several conceptual and methodological approaches are applied to the observation of personality in groups. Students observe, analyze, and quantify behavior in ongoing groups. Emphasis is on systematic observation of interpersonal behavior in open field groups rather than contrived experimental groups.

**423 Evaluation of Social Action Programs**
Fall or spring. 3 credits.
H. Trice.
A consideration of the principles and strategies involved in evaluation research, experimental research designs, process evaluation, and adaptations of cost benefits and cost efficiency to determine the extent to which intervention programs in fields such as training and therapy accomplish their goals. The adaptation of these strategies to large social contexts such as child guidance clinics, mental health clinics, and programs in the poverty areas, such as Head Start, is considered. Includes fieldwork and emphasizes assessment of program implementation.

**424 Study of Public Sector Bureaucracy**
Spring. 3 credits. Prerequisite: permission of instructor.
S. Bacharach.
Field research in public sector organization such as a school bureaucracy or a social welfare bureaucracy. Students conduct a major study into which they integrate themes from organizational theory. Theoretical issues such as decentralization, participation, and communication are discussed in the seminar.

**425 Sociology of Industrial Conflict**
Spring. 4 credits.
R. Stern.
The focus is on the variety of theoretical and empirical evidence available concerning social, economic, and political causes of industrial conflict. The manifestations of conflict, such as strikes, labor turnover, absenteeism, and sabotage, and the influence of the environments in which they occur are emphasized.

**426 Theories of Industrial Society**
Fall. 4 credits. Prerequisites: ILROB 120 and permission of instructor.
S. Bacharach.
Concentrates primarily on the works of Weber and Marx and will consist of readings in the original texts.

**427 The Professions: Organization and Control**
Fall. 4 credits.
P. Tolbert.
Focus is on the sources of power and control exercised by professional groups in contemporary society. A number of issues will be examined in this context including the role of professions in society, processes through which an occupational group becomes defined as a profession, sources of control that professional associations have over their members, relations between professionals and nonprofessionals in organizations, and the relationship between unionization and professionalization of occupations.

**471 Organizational Analysis of Trade Unions**
Fall. 3 credits. Prerequisites: ILROB 120 and 121 and one additional course in organizational behavior.
R. Stern, T. Hammer.
The course is designed to use organizational theory and research in the examination of trade unions. Studying trade unions as organizations includes discussion of the role of unions in contemporary society and the meaning of unions to individual members. Unions will be the unit of analysis in considering unions as agents of social change, unions in interorganizational relationships, and union political activity. Union members will be the focus in considering why people join unions, commitment to unions, dual allegiance problems, and leadership. The course will also address the issue of how effective unions are as a mechanism of worker participation in management decision making. Course material focuses on current research on unions and on strategies for further research.

**472 Applied Organizational Behavior**
Fall. 3 credits. Prerequisites: ILROB 120 and 121.
S. Bacharach.
Introduces students to intermediate theory of organizational behavior. It will specifically concentrate on teaching students to use organizational theories for analytical and applied purposes. Among the issues to be addressed are organizational structure, work processes, organizational politics, organizational design, job design, incentive systems, and quality-of-work-life programs.

**475 Organizational and Political Behavior in School Districts**
Fall. 4 credits. Enrollment limited. Prerequisite: permission of instructor.
S. Bacharach.
This course is intended to provide students with research experience through the study of the administrative and governance processes in school districts. The students will be required to work with school district and union personnel while investigating the following areas: (a) structure and process of decision making in urban and rural school districts, (b) organizational conflict as reflected in school board meetings, (c) the variations in, and effect of, leadership style, as evidenced by different superintendents' advisory techniques, (d) the collective bargaining process as reflected in both contracts and actual negotiations, (e) the effect of the Taylor Law on the structure and process of decision making in school districts, and (f) the effects of administrative law on conflict in school districts. Students will be responsible for the collection of data and the presentation of a final report of their project.

**476 Unions and Public Policy in School Districts**
Spring. 4 credits. Enrollment limited. Prerequisite: permission of instructor.
S. Bacharach.
A continuation of ILROB 475, but 475 is not a prerequisite. This course is strictly a research field seminar. Students will be required to work with school districts and union personnel while investigating the following areas: (a) labor contracts with school districts, (b) relations between teachers' unions, school boards, and superintendents, (c) teachers' unions' involvement with school district policies.

**478 Applied Topics in Organizational Behavior**
Fall. 4 credits. Prerequisites: two courses in organizational behavior beyond the 100 level.
L. Williams.
Reading and classroom discussion will be devoted to each of three topics. The topics are industrial gerontology, with a particular focus on retirement; technology and the office; and gender and personality as organizational variables. Readings will be primarily from journal articles. Students will have a research task for each topic.

**495 Honors Program**
Fall and spring (yearlong course). 3 credits each term.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**497–498 Internship**
Fall or spring. 3 and 6 credits.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**499 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**520 Micro Organizational Behavior and Analysis**
Fall or summer. 3 credits.
Staff.
Survey of concepts, theories, and research from the fields of organizational and social psychology as these relate to the behavior of individuals and groups in organizations. Job attitudes, motivation, performance, leadership and power, group formation, perception, and organizational climate. A preliminary course for advanced work in organizational behavior.

**521 Macro Organizational Behavior and Analysis**
Spring. 3 credits.
Staff.
Formal organizations are studied from the perspectives of classical organization theory, human relations theory, and comparative and cross-cultural analysis. Contemporary theories and quantitative approaches to organizational structure are also considered in some detail. Intended to be preliminary to more intensive work in organizational behavior.

**620 Theories of Organizational Change, Innovation, and Evaluation**
Spring. 4 credits. Prerequisites: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.
H. Trice.
This seminar examines the dynamics of individual, structural, and environmental factors operating in organizational change in general, and in the implementation and use of innovations within formal organizations in particular. The role of evaluative research in assessing the effectiveness of the implementation of innovations and in determining organizational effectiveness are analyzed. Several case studies of organizational change in government, unions, and private industry are examined. The emphasis is on conceptual frameworks for analyzing organizational change and mounting evaluative research on innovations. Readings are interdisciplinary and include sociology, psychology, and political science.

**621 Organizational Diagnosis Intervention and Development**
Spring. 4 credits. Prerequisites: undergraduates, ILROB 120 and 121; graduate students, ILROB 520 and 521 or equivalent; and permission of instructor.
L. Gruenfeld.
This applied course considers theories and techniques for the identification and improvement of organizational problems at the behavioral (micro) level. Methods for the implementing of change are evaluated in the light of several normative and descriptive theories of individual and group development and effectiveness. The course emphasizes both quantitative and qualitative data processing procedures.

**622 Organizations and Environments**
Spring. 3 credits.
P. Tolbert.
This course will survey the literature on organization-environment relations including work on organizational dependence and power, management of uncertainty, and other aspects of interorganizational cooperation and conflict. The objective of the course is to provide students with a general theoretical understanding of the way in which organizations can shape their environment and in which the environment constrains and shapes organizations.

**624 Groups in Work Organizations**
Fall. 4 credits. Enrollment limited. Prerequisites: Senior standing, and ILROB 371 or ILROB 629 or equivalent, or permission of instructor.
L. Gruenfeld.
This is an applied social psychology course that emphasizes the building, maintenance, and renewal of purposive groups. The course deals with models and variables that interact with group cohesion and performance. Structural, environmental, task, motivational, and interpersonal variables are considered. This course work includes observation and analysis of decision making and negotiating behavior in a group.

**625 Labor and Monopoly Capital: The Growth of Large United States Firms in the Past Century**
Spring, 7 weeks only. 2 credits.
Staff.
A critical review of two recent books with very different explanations for the rise of large, hierarchically differentiated corporations in the United States: Harry Braverman, *Labor and Monopoly Capital*, and Alfred D. Chandler, *The Divisible Hand*. These books are supplemented by articles on patterns of industrialization and internal structural transformation of large firms in the United States economy.

**626 Science and Innovation in Industry**
Fall. 3 credits. Prerequisites: ILROB 120, 121/520, 521 or permission of instructor.
S. Barley.
This course seeks to impart an understanding of how industrial R&D is organized, as well as an appreciation for the practical problems that arise when firms employ a significant number of scientists, engineers, and other technical workers. It is designed for students who have a general research interest in industrial R&D or who anticipate working for firms in which R&D plays an important role. The course will bring relevant theoretical perspectives to bear on pragmatic issues surrounding technical innovation and the employment of scientists and engineers. Representative topics include: the organization of scientific and technical communities, the industrialization of research, the nature of scientific and technical work, new patterns of industrial relations, organizational strategies for fostering innovation, and the careers of scientists and engineers.

**627 Leadership in Organizations**
Spring. 3 credits. Prerequisites: two organizational behavior courses at the 300 level or advanced courses in sociology or psychology.
L. Gruenfeld.
An examination of theories and research findings from the behavioral sciences that are relevant to leadership and the influence process in groups and organizations. Personality, situational factors, intergroup processes, interpersonal perception as well as motivation to lead and to follow will be discussed. The implications for leadership training, organization development, and action research are explored.

**628 Cross-Cultural Studies in Organizational Behavior**
Spring. 3 credits. Limited. Permission of instructor before registering in course.
L. Gruenfeld.
Designed for students interested in social psychological theory and research in international culture comparisons of behavior and experience in organizations. Variables such as power distance, individualism-collectivism, universalism-particularism and attitudes toward authority as well as work motivation will be examined. Upon completion of the readings and discussion of conceptual materials and consideration of several major international comparison studies, each student will prepare and present a paper on a topic of his/her own choice usually related to his/her country of origin (China, Japan, German, USA, etc.).

**629 Personality in Organization**
Fall. 4 credits. Open to undergraduates with permission of instructor.
L. Gruenfeld.
This advanced course considers psychodynamic theories of organizational diagnosis at the individual and group levels. Topics include leadership, power, authority, work motivation, intervention, and change. The topics are discussed and applied in small study groups. The professor's role is as a consultant and resource person. Class members study and research their own behavior and present their qualitative and quantitative findings to the class. Students are expected to have background and interest in both research methods and theory.

**670 Employee Assistance Programs: Social Movement and Emerging Occupation**
Spring. 4 credits. Limited to seniors and graduate students with permission of instructor.
H. Trice.
The seminar analyzes the general nature of social movements and considers how the EAP movement fits into that perspective. Will examine the distinctive core tasks performed by EAP workers. These join with the unique ideology of compassion derived from the social movement to form the ingredients for an emerging occupation. Other specific features of this emerging occupation that will be examined are: the types of employee behavioral problems encountered in working populations, role of supervisors, union stewards, and peers in EAP referrals, the role of EAP workers in working with job performance problems, use of constructive confrontation in supervisory/steward training. Will analyze clinical issues involved in EAP work and the interface between the workplace and the treatment place. Similarly, both internal and external marketing of EAPs will be examined, followed by a review of the relationship between these programs and contractual agreements, "just cause" in alcohol, drug, and mental health arbitration cases, including drug testing.

**671 Organizations as Social Networks**
Spring. 3 credits. Prerequisites: one or more courses in organizational behavior, sociology, psychology, anthropology, or political science. A course in statistics or research methods would be helpful.
S. Barley.
Increasing attention has been devoted to the idea that social structures can be fruitfully investigated as social networks. In particular, organizational and inter-organizational structures may be analyzed as patterned relationships among individuals, groups, and even other organizations. Such networks appear to be strong predictors of a variety of social dynamics including attitude similarity, the diffusion of innovation, turnover, and the allocation of organizational resources. A variety of methods for collecting and analyzing network data including: graph theory, sociometry, clique detection, centrality analysis, blockmodeling, and the quadratic assignment procedures will be used. Recent published research will involve work with actual data sets and relevant computer programs.

**673 Cross-Cultural Explorations of Individual Differences**
Fall. 3 credits.
A data-bank analysis of the relationship between socioeconomic status, socialization values, ethnicity, and various indices of individual differences, such as interpersonal trust, propensity to take risks, self-concept, cognitive style, and job preferences.

**674 Social Regulation and Control of Institutions**
Spring, 7 weeks only. 2 credits. Prerequisites: two organizational behavior courses at the 300 level, or advanced courses in sociology or psychology.
R. Stern.
Interorganizational relations are examined in terms of network control agents and target objects. The dynamics of control relationships based on political bargaining, the distribution of power, economic rewards and costs, and historical circumstances are examined in the context of their evolution through organizational adaptation to the environment. Subject matter includes theories of organizational change and application of a control perspective to the institutions of American business, government regulations, athletics, and education.

**675 Cooperative Strategies for Improving Organizational Performance**
Spring. 4 credits.
M. Gaffney.
The course will concentrate on presentation and analysis of a series of case studies involving projects using cooperative strategies to improve organizational performance. Emphasis will be given to cases in which union and management have been working together to enhance productivity and the quality of working life. Cases will be examined against a background of the research literature on improving organizational performance. Students will be responsible for a term paper.

**676 Systems of Labor Participation in Management**
Fall. 4 credits. Limited to 25 students. Prerequisites: senior standing and permission of instructor.
T. Hammer.
Examines the theory and practice of worker participation in systems ranging from informal shop-level participation to self-management. Special emphasis is placed on socio-technical systems of job design and work restructuring that give workers control over the labor process. Attention is also given to legislated programs of participation (codetermination) and to participation in employee-owned firms.

**677 Seminar in Field Research I**
Fall. 4 credits. Enrollment limited. Prerequisite: permission of instructor.
H. Trice.
Recent research efforts are examined and the dynamic nature of the research process is emphasized. The realities of field research are explored, including problems of gaining and sustaining rapport, the initial development of research interviews and observation data, and their conversion to quantitative instruments. Participants share in the exploration of appropriate theories and concepts, and the possibility of actual field participation in an ongoing research project is explored.

**678 Seminar in Field Research II**
Spring. 4 credits. Prerequisites: ILROB 677 and permission of instructor.
H. Trice.
Continuation of recent research efforts is examined, and the dynamic nature of the research process is emphasized. The realities of field research are explored, including problems of gaining and sustaining rapport, the initial development of research interviews and observation data and their conversion to quantitative instruments. Participants share in the exploration of appropriate theories and concepts, and the possibility of actual field participation in an ongoing research project is explored.

**720 Issues of Measurement in Research on Organizations**
Fall. 4 credits.
T. Hammer.
Concerns the study of tests and measures used to assess central variables in organizational behavior and related fields. Students will learn where to find measures suitable for their research purposes and will examine the theories that define the constructs being measured; the empirical information available about different measures; construction, reliability, and validity; and the ways in which the instruments have been used in research and practice.

**721 Advanced Micro Organizational Behavior**
Spring. 3 credits. Prerequisites: ILROB 520 and 521.
Staff.
Examines the historical development of psychological theories of organizations and contemporary issues in micro organizational research. The course will emphasize reading and analysis of primary source material.

**722 Advanced Macro Organizational Behavior**
Fall. 3 credits. Prerequisites: ILROB 520 and 521.
Staff.
Examines the historical development of sociological theories of organizations and contemporary issues in macro organizational research. The course will emphasize reading and analysis of primary source material.

**723 Behavioral Research Theory, Strategy, and Methods I**
Fall. 4 credits. Designed to meet the needs of M.S. and Ph.D. candidates majoring in organizational behavior, but other graduate students may enroll.
L. Williams.
Materials studied in ILROB 723 and 724 include (1) theoretical, conceptual, and ethical questions; (2) survey research and attitude-scaling procedures; (3) laboratory research methods; (4) participant observation and interview methods; (5) use of documents and qualitative data analysis. Provides students with important philosophical background for doing research and exposes them to a well-balanced, interdisciplinary set of quantitative and qualitative research tools.

**724 Behavioral Research Theory, Strategy, and Methods II**
Spring. 3 credits. Designed to meet the needs of M.S. and Ph.D. candidates majoring in organizational behavior, but other graduate students may enroll.
Staff.
Course will cover (a) data analysis and interpretation through the study of psychometric theory, (b) traditional problems encountered in the assessment of human and organizational characteristics, (c) the use of different methods of data analysis, and (d) an examination of the limitations imposed on data analysis and interpretation by traditional measures. Examples of topics covered in the course: the use of Chi-square, t-tests, ANOVA, simple and multiple correlation and regression, reliability and validity analyses, causal models, factor analysis, scale construction.

**725 Analysis of Published Research in Organizational Behavior**
Fall. 3 credits. Prerequisites: ILROB 520 and 521 and one year of statistics.
R. Stern.
An advanced research methods course that critically examines published research papers in the field of organizational behavior in terms of research design and method as well as theory.

**726 Selected Topics in Organizational Behavior**
Fall. 3 credits. Prerequisites: ILROB 520 and 521 and permission of instructor.
S. Barley.
An advanced proseminar that seeks to develop an interdisciplinary perspective on selected topics in organizational behavior. The topics themselves will change from year to year depending on participants' interests. Course is designed to allow students and the instructor to jointly pursue significant scholarly inquiry into one or more arenas of organizational theory. Emphasis will be placed on exploring the relevance of tradition in related disciplines (anthropology, linguistics, philosophy, sociology, etc.) that may enrich our understanding of organizational life.

**727 Work and Industrial Conflict**
Spring, weeks 7–14. 2 credits.
R. Stern.
A concentrated examination of the sociology of industrial conflict. The seminar focuses on classic formulations of conflict theory in sociology, then the social, political, economic causes of industrial conflict. Forms of conflict to be studied include strikes, turnover, absenteeism, and sabotage. Some discussion of the implications of various types of worker management of firms for industrial conflict will be included.

**728 Theories of Motivation and Leadership**
Spring. 2 or 4 credits. Prerequisites: ILROB 520 and 521.
Two independent but sequence-connected minicourses.

(1) Theories of Work Motivation. 7 weeks. 2 credits.
T. Hammer.
Course will provide an introduction to basic concepts of human motivation in general, with particular emphasis on the theories that explain and predict work motivation. Students will examine the empirical research that tests the validity of the theories and shows how and under what conditions different motivation models can be used in practice in work organizations.

(2) Theories of Leadership and Power. 7 weeks. 2 credits.
L. Gruenfeld.
Several current microtheories of leadership-power and related research are examined. The disciplinary perspective employed is social psychology and the level of analysis emphasized is action and experience of individuals in groups.

**729 Organizational Change and Intervention**
Fall. 3 credits. Graduate students only; no exceptions.
L. Williams.
This seminar is concerned with planned and unplanned change in organizations. It is designed to analyze theory in practice. Particular attention will be paid to the role of internal and external change agents. Several applied research programs such as the Center for Creative Leadership, Tavistock, and SRC will also be examined.

**770 The Cultures of Work Organizations**
Fall. 3 credits. Open only to graduate students.
H. Trice.
The course considers both administrative and occupational cultures in the workplace. It takes an anthropology perspective, focusing on ideologies as the main ingredient of cultures but emphasizing the role of cultural forms, e.g., myths, stories, sagas, language, rites and ceremonials, and physical settings of meaning. It pays special attention to the place of subcultures and countercultures in the makeup of administrative culture and to occupations as a major source of subcultures. The role of the environment in which organizations are embedded, and its influence on workplace cultures, is also included. Forms of cultural leadership and approaches to reading and changing cultures are also considered.

**771 Decision Making in Organizations**
Spring. 3 credits.
J. Sniezek.
Surveys current and classic articles on individual and group judgment and decison making. Examines their applications in current theory and research in organizational behavior. Topics covered will include policy capturing, risk perception, confidence in judgment, preference and choice, experience and expertise, judgment-behavior relationships, the Sniezek and Henry model of group judgment, interdependent decision making, judgmental forecasting, and resource allocation decisions. Special attention will be given to the role of judgment and decision theory to problems of work motivation. Each student will be required to give a class presentation based on their paper.

**798 Internship**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**799 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**920 Organizational Behavior Workshop**
Fall. 2 credits. Limited to M.S. and Ph.D. candidates in the department. S-U grades only.
Staff.
This workshop is designed to provide a forum for the presentation of current research undertaken by faculty members and graduate students in the Department of Organizational Behavior and by invited guests. All M.S. and Ph.D. candidates in the department who are at work on their theses are strongly urged to enroll. Each student in the course will be expected to make at least one presentation during the year, focusing on the formulation, design, execution, and results of that student's thesis research.

## PERSONNEL AND HUMAN RESOURCE STUDIES

R. Risley, chair; J. Bishop. J. Boudreau, R. Bretz, V. Briggs, L. Dyer, W. Frank, B. Gerhart, G. Milkovich, S. Rynes, E. VonBorstel, W. Wasmuth.

**260 Personnel Management**
Fall, spring, and summer. 3 credits. Open only to ILR students. Non–ILR students may take ILRPR 461.
Staff.
An introductory overview of the management of human resources from an institutional perspective. Topics include human resource decisions dealing with staffing, employee development, work-system rewards, and employee relations. Emphasis is on (a) problem-solving and decision-making approaches; (b) operational methods, technologies, and practices; (c) application of relevant behavioral science theory and research; and (d) legislation and other environmental constraints having an important bearing on the effective utilization of human resources by an enterprise.

**266 Personal Computer Basics**
Fall or spring. 2 credits. Limited to 20 students.
Staff.
This 7-week course provides basic skills in the use of IBM personal computers (PCs). It covers basic hardware, terminology, fundamentals of the Disk Operating System, LOTUS 1–2–3, and DBASE III Plus. Emphasis is placed on hands-on experience using examples demonstrating human resource issues and PC-based solutions. This course is a prerequisite to several advanced Human Resource Management electives (e.g., ILRPR 694, Personal Computer Applications to Human Resource Management; ILRPR 666, Cost Benefit Analysis for Human Resource Management; and ILRPR 690, Personnel Information Systems).

**360 Human Resource Economics and Public Policy**
Fall or spring. 3 credits. Open to sophomores, juniors, and seniors.
V. Briggs, J. Bishop.
A review of contemporary labor-market trends and theories pertaining to public efforts to develop the employment potential of the nation's human resources. Each of the major segments of the nation's educational training enterprise—elementary and secondary education, higher education, employer-provided training, apprenticeship, and special training programs for the disadvantaged—is examined in depth. Special policy issues pertaining to youth, rural workers, welfare reform, job creation, worker relocation, economic development, targeted tax credits, industrial policy, and "enterprise zone" proposals will be examined. Comparisons are made with European initiatives.

**361 Effective Supervision**
Fall or summer. 3 credits. Limited to juniors and seniors. Prerequisite: ILRPR 260 or equivalent.
W. Wasmuth.
This course covers twenty-five major topics that make a critical difference in the life of a newly appointed or experienced supervisor. Theoretical and real-life case examples are provided from office, factory, union, nonunion, large, and small organizations and cover technical, psychological, social, and political issues at the supervisory level.

**365 New York State Human Resource and Employee Relations Issues and Policies**
Fall or spring. 3 credits. Open to I&LR students participating in an Albany internship.
J. Slocum.
This seminar will consider functions, current issues, and policy development in New York State human resource development and employee relations. The role of the state in protective labor law administration; human resource programs; its function as a neutral party in labor disputes in the public and private sector; and legislation affecting employee-employer relations and economic development will be reviewed. Students will be assigned individual research topics that will be discussed in the seminar and developed into a term paper.

**366 Women at Work**
Fall or spring. 3 or 4 credits. Prerequisite: ILRPR 260 or equivalent.
Staff.
Various aspects of female occupational roles in twentieth-century United States. Historical, social, and legal factors that influence women's choice of careers, work socialization and training, and subsequent labor-market experience are considered. Working women's entry-level jobs, opportunities for advancement, and income are compared to men's.

**460 Human Resource Management for Small Business**
Fall. 4 credits.
R. Risley.
This course will be taught using a series of case studies developed from small firms. After an initial introductory section exploring the human resource management issues most critical to the growth and development of small businesses, the balance of the course will focus on selected human resource management issues raised by the various case studies. Students will analyze the problems of each case and prepare a report setting forth their recommendations for resolving the human resource problems and achieving the desired business objectives. Every second Wednesday the class will meet for a two-hour session to present and discuss the student reports concerning each case. Owners and managers of the small business firms studied will be present to discuss each case with the students.

**461 Human Resource Management in Organization**
Fall and spring. 4 credits. Open to juniors and seniors out-of-college ONLY.
R. Bretz, W. Frank.
An introductory level survey course that is designed to introduce the student to the methods and processes of human resource management in work organizations. It is primarily intended to acquaint non-industrial relations majors with the personnel management function so that they may better understand the rationale behind human resource decisions. Factors external to the organization are discussed in regard to their impact on human resource decision making. The course includes the integration of topics such as analyzing and designing jobs; the causes and consequences of employee satisfaction, attendance, and turnover; motivating and evaluating employee performance; recruiting and selecting employees; compensating the work force; and dealing with organized labor unions. Throughout the course, emphasis is placed on the importance of the supervisor or manager in the implementation of personnel policy.

**469 Immigration and the American Labor Force**
Spring. 3 credits.
V. Briggs.
Assesses the role that immigration continues to play as a source of human resource development in the United States. The primary focus is on developments since the Immigration Act of 1965, the Refugee Act of 1980, and the Immigration Reform and Control Act of 1986. In addition to legal immigration, border commuters, the topics of illegal immigration, refugees, asylees, and nonimmigrant workers are also examined. Comparisons are also made with immigration systems of other nations. Public policy aspects are explored in depth.

**495 Honors Program**
Fall and spring (yearlong course). 3 credits each term.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**497–498 Internship**
Fall or spring. 3 and 6 credits.
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**499 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**560 Personnel Management**
Fall or spring. 3 credits. Open only to graduate students.
Staff.
A survey course covering the major areas of the management of human behavior in work organizations. Consideration is given to such aspects of personnel work as job analysis, motivation, human resource planning, recruitment and selection, training, management development, organization development, compensation, and employee and labor relations. Emphasis is on the application of theory and research to the solution of personnel problems.

**653 Personnel and Human Resource Management: Policy and Practices**
Fall. 4 credits. Limited to 30 students, seniors and graduate students only. Prerequisites: ILRPR 260/560, electives in personnel and human resource management, and permission of instructor.
R. Risley.
This seminar will be concerned with issues of current importance to leading practitioners and explore the policies and practices developed to meet organizational goals. Changing concepts of the P/HR function within organizations and new policies and programs to meet changing needs will receive special attention. Outstanding leaders from the practitioner area will serve as guest seminar leaders during the term. Students will be required to do background reading for each topic as well as read the advanced material prepared by the guest leader. Students should be prepared to be active participants in the seminar discussions.

**658 Training and Development: Theory and Practice (also Education 685, Communication 685, and International Agriculture 685)**
Spring and summer. 4 credits.
F 9:05–12:05. N. Awa, W. Frank, D. Deshler.
Analysis, design, conduct, administration, and evaluation of training programs for the development of human resources in small-farm agriculture, rural health and nutrition, literacy and nonformal education, and general community development. Designed for scientists, administrators, educator-trainers, and social organizers in rural and agricultural development programs in the United States and abroad.

**659 Internal Staffing: Managing Careers in Organizations**
Spring or summer. 4 credits. Limited to 30 students. Prerequisites: ILRST 210/510 and ILRPR 260/560 or equivalent and permission of instructor.
S. Rynes.
Analysis of the movements of people within organizations and the management of career development processes. Selected topics include job search and choice processes, career planning methods and techniques, career and life stages, mentorships, employment security programs, midlife career changes, career and family integration, criteria for internal promotions, succession planning, and the role of performance evaluation and assessment centers in placement decisions.

**660 Seminar in Personnel or Human Resource Studies**
Fall or spring. 3 credits.
Staff.
A "floating" seminar designed to give faculty and students an opportunity to pursue specific topics in detail, with an emphasis on theory and research. Topics vary from semester to semester. Interested students should consult current course announcements for details.

**661 Applied Personnel and Organizational Development Practice**
Spring. 3 credits. Prerequisites: undergraduates, ILRPR 260; graduate students, ILRPR 560 or equivalent.
Staff.
Deals with personnel development technique and organizational development intervention methodology. Students examine and practice group methods, feedback and processing technique, active listening, one-to-one counseling, behavior modeling, role playing, the case method, team building, survey-guided intervention, and other relevant methods, techniques, and issues. This course combines pertinent literature with the opportunity for hands-on practice in a workshop setting. Students have responsibility for developing and delivering scholarly papers that explore a specific method, technique, and/or critical issue. In addition, a final project requires a comprehensive proposal that describes an organizational development intervention.

**662 Managing an Organization through Simulation Training**
Spring or summer. 3 credits. Limited to a total of 40 ILR and hotel administration students, seniors and graduate students only. Prerequisite: ILRPR 260/560 or equivalent and permission of instructor.
W. Wasmuth.
Techniques of simulation are applied to a hotel banquet facility to enable students working in a small group (task force) to accomplish the following objectives: (1) plan and develop strategies to solve a variety of realistic problems in a supportive low-risk simulated setting; (2) provide direct feedback to the participants as to the effects of their decisions on ten organizational performance indicators, including morale, turnover, productivity, customer satisfaction, and profit/loss; (3) understand the interrelationships of the indicators and of various parts of an organization through an open systems approach; (4) develop an awareness of how group interaction affects the quality and timeliness of team decision making; (5) demonstrate communication skills in organizing and reporting significant results of team accomplishments. Also, each student will prepare an individual research project that focuses on some aspect of the simulation experience.

**663 Performance Appraisal and Productivity Improvement**
Fall. 3 credits. Limited to 30. Prerequisites: ILRPR 260/560 and one course in statistics.
R. Bretz.
This course covers the measurement and evaluation of both individual and organizational performance. It is based on the concept that organizational effectiveness and performance are largely a function of the effectiveness and performance of individuals within the organization. Improving organizational effectiveness and productivity involves improving the effectiveness and performance of individuals and work groups that make up the organization. The course begins by exploring the concept of organizational effectiveness, proceeds with a treatment of the measurement of work performance at the

individual and group levels, and concludes with an emphasis on planning, measuring, and controlling organizational performance through the integration of performance from the organization to the individual levels. Different methods of appraising performance are considered and evaluated in terms of their impact on the individual, the appraiser, and the organization.

**664 Seminar in Organizational Communication**
Spring. 3 credits. Prerequisite: permission of instructor.
W. Frank.
Seminar centers on selected issues and relevant research involved in the study of communication with formal organizations. Organizational structure and design, patterns of information flow, and individual and group determinants of communication effectiveness will be important concerns.

**665 Case Studies in Personnel Administration**
Spring. 4 credits. Enrollment limited. Prerequisite: ILRPR 260/560 plus two other courses in personnel and human resource studies and permission of instructor.
Staff.
An analysis of personnel management activities and their impact on organizational objectives and administration. Cases, incidents, and field data derived from a variety of institutional settings provide a framework for examining and explaining the various roles played by personnel managers. Students with a special interest in personnel are encouraged to use this course as a "capstone" to their studies.

**666 Cost-Benefit Analysis for Human Resource Management**
Spring. 4 credits. Prerequisites: ILRPR 260/560 or equivalent, ILRPR 266, one course in statistics, one elective in personnel and human resource studies, and permission of instructor.
J. Boudreau.
This seminar explores how to account for the contribution of personnel and human resource management programs and decisions to achieving organizational goals. It emphasizes a systematic decision-making system that organizes the discipline of personnel and human resource management and can assist in planning and evaluating programs. Topics include the role of financial-accounting statements in managing personnel and human resources, cost-benefit analysis for programs, managing human resources as a profit center, and identifying personnel and human resource management constituents to address their goals.

**667 Employee Relations**
Fall. 4 credits. Prerequisites: ILRPR 260/560 or equivalent and permission of instructor.
L. Dyer.
Explores the policies, programs, and practices used by employers to promote the just and humane treatment of employees, especially managerial, professional, and other employees not covered by collective bargaining contracts. Includes such policies as the protection of employee rights and the nature of processes used to allocate organizational opportunities and rewards; such programs as employee assistance plans and due process procedures; and elements of such practices as employee communication and supervision. Treats these as a "package" to be considered in totality and developed strategically. Considers variations in employee relations strategies, the motives of employers in establishing such strategies, and the effects of these strategies on relevant individual and organizational outcomes.

**668 Staffing: Employee Selection and Utilization**
Fall or spring. 4 credits. Prerequisites: ILRST 510/511 and ILRPR 260/560 or equivalent, plus ILRPR 266; working knowledge of factor analysis, item analysis, regression analysis, and ANOVA; and permission of instructor.
J. Boudreau, S. Rynes.
An analysis of the staffing process as applied to employing organizations. Topics include employment planning, recruitment, selection processes and techniques, legal issues in selection, and the relationship between staffing and other organizational practices.

**669 Administration of Compensation**
Fall or spring. 4 credits. Limited to 30 students. Prerequisites: ILRPR 260/560 or equivalent, ILRPR 266 and basic statistics or permission of instructor.
B. Gerhart, G. Milkovich, R. Risley, S. Rynes.
Major emphasis is on the decisions and issues involved in the design and administration of pay systems. Topics include behavioral and economic theories and research related to compensation, administration, and factors influencing decisions about pay levels, hierarchies, forms, and administration of pay. Also focuses on the effects of various pay systems on employee behaviors and firm performance.

**690 Personnel Information Systems**
Spring. 4 credits. Limited to 20 students. Prerequisites: ILRPR 260/560 or the equivalent; ILRPR 266; advanced electives in personnel; at least one course in statistics; and permission of instructor.
B. Gerhart.
Explores the development, implementation, and management of computerized personnel information systems and their use in human resource management. Intermingles two types of activities. One (the more theoretical) involves the study of the essential components of such systems and the steps involved in designing and running them. The other (the more applied) involves the actual use of systems on both the PC (e.g., dBASE III PLUS) and the mainframe (e.g., SAS). Considerable in- and out-of-class time is spent working through a series of exercises that require (1) the identification of data needs, (2) the retrieval of appropriate data from one of two databases, (3) data analysis, and (4) data presentation. The objective is for students to develop the skills needed to become intelligent users of database management systems in personnel work.

**691 Human Resource Planning**
Spring. 4 credits. Limited to 35 students. Prerequisites: ILRPR 560 or equivalent, one course in statistics, and permission of instructor.
L. Dyer, G. Milkovich.
The process of human resource planning as practiced by public and private employers. Included are topics such as forecasting human resource needs, programming, techniques to meet forecasted needs, and methods of controlling an organization's supply of human resources. The seminar is organized around a computer simulation game in which students make policy and program decisions for a fictional organization. Decisions are evaluated on the basis of their contributions to the organization's human resource and profit objectives.

**692 Training the Displaced and Disadvantaged**
Fall or spring. 3 credits. Prerequisite: permission of instructor.
J. Bishop.
Examines public and private efforts to lower unemployment and underemployment of displaced and disadvantaged workers. The seminar examines the scope of the problem, its causes, and why specific programs have worked and others have not. Topics covered will include training for displaced workers, rehabilitation of the disabled, job-search training, tax credits for hiring, vocational training, literacy instruction, EEO, public service employment, assisting new business, and industrial policy. The seminar also investigates how the structure of the economy influences the ability of targeted training and job creation to achieve sustained reductions in unemployment and draws lessons from the experience of other societies.

**693 Design and Administration of Training Programs**
Spring. 3 credits. Prerequisites: ILRPR 560 or equivalent and permission of instructor.
W. Frank.
An analysis and exploration of the training and retraining function as applied in business, government, and industrial organizations. Consideration is given to learning theory as well as to the concept framework and practical approaches with which learning activities are developed at the workplace at all levels.

**694 Personal Computer Applications in Human Resource Management and Labor Relations**
Spring. 4 credits. Limited to 22 students. Prerequisites: ILRPR 260/560 or equivalent; ILRPR 266; at least one upper-level PHRS elective; basic statistics; and permission of instructor.
J. Boudreau, B. Gerhart.
Personal computers are gaining increasing use in organization decision making. This is true in human resource management and labor relations as well as in other areas. This course is designed to present students with current personal computer software packages and to explore how they can be used to improve human resource decision making. The course involves hands-on personal computer cases designed to present human resource situations that can be analyzed using PC applications. In addition, students will have opportunities to design their own applications and present them to the class.

**695 Education, Technology, and Productivity**
Fall. 3 credits.
J. Bishop.
The seminar investigates the nexus between the education and training occurring in schools and at the workplace and the technological progressiveness, productivity, and competitiveness of firms, individuals, and nations. We will investigate (1) how technological progress is changing the nature of work and what this implies for reform of education and training, (2) why United States productivity has not increased in the past fourteen years, (3) how education and training contribute to the growth and competitiveness, (4) why educational achievement has declined, and (5) how the responsibility for education and training should be apportioned among individuals, firms, private nonprofit organizations, and government.

**696 Personnel Administration and Government Regulations**
Fall. 4 credits. Prerequisite: ILRPR 260 or equivalent.
R. Risley.
A survey and analysis of government legislation and regulations affecting human resource management in nongovernment organizations, examining the framework within which management must operate. Government agencies' methods of enforcement of such regulations and the firms' responsibilities for failure to comply with these legal requirements are considered. Emphasis will be on human resource policy development and administration to meet legal requirements. Topics include FLSA, OSHA, ERISA, Employee Rights, Employment at Will, EAP and Title VII.

**698 International Human Resource Policies and Institutions**
Fall. 3 credits.
J. Bishop.
A comparative study of human resource policies and institutions in Western Europe, North America, Japan, and the Soviet Union (with special emphasis on math and science education) and of the effects of these institutions on productivity, growth, and equality of opportunity. The institutions studied include primary and secondary education, apprenticeship, higher education, employer training, and government regulation of employment contracts. Data on the consequences of policies is presented and an effort made to understand how human resource policies and institutions have contributed to the rapid growth and low levels of inequality in Europe, Japan, and the Pacific Rim nations. Another focus of the course is understanding the causes of the low levels of achievement of American high school students relative to their counterparts abroad.

**699 Contemporary European Labor Markets**
Spring. 3 or 4 credits (1 additional credit available for those who elect to prepare a special report).
J. Bishop.
Aggregate unemployment rates in Europe have risen from 3–4 percent in the 1960s to 11 percent in the late 1980s. The course is an examination of the causes and consequences of this transformation of European labor markets. In the process of addressing these questions, we review the recent history of these economies, their labor market institutions, and government labor market policies in a comparative framework. Some European nations—Sweden, Norway, Switzerland, and Austria—have kept their unemployment rates low and the reasons for their success will be explored. The question of why economies that performed so well in the 1960s are performing so poorly now can only be addressed in the context of an overall theory of unemployment. The course examines the debate that currently rages over the causes of European unemployment and between the advocates of Keynesian, new classical (rational expectations and real business cycle theorists), and new Keynsian (efficiency wage, implicit contracts, and overlapping contracts) theories of aggregate unemployment.

**760 Seminar in Personnel or Human Resource Studies**
Fall or spring. 3 credits. Prerequisites: ILRPR 560, ILRST 510/511, and ILRPR 669 and permission of instructor.
Staff.
A "floating" seminar designed to give faculty and students an opportunity to pursue specific topics in detail, with an emphasis on theory and research. Topics vary from semester to semester. Interested students should consult current course announcements for details.

**761 Human Resource Economics and Public Policy**
Spring. 3 credits.
V. Briggs, J. Bishop.
A review of contemporary labor-market trends and theories as they relate to public policy efforts to develop the employment potential of the nation's human resources. Each of the major segments of the nation's educational training enterprise—elementary and secondary education, higher education, employer-provided training, apprenticeship, and special training programs for the disadvantaged—are examined in depth. Special policy issues pertaining to youth, rural workers, welfare reform, job creation, industrial policy, wage subsidies, and worker relocation will be examined. The role of research to policy formulation and methods of evaluation of social programs will be reviewed. Comparison will also be made with related European initiatives.

**769 Topics in Compensation Theory and Research**
Fall. 4 credits. Prerequisite: ILRPR 669.
G. Milkovich.
Examines recent developments in theory, research, and practice related to compensation. Discussion emphasizes the relevance of theory and research to compensation decision making. Topics include strategic perspectives, variable compensation including gainsharing, bonus, spot awards, etc., risk and leverage in pay, egalitarian and meritorious structures, and the relationship between pay, employee behaviors, and organization.

**798 Internship**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**799 Directed Studies**
For description, see the section on Collective Bargaining, Labor Law, and Labor History.

**960 Workshop in Personnel and Human Resource Studies**
Fall or spring. 2 credits. Enrollment limited to M.S. and Ph.D. candidates. S-U grades only.
Staff.
The workshop is designed to provide a forum for the presentation and critical discussion of current research being undertaken by graduate students, faculty members, and invited guests in the field of personnel and human resource studies. All M.S. and Ph.D. candidates in the Department of Personnel and Human Resource Studies are urged to enroll; candidates in other departments are cordially invited to do so. Each participant will have an opportunity to benefit from the collective wisdom of the others in the formulation, design, and execution of his or her research, as well as to become current on the latest developments in the field.

## INTERDEPARTMENTAL COURSES

**150 Employment Policy and Practice**
Fall or spring. 3 credits.
O. Mitchell.
The object of this course is to introduce non–I&LR students to labor market policy and practice. Throughout the semester we emphasize topical issues and problems, including effective compensation policy, the value of education and training, causes and consequences of women's work and poverty, racial differences in labor market status, the political economy of income support programs, the current and future status of labor unions, the impact of baby boomers on pay and promotion, the proper role of regulation in the labor market, the productivity gap, and how trade and migration affect wages and jobs. Other topics will be added depending on student interest.

**451 Science, Technology, and the American Economy**
Fall or spring. 4 credits.
V. Briggs.
Examines the influences of the growth of science and the spread of technology on the development of the American economy. Although attention will be given to evolutionary influences, the primary focus will be upon the post-World War II experiences as a result of the introduction of automation, robotics, and computer technology. The vantage point will be the linkage of these developments with employment, unemployment, income, and productivity considerations. Public policy issues such as research and development policy, the role of national defense priorities, the development of the biotechnology industry, the agricultural revolution, savings and investment rates, retraining and education needs, etc., will be explored. The related experiences of other industrial nations will also be discussed.

**452 Writing in Industrial and Labor Relations**
Fall or spring. 3 credits. Limited to 20 students.
J. Farley.
This course will require close reading of four books in the field of industrial and labor relations and careful writing about them. Students will also have an opportunity to practice writing about the world of work for different audiences with an eye to publication.

# ILR EXTENSION

## Metropolitan

The following courses are open only to participants in the Extension Division in New York City. These courses are not open to undergraduate or graduate students matriculated in the Ithaca ILR programs. ILR Credit and Certificate Program courses at the Labor College are offered for four credits. Courses and course credits earned in Extension Division certificate programs are not automatically accepted as transfer credits or as a basis of admission to the resident ILR undergraduate and graduate programs in Ithaca. Student applications for course transfer are evaluated by the ILR school on an individual basis.

**260 Personnel Management**
Fall or spring. 3 credits.
Focuses on management of personnel in organizations. Deals with manpower planning, recruiting, selection, wage and salary administration, training, performance appraisal, organizational development, and the administration of personnel department activities. Special attention is paid to government manpower policy and its implication for personnel management.

**301 Labor Union Administration**
Fall or spring. 3 credits.
A review of the operations of American unions, including a general theoretical framework but with major emphasis on practical operating experience. The course will consider the formal government of unions; organizational or institutional purposes and objectives and how these are achieved; underlying structure and relationship among members, locals, and national organizations; the performance of the primary function of organizing; negotiating; contract administration; and the effect of the Landrum-Griffin Act.

**326 Sociology of Occupations**
Fall or spring. 3 credits.
Focuses on (1) the changing character of American occupations within the context of social change; (2) occupational status—differences in income, prestige, and power and the resultant general phenomenon of social stratification; (3) vertical and horizontal occupational mobility; (4) recruitment and socialization into occupational roles; (5) the process of professionalization; and (6) comparison of personnel occupations with the career and organizational patterns of other occupations. A major sociological theme is the relationship between occupational structure and workplace structure.

**346 Economics of Collective Bargaining**
Fall or spring. 3 credits.
Economic aspects of the negotiation, terms, and effects of union-management agreements at the individual firm, industry regional, and national levels. Topics examined include forces influencing contract demands and terms, employer adaptation to higher wages and benefits; interindustry differences in competitiveness, firm size, and markets; regional location of industry, international competition; government regulations; labor supply; inflation, recession, and unemployment.

**350 History of Industrial Relations in the United States**
Fall or spring. 3 credits.
This review of the history of industrial relations in the United States emphasizes developments in the twentieth century. The course concentrates on the American worker, both union and nonunion; labor movements; and the environmental forces that have shaped industrial relations in the United States. Readings are selected from scholarly accounts and original sources.

**351 Collective Bargaining**
Fall or spring. 3 credits.
A comprehensive study of collective bargaining; the negotiation and scope of contracts; the day-to-day administration of contracts; the major substantive issues in bargaining, including their implication for public policy; and the problem of dealing with industrial conflict.

**352 Labor Relations Law and Legislation**
Fall or spring. 3 credits.
A survey of the law governing labor relations. The legal framework in which the collective bargaining relationship is established and bargaining takes place is analyzed. Problems of the administration and enforcement of collective agreements are considered, as are problems of protecting individual employee rights in the collective labor relations context. Also serves as an introduction to the legal system and method and to legal and constitutional problems of governmental regulation of industrial and labor relations.

**353 Statistics (Statistical Reasoning)**
Fall or spring. 3 credits.
An introduction to the basic concepts of statistics: description of frequency distribution (averages, dispersion, and simple correlation) and introduction to statistical inference. Prerequisite to certain specialized courses on applications of statistics offered in various departments.

**400 Union Organizing**
This course explores various aspects of unions' attempts to organize workers; why some workers join unions and others do not; the techniques used by both unions and employers during organizing campaigns; and the present law of organizing and proposed amendments to the law.

**440 Health, Welfare, and Pension Plans**
Fall or spring. 3 credits.
An analysis and appraisal of private health, welfare, and pension plans. A consideration of the origin and development of employer, union, and joint programs and a critical examination of the financing, administration, and general effectiveness of the plans.

**602 Arbitration**
Fall or spring. 3 credits.
A study of the place and function of arbitration in the field of labor-management relations, including an analysis of principles and practices, the law of arbitration, the handling of materials in briefs or oral presentation, the conduct of an arbitration hearing, and the preparation of an arbitration opinion.

**681 Labor Relations Law**
Fall or spring. 3 credits.
An advanced course in labor law, covering such topics as emergency labor disputes, legal problems of labor relations in public employment, labor and the antitrust laws, civil rights legislation, rights of individual employees and union members, and legal problems of union administration.

**684 Employment Discrimination and the Law**
Fall or spring. 3 credits.
An examination of legal problems involving employment discrimination based upon race, color, religion, sex, national origin, or age. The impact of developing principles of law on preemployment inquiries and testing, seniority and promotions, and other personnel policies, practices, and procedures will be discussed. The prerequisites of affirmative action under Executive Order No 11246, as amended, will be analyzed. Special attention will be given to the role of state law in resolving employment discrimination claims and the procedural framework for raising and adjudicating such claims before administrative agencies and the courts.

**686 Collective Bargaining in the Public Sector**
Fall or spring. 3 credits.
An examination of the development, practice, and extent of collective bargaining between federal, state, and local governments and their employees. The course will emphasize public policy issues related to sovereignty, unit determination, representation procedures, and the strikes against government.

## Upstate

The following courses are open only to participants in the Extension Division's statewide credit programs in labor studies and management studies. These courses are not open to undergraduate or graduate students matriculated in the Ithaca ILR programs.

**241 Arbitration**
3 credits.
A study of the place and function of arbitration in the field of labor-management relations, including an analysis of principles and practices, the law of arbitration, the handling of materials in briefs or oral presentation, the conduct of an arbitration hearing, and the preparation of an arbitration opinion.

**242 Public Sector Collective Bargaining**
Fall or spring. 3 credits.
This course is designed as an introduction to collective bargaining in the public sector. The course examines the historical development of bargaining in public employment, the evolution of state and federal and bargaining theory and practices, as well as impasse resolutions techniques frequently found in this sector. Special emphasis will be given to developing an understanding of the similarities and differences between public and private sector bargaining and how they have affected tactics and strategies employed by the parties.

**243 Growth of American Business and Management History**
Fall or spring. 3 credits.
The growth and cycles of American business enterprise produced significant changes in education, government, work, the family, the ethnic composition of the population, and the landscape. As business and industry expanded, new methods evolved for managing these enterprises. This course will examine the development of managerial practices, the relationship of management to the work force, and the social ramifications of capitalist expansion.

**245 Public Sector Labor Law**
3 credits.
A survey and analysis of the New York State Public Employees Fair Employment Act is made as well as a comparison with other state laws covering public employees. The course will examine the extent to which the law protects and regulates concerted actions by employees in the public sector. The intent is to study and understand the law as written, but more importantly how it has been interpreted by the courts of New York State in its application. Major emphasis will be employee and employer rights, including recognition and certification, improper practices, strikes, grievances, and disciplinary procedures of the New York State Public Employment Relations Board.

**247 Labor and the American Economy**
3 credits.
Will help the student understand how economic theories relate to the economic problems confronting the American citizen in general and the American union member in particular. Emphasis will be placed on contemporary economic theories and how their proponents attempt to solve American economic problems.

**251 Principles and Practices of Management**
Fall or spring. 3 credits.
Presents the theory and processes of management with an emphasis on supervision. Management functions of planning, organizing, staffing, and evaluating are included. Concepts and theories are presented, and case studies are analyzed. Motivating people, exercising leadership, and effectively developing employees are emphasized.

**252 Contract Bargaining**
Fall or spring. 3 credits.
Examines the principles of contract bargaining, including bargaining environments and structures as well as standards used in bargaining. Students will learn to prepare bargaining demands, cost economic items, draft noneconomic contract language, negotiate economic and noneconomic issues, and resolve a contract bargaining impasse. The course will consider the impact of contract bargaining outcomes on workers, unions, employers, and the public.

**253 Contract Administration**
Fall or spring. 3 credits.
Focuses on the role of the steward in administering the union contract in the workplace. Students will evaluate grievance and arbitration contract clauses, the grievance procedure in practice, the role of the union steward, the role of local and international unions, negotiation of grievances, and preparation for arbitration. Students will analyze the impact of grievance and arbitration procedures on workers, unions, and employers.

**254 Labor Law**
Fall or spring. 3 credits.
Examines the principles of labor law by looking at social philosophy and the historical context of federal labor legislation from the 1930s. Students will concentrate on major provisions of the National Labor Relations Act, examining how the National Labor Relations Board and the federal courts have interpreted the national labor laws. Discussion will include new directions in labor legislation and interpretation with consideration given to the impact of labor law on workers, unions, and employers.

**255 Labor History**
Fall or spring. 3 credits.
Reviews American labor history from the prespective of workers' social dimensions of the development of the working class, reform and revolutionary movements, and the emergence of craft, industrial, and public employee unions. Included will be a discussion of the development of trade union institutions and leaders and the evolution of union political activities and collective bargaining. Special attention will be paid to the involvement of women and minority workers with unions.

**256 Dispute Resolution**
Fall or spring. 3 credits.
Examines third-party participation in dispute resolution in private and public sector collective bargaining. Development of dispute resolution methods in American labor relations; issues and practices in neutral, binding arbitration of grievances and mediation; conciliation; and fact finding procedures will be discussed. We will also look at exclusive labor-management mechanisms to settle industry disputes.

**257 Personnel Administration**
Fall or spring. 3 credits.
Designed to provide an overview of personnel practices in the modern organization. It will focus on manpower planning, employment, training and development, motivation and compensation, and performance appraisal and communication for students who are currently supervisors or personnel practitioners or for those aspiring to those positions.

**258 Organizational Behavior**
Fall or spring. 3 credits.
Designed to illustrate how behavioral science theory leads to research and how theory and research provide a basis for practical application in business, industry, education, and government.

**259 Union Administration**
Fall or spring. 3 credits.
Focus is on the principles and practices of effective union administration. Students will study the dynamics of democratic organizations and the development of organizational leadership. The course explores alternative methods of decision making and lines of responsibility. The legal obligations of unions and union officials will be discussed and analyzed. The course also examines the structure and evolution of relationships inside the labor movement.

**346 Economics of Collective Bargaining**
3 credits.
Economic aspects of the negotiation, terms, and effects of union-management agreements at the individual firm, industry regional, and national levels. Topics examined include forces influencing contract demands and terms, employer adaptation to higher wages and benefits; interindustry differences in competitiveness, firm size, and markets; regional location of industry; international competition; government regulations; labor supply; inflation, recession, and unemployment.

**350 History of Industrial Relations in the United States**
3 credits.
This review of the history of industrial relations in the United States emphasizes developments in the twentieth century. The course concentrates on the worker, both union and non-union; labor movements; and the environmental forces that have shaped industrial relations in the United States. Readings are selected from scholarly accounts and original sources.

**352 Labor Relations Law and Legislation**
3 credits.
A survey of the law governing labor relations. The legal framework in which the collective bargaining relationship is established and in which bargaining takes place is analyzed. Problems of the administration and enforcement of collective agreements are considered, as are problems of protecting individual employee rights in the collective labor relations context. Also serves as an introduction to the legal system and method, and the legal and constitutional problems of governmental regulation of industrial and labor relations.

**357 Labor Education I**
Fall or spring. 3 credits.
An examination will be made of labor education and its origin, development, scope, form, functions, curricula, goals, issues, and roles in universities, unions, and other organizations. Attention will be devoted to various practical aspects associated with the administration of programs and to labor education as an occupation. The course will involve students in field activities in connection with current Extension Division programs.

**358 Labor Education II**
Fall or spring. 3 credits.
The course will be divided into two parts: Part I is planned to develop an understanding of the theories of program organization and administration, including budgeting, which is necessary if labor education is to be transferred to the local union level. Part II joins theory and practice in the effort to (1) provide

rank and file union leaders with the opportunity to develop and use research skills, (2) garner subject matter expertise, (3) formulate course outlines from which to teach, and (4) select appropriate teaching methods and prepare materials for classroom use. Practice teaching is a necessary component of such an advanced course, again providing experiences that combine theory and practice.

**359 Directed Studies in Labor Education**
Fall or spring. 3 credits.
Designed to grant credit for fieldwork under the direction of members of the faculty. Third semester of an intensive training program in labor education for mature students with demonstrated ability to undertake independent work who have been carefully screened and selected for participation in this course. Combines 180 hours of fieldwork in a union education or related program with 3-hour seminars in the classroom. Classroom meetings are devoted to (1) in-depth analysis of union experiences in relation to labor education, theory, method, and techniques, and (2) individual consultations.

**360 Labor Education III**
2 credits.
This is a course designed to give labor educators advanced teaching techniques and specific methodology for expanding their training. Instruction will be combined with practical teaching experience in three, three-hour laboratories. Students will learn to polish their presentation style by studying voice projection, rhetorical techniques, timing and pacing of class units, controlling individual disruptors to the progress of the class, and, finally, summarizing the work accomplished.

**361 Contemporary Labor Problems**
3 credits.
A survey of the major challenges that confront the American labor movement. Students are briefed on the background of each problem and discuss and analyze a broad range of solutions proposed by the experts.

**363 Wages and Salary System Design**
3 credits.
An examination of compensation practices and special issues affecting wage and salary systems. Topics to be discussed include: determining pay level and structure, employee equity, incentive plans, and performance evaluation. Will also examine benefits and legislation that are relevant to compensation practices and theories.

**364 Labor, Government, and Politics**
3 credits.
A survey of the ways the American political system affects labor and how organized labor affects the system through voting, political parties, and interest groups.

## FACULTY ROSTER

Abowd, John M., Ph.D., U. of Chicago. Assoc. Prof., Labor Economics
Bacharach, Samuel, Ph.D., U. of Wisconsin. Prof., Organizational Behavior
Barley, Stephen R., Ph.D., Mass. Inst. of Technology. Asst. Prof., Organizational Behavior
Beran-Ghosh, Sucharita, Ph.D., U. of Toronto. Asst. Prof., Economics and Social Statistics
Bishop, John H., Ph.D., U. of Michigan. Assoc. Prof., Personnel and Human Resource Studies
Blumen, Isadore, Ph.D., U. of North Carolina. Prof. Economic and Social Statistics
Boudreau, John W., Ph.D., Purdue U. Assoc. Prof., Personnel and Human Resource Studies
Boyer, George R., Ph.D., U. of Wisconsin. Assoc. Prof., Labor Economics
Bretz, Robert D. Jr., Ph.D., U. of Kansas. Asst. Prof., Personnel and Human Resource Studies
Briggs, Vernon M., Jr., Ph.D., Michigan State U. Prof., Personnel and Human Resource Studies
Brooks, George W., M. A., Brown U. Prof. Emeritus, Collective Bargaining, Labor Law, and Labor History
Burton, John F., Jr., Ph.D., U. of Michigan. Prof., Collective Bargaining, Labor Law, and Labor History/Labor Economics
Crivens, Thelma A., J. D., George Washington U. Asst. Prof., Collective Bargaining, Labor Law, and Labor History
Cullen, Donald E., Ph.D., Cornell U. Prof., Collective Bargaining, Labor Law, and Labor History
Daniel, Cletus E., Ph.D., U. of Washington. Prof., Collective Bargaining, Labor Law, and Labor History
DeVault, Ileen A., Ph.D., Yale U. Asst. Prof., Collective Bargaining, Labor Law, and Labor History
Doherty, Robert E., Ed.D., Columbia U. Prof., Emeritus, Extension/Collective Bargaining, Labor Law, and Labor History
Donovan, Ronald, M. A., U. of Minnesota. Prof., Emeritus, Extension/Collective Bargaining, Labor Law, and Labor History
Dyer, Lee D., Ph.D., U. of Wisconsin. Prof., Personnel and Human Resource Studies
Ehrenberg, Ronald, Ph.D., Northwestern U. Irving M. Ives Professor of Industrial and Labor Relations and Economics, Labor Economics
Farley, Jennie T., Ph.D., Cornell U. Assoc. Prof., Extension
Fields, Gary S., Ph.D., U. of Michigan. Prof., Labor Economics
Frank, William W., Ph.D., Michigan State U. Prof. Extension/Personnel and Human Resource Studies
Gerhart, Barry A., Ph.D., U. of Wisconsin. Asst. Prof., Personnel and Human Resource Studies
Gold, Michael E., LL.B., Stanford U. Assoc. Prof. Collective Bargaining, Labor Law,and Labor History
Gramm, Cynthia L., Ph.D., U. of Illinois. Asst. Prof., Collective Bargaining, Labor Law, and Labor History
Gray, Lois S., Ph.D., Columbia U. Prof., Extension
Gross, James A., Ph.D., U. of Wisconsin. Prof., Collective Bargaining, Labor Law, and Labor History
Gruenfeld, Leopold W., Ph.D., Purdue U. Prof., Organizational Behavior
Hadi, Ali S., Ph.D., New York U. Asst. Prof., Economic and Social Statistics
Hammer, Tove H., Ph.D., U. of Maryland. Assoc. Prof., Organizational Behavior
Hutchens, Robert M., Ph.D., U. of Wisconsin. Assoc. Prof., Labor Economics
Jakubson, George H., Ph.D., U. of Wisconsin. Asst. Prof., Labor Economics
Katz, Harry C., Ph.D., U. of California at Berkeley. Prof., Collective Bargaining, Labor Law, and Labor History
Korman, A. Gerd, Ph.D., U. of Wisconsin. Prof., Collective Bargaining, Labor Law, and Labor History
Lieberwitz, Risa L., J. D., U. of Florida. Asst. Prof., Collective Bargaining, Labor Law, and Labor History
Lipsky, David B., Ph.D., Massachusetts Inst. of Technology. Prof., Collective Bargaining, Labor Law, and Labor History
McCarthy, Philip J., Ph.D., Princeton U. Prof. Emeritus, Economic and Social Statistics
Milkovich, George, Ph.D., U. of Minnesota. Prof., Personnel and Human Resource Studies
Miller, Frank B., Ph.D., Cornell U. Prof. Emeritus, Personnel and Human Resource Studies
Mitchell, Olivia S., Ph.D., U. of Wisconsin. Assoc. Prof., Labor Economics
Risley, Robert F., Ph.D., Cornell U. Prof., Emeritus, Personnel and Human Resource Studies/Extension
Ross, Philip, Ph.D., Brown U. Prof., Collective Bargaining, Labor Law, and Labor History
Rynes, Sara L., Ph.D., U. of Wisconsin. Assoc. Prof., Personnel and Human Resource Studies
Salvatore, Nicholas, Ph.D., U. of California at Berkeley. Assoc. Prof., Collective Bargaining, Labor Law, and Labor History
Seeber, Ronald L., Ph.D., U. of Illinois. Assoc. Prof., Extension
Smith, Robert S., Ph.D., Stanford U. Prof., Labor Economics
Sniezek, Janet A., Ph.D., Purdue U. Asst. Prof., Organizational Behavior
Stern, Robert N., Ph.D., Vanderbilt U. Assoc. Prof., Organizational Behavior
Tolbert, Pamela S., Ph.D., U. of California. Asst. Prof., Organizational Behavior
Trice, Harrison M., Ph.D., U. of Wisconsin. Prof., Organizational Behavior
Velleman, Paul F., Ph.D., Princeton U. Assoc. Prof., Economic and Social Statistics
Wasmuth, William J., D.B.A., Indiana U. Prof., Extension/Personnel and Human Resource Studies
Wells, Martin T., Ph.D., U. of California at Santa Barbara. Asst. Prof., Economic and Social Statistics
Williams, Lawrence K., Ph.D., U. of Michigan. Prof., Organizational Behavior
Windmuller, John P., Ph.D., Cornell U. Prof. Emeritus, Collective Bargaining, Labor Law, and Labor History/ International and Comparative Labor Relations

# LAW SCHOOL

## ADMINISTRATION

Russell K. Osgood, dean of the law faculty and professor of law

Jane L. Hammond, law librarian and professor of law

Charles W. Wolfram, associate dean for academic affairs and Charles Frank Reavis Sr. Professor of Law

Anne Lukingbeal, associate dean for student affairs

Albert C. Neimeth, associate dean and director of alumni affairs and placement

Frances M. Bullis, assistant dean for development and public affairs

Richard D. Geiger, assistant dean for admissions

## LAW SCHOOL

The primary function of the Law School is to prepare attorneys for both public and private practice who are equipped to render skillful professional service and who are thoroughly conscious of the important role played by the law as a means of social control. The curriculum is designed to prepare students for admission to the bar in all American states and territories.

Ordinarily, a student who is admitted to the Law School must have a baccalaureate degree from an approved college or university. The course of study leading to the degree of Doctor of Law (J.D.) covers three academic years. A number of students will be admitted to a program of study leading to the degree of Doctor of Law "with specialization in international legal affairs."

There are combined graduate degree programs with the Johnson Graduate School of Management, the College of Arts and Sciences, the Department of City and Regional Planning, the School of Industrial and Labor Relations, and the graduate divisions in economics, history, and philosophy, as well as a special opportunity for highly qualified undergraduates in the College of Arts and Sciences to register in the Law School during their senior year.

The graduate program of the Cornell Law School is a small one, to which only a few students are admitted each year. The LL.M. degree (Master of Laws, Legum Magister) and the J.S.D. degree (Doctor of the Science of Law, Jurisprudentiae Scientiae Doctor) are conferred. A small number of law graduates may also be admitted as special students, to pursue advanced legal studies without being degree candidates.

For further information, refer to the Law School catalog, obtainable from the assistant dean for admissions, Myron Taylor Hall.

## FIRST-YEAR COURSES

**500 Civil Procedure**

**502 Constitutional Law**

**504 Contracts**

**506 Criminal Justice**

**507 Legal Process**

**508 Practice Training I**

**509 Practice Training II**

**512 Property**

**515 Torts**

## UPPERCLASS COURSES

**602 Administrative Law**

**604 Alternative Dispute Resolution**

**607 American Indian Law**

**609 Antitrust Law**

**610 Arbitration (also ILR 602)**

**614 Civil Rights Legislation**

**616 Commercial Law**

**617 Communicative Torts**

**618 Comparative Law**

**619 Comparative Public Law of the United States and the United Kingdom**

**620 Conflict of Laws**

**621 Consumer Law**

**622 Corporations**

**624 Criminal Procedure: The Investigatory Process**

**626 Debtor-Creditor Law**

**628 Development of Legal Institutions**

**636 Environmental Law**

**640 Evidence**

**642 Family Law**

**643 Federal Courts**

**644 Federal Income Taxation**

**646 Federal Taxation of Wealth Transfer**

**647 Freedom of Expression**

**648 Injunctions**

**650 International Law**

**651 International Business Transactions**

**652 International Taxation**

**654 Introduction to Accounting and Finance**

**658 Labor Law**

**665 The Law of Mergers and Acquisitions (also NBA 572)**

**666 Law, Society, and Morality (also Philosophy 342)**

**668 Lawyers and Clients**

**670 Lawyers and Society**

**672 Modern Japanese Law**

**677 Products Liability**

**680 Real Estate Transfer and Finance**

**682 Securities Regulation**

**683 Social Security Law**

**684 Soviet Law**

**688 Taxation of Corporations and Shareholders**

**690 Taxation of Partnership Income**

**692 Trial Advocacy**

**694 Trusts and Estates**

## PROBLEM COURSES AND SEMINARS

**700 American Legal Theory**

**701 Antitrust and Health Care**

**702 Anthropology of Law (also Anthropology 627)**

**704 Children's Rights**

**705 Chinese Law Seminar**

**706 Computer Applications in Law Practice**

**708 Constitutional Law and Political Theory**

**709 Constitutional Theory**

**710 Contemporary Legal Theory (also Philosophy 444)**

**716 Empirical Studies of the Legal System**

**718 Employment Discrimination**

**720 Estate Planning**

**723 The European Community—Integration Through Law**

**725 Family Law Clinic**

**728 History of the Canon Law: Marriage**

**730 History of Law in Massachusetts**

**732 International Law and the Global Environment**

**734 International Protection of Intellectual Property Rights**

**738 Land, Law, and Community: Dilemmas of Race and Class**

**742 Law and Medicine**

**744 Lawyers and the Legal Profession**

**748 Law, Science, and Technology**

**752 Legal Aid I**

**753 Legal Aid II**

**763 Organized Crime Control**

**764 Problems in Modern Property Law**

**766 The Religion Clauses of the First Amendment**

**767 RICO**

**770 Securities Regulation, Corporate Finance, and the Public Corporation**

**774 Seminar on Modern Contract Theory**

**778 Theory of Civil Liberties**

## FACULTY ROSTER

Alexander, Gregory S., J.D., Northwestern U. Prof.
Aman, Alfred C., Jr., J.D., U. of Chicago. Prof.
Barcelò, John J. III, S.J.D., Harvard U. A. Robert Noll Professor of Law
Clermont, Kevin M., J.D., Harvard U. Prof.
Cramton, Roger C., J.D., U. of Chicago. Robert S. Stevens Professor of Law
Eisenberg, Theodore, J.D., U. of Pennsylvania. Prof.
Farina, Cynthia, J.D., Boston U. Assoc. Prof.
Hammond, Jane L., J.D., Villanova U. Prof.
Hay, George A., Ph.D., Northwestern U. Prof. Law/Economics
Henderson, James A., Jr., LL.M., Harvard U. Frank B. Ingersoll Professor of Law
Hillman, Robert A., J.D., Cornell U. Prof.
Johnson, Sheri L., J.D., Yale U. Prof.
Kent, Robert B., LL.B., Boston U. Prof.
Lyons, David B., Ph.D., Harvard U. Prof., Law/Philosophy
Macey, Jonathan R., J.D., Yale U. Prof.
Martin, Peter W., LL.B., Harvard U. Edward Cornell Professor of Law
Oesterle, Dale A., J.D., U. of Michigan. Prof.
Osgood, Russell K., J.D., Yale U. Prof.
Palmer, Larry I., LL.B., Yale U. Prof.
Roberts, Ernest F., LL.B., Boston Coll. Edwin H. Woodruff Professor of Law
Rossi, Faust F., J.D., Cornell U. Samuel S. Leibowitz Professor of Trial Techniques
Schwab, Stewart J., Ph.D., U. of Michigan. Assoc. Prof.
Shiffrin, Steven H., J.D., Loyola U. of Los Angeles. Prof.
Siliciano, John A., J.D., Columbia U. Assoc. Prof.
Simson, Gary J., J.D., Yale U. Prof.
Summers, Robert S., LL.B., Harvard U. William G. McRoberts Research Professor in Administration of the Law
Williams, David C., J.D., Harvard U. Assoc. Prof.
Williams, Susan H., J.D., Harvard U. Assoc. Prof.
Wolfram, Charles W., LL.B., U. of Texas. Charles Frank Reavis Sr. Professor of Law
Zacharias, Fred C., LL.M., Georgetown U. Law Center. Assoc. Prof.

# JOHNSON GRADUATE SCHOOL OF MANAGEMENT

## ADMINISTRATION

Alan G. Merten, dean

Thomas R. Dyckman, associate dean for academic affairs

Dick R. Wittink, director, doctoral program

James W. Schmotter, associate dean

Ann L. Calkins, assistant dean for external relations

Mariea Noblitt, director of admissions

Paul Brenner, director of corporate relations

Nancy A. Culligan, business manager and director of personnel

Laurie Foltman, director of career services

Daniel Mansoor, director of development and capital campaign manager

Linda Myers, managing editor, *Cornell Enterprise*, and publications coordinator

Rhea J. Nickerson, assistant to the dean

Donald Schnedeker, librarian

Harriet Peters, director of advising and student activities

Linda Pike, managing editor, *Administrative Science Quarterly*

John P. McKeown, director of finance and business operations and director of executive education

Ann C. Weibel, director of financial aid, and registrar

L. Joseph Thomas, director of the Executive Development Program

Eugene Ziegler, director of computing services

The Johnson Graduate School of Management prepares men and women for managerial careers in business. The school offers course work in many disciplines to provide potential managers with an understanding of the complexities of the professional world in which they will operate and of the organizations of which they will become a part.

A bachelor's degree or its equivalent is required for admission to the two-year program leading to the Master of Business Administration (M.B.A.) degree. Nearly half of the students have a background of undergraduate studies in arts and sciences, and about one-quarter in engineering. Ten percent of the students begin their graduate training immediately after receiving their bachelor's degrees and the remaining 90 percent following work experience.

Combined degree programs allow highly qualified Cornell students to register in the school during their senior year, thereby earning a master's degree in less than the usual time.

The doctoral program, administered through the Graduate School, provides an advanced level of education in business for those who seek careers in teaching and research at leading universities.

More detailed information about these programs is available in the Cornell University Announcement, Johnson Graduate School of Management, obtainable from the Office of Admissions and Student Affairs, Johnson Graduate School of Management, Malott Hall.

## UNDERGRADUATE ONLY

NBA 300 Entrepreneurship and Enterprise
Prerequisite: Introductory Accounting or equivalent, or permission of instructor.

This course provides a disciplined look at the entrepreneur and small business management. It deals with the formation and the acquisition of enterprises from the viewpoint of individuals who desire to become the principal owners. Reviews include legal and tax aspects, valuation techniques, organization forms, and venture-capital sources, as well as planning techniques necessary to launch a successful venture.

## NCC COMMON CORE COURSES

**NCC 500 Financial Accounting**
**NCC 501 Quantitative Methods for Management**
**NCC 502 Microeconomics for Management**
**NCC 503 Marketing Management**
**NCC 504 Behavioral and Organizational Science**
**NCC 505 Macroeconomics and International Trade**
**NCC 506 Managerial Finance**
**NCC 507 Management Information Systems**
**NCC 508 Production and Operations Management**

## NBA MANAGEMENT ELECTIVE COURSES

### Accounting

**NBA 500 Intermediate Accounting**
**NBA 501 Advanced Accounting**
**NBA 502 Managerial Cost Accounting**
**NBA 504 Taxation Affecting Business and Personal Decision Making**
**NBA 505 Auditing**
**NBA 506 Financial Information and Evaluation**
**NBA 507 Federal Income Tax**
**NBA 508 Accounting for Mergers and Consolidations**

### Behavioral and Organizational Science

**NBA 660 Strategy Implementation: Process and Politics**
**NBA 661 Organizational Theory**
**NBA 662 Power and Interpersonal Influence**
**NBA 663 Behavioral Decision Theory**
**NBA 664 Decision Aiding**
**NBA 665 Managing Innovation and Technological Change**
**NBA 666 Negotiation**
**NBA 667 Managing Groups**
**NBA 668 Organizational Politics**
**NBA 669 Organizational Design**
**NBA 670 Strategy Formulation**

### Economics

**NBA 520 Pricing and Strategy**
**NBA 521 Regulation, Deregulation, and Antitrust: Government Regulation of Business**
**NBA 522 Managerial Economics**
**NBA 523 Business and Economic Forecasting**
**NBA 524 Competitive Industry Analysis**
**NBA 525 Executive Compensation**

### Finance

**NBA 540 Financial Policy Decisions**
**NBA 541 Economic Evaluation of Capital Investment Projects**
**NBA 542 Investment Management and Security Analysis**
**NBA 543 Financial Markets and Institutions**
**NBA 544 Bank Management**
**NBA 545 Finance Theory**
**NBA 546 Options, Bonds, and Commodities**
**NBA 547 Investment Banking**
**NBA 548 Trading**
**NBA 549 Strategic Decision Making**
**NBA 550 Financial Instruments and Contracts**

### General Management

**NBA 560 Business Law**
**NBA 561 Advanced Business Law**
**NBA 562 An Introduction to Estate Planning**
**NBA 563 Strategic Business Policy Issues**
**NBA 564 Entrepreneurship and Enterprise**
**NBA 565 Law of Business Associations**
**NBA 567 Management Writing**
**NBA 568 Oral Communication**
**NBA 569 Effective Management Consulting**
**NBA 570 Negotiations for Managers**
**NBA 571 Business and American Society**
**NBA 572 Law of Mergers and Acquisitions**
**NBA 574 Health-Services Organization and Financing**

**NBA 575 Health and Welfare Policy Analysis**
**NBA 576 Alternative Health and Social Service Delivery Systems**
**NBA 577 The External Environment of Business**
**NBA 578 Ethics**
**NBA 579 Business Strategy and Policy**

### International Management

**NBA 580 Industrial Policy: Lessons for the United States from Japan and Europe**
**NBA 581 The International Context of American Business**
**NBA 582 International Trade and Finance**
**NBA 583 International Environment of Business**
**NBA 584 Management of the Multinational Corporation**
**NBA 585 Comparative International Management**
**NBA 586 Business in Europe and Latin America**
**NBA 589 Business in Japan**

### Management Information Systems

**NBA 600 Data-Base Management**
**NBA 601 Information Systems in Manufacturing**
**NBA 603 Systems Analysis**
**NBA 607 Supplemental Studies in MIS**

### Marketing

**NBA 620 Marketing Research**
**NBA 621 Advertising Management**
**NBA 622 Marketing Strategy**
**NBA 623 Models and Methods for New Products**
**NBA 624 Marketing Decision Analysis**
**NBA 625 International Marketing**
**NBA 626 Consumer Behavior**
**NBA 627 Market Communications**
**NBA 628 Market Planning**
**NBA 629 Industrial Marketing**
**NBA 630 Marketing Research Project**
**NBA 631 Marketing Science**
**NBA 632 Marketing Analysis and Planning**

### Operations Management

**NBA 640 Production Management**
**NBA 641 Business Logistics Management**
**[NBA 642 Applied Econometrics Not offered 1988–89.]**
**NBA 643 Management Science**
**NBA 644 Projects in Operations Management**

## NMI AND NRE RESEARCH AND ADVANCED STUDIES

**NMI 500-502 Directed Readings and Research**
**NRE 502 Doctoral Seminar in Marketing**
**NRE 503 Doctoral Seminar in Economics**
**NRE 504 Doctoral Seminar in Accounting**
**NRE 506 Doctoral Seminar in Banking and Financial Markets**
**NRE 507 Doctoral Seminar in Corporate-Finance Theory**
**NRE 508 Doctoral Seminar in Operations Management**
**NRE 509 Doctoral Seminar in Organizational Behavior**
**NRE 513 Doctoral Seminar in Finance**
**NRE 514 Doctoral Seminar in Decision Aiding**
**NRE 515 Doctoral Seminar in Behavorial and Experimental Economics**

## FACULTY ROSTER

Abolafia, Mitchell, Ph.D., SUNY at Stony Brook. Asst. Prof., Organizational Behavior
Anderson, Philip, Ph.D., Columbia U. Asst. Prof., Organizational Behavior
Bayus, Barry L., Ph.D., U. of Pennsylvania. Asst. Prof., Marketing
Bell, Nancy, Ph.D., U. of California at Berkeley. Asst. Prof., Organizational Behavior
BenDaniel, David J., Ph.D., Massachusetts Inst. of Technology. Don and Margi Berens Professor of Entrepreneurship
Bierman, Harold, Jr., Ph.D., U. of Michigan. Nicholas H. Noyes Professor of Business Administration
Bugliari, Joseph B., J.D., Cornell U. Prof., Agricultural and Business Law
Carr, Peter, Ph.D., U. of California at Los Angeles. Asst. Prof., Finance
Conway, Richard W., Ph.D., Cornell U. Prof., Information Systems
DeGraba, Patrick, Ph.D., U. of Pennsylvania. Asst. Prof., Economics
Dyckman, Thomas R., Ph.D., U. of Michigan. Ann Whitney Olin Professor of Accounting
Elliott, John A., Ph.D., Cornell U. Assoc. Prof., Accounting
Freeman, John, Ph.D., North Carolina at Chapel Hill. Prof., Organizational Behavior
Hass, Jerome E., Ph.D., Carnegie-Mellon U. Prof., Managerial Economics and Finance
Highfield, Richard A., Ph.D., U. of Chicago. Asst. Prof., Economics
Hilton, Ronald W., Ph.D., Ohio State U. Prof., Accounting
Isen, Alice, Ph.D., Stanford U. S. C. Johnson Professor of Marketing
Jarrow, Robert A., Ph.D., Massachusetts Inst. of Technology. Ronald P. and Susan E. Lynch Professor of Investment
Kasa, Kenneth, Ph.D., U. of Chicago. Asst. Prof., Economics
Krackhardt, David, Ph.D., U. of California at Irvine. Asst. Prof., Organizational Behavior
Kumar, Akhil, Ph.D., U. of California at Berkeley. Asst. Prof., Management Information Systems
Libby, Robert, Ph.D., U. of Illinois. Prof., Accounting, and Behavioral and Organizational Science
Lind, Robert C., Ph.D., Stanford U. Prof., Economics, Management, and Public Policy
McAdams, Alan K., Ph.D., Stanford U. Assoc. Prof., Managerial Economics
McClain, John O., Ph.D., Yale U. Prof., Quantitative Analysis
Malik, Kavindra, Ph.D., U. of Pennsylvania. Asst. Prof., Operations Research
Morse, Dale, Ph.D., Stanford U. Assoc. Prof., Accounting
O'Hara, Maureen, Ph.D., Northwestern U. Assoc. Prof., Finance
Orman, Levent, Ph.D., Northwestern U. Assoc. Prof., Information Systems
Rao, Vithala R., Ph.D., U. of Pennsylvania. Prof., Marketing/Quantitative Methods
Robinson, Lawrence W., Ph.D., U. of Chicago. Asst. Prof., Operations Management
Russo, J. Edward, Ph.D., U. of Michigan. Assoc. Prof., Marketing and Behavioral Science
Shaw, Wayne H., Ph.D., U. of Texas at Austin. Asst. Prof., Accounting
Smidt, Seymour, Ph.D., U. of Chicago. Nicholas H. Noyes Professor of Economics and Finance
Tarr, Curtis W., Ph.D., Stanford U. Prof., Management
Thaler, Richard H., Ph.D., U. of Rochester. Henrietta Louis Johnson Professor of Management
Thomas, L. Joseph, Ph.D., Yale U. Nicholas H. Noyes Professor of Manufacturing, Operations Management
Wiggins, James B., Ph.D., Massachusetts Inst. of Technology. Asst. Prof. Finance
Wittink, Dick R., Ph.D., Purdue U. Prof., Marketing and Quantitative Methods

### Lecturers

Katz, Jan, Ph.D., Massachusetts Inst. of Technology. Visiting Asst. Prof., International Business and Marketing
Mink, Barbara E., M.A., Cornell U. Lec., Management Communication
Pike, Alan, M.A., Cornell U. Lec., Management Communication
Rosen, Charlotte, Ph.D., Cornell U. Sr. Lec., Coordinator, Management Communication
Smith, Donald E., M.B.A., B.S.M.E., U. of Pittsburgh. Lec., Industrial Marketing

### Adjunct, Visiting, and Faculty

Abowd, John, Ph.D., U. of Chicago. Visiting Assoc. Prof., Industrial and Labor Relations
Agarwal, Manoj, Ph.D., SUNY Buffalo. Visiting Assoc. Prof., Marketing
DeBondt, Werner F. M., Ph.D., Cornell U. Visiting Asst. Prof., Finance
Grossman, Dale A., J.D., American U. Lec., Business Law
Johnson, Blair T., Ph.D., Purdue U. Visiting Asst. Prof., Marketing
Pempel, T.J., Ph.D., Columbia U. Prof., Government
Schmotter, James W., Ph.D., Northwestern U. Lec., Business History
Phillips, William E., Executive-in-Residence

# DIVISION OF NUTRITIONAL SCIENCES

## ADMINISTRATION

Cutberto Garza, director

Carole Bisogni, associate director for academic affairs

Betty Lewis, graduate faculty representative, Field of Nutrition

T. Colin Campbell and William Arion, division honors chairs

## THE DIVISION

Nutritional science deals with the intricate relationship of food, nutrition, and health. At Cornell, the focal point for this broad field of study, which ranges from nutrient chemistry to world hunger, is the Division of Nutritional Sciences.

The division is affiliated with both the College of Human Ecology and the College of Agriculture and Life Sciences and brings together specialists from many disciplines in the biological and social sciences. Their work covers undergraduate and graduate teaching, nutrition research, and public education, including cooperative extension services.

The faculty in the division are working toward two closely related goals: increasing our knowledge of nutrition and health, and applying what we know to people's everyday problems. This approach carries over to undergraduate education. Students who major in nutritional sciences learn how to interpret basic research from the laboratory and from the social sciences. They also come to understand the practical implications of their studies. Many students have the chance to test out their ideas by conducting a research project or working in the community.

## FACILITIES

Most of the faculty members of the division work in Savage Hall and Martha Van Rensselaer Hall. In addition to housing offices, classrooms, and seminar rooms, those buildings contain animal-care and research facilities, specialized laboratories, a human metabolic research unit, and interactive terminals for the university's computer system.

Savage Hall also has a graduate reading room, and in Martha Van Rensselaer Hall the division has set up the Learning Resources Center, which many undergraduates use for individual study and small group discussions. The Learning Resources Center contains class materials, audiovisual aids, and supplementary books and periodicals for independent study and special projects in nutrition.

## THE MAJOR

The B.S. degree program with a major in nutritional sciences (NS) offers five major options, but all of them give students a thorough foundation in the basic sciences, the field of nutrition, and communication skills. Graduates are qualified for a variety of entry-level positions in laboratory research, consumer affairs, nutrition education, and clinical and public-health services. All students are well prepared to pursue dietetic training or advanced study in fields such as nutrition, food science, biomedical sciences, and public policy.

Most undergraduates who major in nutritional sciences enroll in the College of Human Ecology. Students in the College of Agriculture and Life Sciences can also pursue a nutritional sciences option through the General Studies Program, and students in the College of Arts and Sciences can take a nutrition concentration as an independent option in the Division of Biological Sciences. Nutrition courses can be used to meet graduation requirements in all three colleges.

## ACADEMIC ADVISING

Every student majoring in nutritional sciences is assigned a faculty adviser from the division. An effort is made to match interests, and students may change advisers at any time if their goals and interests change. Regular student-adviser conferences are required at least twice a year. The adviser not only helps students select courses but can often suggest opportunities for individual study or experience outside the classroom.

The specific course requirements for graduation and for each major option are listed in the Human Ecology *Student Guide*, available on request. Questions about undergraduate study should be addressed to Carole Bisogni, associate director for academic affairs, 334 Martha Van Rensselaer Hall.

## THE CORE CURRICULUM

In their freshman and sophomore years, all undergraduates majoring in nutritional sciences follow a core curriculum that builds the foundation for any aspect of advanced study in nutrition. The core curriculum includes courses in food and nutrition, laboratory skills, humanities and communications, introductory social sciences, and basic sciences. There is some choice of science courses, but all nutrition students need a good background in general and organic chemistry, biochemistry, microbiology, physiology, and mathematics.

Transfer students need to pay particular attention to the core curriculum and may need to take an extra semester to fulfill all of the basic requirements, especially in the sciences. The course NS 300, Special Studies for Undergraduates, which allows students to take "pieces" of courses, helps transfer students integrate their previous training into the requirements for the nutritional sciences major without duplicating course work.

By their junior year, students start taking the more specialized courses required for the nutritional sciences option they choose: experimental and consumer food studies, nutrition, nutritional biochemistry, clinical nutrition, or community nutrition. The core curriculum ensures that they can move into any option or change options.

## OPTIONS

### Option I: Experimental and Consumer Food Studies

Students electing this option concentrate on basic and applied science courses, including physicochemical aspects of food, experimental food methods, and nutrition. From this option, students are prepared to pursue graduate study in food and/or nutritional sciences. With their knowledge of how the composition and treatment of food affect food quality, safety, acceptability, and nutritive value, graduates find jobs in dietetics, food service, development and evaluation of food products, food and nutrition education, consumer service, and public policy. To support those career options, additional course work is recommended in areas such as dietetics, food service administration, communications, economics, government, public policy, marketing, and management.

### Option II: Nutrition

This option is designed for students with an interest in the scientific basis of nutrition and who may also wish to undertake an interdisciplinary program with other areas such as food sciences, communications, health, human development, or policy. The program includes lectures and laboratory experience in biochemistry, physiology, and microbiology to provide a sound scientific basis for graduate study in either nutrition or food sciences. The option allows the student to plan an individual concentration of courses in a selected area to supplement the fundamental training in nutrition and to meet specific career goals.

### Option III: Nutritional Biochemistry

This basic science-oriented curriculum prepares students for advanced study in the nutritional and biomedical sciences. Students who wish to explore more broadly the scientific basis of food and nutrition may wish to concentrate in this area. Courses and laboratory work in chemistry, biochemistry, and physiology help develop a deeper understanding of nutrient action at the cellular and subcellular levels.

### Option IV: Clinical Nutrition

This option builds on the basic science core to give a solid foundation in the biological aspects of human nutrition in health and disease. Designed for students interested in pursuing advanced study in human nutrition or medicine, the program stresses courses and laboratory work in the natural and biological sciences, with an emphasis on application to human problems.

### Option V: Community Nutrition

This option gives students the skills to help people translate nutritional knowledge into action. It provides a strong background in basic and nutritional sciences but also includes supporting courses in the social sciences and communications. Students are prepared to pursue graduate study in community nutrition, public health nutrition, and related fields. Practical experience through supervised field study is strongly recommended and is an asset to finding entry-level positions in community nutrition, including nutrition education.

## CAREER PLANNING

Major requirements represent the minimum course work for each option. With an adviser's help, students can add courses and special experiences that will meet their career interests.

There is some choice among the basic sciences regardless of the options selected. All students who have adequate preparation in high school mathematics and chemistry are encouraged to take Chemistry 207-208.

Students considering advanced study at a graduate or medical school should select science alternatives that prepare them for admission. Many graduate schools require a year of college mathematics, biology, organic chemistry, and in some cases, physics, for entrance.

Students interested in dietetics in applied nutrition should consider planning their course work to meet the requirements for membership and registration in The American Dietetic Association (ADA). Advisers in the division will help students plan their course work to meet the ADA's academic requirements and will counsel them on applying for internships. Additional information on the dietetics program at Cornell can be obtained from Rose Marie Holmes, N206B Martha Van Rensselaer Hall, and Joan M. L. Koch, 373 Martha Van Rensselaer Hall.

## FIELD STUDY PROGRAM

Structured field experience in a community agency or health-care facility can be taken for credit in several ways: through an independent study course, as a class project, or as a summer study project.

## INDEPENDENT STUDY ELECTIVES

Independent study courses (NS 400, 401, 402) can be used to obtain credit for more diverse or intensive experience than the classroom can offer, whether this involves laboratory work, library research, or field study. Any student interested in independent study should obtain the sponsorship of a faculty adviser and the approval of Carole Bisogni or consider applying to the honors program.

## HONORS PROGRAM

The honors program, leading to a B.S. degree with honors in nutritional sciences, gives official recognition to students who have demonstrated excellence in their academic work and their capacity for independent study.

In addition to fulfilling the requirements for a major option in nutritional sciences, students in the honors program take courses on designing and evaluating research, complete an original piece of research, and prepare an honors thesis. The honors project may be laboratory or field research or deal with policy and program development. Animals may be used in some research studies.

For more information, students should contact T. Colin Campbell, N204 Martha Van Rensselaer Hall or William Arion, 227 Savage Hall, honors chairs.

## EXERCISE SCIENCE CONCENTRATION

Students interested in physical fitness and nutrition may pursue a concentration in exercise science through a special program with the School of Health, Physical Education, and Recreation at Ithaca College. This program includes elective courses in fitness measurements, exercise physiology, and the biomechanics of human movement. For further information, contact Carole Bisogni, associate director for academic affairs, 334 Martha Van Rensselaer Hall.

## COURSES RECOMMENDED FOR NONMAJORS

Courses in nutritional sciences can strengthen programs of study in biological science, medicine, agriculture, food science, human services, and other fields.

Introductory courses in nutrition (NS 115) and food (NS 146) are open to all students, as are some special-interest courses (NS 222, Maternal and Child Nutrition; NS 325, Sociocultural Aspects of Food and Nutrition; and NS 457, National and International Food Economics).

Nonmajors who have taken college courses in chemistry, biological sciences, and nutritional sciences may elect advanced food and nutrition courses with the permission of the instructor.

## GRADUATE PROGRAMS

Graduate study is administered by the Field of Nutrition, a group of more than forty faculty members from throughout the university who have a common interest in nutritional problems. In the M.S. and Ph.D. degree programs, students may major in animal nutrition, human nutrition, international nutrition, nutritional biochemistry, foods, or general nutrition. A professional Master of Nutritional Science (M.N.S.) degree in clinical nutrition combines academic study and research on campus with clinical training at affiliated institutions in upstate New York and New York City. Field experience is also a component of concentrations in community nutrition, public-health nutrition, and nutrition education.

The specialties and interests represented by faculty in the Field of Nutrition provide almost unlimited opportunity for graduate study. Cornell's extensive laboratory and agricultural facilities ensure that students interested in experimental nutrition have exceptional choice and thorough training. As the largest faculty in the country devoted to the study of human nutrition, the field includes specialists in biochemical, metabolic, epidemiological, and sociocultural research. Opportunities to work with community and federal agencies are available to students interested in applied nutrition and public policy, and students in international nutrition are expected to conduct their thesis research abroad.

For more information about the graduate program, interested persons may write for the brochure *Graduate Study in Nutrition*, available from the Graduate Faculty Representative, Field of Nutrition, Cornell University, Savage Hall, Ithaca, New York 14853-6301.

## COURSES

**115 Ecology of Human Nutrition and Food**

Fall. 3 credits. Prerequisites: fall, high school biology (juniors and seniors with advanced biological science background should check with the instructor); spring, a one-semester college biology course. S-U grades optional.

Fall: M W F 1:25; spring: M W F 11:15. Four discs scheduled in place of some lecs. Evening prelims, times to be arranged. D. Levitsky and staff.

An introduction to the field of human nutrition and food. Human nutritional needs are considered from the perspective of the "new" nutrition, including problems encountered in providing food to meet nutritional needs; relationships among physiological needs, sociocultural systems, food, and the significance of those relationships to health promotion and disease prevention. Discussion of current issues such as weight control, vegetarianism, athletes' diets, heart disease, and cancer prevention.

**146 Introductory Foods**
Fall and spring. 3 credits. Each section limited to 16 students. Prerequisite: NS 115 or concurrent registration. Permission of instructor during course registration required (permission-of-instructor forms must be obtained from and returned to 335 Martha Van Rensselaer Hall).

Lec, M 12:20; labs, T R 10:10–12:05 or 2:30–4:25. Evening prelims: times to be arranged. J. M. L. Koch.

Criteria for evaluating the practice of the science of food and nutrition. Laboratory includes an introduction to the physiochemical properties of food and the relationship of those properties to preparation techniques and palatability characteristics of food. Meal preparation, focusing on human nutritional needs and the management of money and time, is included.

**222 Maternal and Child Nutrition**
Spring. 3 credits. Prerequisites: NS 115 and a college biology course. S-U grades optional.

M W F 1:25. Evening prelims, times to be announced. V. Utermohlen.

Involves the study of nutritional requirements in pregnancy, lactation, infancy, and childhood growth through adolescence. Topics include the relationship between maternal diet and pregnancy outcome; analysis of different methods of infant feeding; and nutritional status of pregnant women, children, and adolescents in the United States and in developing countries.

**246 Introduction to Physicochemical Aspects of Food**
Fall or spring. 4 credits. Each section limited to 18 students. Prerequisites: a college course in organic chemistry or biochemistry, NS 146, and permission of instructor during course registration (permission-of-instructor forms must be obtained from and returned to 335 Martha Van Rensselaer Hall). S-U grades optional.

Lecs, T R 9:05; labs: fall M W 2–4:25 or T R 10:10–12:25; spring M W 2–4:25 or T R 2–4:25. Fall, B. Lewis; spring, B. Lewis and R. Parker.

A study of (a) the colligative properties of solutions; (b) colloidal systems—sols, gels, foams, and emulsions; (c) physical and chemical properties of the major groups of foods, the effect of basic methods of food preparation and preservation on these properties, and their relation to food quality—especially color, flavor, and texture. Laboratories introduce the experimental study of food and illustrate the function of ingredients and effect of treatment on food quality.

**300 Special Studies for Undergraduates**
Fall or spring. Prerequisites: permission of instructor. S-U grades optional.

Special arrangements to establish equivalency for courses not transferred from a previous major or institution. Students prepare a description of the study they want to undertake on a form available from the Student Services Office. The form, signed by both the instructor directing the study and the associate director for academic affairs, is filed at course registration or during the change-of-registration period.

**301 Nutritional Aspects of Raw and Processed Foods (also Food Science 301)**
Spring. 3 credits. Prerequisites: organic chemistry and Food 100 or NS 115. S-U grades optional.

M W F 9:05. D. Miller.

An evaluation of factors that affect the nutritional quality of foods and diets. Nutritional quality is defined. Methods and approaches for assessing nutritional quality are presented. Factors that may alter the nutritional quality of foods and food supplies (e.g., agricultural practices, processing, storage, cooking, fortification, government regulations, and new technologies) are discussed.

**315 Obesity and the Regulation of Body Weight (also Psychology 315)**
Spring. 3 credits. Prerequisites: NS 115, Psych 101.

T R 1:30–3. D. Levitsky.

This course is a multidisciplinary discussion of the causes, effects, and treatments of human obesity. Topics include the biopsychology of eating behavior, genetics of obesity, role of activity and energy metabolism, psychosocial determinants of obesity, anorexia nervosa, therapy and its effectiveness, and social discrimination.

**325 Sociocultural Aspects of Food and Nutrition**
Fall. 3 credits. Limited to juniors and seniors. Prerequisites: NS 115 and a college course in anthropology or sociology.

M W F 2:30. D. Sanjur.

The course offers a cross-cultural perspective for understanding the environmental and sociocultural parameters affecting the development of food consumption patterns. Emphasis is on theories on formation of food habits, dietary methodologies, ethnicity and food habits, and educational programs in nutrition, in national and international contexts.

**331 Physiological and Biochemical Bases of Human Nutrition**
Spring. 3 credits. Prerequisites: Biological Sciences 330 or 331 or equivalent and NS 115 or permission of the instructor. S-U grades optional.

M W F 10:10. M. H. Stipanuk.

The biochemical and physiological bases for human nutritional requirements, including digestion and absorption, energy metabolism, food intake regulation, lipids, carbohydrates, protein and amino acids, minerals, vitamins, and relationship of nutrition to major chronic diseases.

**332 Laboratory Methods in Nutritional Sciences**
Spring. 3 credits. Each section limited to 18 students. Prerequisites: NS 331 or concurrent registration and permission of instructor during course registration (permission-of-instructor forms must be obtained from and returned to 335 Martha Van Rensselaer Hall).

Lec, M 12:20; labs, M W 1:25–4 or T R 8:15–10:45 or T R 1:25–4. M. Kazarinoff.

Introduction to principles and procedures of experimental design, analytical techniques, and data analysis in human nutrition. Emphasis on methods of analysis of nutrients and metabolites in food, tissues, and body fluids. Application of these methods in assessing physiological and biochemical responses to alterations of nutrient intake in animal and human studies.

**347 Human Growth and Development: Biological and Social Psychological Considerations (also Human Development and Family Studies 347)**
Spring. 3 credits. Prerequisites: Biological Sciences 101 or 109 or equivalent; Human Development and Family Studies 115 or Psychology 101 and NS 115 or equivalent. Offered alternate years. Not offered 1990–91.

M W F 1:25. J. Haas, S. Robertson.

A review of major patterns of physical growth from the fetal period through adolescence, with consideration of biological and socioenvironmental determinants of growth, as well as physical and psychological consequences of variations in growth patterns. An examination of normal patterns of growth is followed by an analysis of major sources of variations (normal and atypical).

**349 Geriatric Nutrition**
Fall. 3 credits. Prerequisites: NS 115.

M W F 10:10. D. Roe.

Aims of the course are to acquaint students with effects of aging on nutritional needs; to teach them methods of nutritional assessment that are appropriate for use with the elderly; and to give them information on nutritional interventions that have been shown to have positive effects on the nutritional and health status of older individuals.

**361 Biochemistry and Human Behavior (also Psychology 361)**
Fall. 3 credits. Prerequisites: Biological Sciences 101–102, Chemistry 103–104, Psychology 123, or permission of instructor. A fundamental knowledge of human biology and chemistry is essential. S-U grades optional.

M W F 11:15. D. Levitsky.

A survey of the scientific literature on the role of brain and body biochemical changes as determinants of human behavior. The topics covered include action and effects of psychopharmacologic agents, biochemical determinants of mental retardation, biochemical theories of psychosis, and effects of nutrition on behavior.

**378 Management Principles in Foodservice Operation**
Spring. 4 credits. Prerequisites: NS 246 and Agricultural Economics 220 or equivalent, or permission of instructor. S-U grades optional.

T R 10:10–12:05. R. Holmes.

Application of management principles to foodservice operations involved in the production, distribution, and service of quality food in quantity. Topics include menu planning, foodservice layout and design, production and service controls, purchasing, food-cost control, personnel management, sanitation, safety, and computers.

**398 Honors in Nutritional Sciences**
Fall. 1 credit. Limited to students admitted to the division honors program. S-U grades only.

T 2:30–4. T. C. Campbell.

Research design. Analysis of research papers on selected topics.

**400–401–402–403 Special Studies for Undergraduates**
Fall or spring. Credits to be arranged. S-U grades optional.
Division faculty.
For advanced independent study by an individual student or for study on an experimental basis with a group of students in a field of nutritional sciences not otherwise provided through course work in the division or elsewhere at the university. Students prepare a description of the study they want to undertake on a form to be signed by the instructor directing the study and the associate director of academic affairs. The form, available from the Counseling Office, is filed at course registration or within the change-of-registration period. To ensure review before the close of the course registration or change-of-registration period, students should submit the special-studies form to the associate director for academic affairs as early as possible.

**400 Directed Readings**
For study that predominantly involves library research and independent reading.

**401 Empirical Research**
For study that predominantly involves data collection and analysis or laboratory or studio projects.

**402 Supervised Fieldwork**
For study that involves both responsible participation in a community setting and reflection on that experience through discussion, reading, and writing. Academic credit is awarded for this integration of theory and practice.

**403 Teaching Apprenticeship**
For study that includes assisting faculty with instruction.

**[415 Field-based Learning in Nutrition**
Fall, spring, or summer. 2–6 credits. S-U grades optional. Prerequisites: junior, senior, or graduate standing; 9 hours of coursework in NS; participation in prefield activities and a training workshop; and permission of instructor. Obtain application/questionnaire outside of 335 Martha Van Rensselaer Hall. Not offered 1989–90.
Hours in placement arranged individually; biweekly seminar to be announced.
Undergraduate and graduate students are placed, according to their interests and backgrounds, in organizations and agencies that provide nutrition and food services. Placements are individually designed to enable students to develop critical-thinking skills related to nutrition and food issues. A biweekly seminar provides a basis for the sharing of experiences among students, with a focus on the attainment of communication skills appropriate to the field of nutrition. Students may be required to provide their own transportation to placements.]

**441 Nutrition and Disease**
Fall. 4 credits. Prerequisites: NS 331 and a human physiology course. S-U grades optional.
M W F 10:10 and F 8. V. Utermohlen.
Study of the physiologic and metabolic anomalies in chronic and acute illnesses and the principles of nutritional therapy and prevention. The topics covered include diabetes mellitus, starvation, obesity, nutritional assessment, nutritional pharmacology, severe injury, infection, cancer, gastrointestinal diseases, liver disorders, renal diseases, cardiovascular diseases, and pediatrics. Original research papers, books, review papers, and publications of professional organizations are used throughout the course.

**442 Diet Formulation and Analysis**
Fall. 2 credits. Limited enrollment. Prerequisites: NS 146, concurrent registration in NS 441 (or equivalent background in either course), and permission of instructor during course registration. (Permission-of-instructor forms must be obtained from and returned to 335 Martha Van Rensselaer Hall.) S-U grades optional.
Lec, M 9:05; lab 1 T 2:30–4:20, lab 2 R 11:15–1:10. A. Kendall Casella.
Development of skills in formulation and analysis of therapeutic dietary regimes. Various sources of information on food composition, diet planning, and enteral and parenteral nutrition supplements are used.

**445 Community Nutrition and Health**
Spring. 3 credits. Prerequisites: NS 331 or concurrent enrollment in 331. Recommended: NS 325. S-U grades optional. The field-project component of this course may involve off-campus activity; students are responsible for their own transportation or bus fare.
M F 11:15; disc, W 2:30–4:30. C. Olson.
Study of human nutrition and health problems from a community perspective; programs and policies related to nutrition at local, state, and federal levels; and approaches and techniques of effective application and dissemination of nutrition knowledge in communities.

**446 Physiochemical Aspects of Food**
Fall. 3 credits. Prerequisites: NS 246 and a college course in biochemistry, which may be taken concurrently. S-U grades optional.
M W F 9:05. G. Armbruster.
The relation of food quality to (a) rheological properties of food systems, (b) oxidation and reduction reactions, and (c) enzymatic and nonenzymatic browning. Covers physical and chemical factors accounting for the color, flavor, and texture of natural and processed foods.

**447 Physiochemical Aspects of Food—Laboratory**
Fall. 1 credit. Limited to 16 students. Prerequisite: NS 446 or concurrent registration. S-U grades optional.
T 1:25–4:25. G. Armbruster.
Laboratory experiments designed to illustrate the effect of varying ingredients and treatment on the quality of food products. Objective testing methods are used to determine food quality characteristics.

**448 Physiochemical Aspects of Food—Laboratory**
Fall. 1 credit. Limited to 16 students. Prerequisite: NS 446 or concurrent registration. S-U grades optional.
R 1:25–4:25. G. Armbruster.
Laboratory experiments designed to illustrate (a) the physiochemical behavior of colloidal systems, (b) chemical reactions of some food components, and (c) effects of temperature, pH, moisture, inorganic salts, and enzymes on physiochemical changes in natural foods, food components, and food mixtures.

**456 Experimental Foods Methods**
Spring. 3 credits. Limited to 16 students. Prerequisites: NS 446 and 448. Recommended: a course in statistics.
Labs, T R 1:25–4:25. G. Armbruster.
Application of the scientific method in the design and performance of experimental food problems and the interpretation and evaluation of results. Evaluation of the use of instruments and chemical and sensory methods in the measurement of food properties. Independent problems.

**457 National and International Food Economics**
Spring. 3 credits. Prerequisites: Econ 101 or CEH 110 and junior standing, or permission of instructor. S-U grades optional.
M W F 9:05. E. Thorbecke.
Examination of individual components essential for an understanding of the United States and world food economies. Analysis of the world food economy. Review and analysis of (a) the major economic factors determining the demand for food, the composition of food consumption, and nutritional intake; and (b) the major economic factors affecting food production and supply. Examination and evaluation of the effectiveness of various food policies and programs in altering food consumption patterns. Principles of nutritional planning in developing countries within the context of the process of economic and social development.

**488 Advanced Management in Foodservice Systems**
Spring. 3 credits. Limited to 30 students. Prerequisites: NS 378, Microbiology 290 and 291, a course in learning theory, and permission of instructor during course registration (permission-of-instructor forms must be obtained from and returned to 335 Martha Van Rensselaer Hall). S-U grades optional. Possible field trip. Uniform required.
Lec, M 2–4:10; lab, T W or R 1:30–6.
J. Koch.
Some laboratories will be arranged through Cornell Dining. Other experiences may be possible in community foodservice operations. Students will gain experience in care and use of institutional equipment, recipe development, job analysis, volume food production, applied sanitation, and in-service training, as well as other management skills required to operate a foodservice program.

**498 Honors in Nutritional Sciences**
Spring. 1 credit. Limited to students admitted to the division honors program. Students may register in NS 499 concurrently.
T 2:30–4. W. Arion, coordinator.
Informal presentation and discussion of current topics in food and nutrition in which all members participate. Written reports on topics discussed may be requested. Delineation of honors research problems in consultation with faculty adviser.

**499 Honors Problem**
Fall and spring. Credits to be arranged. Open only to students in the division honors program.
Disc, T 11:15, plus additional hours to be arranged. Division faculty; W. Arion, coordinator.
An independent literature, laboratory, or field investigation. Students should plan to spread the work over two semesters.

**600 Special Problems for Graduate Students**
Fall or spring. Credit to be arranged. Limited to graduate students recommended by their chair and approved by the instructor in charge. S-U grades optional.
Hours to be arranged. Division faculty.
Emphasis on independent advanced work. Experience in research laboratories in the division may be arranged.

**601–604 Advanced Nutrition Series**
A series of nutrition courses offered jointly by the Division of Nutritional Sciences and the Departments of Animal Science and Poultry Science. Prerequisites: courses in nutrition, physiology, and biochemistry, including intermediary metabolism, or permission of instructor.

**[601 Proteins and Amino Acids (also Animal Science 601)**
Fall. 2 credits. Prerequisites: physiology, biochemistry, and nutrition, or permission of instructors. Letter grade only. Offered even-numbered years. Next offered 1990–91.
Hours to be arranged. R. E. Austic.
A course in amino acid and protein nutrition with emphasis on the dynamic aspects of protein digestion and amino acid absorption, protein and amino acid metabolism, nutrient interrelationships, assessment of protein quality, and amino acid availability and amino acid requirements in humans.]

**602 Lipids**
Fall. 2 credits.
T R 11:15. A. Bensadoun.
Advanced course on biochemical, metabolic, and nutritional aspects of lipids. Emphasis is on critical analysis of current topics of lipid methodology, lipid absorption, lipoprotein secretion, structure, and catabolism; mechanisms of hormonal regulation of lipolysis and fatty acid synthesis; and cholesterol metabolism and atherosclerosis.

**604 The Vitamins**
Fall. 2 credits.
T R 10:10. G. F. Combs, Jr.
Lectures on nutritional aspects of the vitamins, including recent developments in nutritional and biochemical interrelationships with other nutrients and metabolites.

**[607 Nitrogen Metabolism (also Biological Sciences 650)**
Spring. 2 credits. Prerequisites: Chemistry 358 or 360 and Biological Sciences 330 or 331, or permission of instructor. Offered alternate years. Not offered 1989–90; next offered 1990–91.
T R 9:05. Staff.
The course will cover most aspects of nitrogen metabolism. The first section will consider nitrogen fixation and assimilation in bacteria and the metabolism and biological importance of purines, pyrimidines, porphyrins, alkaloids, and amines. This will be followed by discussion of the pathways of amino acid biosynthesis and degradation. The final section will include discussion of protein turnover and degradation, nitrogen excretion, and interorgan relationships in higher organisms. Emphasis throughout the course will be on hormonal, developmental, and molecular biological aspects of metabolic regulation and evolutionary differences.]

**611 Molecular Toxicology (also Toxicology 611)**
Spring. 2 credits. Prerequisite: full-year 400-level course in biochemistry or equivalent. S-U grades optional. Offered alternate years. Not offered 1990–91.
Hours to be arranged. C. Wilkinson and others.
A study of fundamental biochemical mechanisms of absorption, transport, metabolism, and excretion of drugs, carcinogens, and toxicants. Emphasis on oxidative and conjugative pathways of metabolism and of environmental and nutritional factors that influence toxicant metabolism and disposition. Methods of evaluating *in vivo* and *in vitro* metabolism.

**612 Methods of Assessing Physical Growth in Children**
Spring. 3 credits. Limited to graduate students and students who have permission of the instructor. A previous course in statistics required. S-U grades optional.
Lec, T 1:25; labs, R 1:25–4:25; disc, T 2:15–3:05. J. Haas.
A laboratory course to train students in methods and techniques used to assess the physical growth and development of children. The methods explored are those applicable for field or community studies and cover anthropometry, body composition, skeletal age, maturity indicators, physical fitness, and energy expenditure.

**[614 Topics in Maternal and Child Nutrition**
Fall. 3 credits. Prerequisites: NS 331, and 222 or 347, Biological Sciences 311, and permission of instructor. Not offered 1989–90.
T R 9:05–10:30. K. Rasmussen.
Advanced course on the role of nutrition during pregnancy and lactation. Feeding and growth of infants and children in health and disease is considered. Critical evaluation of current literature is emphasized.]

**616 Readings in Food**
Fall. 2 credits. Prerequisite: organic chemistry. Recommended: biochemistry. S-U grades optional. May be repeated for credit with permission of instructor.
W 7:30–9:25 p.m. N. Mondy.
Critical review of selected topics in the current literature. Emphasis on experimental data and basic scientific principles underlying modern theory and practice relative to food quality. Training in oral and written presentations of scientific information.

**617 Teaching Seminar**
Fall or spring, first half of semester. 1 credit. Limited to division graduate students and students who have permission of the instructor. S-U grades only.
W 4:30–6. C. Bisogni, D. Taylor-Way.
A series of workshops focusing on development of teaching skills for guiding classroom learning in lecture, discussion, and laboratory settings. Preparation of content, presentation, and interaction techniques and evaluative methods are emphasized in relation to the student's specific teaching assignment. Videotape simulations provide opportunity for practice and analysis of teaching behaviors.

**618 Teaching Experience**
Fall or spring. No credit. Limited to division graduate students and students who have permission of instructor.
Hours to be arranged. Division faculty; C. Bisogni, coordinator.
Designed to provide experience in teaching nutritional sciences by direct involvement in college courses under supervision of a faculty member. The aspects of teaching and the degree of involvement vary, depending on the needs of the course and the experience of the student.

**619 Field of Nutrition Seminar (also Animal Science 619)**
Fall or spring. No credit. S-U grades only.
M 4:30. Faculty and guest lecturers.
Lectures on current research in nutrition.

**620 Food Carbohydrates (also Food Science 620)**
Spring. 2 credits. Prerequisites: Biological Sciences 330 or equivalent. Letter grades only. Offered alternate years; not offered 1990–91.
T R 10:10. J. Brady, B. Lewis, R. Shallenberger.
A consideration of the chemistry of carbohydrates, including sugars and complex carbohydrates (starches, pectins, hemicelluloses, gums, cellulose, and conjugated carbohydrates). Emphasis is on intrinsic chemistry, functionality in food systems, and changes occurring during food processing and storage.

**626 Special Topics in Food**
Spring. 2 credits.
Hours to be arranged. G. Armbruster, B. Lewis.
Current research related to food is reviewed in the context of basic principles and their application to the quality of food.

**627 Special Topics in Food**
Spring. 2 credits. Prerequisite: organic chemistry. Recommended: biochemistry. S-U grades optional. May be repeated for credit with permission of instructor.
W 7:30–9:30 p.m. N. Mondy.
Current research related to international food production and processing and toxicants in the food chain.

**630–633 Advanced Nutrition Laboratory**
Fall or spring. 1–5 credits. Limited to 12 students.
630: T 2:30–5:30, S 9–12. 631–633: T R 2:30–5:30. Division faculty.
Laboratories on the anthropometric, dietary, clinical, and biochemical assessment of human nutritional status. The individual courses are taught in sequence over the entire semester. Any or all of the modules may be taken for credit.

**630 Anthropometric Assessment**
Spring, weeks 1–3. 1 credit. Prerequisites: NS 331 or equivalent and permission of instructor.
T 2:30–5:30, S 9–12. J. Haas.
Presentation of methods and procedures for anthropometric, radiographic, and energetic assessment of children and adults in clinical, research, and survey settings.

**631 Dietary Assessment**
Fall. 1 credit. 7 weeks only. Prerequisites: statistics and NS 331 or equivalent. Enrollment limited.
R 2:30–5:30. D. Sanjur.
Study of methods and techniques for assessing dietary intakes at the individual and household levels.

**632 Clinical Assessment**
Spring. 1 credit. Prerequisites: NS 441, 630, 631, and Biological Sciences 330 or 331; NS 332 or Biological Sciences 430; and permission of instructor.
T R 2:30–5:30. V. Utermohlen and division faculty.
Study of methods and techniques for clinical assessment of nutritional status and diagnosis of nutritional disorders.

**633 Human Metabolic Studies**
Spring. 1 credit. Prerequisite: NS 331. Limited to 20 students. S-U grades optional.
Hours to be arranged; 6 meetings over a 3-week period, 2-1/2 hours each. D. Roe.
Instruction in the principles of human metabolic studies and how these are carried out. Includes how to plan and write a protocol for a study; how to select an appropriate experimental design; how to select subjects; how to design, prepare, and analyze diets; how to make collections of urine and feces; and how to examine data for subject period and treatment effects. Assigned readings, which will be discussed in class, will be from selected recent papers in which techniques of human metabolic studies are described. Learning experiences will include participation in a six-day study.

**634 Vitamins and Coenzymes (also Biological Sciences 634)**
Spring. 2 credits. Prerequisites: organic chemistry 253 or 357–358 and Biological Sciences 330 or 331, or their equivalents in biochemistry. Offered alternate years. Not offered 1990–91.
T R 10:10. M. N. Kazarinoff.
The chemical, biochemical, and nutritional aspects of the vitamins and coenzymes.

**635 Mechanisms of Metabolic Regulation (also Biological Sciences 635)**
Spring. 2 credits. Prerequisites: Chemistry 358 or 360 and either Biological Sciences 330 or 331 or permission of instructor. Offered alternate years, alternating with NS 607/BS 650, Nitrogen Metabolism. Not offered 1990–91.
T R 9:05. T. C. Campbell, R. Schwartz, W. Arion.
Lectures only. The identification and characterization of regulatory steps in metabolism are considered from both theoretical and practical aspects. The intracellular mechanisms of regulation are stressed, with specific examples examined in detail.

**636 Integration and Coordination of Energy Metabolism (also Biological Sciences 637)**
Fall. 3 credits. Prerequisites: Biological Sciences 330 and 331, or equivalent.
M W F 9:05. W. J. Arion.
The elements and dynamics of energy metabolism in higher animals are systematically developed through biochemical characterizations of the metabolic components and structure of major tissues and organs, stressing correlations with physiologic functions.

Mechanisms that control energy metabolism within individual tissues and coordinate these processes in an intact animal are analyzed in the contexts of selected physiologic and pathologic stresses.

**637 Epidemiology of Nutrition**
Fall. 2 credits. Taught in conjunction with Advanced Epidemiology (Vet Med 665). Limited to graduate students. Prerequisites: Statistics and Biometry 602 or 604 or equivalent, NS 331 or equivalent, Vet Med 664 or equivalent.
Hours to be announced. J.-P. Habicht.
Course covers principles of nutritional epidemiology, impact assessment of nutrition intervention programs, and nutritional surveillance. Teaching principles of using nutritional information for decision making, including the levels of evidence about nutrition and health for making decisions. The course shows how the biochemistry and physiology of nutrition can be related to epidemiological assessment and research strategies.

**638 Epidemiology of Nutrition Seminar**
Spring. 3 credits. Reserved for graduate students planning field intervention studies; by permission of instructor. Prerequisite: NS 636.
Hours to be announced. J.-P. Habicht.
Covers the meta-analysis, design, measurement, and analytic issues involved in developing, implementing, and analyzing studies of field interventions with nutritional impact.

**639 Epidemiology Seminar (also Statistics and Biometry 639)**
Fall and spring. 1 credit. Limited to graduate students; others by permission of instructor. S-U grades only.
Hours to be announced. J.-P. Habicht, H. Erb.
This course will develop skills in the preparation and interpretation of epidemiological data by discussing current research topics and issues.

**644 Community Nutrition Seminar**
Fall and spring. No credit.
Hours to be announced. A. Gillespie and faculty in Community Nutrition.
This seminar series focuses on research presentations in nutrition education and other areas of community nutrition. Cornell faculty and graduate students and outside invited speakers present research proposals, results from ongoing research, theoretical bases for research, program evaluations, and discuss current issues in community nutrition research. The format varies but always includes discussion by participants.

**645 Seminar on Community Nutrition Issues**
Spring. 2 credits. Limited to graduate students with a major or minor in human nutrition who have had a previous course in community nutrition.
M 1:25–3. A. Gillespie.
Students will be actively involved in discussing and undertaking community nutrition needs assessments, program planning and development, evaluation of impact, and the implications of public policy. Students will prepare a proposal as part of the coursework.

**646 Seminar in Physicochemical Aspects of Food**
Fall or spring. 1–3 credits. Prerequisite: a college course in organic chemistry or biochemistry. S-U grades optional.
T R 9:05; disc to be arranged. Fall, B. Lewis; spring, R. Parker.
An introduction to physicochemical aspects of food, for graduate students who have had limited or no work in this area. The seminar uses the lectures of NS 246 as a basis for supplementary readings and critical review of research on selected topics.

**650 Clinical and Public Health Nutrition**
Spring. 3 credits. For graduate students with a major or minor in nutrition and undergraduate nutrition majors in their senior year. Prerequisite: NS 331 or equivalent.
M W F 9:05. D. Roe.
Lectures cover social, environmental, and disease variables that influence the nutrition of infants, children, and adults. Students gain experience in nutritional assessment methods. Endemic nutritional problems (such as obesity, dental caries, and anemias) of public health importance of the United States are discussed. Student presentations are made in class. Field experience is offered.

**651 Nutrition and the Chemical Environment (also Toxicology 651)**
Fall. 3 credits. Prerequisite: NS 331 or equivalent. S-U grades optional.
M W F 11:15. D. Roe.
An overview of interactions between drugs and nutrients is presented. Specific lecture topics include food-drug incompatibilities, drug-induced nutritional deficiencies, and nutritional teratology. Students will obtain methods skills in selection of animal models, in nutritional pharmacology, and in research designs appropriate to human studies.

**652 Nutrition Counseling**
Spring. 2 credits. Prerequisites: NS 441 and 442 and permission of instructor. S-U grades only.
W 10:10–12:05. J. Koch.
Principles and procedures of nutritional counseling in clinical practice. Emphasis on subject matter and process skills necessary to develop, implement, and evaluate nutritional care plans for individuals and groups. Includes workshops, simulation techniques, and work with clients in selected settings.

**[659 The Nutrition, Physiology, and Biochemistry of Mineral Elements (also Veterinary Medicine 759 and Biological Science 615)**
Fall. 3 credits. Prerequisites: basic physiology, intermediate biochemistry, and general nutrition. Offered alternate years. Next offered 1990–91.
M W F 10:10. R. Schwartz, D. R. Van Campen, R. H. Wasserman, C. S. Fullmer, C. C. McCormick.
Lectures and discussions on nutritional aspects and physiological, biochemical, and hormonal factors relating to the major macro and micro elements. Included is information on the chemistry of ions and complexes, methods used in research on biologically important minerals, absorption, transport, homeostasis, essentiality, toxicity, and requirements of mineral elements. Lectures and class discussions will emphasize recent developments and experimental approaches.]

**660 Special Topics in Nutrition**
Fall or spring. 3 credits maximum each term. Registration by permission of the instructor.

Hours to be arranged. Division faculty.
Designed for students who want to become informed in any specific topic related directly or indirectly to nutrition. The course may include individual tutorial study, experience in research laboratories, a lecture series on a special topic selected by a professor or a group of students, and/or selected lectures of another course already offered. Topics may be changed so that the course may be repeated for credit.

**669 Field Seminar**
Spring. 1 credit. Limited to 15 students. Required for graduate students in clinical nutrition. Open to other graduate students in nutrition with permission of instructor. S-U grades only.

R. Holmes, V. Utermohlen.
This 2–3 day seminar provides an overview of policy decision making and implementation of nutrition programs at the state and national levels. Seminars alternate yearly between Washington, D.C. and Albany, NY. Provides opportunities to meet and confer with staff members of the legislature and selected government and private agencies. An orientation meeting and follow-up group discussion and summary report are also part of this seminar.

**670 Clinical Field Studies**
Fall, spring, or summer. 15 credits maximum. Limited to graduate students in clinical nutrition. Prerequisites: NS 441, 442, 630, 631, 632, 633 and 652. S-U grades only.

Full-time study at off-campus clinical sites. R. Holmes, V. Utermohlen.
The delivery of nutritional care in hospitals, outpatient clinics, and community settings.

**680 International Nutrition Problems, Policy and Programs**
Fall. 3 credits. Prerequisite: permission of instructor.

T R 11:15–12:30. J. Haas, J.-P. Habicht.
Designed for graduate students who want to learn about the important nutritional problems of developing countries. The major forms of malnutrition related to poverty and their underlying causes are discussed. Emphasis is placed on programs and policies that can assist poor countries and communities to improve their nutritional and health status.

**[681 Nutritional and Public Health Importance of Human Parasitic Infections**
Fall. 2 credits. Prerequisites: graduate student status or permission of instructor. S-U grades optional. Offered alternate years. Not offered 1989–90; next offered 1990–91.

M 1:25–3:20. L. Stephenson and staff.
Reviews the scientific evidence for relationships between human nutritional status and common human parasitic infections. Concentrates on malnutrition (protein-energy malnutrition, anemia) in developing countries. Parasitic infections emphasized are malaria, hookworm, ascaris, schistosomiasis, and trichuriasis. Format is lecture-demonstration-discussion.]

**682 Isotope Kinetics (also Biological Sciences 752)**
Spring. 2 credits. Prerequisite: calculus. S-U grades optional. Offered alternate years. Not offered 1990–91.

T 7:30–9:30 p.m. D. Zilversmit.
Quantitative analysis of the transport and distribution of nutrients, metabolites, and drugs in multicompartmental systems. The material will be presented as lectures, discussion groups, and problem sets.

**[683 Field Studies in International/ Community Nutrition**
Fall. 1 credit. Graduate student status or permission of instructor required. S-U grades only. Not offered 1989–90.

Hours to be arranged; 12 class hours on 3 Saturdays. L. Stephenson.
Reviews practical considerations in conducting field research in developing countries, including (1) seeking fundings (where, how, when), (2) experimental design issues (choice of population, design, sample sizes, ethics), (3) choice of procedures (laboratory and other), and (4) planning for and carrying out data collection (including specifics of purchasing equipment and supplies; transport of equipment, self and data; health precautions; and data collection and coding). Also includes how to a) construct a C.V., b) write an abstract and prepare a clear 10-minute talk with legible slides (FASEB formation), and c) when, where, and how to publish research results. Extensive handouts. Lecture/ demonstration/discussion.]

**685 Food and Nutrition Policy (also Agricultural Economics 685)**
Fall. 3 credits. Prerequisites: Consumer Economics and Housing 603 or Economics 311 or 313 or Agricultural Economics 415 or equivalent. Knowledge of multiple regression.

M W 1:15–2:25. P. Pinstrup-Andersen.
The course will identify the principal links between human nutrition and government action, with emphasis on developing countries. The process of policy formation, including economic and political factors, will be discussed. Political-economy issues, including the influence of and conflict among interest groups and rent-seeking behavior related to food and nutrition policies and programs, will be analyzed. The role of nutrition information and surveillance in policy design, implementation, and evaluation will be analyzed along with methodologies for empirical analysis of food and nutrition policy. Findings and analytical methodologies from case studies in developing countries will be used as appropriate. The role of improved nutrition in economic development as both an indicator of welfare and a productivity-enhancing factor as well as basic relationships among nutrition, poverty, food, health, and household behavior will be briefly presented at the beginning of the course to provide a context for policy discussions.

**695 Seminar in International Nutrition, Agriculture, and Development Policy (also International Agriculture 695)**
Spring. 1 credit. Prerequisite: Permission of instructor.

Hours to be announced. T. Brun.
Concentrates on major issues in food and nutrition policies as they relate to agriculture. Issues include Africa's nutritional and agricultural decline, lessons from socialist countries, the cash crop-food crop debate, land reform, the Green Revolution, "operation flood" and price policies, and the nutritional impact of agricultural programs. Emphasis is placed on agricultural policies that are leading to growth and equity.

**698 International Nutrition Seminar**
Fall and spring. No credit.

R 12:20–1:10. Fall, P. Pinstrup-Andersen; spring, D. Sanjur.
This seminar series consists of presentations by Cornell faculty and graduate students, and by outside invited speakers. Speakers cover a range of topics which relate to nutritional problems, policy, and programs in the non-industrialized countries. Some presentations consist of discussion of a proposed research protocol. Sometimes a debate or forum is organized to allow a broad-ranging discussion of an issue related to international food and nutrition.

**699 Special Topics in International Nutrition**
Fall and spring. 3 credits maximum each term. Registration by permission of instructor.

M. Latham and faculty in Program in International Nutrition.
This option is designed for graduate students, mainly those with a concentration in international nutrition, who wish to become familiar with some specific topic related to international nutrition that is not adequately covered in an existing course. Usually one or more students will approach a professor and arrange for tutorial study on an agreed topic. This will usually be achieved by extensive use of literature and discussions of this with the faculty members. In certain semesters it may consist of a small seminar or lecture course on a subject not now adequately convered in an existing course. On occasion it may involve laboratory or field work. Because the topics change, the course may be repeated for credit.

**700 Current Topics in Toxicology (also Toxicology 698)**
Fall or spring. 1–3 credits. S-U grades optional.

Hours to be arranged. Staff.
A discussion of the most current developments in various areas of toxicological research and testing. Faculty and students will participate jointly in evaluating research findings and provide seminars and discussion of such material. For information regarding topic, instructor, and credit, contact the office of the Graduate Field of Environmental Toxicology, 257 Clark Hall, 255–6047.

**702 Seminar in Toxicology (also Toxicology 702)**
Fall or spring. 1 credit. S-U grades only.
F 12:20. J. Scott.
The seminar program covers varied topics in biochemical, genetic, nutritional, veterinary, and regulatory toxicology and ecotoxicology and environmental chemistry. Included are presentations of basic research studies as well as fundamental concepts and research activities involving environmental problems of a toxicological nature. Presentations are given by speakers from Cornell and visitors.

**703 Seminar in Nutritional Science**
Fall or spring. 1 credit. S-U grades only.
T 12:20 or W 12:20. D. Zilversmit.

**899 Master's Thesis and Research**
Fall or spring. Credit to be arranged.
Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.
Hours to be arranged. Division graduate faculty.

**999 Doctoral Thesis and Research**
Fall or spring. Credit to be arranged.
Prerequisite: permission of the chair of the graduate committee and the instructor. S-U grades optional.
Hours to be arranged. Division graduate faculty.

## FACULTY ROSTER

Arion, William J., Ph.D., U. of N. Dakota. Prof.
Armbruster, Gertrude, Ph.D., Washington State U. Assoc. Prof.
Bensadoun, Andre, Ph.D., Cornell U. Prof., Nutritional Sciences/Physiology
Bisogni, Carole, Ph.D., Cornell U. Assoc. Prof.
Brink, Muriel, M.S., Michigan State U. Assoc. Prof.
Brun, Thierry, Ph.D., U. of California, Berkeley. Visiting Prof.
Campbell, Cathy C., Ph.D., Cornell U. Asst. Prof.
Campbell, T. Colin, Ph.D., Cornell U. Jacob Gould Schurman Professor of Nutritional Biochemistry
Chen, Junshi, M.D., Peking Medical College, China. Adjunct Prof.
Cowell, Catherine, M.S., U. of Connecticut. Adjunct Prof.
Crompton, D. W. T., Ph.D., Sc.D., U. of Cambridge (England). Adjunct Prof.
Garza, Cutberto, M.D., Baylor College; Ph.D., MIT. Director and Prof.
Gillespie, Ardyth, Ph.D., Iowa State U. Asst. Prof.
Haas, Jere D., Ph.D., Pennsylvania State U. Assoc. Prof.
Habicht, Jean-Pierre, Ph.D., Massachusetts Inst. of Technology. James Jamison Professor of Nutritional Epidemiology
Kazarinoff, Michael N., Ph.D., Cornell U. Assoc. Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology
Latham, Michael C., D.T.M.&H., U. of London (England). Prof.
Levitsky, David A., Ph.D., Rutgers U. Assoc. Prof.
Lewis, Bertha A., Ph.D., U. of Minnesota. Assoc. Prof.
Mondy, Nell I., Ph.D., Cornell U. Prof.
Nesheim, Malden C., Ph.D., Cornell U. Prof.
Olson, Christine M., Ph.D., U. of Wisconsin. Assoc. Prof.
Parker, Robert S., Ph.D., Oregon State U. Assoc. Prof.
Pinstrup-Andersen, Per, Ph.D., Oklahoma State U. of Agriculture and Applied Science. Prof.
Rasmussen, Kathleen M., Sc.D., Harvard U. Assoc. Prof.
Rivlin, Richard S., M.D., U. of London (England). Prof.
Roe, Daphne A., M.D., U. of London (England). Prof.
Sanjur, Diva M., Ph.D., Cornell U. Prof.
Schwartz, Ruth A., Ph.D., U. of London (England). Prof.
Stephenson, Lani, Ph.D., Cornell U. Assoc. Prof.
Stipanuk, Martha H., Ph.D., U. of Wisconsin. Assoc. Prof.
Thorbecke, Erik, Ph.D., U. of California. H. E. Babcock Professor of Economics and Food Economics
Utermohlen, Virginia, M.D., Columbia U. Assoc. Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology
Watford, Malcolm, Ph.D., U. of Oxford (England). Asst. Prof.
Zilversmit, Donald B., Ph.D., U. of California. Prof., Nutritional Sciences/Biochemistry, Molecular and Cell Biology

### Other Teaching Personnel

Holmes, Rose Marie, R.D., B.S. Iowa State University, Lecturer
Kendall Casella, Anne, R.D., Ph.D., Cornell University, Lecturer
Kock, Joan M.L., R.D., Ph.D. Cornell University. Senior Lecturer

### Joint Appointees

Apgar, B. Jean, Visiting Asst. Prof., U.S. Plant, Soil, and NutritionLaboratory/Nutritional Sciences
Austic, Richard E., Assoc. Prof., Poultry Science/Nutritional Sciences
Bauman, Dale, Prof., Animal Science/ Nutritional Sciences
Combs, Gerald F., Jr., Assoc. Prof., Poultry Science/Nutritional Sciences
Krook, Lennart P., Prof., New York State College of Veterinary Medicine/Nutritional Sciences
McCormick, Charles, Assoc. Prof., Poultry Science/Nutritional Sciences
Miller, Dennis, Assoc. Prof., Food Science/ Nutritional Sciences
Van Campen, Darrell R., Assoc. Prof., U.S. Plant, Soil, and Nutrition Laboratory/ Nutritional Sciences
VanSoest, Peter J., Prof., Animal Science/ Nutritional Sciences
Warner, Richard G., Prof., Animal Science/ Nutritional Sciences
Wasserman, Robert H., Prof., New York State College of Veterinary Medicine/Nutritional Sciences

# OFFICER EDUCATION

Military instruction began at Cornell University in 1868 under the provisions of the Morrill Act of 1862. Since that time, officer education has been highlighted by the construction of Barton Hall in 1914, establishment of a formal Reserve Officers Training Corps (ROTC) unit in 1916, and the evolution of a program that deemphasizes drill and formations and places greater stress on the development of leadership and managerial skills. Throughout the years Cornell's program of officer education has provided many outstanding civilian and military leaders well equipped for success as a result of knowledge and skills gained from their involvement in the Officer Education Program while pursuing undergraduate and graduate degrees.

The programs of officer education allow the student to prepare for a commission as an officer in either the United States Army, Navy, Marines, or Air Force. Each service program is headed by a senior military officer who also serves as a full professor on the Cornell faculty.

## MILITARY SCIENCE

Lieutenant Colonel Robert N. D'Entremont, Quartermaster Corps, United States Army, Professor of Military Science and Commanding Officer, U.S. Army ROTC Instructor Group

Major Steven A. Barrows, Field Artillery, United States Army

Major Edward R. Murdough, Engineer Corps, United States Army Reserve

Major Robert E. Newman, Field Artillery, United States Army National Guard

Captain James S. Jenkins, Jr., Infantry, United States Army

Captain Timothy M. Kaseman, Aviation, United States Army

### United States Army ROTC Program

The primary objective of the Army Officer Education Program at Cornell is to commission the officer leadership of the United States Army. Intermediate objectives are to provide students with an understanding of the fundamentals of responsibility, integrity, and self-discipline, as well as an appreciation of the citizen's role in national defense. The application of the decision-making process to a variety of situations is given major emphasis as a valuable aid in developing leadership potential.

These objectives are achieved through a program normally covering four years. A two-year program is available, however, and is discussed in a later section. The program includes specific courses in military science, more general academic subjects that assure a well-rounded education, practical training in leadership through participation in the Cadet Corps (including attendance at one six-week summer camp at an Army installation), and the opportunity to participate in a number of extracurricular activities. The combination prepares the student for commissioning and effective performance in the many branches of the Army. The student's academic major, academic performance, leadership ability, and personal desires and the needs of the Army determine the branch of the Army in which he or she is commissioned upon graduation.

### Requirements for Enrolling

Applicants must be citizens of the United States (Noncitizens may enroll in selected portions of the program.)

An applicant's vision must be correctible to a minimum of 20/20 in one eye and 20/400 in the other eye. Height must be at least sixty inches for men, fifty-eight inches for women, and no more than eighty inches for men and seventy-two inches for women, although exceptions will be considered. The weight requirement varies according to age, height, and sex. Overall sound mental and physical condition is essential, and students are required to undergo periodic physical examinations. Enrollment in the program is subject to the approval of the professor of military science.

Enrollment in specific courses by students not formally enrolled in the program must be approved by course instructors.

### Four-Year Program

The Four-Year Program is open to students in their freshman year or, with the approval of military and university authorities, to sophomores in a five-year degree program. Veterans of the Armed Forces of the United States and students entering Cornell with AROTC credit from secondary or military schools (Junior Division AROTC) may receive advanced standing.

Under the Four-Year Program students enroll in the basic courses (Mil S I and II) during the first two years, and the advanced courses (Mil S III and IV) during the next two years. A total of fourteen credits of military subjects is taken. In addition, academic-enrichment courses are required in such fields as written communications, math, logic, computer science, human behavior, military history, and perhaps foreign languages. Specific requirements are determined by the student and his or her adviser after initial enrollment. Throughout the four years, cadets spend an additional two hours each week each semester in practical leadership training for which there is no academic credit. All cadets attend a six-week camp, with pay, between the junior and senior years.

#### Basic Courses (Mil S I and Mil S II)

Students in the first year of the basic courses take one classroom course in military science in the fall and spring semesters, for which they receive academic credit. These courses include study of the U.S. organization for defense and principles and techniques of leadership and management.

Students also participate in leadership modules that include rappelling, orienteering, drill and ceremony, physical training, winter survival, and individual tactical training. These modules are designed to promote personal development and enrichment. While they do not receive academic credit for these activities, students receive physical education credit. Typical freshman participation in Army officer education is 48 1/2 program-related hours.

During the fall of the second year, the student takes a three-credit class in military history, including the evolution of warfare and armed conflict in society. In the spring, the student takes a one-credit course in map reading and spends approximately two hours a week in practical leadership training, land navigation, and military skills.

#### Advanced Courses (Mil S III and Mil S IV)

The advanced courses of the Four-Year Program are open to students who have successfully completed the basic course and are accepted by the professor of military science for further enrollment. It is also open to students who have gained appropriate advanced standing through either successful completion of basic summer programs (see the description of the Two-Year Program) or prior military training. Any student entering the advanced courses must have two years of academic work remaining at Cornell or another degree-granting institution. The student must pass such physical and aptitude tests as may be prescribed. In addition, the past performance and desire of each student is evaluated to determine if he or she has the potential for eventual commissioning.

When students are accepted for the advanced course, they execute a written contract with the U.S. government. Under terms of the contract, they agree to complete the advanced course and to accept a commission if tendered. Concurrently with the signing of the contract, students enlist in the United States Army Reserve for control purposes.

Classroom study in the advanced course includes one military science course each semester on such subjects as leadership and management, small-unit tactics, and command and staff organization and functions. The two hours a week of practical leadership training continues, and between the junior and senior years all cadets attend a six-week advanced summer camp currently conducted at Fort Bragg, North Carolina.

### Two-Year Program

The Two-Year Program consists of the last two years (the advanced courses) of the regular Four-Year Program. To qualify for the Two-Year Program, a student must successfully complete a basic six-week summer camp or receive placement credit for prior military service.

The Two-Year Program is open to selected students who have two years of academic study remaining at Cornell or another accredited degree-granting institution.

Applications are accepted October to April of the sophomore year. Selectees complete the basic six-week camp before registering in the advanced courses the following fall. They must also meet specified physical requirements and execute the same written contract as those students who enter the advanced courses after completing the regular basic courses.

## Scholarships

Scholarships are awarded on the basis of merit and are available for two, three, or four years. AROTC scholarships are awarded each year to outstanding basic camp participants and students in the freshman and sophomore classes. Cadets who are awarded scholarships continue to receive support until graduation as long as they fulfill the requirements. Scholarship cadets receive a stipend for university tuition, required fees, required textbooks, and classroom materials for the duration of their scholarship. Scholarship cadets and advanced course cadets also receive $100 a month for up to ten months a year.

## Commissioning

All students who successfully complete the advanced course, including the advanced summer camp, are commissioned as second lieutenants in the United States Army Reserve or the Regular Army upon graduation.

### Distinguished Military Graduates

Selected senior cadets with high academic achievement and outstanding military qualities are designated Distinguished Military Graduates after fulfilling all obligations for a baccalaureate degree. All cadets, scholarship and nonscholarship, are eligible to compete for this distinction.

### Service Obligations

A variety of active duty and reserve combinations are available. The manpower requirements of the Army and the qualifications of the cadets determine the option.

An officer beginning active duty first attends the Basic Officer Course (normally eight to twelve weeks) of the assigned branch. Upon completion of this course the officer is assigned to a unit and location that is determined by the desires of the individual and the requirements of the Army. Those officers selected for reserve duty attend the Officer Basic Course, after which they are released to reserve status.

Nonscholarship cadets accepting a Regular Army commission serve a minimum of three years on active duty followed by up to five years in reserve status.

Scholarship cadets, whether commissioned in the Regular Army or the Reserve, generally serve four years on active duty and four years in reserve status; however, some may serve eight years on reserve duty.

### Choice of Branch

Cadets in the second year of the advanced course (normally the senior year) may specify the branch of the Army—such as Infantry, Corps of Engineers, Armor, Signal Corps, Artillery, Air Defense, Ordnance, Chemical, Adjutant General, Quartermaster, Finance, Medical Service, Military Intelligence, Military Police—in which they prefer to serve. They are notified in the spring, before commissioning, of the branch to which they are assigned. The likelihood of appointment in a chosen branch depends upon the student's academic and officer education performance, degree area, and the needs of the Army at that time.

## Graduate Study

Active duty deferments, or educational delays, may be granted to individuals who want to attend graduate school at their own expense. Requests will be considered on the basis of needs of the service. Admission to graduate school is the student's responsibility.

## Benefits

Each cadet in the advanced courses (Mil S III and Mil S IV) receives $100 a month for up to ten months a year. While attending the advanced summer camp (between the junior and senior years), each cadet receives approximately $600 and an allowance for travel to and from camp. Each semester approximately $180 is provided to cover textbooks, supplies, and fees for scholarship recipients.

A cadet in the Two-Year Program receives the same payments as cadets in the advanced course and, in addition, receives approximately $700 and a travel allowance for basic summer camp attendance before entering the advanced course.

## Military Science Courses

All cadets take one course and a leadership laboratory each semester in military science. The number of hours a week spent in the classroom varies from semester to semester, as does the credit received for each course. Students in the Four-Year Program are required to take courses as noted below. Students in the Two-Year Program are required to take all of the courses listed for the junior and senior year and the military history course (Mil S 211).

### Freshman Year (Mil S I)

**Mil S 101 United States Organization for Defense**
Fall. 1 credit. Required.
Staff.
Students examine the U.S. defense apparatus in terms of organization, mission, personnel, and relationships among military forces and between the military forces and various branches and departments of the government. The United States Army force structure is examined at all levels. The complexities and magnitude of operating the defense organization are studied to provide a framework for subsequent instruction.

**Mil S 102 Leadership Theory**
Spring. 1 credit. Required.
Staff.
This course allows students to develop a basic understanding and appreciation of the theories of social and organizational psychology and behavior as they apply to the military setting. Attention is given to leader types, the source and exercise of authority, and the impact of varying styles of leadership on motivation and organization effectiveness. The student is introduced to the concepts of integrity, ethics, and professionalism.

### Sophomore Year (Mil S II)

**Mil S 321 Armed Conflict and Society**
Fall. 3 credits. Required.
3 classes each week. Presentation by Army, Air Force, Marine Corps, and Navy instructors with guest lecturers, primarily from government and history departments. A study of modern warfare that examines the relationship of military strategy to geography, economics, sociology, technology, and national political realities and values; the evolution of warfare, including principles of war, weapons, and associated equipment; and the effects of nuclear weapons and guerrilla warfare on traditional concepts of national strategy.

**Mil S 222 Mapping: Land Navigation**
Spring. 1 credit. Required.
Staff.
This course provides practical knowledge of the various forms of topographic representation. Students interpret and use maps in terrain association and land navigation. Knowledge of topography is complemented by an orientation on significant environmental influences from physical, social, and climatic factors. Portions of the course offer practical experience in land navigation and orienteering.

### Junior Year (Mil S III)

**Mil S 331 Theory and Dynamics of the Military Team**
Fall. 2 credits. Required.
Staff.
After an initial introduction to techniques of presenting briefings, students are provided with a broad understanding of the principles and application of teamwork in military organizations. Particular emphasis is given to leadership responsibilities of the commander as the team coordinator. Additionally, students have an opportunity to develop an understanding of the roles and contributions of the various branches of the Army in support of the military team.

**Mil S 332 Leadership in Small-Unit Operations**
Spring. 2 credits. Required.
Staff.
This course provides an understanding of the nature of decision making and the tactical application of the military team. Through the use of conferences and extensive practical exercises, students develop familiarity with the factors influencing the leader's decisions; the processes of planning, coordinating, and directing the operations of military units to include troop-leading procedures; and development of operation plans and orders.

### Senior Year (Mil S IV)

**Mil S 441 Contemporary Military Environment I**
Fall. 2 credits. Required.
Staff.
An overview of the functions, responsibilities, and interrelationships between the small-unit leader, the commander, and the staff, using a combat arms battalion as a typical organizational structure. Detailed discussions focus on actions of the small-unit leader, communication skills, the military justice and legal system, the threat environment, and the logistical support of the army in the field.

**Mil S 442 Contemporary Military Environment II**
Spring. 2 credits. Required.
Staff.
A continuation of Mil S 424. Students examine the leadership environment of the Army officer. Conferences and seminars examine the techniques of effective military leadership with special attention given to professionalism and ethical considerations in the armed forces during peacetime and armed conflict.

## Practical Leadership Training

### All Army Officer-Education Students

In the leadership laboratory, all of these objectives are accomplished by emphasizing practical exercises and firsthand experience. Types of practical laboratory activities include an introduction to rifle marksmanship, mountaineering, physical training, land navigation and orienteering, signal communications, tactics, and orientations and training exercises at military installations.

As with many laboratory periods, no credit is given, and participation is required for successful completion of the AROTC program. Students will receive physical education credit for the laboratory. Students register as follows:

**Mil S I Leadership Laboratory I**
*Fall* *Spring*
Mil S 151 Mil S 152
Mil S I cadets select either rappelling-drill and physical training, or ranger training. In the spring, class choices are winter survival–land navigation or ranger training. These interesting and challenging activities do not provide academic credit but may be used for physical education credit if adequate hours have been accrued.

**Mil S II Leadership Laboratory II**
*Fall* *Spring*
Mil S 251 Mil S 252
Cadets meet for two hours each week as members of the cadet organization to participate in practical leadership exercises. Types of practical activities include familiarization in rifle marksmanship, orienteering, drill and ceremonies, signal communications, physical fitness training, tactics and field exercises, and discussions.

**Mil S III Leadership Laboratory III**
*Fall* *Spring*
Mil S 351 Mil S 352
Cadets meet for two hours a week to prepare for a six-week summer camp that follows the junior year. Emphasis is on the development of individual skills in leadership techniques and practical skills. Cadets rotate among leadership positions to develop an ability to apply decision-making processes to a myriad of situations. They also acquire technical expertise and proficiency in signal communications, physical fitness, drill and ceremonies, rappelling, orienteering, tactics, water survival, and other military skills. This also includes two to three hours a week devoted to physical fitness.

**Mil S IV Leadership Laboratory IV**
*Fall* *Spring*
Mil S 451 Mil S 452
Senior cadets plan and operate the leadership laboratory programs for Mil S I–III cadets. The development of planning and supervisory skills is emphasized. Cadets have an opportunity to practice leadership skills developed during previous ROTC training and summer camp experiences. This also includes two to three hours a week devoted to physical fitness.

# NAVAL SCIENCE

Captain Edward W. Colbert, Jr., United States Navy, Professor of Naval Science and Commanding Officer, Naval ROTC Unit

Commander Dennis R. Kukulski, United States Navy

Major James M. Higgins, United States Marine Corps

Lieutenant Walter A. Powell, United States Navy

Lieutenant Steven LaPorte, United States Navy

Lieutenant John M. Fleming, United States Navy

The objective of the Naval Officer Education Program is to prepare selected students for service as commissioned officers in the United States Navy or United States Marine Corps by supplementing their undergraduate education with instruction in essential concepts of naval science and fostering development in the qualities of leadership, integrity, and dedication to their country and the naval services. The program is compatible with most undergraduate major fields of study, including five-year baccalaureate degree programs on a case-by-case basis.

The objective is achieved through a broad program, normally covering four years, that combines specific courses in naval science and specified academic subjects to supplement weekly professional development sessions in which the practical aspects of naval science and leadership procedures are stressed. It also includes at least one summer-at-sea period.

**Non–naval officer education students.** Though the Navy–Marine Corps program has been designed to prepare future officers, Naval science courses are open to all students at Cornell University as space limitations allow.

## Requirements for Enrollment

An applicant for Naval ROTC at Cornell must be a citizen of the United States. Applicants must have reached their seventeenth birthday by June 30 of the entering year and be less than twenty-five years of age on June 30 of the calendar year in which they are commissioned. Waivers of the upper age limit may be available for applicants who have prior active duty military service. Applicants must also meet physical and medical requirements. Interested students should visit the Naval ROTC Unit in Barton Hall.

## Programs

There are two types of Naval programs: the Scholarship Program and the College Program. They differ primarily in benefits to the student and type of commission earned.

## Scholarship Program

The Naval Officer Education Program provides approximately seventy-eight hundred scholarships in over sixty-five universities nationwide to selected students who want to serve in the Navy or Marine Corps. Financial support is provided students during college preceding the award of the baccalaureate degree.

### Benefits

The program provides uniforms, full tuition, most instructional fees, textbooks, nonconsumable supplies, and $100 a month for a maximum of forty months.

Successful completion of the Scholarship Program leads to a regular commission in the Navy or Marine Corps. At Cornell University over 90 percent of NROTC students have a scholarship. Students entering NROTC without a scholarship are entitled to compete for one-, two-, or three-year scholarships controlled by the Chief of Naval Education and Training.

### Entering the Scholarship Program

There are three ways to enter the Scholarship Program:

*First,* by applying for the national competition each year. This entails filling out and sending an appropriate application; being interviewed; having a physical examination; and applying to, and being accepted by, one of the colleges or universities throughout the country that offers an NROTC program.

*Second,* by enrolling in the College Program at Cornell and being recommended by the professor of naval science for a scholarship after at least one semester in the program.

*Third,* by entering through the Two-Year Scholarship Program.

## College Programs

There are two College Programs available. Both lead to a commission in the Naval or Marine Corps Reserve and three years of active duty.

Each of these programs provides textbooks for naval professional courses, uniforms, and a subsistence allowance of $100 a month from the beginning of the junior year.

The regular College Program is three to four years long. Academic requirements for students in this program are somewhat less than those for scholarship students, as noted in the curriculum section of this booklet.

The Two-Year College Program begins the summer before the junior year, when students attend a required program with pay at the Naval Science Institute in Newport, Rhode Island.

## Summer Training

Each summer, students in the Scholarship Program spend approximately four to six weeks on a Navy ship, the unit sail-training vessel *Vindicator,* or with a naval activity anywhere in the world for on-the-job training. College Program students attend one summer training session of the same duration between the junior and senior years. While attending summer training sessions, midshipmen are paid approximately $500 a month.

## Active Duty Requirements

As required by Section 2107, Title 10, United States Code, selected applicants must enlist in the United States Naval Reserve for eight years in pay grade E-1 (seamen recruit) before being appointed midshipman, USNR, and receiving compensation. Students who are disenrolled from the NROTC Scholarship Program for reasons beyond their control will, upon disenrollment, be discharged from their enlisted status. It should be understood that two years' active enlisted service may be required of those students who default on the terms of their NROTC contract after the beginning of their sophomore year.

Officers commissioned in the Regular Navy or Marine Corps serve on active duty for a minimum of four years. Those commissioned in the Naval or Marine Corps Reserve serve a minimum of three years on active duty. Specialized training following commissioning adds additional active duty requirements in some cases.

### Choice of Assignment

Graduates have an opportunity to request the duty they prefer upon graduation. These requests are given careful consideration, and every effort is made to assign the newly commissioned officer the duty of his or her choice.

Among the types of assignments are duty in nuclear propulsion for surface ships and submarines, naval aviation, and large and small surface ships. Other specialties are available on a limited basis.

## Marine Corps Options

The United States Marine Corps is an integral part of the Naval Services and is commanded by the commandant of the Marine Corps. One-sixth of the NROTC scholarship students may be Marine selectees who will be designated Marine-option midshipmen. Upon successful completion of the program they will be appointed second lieutenants in the United States Marine Corps.

Marine-option midshipmen will follow the same program as other NROTC midshipmen for the first two years. Beginning with the junior year, Marine-option midshipmen will be taught Marine courses by a Marine officer instructor. For the first class summer-cruise (after the junior year), known as the USMC Officer Candidate School, Marine-option students will travel to Quantico, Virginia, where they will undergo six weeks of intensive training. Upon commissioning the following year as second lieutenants, they will be assigned to the Basic School at Quantico, Virginia. After the Basic School, the Marine officer is assigned duty in a variety of occupational fields. Among the duties available are Infantry, Aviation, Artillery, Tracked Vehicles, Engineers, Communications, Electronics, Supply, Administration, and Computer Science. The officer may serve on board naval vessels or at shore installations of the Marine Corps or Navy, in this country or overseas.

The Marine Corps has a postgraduate educational system similar in objectives and organization to that of the Navy. Marine officers selected for aviation receive flight training at the Naval Air Station, Pensacola, Florida, along with their Navy counterparts.

## Curriculum

A student has three categories of requirements to fulfill as a midshipman. The first of these requirements is a weekly naval professional development session each semester. The second requirement is a naval science course each semester. The last set of requirements consists of other required courses prescribed by the Navy to meet the growing need for more and better technically educated junior officers.

## Naval Professional Laboratories

**Nav S 141–142, 241–242, 341–342, or 441–442**

All students in the program participate in one ninety-minute professional development session each week. The session is held from 2:30 until 4:00 on Wednesday afternoon. This period is planned and implemented for the most part by the midshipmen officers in the battalion organization and consists of both drill and professional information briefings. Students gain experience in actual leadership situations and at the same time learn the fundamentals of seamanship, military formations, movements, commands, discipline, courtesies, and honors. During information briefings special emphasis is given to applied leadership as it relates to the administrative and managerial aspects of a Navy or Marine Corps officer's duties.

## Naval Science Courses

All Navy and Marine midshipmen take one naval science course together each semester during their freshman and sophomore years. Navy-option students continue to take a naval science course each semester during their junior and senior years. Marine-option students are required to take the History of Amphibious Warfare and the Evolution of War courses in either their junior or senior year, depending on when the courses are offered.

### Freshman Year (Navy and Marines)

**Nav S 101 Fundamentals of Naval Science**

Fall. No credit.
Two-hour class each week (lecture-recitation). Navy staff.
A study of fundamental aspects of naval science, including its conceptional contributions to sea power, factors involved in the physical development of naval forces, resources that must be managed, and prospects for the future.

**Nav S 102 Naval Ship Systems (also Mechanical and Aerospace Engineering 101)**

Spring. 3 credits. Three lecture-recitation classes each week.
Prof. M. Louge, Navy staff.
An introduction to primary ship-systems and their interrelationship. Basic principles of thermodynamics, propulsion, mechanical operation, internal communications, electronics, ship structure, and other marine systems are considered.

**Nav S 157 Principles of Sailing**

Fall and spring. Physical education credit.
One class each week. Navy staff.
Instruction in basic sailing skills and safety principles. Students sail small and large boats on Cayuga Lake, weather permitting. Focus is U.S. Navy Class B inshore skipper certification.

### Sophomore Year (Navy and Marines)

**Nav S 201 Naval Ships Systems II (Weapons)**

Fall. 3 credits.
Lecture-recitations, M W F. Navy staff.
The principles and theories used in the development of naval weapons systems are examined. Initially, extensive study is made of sensing and detection systems, especially radar and sonar, followed by discussions of ancillary systems for computing, tracking, stability, and weapons control and delivery. The latter part of the course covers the formal derivation of the fire-control problem and specific U.S. naval weapons.

**Nav S 202 Sea Power and Maritime Affairs**

Spring. 3 credits.
Three seminars each week. Navy staff.
Discussions examine the history of the Navy as a force in diplomacy. Relationships between Congress and the military for determining the national defense policy are also explored. The last section of the course concentrates on the balance between the superpower navies today. An integrated examination of current events and issues gives a historical perspective throughout the course.

### Junior Year (Navy)

**Nav S 301 Principles of Navigation (also Agricultural Engineering 305)**

Fall 4 credits.
Four classes each week (lecture-recitation-project work).
The course covers coordinate systems, chart projections, navigational aids, instruments, compass observations, tides and currents, and soundings. It also includes celestial navigation, time, spherical trigonometry, motion of the stars and sun, star identification, position fixing, use of the nautical almanac, electronic navigation systems, and air navigation.

**Nav S 302 Naval Operations**

Spring. 3 credits.
Three lectures each week. Navy staff.
The course covers the application of command and control principles and the integration of sensors and weapons systems in the conduct of naval operations. Visual and electronic communications methods, data-systems employment, tactical disposition of forces, and fleet logistics support are studied. Topics in shiphandling are also discussed.

### Senior Year (Navy)

**Nav S 401 Organizational Behavior and Small Group Processes (also Hotel Administration 414)**

Fall. 3 credits.
Current research is examined to provide a conceptual framework for understanding group processes within organizations. In addition, students participate in experiential laboratories aimed at enhancing their effectiveness as members or leaders of groups. Topics include stages of group development, leadership, decision making, motivation, individual versus group needs, organizational communication, power, and organizational change.

**Nav S 402 Naval Administration Topics**
Spring. Two credits.
A variety of topics important to the naval officer for both professional and managerial development are reviewed. The material is directed at the midshipman for his own understanding of naval administration and for use in the role of the division officer in counseling his subordinates. Through the use of lectures, situation problems, and role playing, the student will learn about the various aspects of Navy management and administration.

### Junior or Senior Year (Marine Options)

**Nav S 310 Evolution of War**
Fall. 3 credits.
3 classes each week. Presentations by Marine Corps staff.
A study of warfare that examines the relationship of military strategy to geography, economics, sociology, technology, and national political realities and values; the evolution of warfare, including principles of war, weapons, and associated equipment; and the effects of nuclear weapons and guerrilla warfare on traditional concepts of national strategy.

**Nav S 410 History of Amphibious Warfare**
Spring. 3 credits.
Three lectures-recitations each week. Marine Corps staff.
The history of the development, theory, techniques, and conduct of amphibious operations from 490 B.C. to the present. Special emphasis will be on amphibious operations conducted in the central Pacific during World War II. Additionally, the future potential of amphibious operations will be discussed.

## Other Required Courses

### Navy Option Scholarship Program

To be eligible for a commission in the United States Navy, midshipmen must successfully complete all the requirements for a baccalaureate degree in any field of study offered by Cornell University and complete courses in the following subjects (specified courses to be approved by the professor of naval science):

American military affairs or national security policy (one year)

English (one year)

calculus (one year)

calculus-based physics (one year)

computer science (one term)

modern foreign language (one term)—this requirement may be waived by the professor of naval science under some circumstances.

The calculus requirement must be satisfied by the end of the sophomore year and the physics requirement by the end of the junior year.

Although free choice of academic majors is permitted, students are encouraged to pursue majors in engineering and the physical sciences to meet the technological requirements of the modern Navy.

### Navy Option College Program

Navy-option College Program students must complete one year of college-level study in mathematics, physical science, and English as a prerequisite for commissioning. The mathematics course must be completed by the end of the junior year; the physical science course by the end of the senior year. In addition, one term of computer science is required. College Program students who desire entry into the Navy-option Scholarship Program should fulfill all of the requirements applicable to Navy-option scholarship students to be eligible and competitive for a Professor of Naval Science (PNS) Scholarship.

### Marine Option

Any midshipman, in either the Scholarship Program or the College Program, who completes all of Cornell University's degree requirements in any academic major is eligible for a commission in the United States Marine Corps or United States Marine Corps Reserve. Marine-option students take the same naval science courses and naval professional laboratories as Navy-option students for the freshman and sophomore years. During the junior and senior years, Marine-option students meet with the Marine officer instructors for naval professional laboratories and take two naval science courses. In addition, two semesters of any courses (a minimum of three hours each) in the following subject areas are required, the intent being to broaden the base of knowledge of the individual. The specific course chosen must be approved by a Marine Officer Instructor (MOI).

communication skills (oral or written)

computer science

economics

government

history

modern languages

operations research

organizational behavior

psychology

sociology

## University Courses

A wide range of courses satisfy Naval ROTC science and engineering electives or social sciences and humanities requirements. Students should consult their naval science instructor or adviser concerning appropriate course selections. A partial list of those Cornell University courses that meet academic requirements of the program follows.

*Calculus*
Math 111, and 112 or 122 Calculus
Math 191, 192, or 193 Calculus for Engineers

*Physics*
Phys 112 or 116, and Phys 213 or 217
Phys 207–208 Fundamentals of Physics

*Computer Science*
Engr 100 Introduction to Computer Programming
Com S 100 Introduction to Computer Programming
Com S 102 Introduction to Microcomputer Applications
Ag En 102 Introduction to Microcomputer Applications
Ag Ed 447 Instructional Applications of the Microcomputer

*American Military Affairs or National Security Policy*
Econ 306 Economics of Defense Spending
Econ 307 Introduction to Peace Science
Govt 349 Political Role of the Military
Govt 390 Principles of Strategy
Govt 391 United States National Security Policy
Hist 313–314 History of American Foreign Policy
Hist 341 Recent American History, 1945 to the Present

*English*
Fulfilled by completing freshman writing seminar course requirements.

## Extracurricular Activities

The NROTC midshipman at Cornell is offered a broad range of activities in which to participate. Each summer, as an optional part of their summer training, midshipmen sail aboard the unit sail-training vessel *Vindicator* to distant ports of call. Back at Cayuga Lake, a highly respected sail-training program offers instruction, both in small sailboats and in large-boat sailing on board *Vindicator*, to all who want to participate. The unit offers a comprehensive sports program in which most midshipmen participate. The naval unit has won the Independent Division All Sports Trophy for fifteen of the last twenty-one years. Midshipmen participate in a myriad of social events, including the annual Navy/Marine Corps ball, the All-Service military ball, and traditional naval mess nights.

# DEPARTMENT OF AEROSPACE STUDIES

Colonel Kent E. Wolcott, United States Air Force, Professor of Aerospace Studies and Commander, Air Force ROTC Detachment 520

Major Paul D. Decker, United States Air Force

Captain James Marchio, United States Air Force

Captain Timothy E. Edem, United States Air Force

Captain Peter Sefcik, United States Air Force

The objective of the Air Force Officer Education Program at Cornell is to prepare men and women for positions as officers in the United States Air Force. The program is designed to provide the student with a background of aerospace knowledge and to further develop qualities of leadership, integrity, and self-discipline. The objectives are achieved through Four-Year and Two-Year programs. These programs include specific courses in aerospace studies and practical laboratories.

Entering students are assigned to one of four categories: flying (pilot-navigator), missile, engineering-science, and nontechnical. These assignments are based on the student's preferences, qualifications, and academic field of study and the needs of the Air Force.

## Requirements for Enrollment

The Air Force officer education program is open to any undergraduate or graduate student enrolled in any major field of study. The student's academic course of study is often a prime factor in determining the kind of career pursued in the Air Force. (See Air Force Careers, below.)

Applicants must be U.S. citizens. Noncitizens may enroll and will receive certificates acknowledging completion of the course but cannot receive a commission.

Applicants who are interested in flying (as pilot or navigator) or missile duty should make that request known at the time they enter the program.

All applicants receive physical examinations at no cost and, to be accepted, must meet the physical requirements listed below.

Though the program is designed to prepare future Air Force officers, Department of Aerospace Studies courses are open to all students at Cornell.

## Physical Requirements

Every applicant must be free from any limiting physical infirmity and must have normal hearing, blood pressure, and heartbeat. Weight must be normal for height and age.

Following are the additional specific requirements for nonflying categories.

*Vision:* bilateral distant vision without corrective lenses, at least 20/400.

*Height:* for men, at least sixty, but not more than eighty, inches; for women, at least fifty-eight, but not more than seventy-two, inches.

*Allergy:* no history of asthma since twelfth birthday.

*Dental health:* good.

Those students who are interested in qualifying for flying categories (pilot or navigator) must meet more stringent requirements than outlined above. Students are given physicals at Air Force expense to determine if they qualify.

## Four-Year Program

The Four-Year Program is open to all freshmen. Sophomores may enter the program but require departmental approval. Students in a five-year degree program may enroll in their freshman or sophomore year.

Veterans of the U.S. armed forces and students entering Cornell from military schools may receive advanced standing, subject to approval by the professor of aerospace studies.

The Four-Year Program consists of the General Military Course (GMC) and the Professional Officer Course (POC). For scholarship cadets, the first year of the GMC carries no military commitment, and students may withdraw at any time. For nonscholarship cadets, both years of the GMC carry no military commitment, and students may withdraw at any time.

### General Military Course

Students in the General Military Course take one credit of classroom work offered by the Department of Aerospace Studies each semester. During the freshman year the student examines the organization and mission of the United States Air Force and the role of U.S. military forces in the contemporary world. In the sophomore year the student studies the history and development of military aviation and American air power. In both years officership, professionalism, and human rights within the United States Air Force are emphasized.

Students also spend 1-1/2 hours a week in a leadership laboratory, which includes classroom instruction in responsibilities and the environment of the junior officer and instruction and practice in basic drill and ceremonies. In addition, all students participate in summer field training for four weeks between their sophomore and junior years.

### Professional Officer Course

The Professional Officer Course (POC) is a two-year advanced course of instruction. Students who are accepted for the POC must have successfully completed or validated the basic course and must meet the academic and physical standards. Each cadet accepted into the POC must sign an agreement to complete the program and accept, if tendered, a commission in the Air Force Reserve on graduation.

Classroom study in the POC requires three hours a week each semester. In the junior year, cadets study Air Force leadership and management at the junior officer level. During the senior year cadets study the elements of national security and the place of the military in American society. Leadership laboratory requires a minimum of 1-1/2 hours a week in the junior and senior years. In the leadership laboratory the cadet is exposed to advanced leadership experiences and applies principles of management learned in the classroom.

## Two-Year Program

The Two-Year Program consists of the last two years (Professional Officer Course) of the regular Four-Year Program plus a six-week summer training course preceding enrollment. (Details of the Professional Officer Course are given above.)

The Two-Year Program is open to male and female students with two years of academic study remaining at Cornell (graduate or undergraduate) or at schools under crosstown or consortium agreement. Applications are accepted from October through April of the year preceding the applicant's planned entry into the program. Selectees are then required to successfully complete a six-week summer training program at government expense.

## Scholarships

Air Force ROTC offers four-year scholarships on a competitive basis to high school seniors and graduates who will major in selected scientific and technical areas such as engineering, mathematics, meteorology, and computer science. Four-year scholarships are awarded on a limited basis to individuals who will major in nontechnical areas. Scholarship information can be obtained from a high school counselor, from Air Force ROTC officers at a campus offering Air Force ROTC, from a local Air Force recruiter, or from AFROTC/RROO, Maxwell AFB, AL 36112–6663. The deadline for submitting a four-year scholarship application is December 1 of the year preceding the academic year in which a student wants to enter the program. *Students should apply early.*

Scholarships for 3-1/2, 3, 2-1/2, and 2 years are also available to college students. There are also two- and three-year scholarships for qualified men and women who are pursuing selected medical and nursing degrees. Applications for these scholarships should be made to the professor of aerospace studies during the freshman or sophomore years of college. Appropriate application information is furnished by the professor of aerospace studies at the Air Force ROTC detachment. Selections are based on scores achieved on the Air Force Officer Qualifying Test, the overall grade point average, and the rating from an interview board composed of Air Force ROTC staff officers. All scholarships pay, at a minimum, $7,500 toward tuition and provide a $100 monthly nontaxable allowance during the school year.

## Fees

An initial uniform deposit of $30 is required on entry into AFROTC. There are two subsequent $30 uniform payments due, one on entry into the POC and the final one before commissioning, at which point the cadet owns the uniform.

## Benefits

All cadets in the advanced program (POC) receive a $100-a-month, nontaxable subsistence allowance for the academic year. During the four- or six-week summer field training (see below), each cadet receives the pay allowance authorized by current directives, plus an allowance for travel to and from the field site. Most textbooks and supplies required for Department of Aerospace Studies courses are provided.

All cadets are eligible to participate in field trips made to Air Force bases throughout the country. Scholarship and advanced cadets (POC) are entitled to space-available travel on Air Force aircraft flying within the continental United States.

## Field Training

There are two types of field training: a four-week course for cadets in the Four-Year Program and a six-week course for Two-Year Program applicants. Students in these programs normally attend field training between their sophomore and junior years. Field training is hosted each summer by several active Air Force installations.

Field training is designed to stimulate the development of military leadership and skills through meaningful experiences. The curriculum consists of aircraft, aircrew, and survival orientation; junior officer training; physical training; small arms training; a social-actions program; and supplemental training. Special emphasis is placed on career orientation and interaction with other young officers in fields of interest to the student. The six-week training program is unique because it has an additional sixty hours of academic course work similar to that taken during the freshman and sophomore years.

Pilot candidates attend a three-week light aircraft orientation program between their junior and senior years. Objectives of the program are to train and motivate qualified cadets toward a rated career and to screen those cadets who have the potential to become Air Force pilots.

In addition to field training, Army airborne training (parachute jumping instruction) is available between the junior and senior years as an extracurricular activity.

## Advanced Training Program

This program allows selected cadets to visit active duty Air Force bases for a two- or three-week period during the summer following their junior year. As "third lieutenants," cadets receive specialized career orientation and an opportunity to experience leadership, human relations, and management challenges encountered by Air Force junior officers. Cadets have an opportunity to become familiar with the Air Force way of life.

## Commissioning Obligations

All students who successfully complete the AFROTC advanced program (POC) and who are awarded a baccalaureate degree are commissioned as second lieutenants in the Air Force.

Second lieutenants commissioned in nonflying categories are required to serve on active duty for four years. Pilot trainees are required to serve on active duty for eight years after completing flying training and receiving their aeronautical rating. Navigator trainees serve five years after completing training. Some newly commissioned officers are allowed to postpone active service to earn advanced degrees.

## Air Force Careers

Air Force policy has been to assign new officers to a career field appropriate to their educational background. Students in the engineering-scientific category may be assigned to practice in their specialty in research and development, communications, aeronautics, astronautics, design and development, the biological sciences, computer design and maintenance, meteorology, or various other engineering and scientific fields. Those graduating in the nontechnical category can anticipate assignments in manpower management, administration, logistics, police and investigation, intelligence, personnel, transportation, information, and numerous other career fields. They will use their educational backgrounds in positions of responsibility and be given the opportunity to develop further their managerial and administrative skills.

Any undergraduate major is suitable for those who are qualified and interested in becoming pilots or navigators. After completion of flying training they are assigned primary duties flying various kinds of aircraft.

Officers who elect missile duty will train and be assigned to one of the operational missile bases as a crew member. This type of assignment provides an opportunity for a young officer to obtain command experience.

## Curriculum

Students in the Four-Year Program are required to take all courses listed below. Students in the Two-Year Program are required to take all of the courses listed for the junior and senior years.

### Freshman Year

**Air S 161 United States Military Forces**
Fall. 1 credit.
One class each week.
A study of current U.S. military forces with emphasis on the analysis of the doctrine and mission of the United States Air Force. Army and Navy operations, as contributions to the total national defense, are reviewed. Current factors affecting today's professional military officers are considered.

**Air S 162 Aerospace Operations**
Spring. 1 credit.
One class each week plus a field trip to a local military installation.
The aerospace forces of the United States are studied with emphasis on the organization and resources of the United States Air Force. The elements of strategic offensive, defensive general-purpose, and aerospace support forces throughout the world are also studied.

### Sophomore Year

**Air S 211 Development of Military Aviation**
Fall. 1 credit.
One class each week.
Factors leading to the development of aviation and the concepts and doctrine for the employment of air power are studied. Topics to be reviewed and analyzed include the history of manned flight, the effects of World War I on the uses of aviation, the development of pre–World War II aircraft, and the political struggles for an independent U.S. air arm. The role of air power in World War II, including strategic bombing, tactical air power, and the role of air superiority in warfare, is examined.

**Air S 212 American Air Power since 1947**
Spring. 1 credit.
One class each week.
The employment of the Air Force since World War II in military and nonmilitary operations to support national objectives is discussed. Effects of technology on defense policy and strategy are reviewed. The part played by the air forces in activities such as the Berlin airlift and national and international relief missions is discussed. The role of air power in the Korean conflict, the Cuban crisis, and the Vietnam War is examined from the viewpoint of technology and tactical doctrine.

### Junior Year

**Air S 331 Leadership and Communicative Skills**
Fall. 3 credits.
Three classes each week.
The course is divided into three major parts. Part one provides an introduction to the principles and techniques used in the development of effective communication skills through the use of the interpersonal communication model. Part two explores the impact that both individual and group behavior have on organizational goals, with special emphasis on management theories that have evolved to explain human motivation. Part three deals with leadership as a function of the management principle of directing. Attention is given to the impact that various leadership styles have on human motivation and organizational effectiveness. Current leadership research and theory and the responsibilities of command are considered. Case-study exercises and oral and written assignments are required.

**Air S 332 Management**
Spring. 3 credits.
Three classes each week.
Introductory course that deals with the basic principles of management, including planning, organizing, staffing, and controlling. Students will prepare business plans that incorporate the various principles of management to include the study of quantitative methods and computer-generated financial reports used to enhance the management decision-making process. Also considered is the role of management in the development of a corporate code of ethics in relationship to marketing strategies and tactics. Case studies, problem sets, business plans, and oral presentations are required.

### Senior Year

**Air S 461 National Security Forces in Contemporary American Society I**
Fall. 3 credits.
Two classes each week.
This course examines American national security policies in the post–World War II period by seeking to understand the people, politics, and processes involved in their formulation and implementation. A series of historical case studies are used to illustrate both the functioning of this system and the problems associated with it.

**Air S 462 National Security Forces in Contemporary American Society II**
Spring. 3 credits.
Two classes each week.
The functions and roles of the military officer in a democratic society are studied through an examination of topics such as the concept of military professionalism and the military's role in politics. Other issues including the challenges and problems posed by the all-volunteer force, the ethical dilemmas confronted by the military officer, and the new roles played by the military in the war against drugs and terrorism likewise are explored. The course concludes with a brief look at the essential features of the military justice system.

### Leadership Laboratory Courses

All Air Force cadets spend at least 1-1/2 hours a week throughout the academic year in a leadership laboratory, for which no academic credit is given. Occasionally laboratories are held at times other than the normally scheduled period (such as the fall Veterans Day parade and the spring Military Awards Ceremony). All cadets are also expected to participate in an evening dining-in and to meet minimum physical fitness and weight standards each semester.

**Air S 141–142 Initial Military Experiences**
Introduction to the responsibilities, life, and work of an Air Force officer. Basic knowledge of drill and ceremonies, military courtesies, and the wearing of the uniform. Field trip to a local military installation.

**Air S 241–242 Intermediate Military Experiences**
Develops skills in giving commands for drill and ceremonies. Introduction to the Air Force base environment in which the Air Force officer functions. Includes a look at career areas available based on academic majors. Students experience and participate in leadership situations through military drills and ceremonies. Field trip to a local military installation.

**Air S 341–342 Junior Officer Leadership**
Cadets assume leadership responsibilities similar to those of a junior officer. Emphasis is on comprehending the importance of applying effective human relations in dealing with superiors, peers, and subordinates. Relationship between Air Force specialty codes and academic majors. The importance of basic health habits to leadership.

**Air S 441 Advanced Leadership Experiences**
Command leadership in operating a military organization. Cadets apply effective leadership and managerial techniques with individuals and groups and participate in self-analysis of leadership and managerial abilities.

**Air S 442 Precommissioning Laboratory**
Factors that facilitate transition from civilian to military life are reviewed. The need for military security, base services and activities, personal finances, travel regulations, and social obligations are introduced.

# DEPARTMENT OF PHYSICAL EDUCATION AND ATHLETICS

## ADMINISTRATION

Alan E. Gantert, director

John R. West, assistant director

## COURSES

The courses and fees described in this catalog are subject to change or cancellation at any time by official action of Cornell University.

Enrollment in any course is limited by the space available. Other restrictions are included in the course description. Most courses are coeducational. The specific time and place of class meetings, as well as information about fees, are available at physical education course registration. Course fees are billed through the Office of the Bursar.

Additional course offerings may be listed at registration, since the curriculum is frequently reviewed and changed.

**Alexander Technique**
Fall and spring.
Two classes a week, Helen Newman Hall.
Exercise routines that increase sensory awareness.

**Basic Archery**
Fall and spring.
Two classes a week, Helen Newman Hall.
Instruction in the care of equipment; seven basic steps for shooting; scoring; practice shooting at twenty, thirty, and forty yards.

**Intermediate Archery**
Fall and spring.
For those who have playing experience.

**Badminton**
Fall and spring.
Two classes a week.
Fundamental shots, scoring, and general play.

**Basketball**
Fall and spring.
Two classes a week.
Fundamental drills in passing, shooting, and dribbling. Scrimmages each class session.

**Bowling**
Fall and spring. Fee charged.
Two classes a week, Helen Newman Hall.
For the beginning and intermediate bowler. Shoe rental is included in the fee.

**Boxing**
Fall and spring.
Two classes a week, Teagle Hall.
Fundamentals of training methods.

**Equitation**
Fall and spring. Fee charged.
One class a week, Cornell Equestrian Center. Class days and hours are arranged at registration.
Instruction varies according to riding ability and experience

**Flexibility and Toning**
Fall and spring.
Two classes a week, Helen Newman Hall.
Overall stretching exercises.

**Fitness and Conditioning I**
Fall and spring.
Two classes a week.
Physical fitness program that embodies features of stretching exercises, weight lifting, and jogging. Students work on their individual training needs.

**Fitness and Conditioning II**
Fall and spring.
Two classes a week, Teagle Hall.
Flexibility exercises and strength-building concepts with various equipment and cardiovascular endurance tests. Body-fat testing and submaximal treadmill test included.

**Fitness–Exercise–Nutrition**
Fall and spring.
Two classes a week, Helen Newman Hall.
Ways in which exercises may be used in weight control, the role of nutrition and diet in weight control, and the design of an individual exercise and running program.

**Fitness for Women**
Fall and spring.
Two classes a week, Teagle Hall.
Fitness program that is geared toward women's own interests and abilities. Nutrition, time management, relaxation techniques, and stress management are included.

**Judo**
Fall and spring. Fee charged.
Two classes a week, Teagle Hall.
Conditions and increases suppleness. Develops skills in the two parts of judo: standing techniques (throws and trips) and mat techniques.

**Lacrosse**
Fall.
Two classes a week, Schoellkopf Field.
Instruction and practice in basic skills (cradling, passing, catching, goal shooting, checking) and team play.

**Nautilus**
Fall and spring. Enrollment limited to capacity of facilities. Fee charged.
Two classes a week, Schoellkopf Hall.
Advanced weight lifting on specifically designed apparatus. There are ten stations in the room.

**Power Lifting**
Fall and spring.
Teagle Hall.
Introduces the student to the proper use of free weights for improving physical condition and muscular strength. Instruction with focus on the relation between high-rep light weight lifting, low-rep heavy lifting, and the development of bulk, strength, and endurance

**Racket Games**
Fall and spring.
Two classes a week, Teagle Hall.
Racquetball, squash, badminton, and deck tennis. Playing fundamentals, scoring, and rules are stressed. Interclass competition

**Racquetball**
Fall and spring. Fee charged.
Two classes a week, Grumman Squash Courts.
Instruction at all levels. Equipment is furnished

**Racquetball II**
For those who have playing experience and want interclass competition.
One class per week.

**Relaxation and Stress Management**
Fall and spring.
Two classes a week, Helen Newman Hall.
Introduction to basic relaxation techniques for the reduction of everyday stress. Techniques will be taught that can be used in normal everyday living situations.

**Soccer**
Spring.
Two classes a week, Schoellkopf Field.
Introduction to the game. Includes basic individual skills (passing, trapping, volleying) and team play and strategy

**Squash**
Fall and spring. Fee charged.
Two classes a week, Grumman Squash Courts.
Classes for all levels of play. Equipment is furnished.

**Triathlon**
Fall.
Designed to acquaint students with the components of, and conditioning for, triathlon (running, swimming, and bicycling).

**Weight Training**
Fall and spring.
Two classes a week, Teagle Hall.
Classes include instruction in correct lifting techniques involving all muscle groups. Recreational classes are established for experienced lifters; structured classes are for novices. Universal weights are used

## Aquatic Courses

**Beginning Swimming**
Fall, spring, and summer.
Two classes a week, Helen Newman Hall and Teagle Hall.
Instruction and practice in basic skills leading to passing the basic swimming proficiency test.

**Advanced Beginning Swimming**
Fall and spring.
Two classes a week, Helen Newman Hall and Teagle Hall.
This course is ideal for all who have taken one term of Beginning Swimming, regardless of whether the swimming test was successfully completed. Areas of special emphasis are the crawl stroke and rotary breathing, back crawl, sidestroke, breaststroke, diving, treading water, and underwater swimming. The primary objective of the advanced beginning swim course is to strengthen the student's confidence and competence.

**Intermediate Swimming**
Fall and spring.
Two classes a week, Helen Newman Hall and Teagle Hall.
Practice and perfection of basic skills and five basic strokes.

**Advanced Swimming**
Fall and spring.
Two classes a week, Helen Newman Hall and Teagle Hall.
Practice and perfection of the eleven basic strokes

**Advanced Lifesaving**
Fall and spring.
Two classes a week, Helen Newman Hall and Teagle Hall.
American Red Cross senior lifesaving course. Practice and execution of survival and lifesaving skills. Certification is awarded on satisfactory completion of the course.

**American Red Cross Water Safety Instructor Certification**
Fall and spring. Prerequisite: American Red Cross advanced lifesaving certification.
Three or five classes a week, Helen Newman Hall and Teagle Hall. Students must not miss first class.
American Red Cross water safety instructor certification is awarded on satisfactory completion of the course

**Water Safety Instructor Refresher Course**
Spring.
Five classes a week, Teagle Hall.
Selected sessions of the basic water safety instructor certification course.

**Water Aerobics**
Fall and spring.
Two classes a week, Teagle Hall and Helen Newman Hall.
Offers the participant all the components of a standard aerobics class with music, rhythmical routines, resistance activities, cardiovascular conditioning, stretching, and flexibility but in an aquatic environment.

**Scuba Diving**
Fall, spring, and summer. Fee charged.
Teagle Hall.
Program includes skill training in a pool and open-water training in Cayuga Lake. P. A. D. I. certification awarded upon successful completion.

**Advanced Open-Water Scuba Diving**
Fall and spring. Fee charged.
Advanced-level open-water training in Cayuga Lake. For those who have completed the basic course.

**Rescue Diver**
Fall and spring. Fee charged.
Advanced course for scuba divers. For those who have completed Advanced Open-Water Scuba Diving.

**Dive Master**
Fall and spring. Fee charged.
Hours to be arranged. Teagle Hall.
Advanced-level scuba course open only to those who have completed the rescue diver course.

**Bahamas Scuba Diving**
Fall and spring. Fee charged.
This course is offered during intersession periods. One week of sailing and diving in the Bahamas. See the information sheet at the registration table.

**Beginning Synchronized Swimming**
Fall.
Two-hour class one evening a week, Helen Newman Hall.
Sculling stunts, including the tub, marlin, log roll, front and back tuck somersaults, and front and back pikes.

**Advanced Synchronized Swimming**
Spring.
Two-hour class one evening a week, Helen Newman Hall.
Preparing, practicing for, and presenting an aquatic show.

**Aquatic Conditioning**
Fall and spring. Prerequisite: good swimming ability.
Two classes a week, Teagle Hall.
Introduction to, and practice of, different training methods. Final objective: to swim 2,500 yards during class period.

**Board Sailing (Wind Surfing)**
Fall, spring, and summer. Fee charged.
Ten instructional lessons plus free practice times. The equipment is furnished.
A Mistral Board Sailing Academy certificate is awarded on successful completion of the course

**Water Skiing**
Fall and summer. Fee charged.
Three classes a week.
Introductory course for beginning water skiers. Conducted on the east shore of Cayuga Lake. Students must provide their own transportation to and from the lake.

## Dance

**Aerobic Dance**
Fall and spring. Fee charged.
Two classes a week.
A simple dance program designed to keep the cardiovascular system in top shape by making the body demand increased amounts of oxygen.

**Ballroom Dancing**
Fall and spring. Fee charged. Students and their partners must sign up at course registration.
Includes instruction in the waltz, Charleston, rumba, and tango.

**Dance**
Fall and spring.
Two or three classes a week, Helen Newman Hall.
Develop flexibility, coordination, and the ability to perceive and reproduce phrases of dance movement with rhythmic accuracy, clarity of body design, and fullness of feeling. Auditions are required for admission to some advanced courses, since they require the mental and physical ability to perform more-complex phrases in various styles.

**African Dance**

**Ballet I, II, III**

**Jazz Dance II**

**Modern Dance I, II, III, IV**

## Fencing

**Fencing I**
Fall and spring. Fee charged.
Two classes a week, Helen Newman Hall.
Includes warm-up exercises and all basic offensive and defensive moves. Equipment is furnished.

**Fencing II**
Fall and spring. Fee charged. Prerequisite: Fencing I or the equivalent.
Two classes a week, Helen Newman Hall.
Interclass competition is stressed. Equipment is furnished.

## First Aid

**Standard First Aid**
Fall and spring. Textbook fee charged.
One or two classes a week, Schoellkopf Hall.
American Red Cross standard first-aid course. Certification is awarded on satisfactory completion of the course.

**Advanced First Aid**
Fall and spring. Fee charged.
American Red Cross certification is awarded on satisfactory completion of the course.

**Cardiopulmonary Resuscitation (CPR)**
Fall and spring. No credit. Fee charged.
One class a week for four weeks, Schoellkopf Hall.
American Red Cross CPR certification is issued on satisfactory completion of the course.

**Emergency Medical Training Course**
Fall and spring. Fee charged.
Will cover two terms, for 100 hours of training.
Designed for those involved in high-level emergency medical skills. New York State EMT certification will be awarded to those who successfully complete course.

## Golf

**Instruction in Golf**
Fall and spring. Fee charged.
Two classes a week, Moakley golf course.
Instruction by PGA professionals is geared to all levels of experience and ability. The objective is to give beginners enough skill to play, and to give more-advanced players direction in their thinking, practice, and play, through a thorough understanding of fundamentals. Equipment is furnished.

**Recreational Golf**
Fall and spring. Limited to students who are experienced golfers. Fee charged.
Moakley golf course.
Students must provide their own clubs. Twelve rounds of nine holes each must be played to complete the Program.

## Gymnastics

**Beginning Gymnastics**
Fall and spring.
Two classes a week, Teagle Hall.
Basic instruction in tumbling, dance for gymnastics, and use of all pieces of apparatus.

**Intermediate Gymnastics**
Fall and spring.
Two classes a week, Teagle Hall.
Beginning gymnastics or the equivalent is a prerequisite.

## Jogging

**Jogging**
Fall, spring, and summer.
Two classes a week, Barton Hall and track.
A program to meet the needs of each participant. Increases capacity from jogging a few hundred yards to three miles at the end of twelve weeks.

**Jogging Tours**
Fall and spring.
Three classes a week for seven weeks, Barton Hall.
Each class consists of a three-to-five-mile jogging tour of a local area.

## Martial Arts

**Basic Karate**
Fall and spring. Fee charged.
Two evening classes a week, Teagle Hall.
A beginning course taught by professional staff.

**Advanced Karate**
Fall and spring. Fee charged.
Two evening classes a week, Teagle Hall.
Open to those who have taken Basic Karate or the equivalent.

**Kung Fu**
Fall and spring.
Two classes a week, Teagle Hall.
Exploration of conditioning and fitness procedures used in the major martial arts, such as karate or judo. Covers circular movement for generating strong blocks, kicks, and punches.

**Martial Arts and Aerobic Exercises**
Fall and spring.
Three classes a week, Teagle Hall.
Blend of ten basic martial-art techniques in a framework of rhythmic exercises.

**Self-Defense for Women**
Fall and spring. Fee charged.
Hours to be arranged, Teagle Hall.
Basic methods of physical protection for women.

**Tae Kwon Do**
Fall and spring. Fee charged.
A Korean martial art distinguished by its emphasis on high and powerful kicks. Basic kicking, punching, and blocking are emphasized.

**T'ai Chi Chuan I and II**
Fall and spring.
Three classes a week, Teagle Hall.
Introduction to T'ai Chi, a system of graceful, slow-movement exercises that aim at nurturing relaxation, deep breathing, and improved circulation.

## Outdoor Program

See the brochure *Cornell University Outdoor Program* at registration for more information about courses.

**Backpacking in the Finger Lakes Region**
Fall, spring, and summer.
Classes lead to a full weekend on the trail.

**Bicycling**
Fall and spring.
Afternoon or weekend rides. No overnights.

**Bicycle Touring and Camping**
Fall and spring.
Rides lead to overnight weekend tours.

**Canoe Expeditioning**
Fall, spring, and summer.
Outings finish with an Adirondacks expedition.

**Canoeing, Flat-Water**
Fall and spring.
Afternoon or weekend outings to local lakes. No overnights.

**Canoeing, White-Water**
Fall and spring.
Includes three days of white-water trips.

**Caving**
Fall and spring.
Explore caves in central New York State.

**Cross-Country Skiing I and II**
Spring.
Six 3 1/2-hour classes. Meets once each week immediately following spring registration.
Van transportation provided for groups of twelve students and two instructors. Ski rental optional.

**Cross-Country Skiing–Day Touring**
Spring.
Four full-day weekend outings.
Emphasis on backwoods touring. Ski rental optional.

**Adirondack Ski Expedition**
Winter break.
Ten-day winter camping and skiing trip.

**Hiking in the Finger Lakes Region**
Fall and spring.
Includes four weekend days of hiking.

**Technical Ice-climbing**
Spring.
Includes four weekend days of climbing.

**White-Water Kayaking**
Fall and spring.
Includes three days of white-water trips plus pool sessions.

**Natural History**
Fall and spring.
For those interested in the local ecology.

**Outdoor Leadership**
For those interested in becoming Outdoor Program instructors.

**Rock-climbing Skills**
Fall and spring. No experience required.
Meets one afternoon a week for eight weeks.

**Shawangunks Rock-climbing Expedition**
Fall and spring.
Includes a four-day climbing camp.

**Wilderness Skills**
Fall and spring.
Introductory course. Includes a wilderness expedition during fall break or spring break.

**Wyoming Wilderness Expedition**
Summer.
Full-time course for the entire month of June to train outdoor instructors.

## Riflery

**Riflery**
Fall and spring. Fee charged.
Two classes a week, Barton Hall.
Instruction and practice in the techniques of target riflery from various shooting positions.

**Trap and Skeet Shooting**
Fall and spring. Fee charged.
Two-hour class one afternoon a week, Teagle Hall.
Includes lectures and shooting at the Tompkins County Rod and Gun Club range. Guns and shells are furnished.

**Hunter Safety**
Fall and spring.
Hours to be arranged, Barton Hall.
Instruction in hunter safety leads to New York State certification for bow and gun.

**Basic Pistol**
Fall and spring.
Barton Hall range.
Instruction in the use of the pistol in the three modes of fifty-foot competitive target shooting—slow fire, timed fire, and rapid fire. Emphasis placed on safety and responsibility while firing.

## Sailing

**Principles of Sailing**
Fall, spring, and summer. Fee charged.
One class a week, Cayuga Lake.
Instruction in basic sailing skills and safety principles. Students sail small and large boats on Cayuga Lake, weather permitting.

**Intermediate Sailing**
Fall. Fee charged.
One class a week, Cayuga Lake.
Instruction in more-advanced techniques for those already familiar with the basic principles of sailing.

## Skating

**Introduction to Skating**
Fall and spring. For beginning to intermediate skaters. Fee charged.
Three classes a week for half a term, Lynah Rink.
Students provide their own hockey skates or rent them at Lynah Rink.

**Beginning and Low-Intermediate Figure Skating**
Fall and spring. Fee charged.
Three classes a week for half a term, Lynah Rink.
Instruction and practice in basic figure skating techniques: forward and backward, cross-overs, turns, and spirals. Students provide their own figure skates or rent them at Lynah Rink.

**Intermediate and Advanced Figure Skating**
Fall and spring. Limited to experienced skaters. Fee charged.
Three classes a week for half a term, Lynah Rink
Advanced figure skating techniques. Students provide their own figure skates or rent them at Lynah Rink.

**High-Intermediate and Advanced Figure Skating**
Fall and spring. Fee charged.
Three classes a week, Lynah Rink.
Advanced figure skating techniques. Students provide their own figure skates or rent them at Lynah Rink.

**Introduction to Ice Hockey**
Fall and spring. Fee charged.
Two classes a week, Lynah Rink.
Stick handling, passing, and shooting are stressed. Students provide their own skates and sticks; all other equipment is furnished.

**Intermediate Hockey**
Fall and spring. Fee charged. Prerequisite: beginning hockey or participation in organized hockey.
Two classes a week, Lynah Rink.
This course is designed for the intermediate hockey player. Advanced techniques taught include positioning, power play, penalty killing, and offensive and defensive attack. Each session emphasizes game situations and scrimmaging. Skates and hockey sticks must be supplied by the participants. All other necessary equipment will be supplied.

## Skiing

**Skiing Conditioning**
Fall.
Two classes a week, Helen Newman Hall.
Exercises designed to increase flexibility, strength, and endurance in preparation for the ski season.

**Downhill Skiing**
Spring. Fee charged.
One class a week, Greek Peak.
Transportation, instruction, ski-lift fees, and skiing time are offered in a package deal. Greek Peak personnel are present at registration to explain the program and accept fees. Bus transportation to Greek Peak is provided six afternoons a week for six weeks.

Cross-Country Skiing - *See* Outdoor Program.

## Tennis

**Indoor Tennis**
Spring. Fee charged.
Two classes a week, Kite Hill tennis bubble.
Classes for all levels of play. Emphasizes strategy for intermediate and advanced groups. Space limitation requires doubles play.

**Beginning Outdoor Tennis**
Fall.
Three classes a week for half a term. Helen Newman courts.
Instruction and practice in basic strokes (forehand, backhand, serve).

**Intermediate Outdoor Tennis**
Fall.
Three classes a week for half a term. Kite Hill courts.
Use of fundamental strokes, lobs, and drop shots; doubles strategy.

**Advanced Outdoor Tennis**
Fall. Limited to experienced players.
Three classes a week for half a term. Kite Hill courts.
Emphasizes strategy.

## Volleyball

**Introduction to Volleyball**
Fall and spring.
Two classes a week, Barton Hall.
Fundamentals of ball handling, serves, defensive blocks, and position play are stressed. Classes will scrimmage.

**Intermediate Volleyball**
Fall and spring.
Two classes a week, Helen Newman Hall and Teagle Hall.
Passing and blocking strategy; scrimmages in class.

**Advanced Volleyball**
Fall and spring.
Two classes a week, Helen Newman Hall.
Offensive and defensive team strategy is emphasized in class scrimmages.

## Yoga

**Yoga I**
Fall, spring, and summer. Fee charged.
Two classes a week, Teagle Hall.
Fundamentals of hatha-yoga. Covers basic postures, breathing techniques, and deep relaxation. Introduces chanting.

**Yoga II**
Fall and spring. Fee charged.
Two classes a week, Teagle Hall.
Designed for those who have completed Yoga I or its equivalent.

## Independent Study

**Independent Study**
Fall and spring.
Independent study is designed for those who have difficulty fitting any of the regularly scheduled courses into their academic program. Class activities will be based on personal fitness programs. A term paper is required. Special permission to enter this program must be granted by the program director.

# SUMMER SESSION, EXTRAMURAL STUDY, AND RELATED PROGRAMS

## ADMINISTRATION

Charles W. Jermy, Jr., acting dean

Jennifer T. Cook, summer session catalog production manager

Alicia Dowd, division media manager

Judith K. Eger, director, Programs in Professional Education and Special Programs

Mary K. Gloster, administrative course coordinator

Margaret L. Haine, director, Cornell University Summer College

Ralph Janis, director, Cornell's Adult University

Judy M. VanDermark, director, Cornell University Conference Services

Valerie A. Sellers, director of administration

Diane E. Sheridan, director of finance

Colleen M. Emerick-Daniluk, registrar, summer session and extramural study

## THE DIVISION

Cornell University's Division of Summer Session, Extramural Study, and Related Programs provides a wide variety of educational opportunities beyond the degree-granting programs of the university. These programs serve virtually all age groups in a great variety of formats and time frames. The division office is located in B12 Ives Hall, Ithaca, New York 14853-3901 (telephone: 607/255-4987).

## SUMMER SESSION

The Cornell University Summer Session provides unique and unusually attractive opportunities for study and recreation at a time when the Cornell campus and the Finger Lakes region of central New York are at their loveliest and the Ithaca weather is at its best. Participants may choose from a wide spectrum of courses scheduled during three-, six-, and eight-week sessions. In addition, dozens of special programs are presented in varying formats, including on-site fieldwork and overseas study. Although admission is open to persons of all ages, the majority of summer session participants are matriculated Cornell students. Classes meet daily and are usually kept small to foster a close association between students and teachers. For information, consult the Summer Session Office, B12 Ives Hall, or call 607/255-4987.

High school juniors and seniors may attend regular university courses and explore career options through Cornell University Summer College. For information, write Cornell University Summer College, B12 Ives Hall, or call 607/255-6203.

## EXTRAMURAL STUDY

The extensive credit-course offerings of the university are available to area residents on a part-time basis. Those interested may apply for admission to practically any course in the university and will be admitted if they receive the instructor's written approval. The division also offers an Official Visitor's Program that allows persons to attend classes in many divisions of the university on a space-available basis at a reduced charge. Visitors are required to obtain written permission of the instructor. In this program no credit is given and no record is kept of attendance or performance. Between the fall and spring terms the division offers winter session credit courses primarily for undergraduates but open to anyone. For information, contact the Extramural Office in B12 Ives Hall or call 607/255-4987.

## PROGRAMS IN PROFESSIONAL EDUCATION

Because of Cornell's leadership in both theoretical and applied research, the university offers unique opportunities for professional growth to persons in science, technology, government, business, and industry. The division's Programs in Professional Education are intensive updates taught by Cornell faculty members whose research involves areas of importance to the corporate sector and the professions. Programs in Professional Education can also respond to the needs and interests of corporations and professional societies by developing programs both on and off campus that are suited to their particular educational purposes. For information, telephone 607/255-7259.

## CORNELL'S ADULT UNIVERSITY

Cornell's Adult University (CAU) offers one-week noncredit courses on campus during the summer and weekend seminars at off-campus locations during the fall and spring. Originally conceived as a program for alumni, CAU has greatly broadened its mission in the area of adult education. All courses and seminars are inspired by the belief that learning never ends and that one of the roles of a great university is to provide a bridge between traditional, formal education and informal, noncredit study. For information, consult Cornell's Adult University, 626B Thurston Avenue, or call 607/255-6260.

## CONFERENCE SERVICES

Excellent facilities, a beautiful campus, and a conference office concerned with each group's special needs make Cornell an ideal setting for conferences and meetings. Professional groups from all over the country come to Cornell to take advantage of this special learning environment. The staff is available to answer questions, advise on creative program ideas, assist in planning, make special arrangements, secure accommodations, and handle other administrative details. For information about conferences at Cornell, consult Cornell University Conference Services, Box 3, Robert Purcell Union, or call 607/255-6290.

## CONTINUING EDUCATION INFORMATION SERVICE

The extramural study registrar provides free information, counseling, and referral to women and men who have been out of school for several years and want to resume their education. Anyone who wants to take courses, begin an undergraduate or graduate degree program, or complete an unfinished degree is welcome to meet with the registrar. Information is available on all schools and departments of the university; opportunities for part-time and full-time study; special courses, workshops, and seminars; and community resources for older students. A small library includes information on educational opportunities at local institutions of higher learning, financial aid, work-study programs, and admission procedures. For information, contact Continuing Education Information Service, B12 Ives Hall, or call 607/255-4987.

## SUMMER COURSES

The Cornell University Summer Session offers a wide variety of courses. The list that follows includes those courses that are usually offered every summer. The list is not exhaustive; many new courses or courses offered only occasionally are not listed. For complete information, contact the Summer Session Office, B12 Ives Hall, or call 607/255-4987. The summer session catalog is published in February. A preliminary course roster is also available on CUINFO beginning in November.

## Africana Studies

**100 Black Leaders and Movements in South Africa**

**209 African Dance Improvisation**

**264 Modern Southern African and American Literature**

**484 Politics, Conflict, and Change in South Africa**

## Agricultural Economics

**310 Introductory Statistics**

## Anthropology

**101–102 Introduction to Anthropology**

**242 American Indian Philosophies I: Power and World Views**

## Archaeology

**100 Introduction to Archaeology**

**300/333 The Crannog Archaeology Project**

**360 Field Archaeology in Greece**

Other field study opportunities are usually available through this department.

## Architecture

**125 Introduction to Architecture**

Consult the Department of Architecture office for a complete list of summer design offerings.

## Art

**121 Introductory Painting**

**123 Landscape Painting**

**131 Introductory Intaglio**

**132 Introductory Graphics**

**133 Introductory Lithography**

**141 Introductory Sculpture**

**151 Introductory Drawing**

**158 Conceptual Drawing**

**159 Life and Still-Life Drawing**

**161 Introductory Photography I**

**168 Black-and-White Photography**

**169 Color Photography**

**171 Computer Art**

**261 Photography II**

**263 Color Photography**

**361 Photography III**

**379 Independent Studio**

## Astronomy

**105 An Introduction to the Universe**

**106 Essential Ideas in Relativity and Cosmology**

## Biological Sciences

**107–108 General Biology**

**205 Ethics and Medicine**

**245 Plant Biology**

**261 General Ecology**

**322 Hormones and Behavior**

**331 Principles of Biochemistry, Lectures**

**737 Advanced Biotechnology Laboratory**

## Chemistry

**103–104 Introduction to Chemistry**

**207–208 General Chemistry**

**251–252 Introduction to Experimental Organic Chemistry**

**253–255 Elementary Organic Chemistry**

**421 Introduction to Inorganic Research**

**433 Introduction to Analytical Research**

**461 Introduction to Organic Research**

**477 Introduction to Research in Physical Chemistry**

## Classics

**Greek**

**104 Intensive Greek**

**Latin**

**107 Intensive Latin**

**205 Intermediate Latin**

**Classical Civilization**

**109 The Art of Argument: An Introduction to Rhetoric**

**113 Word Power: Greek and Latin Elements in the English Language**

**114 Word Power for the Biological Sciences**

**123 Comedy**

**215 Conquerors and Conquered: The Case of the Romans, Jews, and Greeks**

**236 Greek Mythology**

**360 Field Archaeology in Greece**

## Communication

**116 Theories of Human Communication**

**120 Introduction to Mass Media**

**150 Writing for Media**

**201 Oral Communication**

**204 Effective Listening**

**234 Photo Communication**

**272 Principles of Public Relations and Advertising**

**342 Electronic Media**

**351 Investigative Reporting**

**363 Organizational Writing**

**410 Organizational Communication**

**460–461 Video Communication**

**490 Field Research Techniques**

**624 Communicating for Social Change**

## Comparative Literature

**116 Great Short Masterpieces**

**121 Literatures from the Third World**

**201–202 Great Books**

**211 Science Fiction**

**354 Modern Drama**

## Computer Science

**100 Introduction to Computer Programming**

**101 The Computer Age**

**211 Computers and Programming**

**222 Introduction to Scientific Computation**

**314 Introduction to Computer Systems and Organization**

**410 Data Structures**

**486 Applied Logic**

## Economics

**101 Introductory Microeconomics**

**102 Introductory Macroeconomics**

**105 Principles of Accounting**

**205 Managerial Accounting for Planning and Control**

**306 Economics of Defense Spending**

**311 Intermediate Microeconomic Theory**

**312 Intermediate Macroeconomic Theory**

**313 Intermediate Microeconomic Theory (Calculus Section)**

**314 Intermediate Macroeconomic Theory (Calculus Section)**

**319 Introduction to Statistics and Probability**

**320 Introduction to Econometrics**

**331/531 Money and Credit**

**361/561 International Trade Theory and Policy**

**365 Japanese Economy**

**383 Marxist Political Economy**

## Education

**311 Educational Psychology**

**317 Psychology of Adolescence**

**420 Field Experience**

**497 Informal Study**

**590 Special Topics in Education**

**611 Educational Psychology**

**620 Internship in Education**

**630 Special Problems in Agricultural and Occupational Education**

**730 Seminar in Agricultural and Occupational Education**

**800 Master's-Level Thesis Research**

**900 Doctoral-Level Thesis Research**

## English

**108 Writing about Film**

**109 The Art of Argument: An Introduction to Rhetoric**

**131 Critical Reading and Writing**

**132 The Personal Essay**

**137 Writing Workshop**

**150 The Modern Imagination**

**158 American Authors**

**160 Afro-American Autobiography**

**165 Fantasy**

**227 Shakespeare**

**264 Modern Southern African and American Literature**

**270 The Reading of Fiction**

**272 Introduction to Drama**

**280 Creative Writing Workshop**

**288/289 Expository Writing**

**319 Chaucer**

**327 Shakespeare**

**477 Children's Literature**

## Floriculture and Ornamental Horticulture

**210 Architectural Sketching in Watercolor**

## French Literature

**201 Introduction to French Literature**

**202 Studies in French Literature**

## Geological Sciences

**101 Introductory Geological Science**

**102 Introduction to Historical Geology**

**401 Summer Field Geology in Utah, Wyoming, and Idaho**

## Government

**100.1 Revolutionaries and Power in Latin America**

**100.2 Race, Education, and Politics**

**100.3 Federalism and the American City**

**100.4 Work and Citizenship**

**111 The Government of the United States**

**131 Introduction to Comparative Government and Politics**

**161 Introduction to Political Theory**

**181 Introduction to International Relations**

**310 Power and Poverty in America**

**316 The American Presidency**

**318 The American Congress**

**333 Government and Politics of the Soviet Union**

**340 Latin American Politics**

**358 Modern History of the Middle East**

**392 International Relations of the Middle East**

## History

**101–102 Introduction to American History**

**151–152 Introduction to Western Civilization**

**243 China and the West before Imperialism**

**269 History of Science**

**314 History of American Foreign Policy, 1912 to the Present**

**341 Recent American History, 1945 to the Present**

**342 Hiroshima and Nagasaki**

**363 Russian History since 1800**

## History of Art

**102 The Eiffel Tower, *The Thinker*, and the *Mona Lisa*: What Makes Them Art?**

**202 Survey of European Art: Renaissance to Modern**

**246 Introduction to Art History: Renaissance and Baroque Art**

**261 Introduction to Art History: Modern Art**

## Hotel Administration

**161 Keyboarding on the Macintosh**

**486 Historical Development of the Right to Travel and Its Impact on American Society**

## Human Development and Family Studies

**115 Human Development: Infancy and Childhood**

**150 Families in Modern Society**

**216 Human Development: Adolescence and Youth**

**445 Topics in Early Childhood Education and Development: Education of the Emotionally Disturbed Child**

## Human Service Studies

**380 Community Mental Health**

## Industrial and Labor Relations

**Collective Bargaining**

**100 History of Industrial Relations in the United States**

**200/500 Collective Bargaining**

**201/501 Labor Relations Law and Legislation**

**Economic and Social Statistics**

**210–211 Statistical Reasoning**

**510–511 Introductory Statistics for the Social Sciences**

**Labor Economics**

**240 Economics of Wages and Employment**

**540 Labor Economics**

**Organizational Behavior**

**120 Introduction to Macroorganizational Behavior and Analysis**

**121 Introduction to Microorganizational Behavior and Analysis**

**371 Individual Differences and Organizational Behavior**

**Personnel and Human Resource Studies**

**266 Personal Computer Basics**

## Management

**570 Negotiation for Managers**

## Marine Science

Consult the Shoals Marine Laboratory office for a complete list of summer offerings in marine science.

## Mathematics

**101 History of Mathematics**

**105 Finite Mathematics**

**109 Precalculus Mathematics**

**111–112 Calculus**

**123 Analytic Geometry and Calculus**

**192 Calculus for Engineers**

**213 Calculus**

**231 Linear Algebra**

**294 Engineering Mathematics with Microcomputers**

**336 Applicable Algebra**

**421–422 Applicable Mathematics**

**486 Applied Logic**

## Mechanical and Aerospace Engineering

**454 Introduction to Solar Energy**

## Medieval Studies

**102 Knights and Ladies**

## Microbiology

**290–291 General Microbiology**

## Modern Languages and Linguistics

**Chinese**

**160 Introductory Intensive Chinese (Mandarin)**

**201–202 Intermediate Chinese**

**Dutch**

**131–132 Dutch Elementary Reading Course**

**English**

**101–102 English as a Second Language**

**211 English as a Second Language**

**215 English for Later Bilinguals**

**French**

**123 Continuing French**

**203–204 Intermediate Composition and Conversation**

**320 French Civilization with an Emphasis on Paris**

**German**

**121–122 Elementary German**

**123 Continuing German**

**631–632 Elementary Reading Course**

**Italian**

**123 Continuing Italian**

**Japanese**

**160 Introductory Intensive Japanese**

**203–204 Intermediate Japanese**

**403 Teaching of Japanese as a Foreign Language**

**Linguistics**

**101 Theory and Practice of Linguistics**

**Nepali**

**160 Intensive Nepali**

**Russian**

**123 Continuing Russian**

**203 Intermediate Composition and Conversation**

**Spanish**

**110 Spanish Basic Conversation Course**

**123 Continuing Spanish**

**203 Intermediate Composition and Conversation**

## Music

**101 The Art of Music**

**105 Introduction to Music Theory**

**115 Popular Musics Today**

**287 Mozart**

## Natural Resources

**215 Environmental Disruption and Regulation**

**219 Introduction to Natural History of the Finger Lakes Region**

**230 Food, Famine, and Population: Resource Policy and Management**

## Near Eastern Studies

**103 Elementary Hebrew**

**227 Introduction to the Prophets**

**241 The Holocaust: The Destruction of European Jewry 1934–45**

**294 Modern History of the Middle East**

**364 Introduction to Field Archaeology in Israel**

## Nutritional Sciences

**415 Field-based Learning in Nutrition**

## Operations Research and Industrial Engineering

**260 Introductory Engineering Probability**

**270 Basic Engineering Probability and Statistics**

**622 Operations Research I**

## Philosophy

**101 Introduction to Philosophy**

**103 Reasoning and Writing**

**145 Contemporary Moral Issues**

**212 Modern Philosophy**

**231 Introduction to Formal Logic**

**245 Ethics and Medicine**

## Physical Education

Consult the Physical Education Office for a complete list of summer offerings for credit and recreation.

## Physics

**101–102 General Physics**

**112 Physics I: Mechanics and Heat**

**213 Physics II: Electricity and Magnetism**

**214 Physics III: Optics, Waves, and Particles**

**400 Informal Advanced Laboratory**

**500 Informal Graduate Laboratory**

**510 Advanced Experimental Physics**

**520 Projects in Experimental Physics**

## Psychology

**101 Introduction to Psychology: The Frontiers of Psychological Inquiry**

**123 Introduction to Biopsychology**

**124 Introduction to Psychology: Brain and Behavior**

**128 Introduction to Psychology: Personality and Social Behavior**

**192 Introduction to the Senses**

**199 Sports Psychology**

**205 Perception**

**265 Psychology and Law**

**280 Introduction to Social Psychology**

**281 Interpersonal Relations and Small Groups**

**322 Hormones and Behavior**

**325 Introductory Psychopathology**

**350 Statistics and Research Design**

**380 Community Mental Health**

**469 Psychotherapy: Its Nature and Influence**

**490 History and Systems of Psychology**

## Rural Sociology

**437 Aging: Issues in the 1980s**

## Sociology

**101 Introduction to Sociology**

**121 Sociology of Deviance**

**211 Introduction to Social Research**

**243 Family**

**252 Public Opinion**

**264 Race and Ethnicity**

**281 Interpersonal Relations and Small Groups**

**347 Aging: Issues in the 1980s**

## Spanish Literature

**379 Introduction to Hispanic Cinema**

## Textiles and Apparel

**144 Introduction to Apparel Design**

**245 Dress: A Reflection of American Women's Roles**

## Theatre Arts

**108 Writing about Film**

**200 Introduction to Dance I**

**209 African Dance Improvisation**

**284 Voice and Pronunciation Skills**

**287 Summer Acting Workshop**

**327 Modern Drama**

**354 Stagecraft: Scenery and Lighting**

**362 Lighting Design and Technology**

**377 Fundamentals of 16-mm Filmmaking**

## Theoretical and Applied Mechanics

**202 Mechanics of Solids**

**203 Dynamics**

## Writing

**137 Writing Workshop**

# NEW YORK STATE COLLEGE OF VETERINARY MEDICINE

## ADMINISTRATION

Robert D. Phemister, dean

S. Gordon Campbell, associate dean for academic affairs

Neil L. Norcross, secretary of the college

John A. Lambert, assistant dean for administration

John C. Semmler, assistant dean for public affairs

Marcia J. Sawyer, director of student affairs and admissions

Gloria R. Crissey, registrar, director of financial aid

## DEPARTMENT CHAIRS

Anatomy: A. deLahunta

Avian and Aquatic Animal Medicine: B. Calnek

Clinical Sciences: D. Smith

Microbiology, Immunology, and Parasitology: R. Avery

Pathology: B. Pauli

Pharmacology: G. Sharp

Physiology: D. Robertshaw

## THE COLLEGE

The College of Veterinary Medicine offers a professional program that requires four years of full-time academic and clinical study of the normal and abnormal structure and function of the animal body and the diagnosis, treatment, and prevention of animal disease.

Graduates of the college receive the Doctor of Veterinary Medicine (D.V.M.) degree, which is recognized by licensing boards throughout the world. Graduates generally enter private practice or become engaged in one of the increasing number of other biomedical activities.

Admission requires a minimum of three years of college work, including specific prerequisite courses and experience. Applications must be filed approximately one year before the proposed matriculation date. The competition for admission is keen, since there are many more qualified applicants than can be admitted.

Graduate programs in veterinary research and postdoctoral training in clinical specialties are open to Doctors of Veterinary Medicine and some highly qualified holders of baccalaureate degrees and lead to the degree of Master of Science or Doctor of Philosophy.

More detailed information is contained in the *Announcement of the New York State College of Veterinary Medicine*, which may be obtained by writing to the college.

*Note:* 500- and 600-level courses are open only to veterinary students except by written permission from the instructor.

## ANATOMY

**500 Gross Anatomy: Small Animal Fall.**
**501 Gross Anatomy: Large Animal Spring.**
**502 Microscopic Anatomy First year.**
**504 Neuroanatomy and Clinical Neurology First year.**
**505 Applied Anatomy Fall.**
**506 Applied Anatomy Spring.**
**507 Animal Development Fall.**
**508 Anatomy of the Fish and Bird Spring.**
**600 Special Projects in Anatomy Fall and spring.**
**601 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer.**
**602 Advanced Clinical Neurology Fall.**

## AVIAN AND AQUATIC ANIMAL MEDICINE

**[255 Poultry Hygiene and Disease Spring.]**
**555 Avian Diseases Fall.**
**614 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer.**
**630 Diseases of Aquarium Fish Spring.**
**[631 Fish Health Management Spring.]**
**663 Veterinary Medicine in Developing Nations Spring.**
**[671 Diseases of Aquatic Animals Spring.]**
**672 Aquavet I: Introduction to Aquatic Veterinary Medicine Mid-May to mid-June.**
**673 Aquavet II: Health Management in Confined Populations of Invertebrates and Fish Summer.**
**770 Advanced Work in Avian Diseases Fall and spring.**
**772 Advanced Work in Aquatic Animal Diseases Fall and spring.**
**773 Advanced Work in Avian Immunology Fall and spring.**

## CLINICAL SCIENCES

**520 Preventive Medicine in Animal Health Management Spring.**
**545 Clinical Epidemiology Fall.**
**547 Practice Management Fall and spring.**
**548 Anesthesiology Fall.**
**561 Theriogenology I Spring.**
**562 Theriogenology II Fall.**
**563 Large Animal Medicine and Surgery Fall.**
**564 Large Animal Medicine and Surgery Spring.**
**566 Radiographic Techniques Fall.**
**567 Clinical Nutrition Fall.**
**568 Foundations of Clinical Science I Fall.**
**569 Foundations of Clinical Science II Spring.**
**570 Theriogenology Service Spring.**
**572 Senior Seminar Fall and spring.**
**574 Large Animal Surgery Service Fall and spring.**
**575 Ambulatory Service Fall and spring.**
**578 Clinical Anesthesia Fall and spring.**
**579 General Medicine and Surgery Spring.**
**580 Radiology Service Fall and spring.**
**581 Animal Nutrition Fall.**
**582 Large Animal Surgical Exercises Spring.**
**583 Small Animal Medicine and Surgery Fall.**
**584 Small Animal Medicine and Surgery Spring.**
**586 Small Animal Surgical Exercises Spring.**
**589 Small Animal Medicine Service Fall and spring.**
**591 Small Animal Surgery Service Fall and spring.**
**593 Ophthalmology Service Fall and spring.**
**594 Large Animal Medicine Service Fall and spring.**
**596 Opportunities in Veterinary Medicine Fall, spring, and summer.**
**598 Dermatology Service Fall and spring.**
**616 Research Opportunities in Veterinary Medicine Fall, spring, and summer.**
**664 Introductory Epidemiology Spring.**
**665 Advanced Epidemiology Fall.**
**675 Special Problems in Large Animal Medicine Fall and spring.**
**676 Special Problems in Large Animal Surgery Fall and spring.**
**677 Special Problems in Large Animal Obstetrics Fall and spring.**
**678 Bovine Embryo Transfer Spring.**
**[679 Dairy Herd Management and Health Fall.]**
**680 Poisonous Plants Fall.**
**[681 Horse Health Management Spring.]**
**683 Elementary Biostatistics Spring.**
**684 Horse Lameness Spring.**
**685 Introduction to Practice Management January.**
**686 Goats: Management and Diseases Spring.**
**688 Special Problems in Small Animal Medicine Fall and spring.**
**[689 Special Problems in Small Animal Surgery Fall and spring.]**

690 Veterinary Dermatology Spring.
691 Advanced Large Animal Internal Medicine Problems Spring.
692 Computers in Veterinary Medicine Spring.
694 Diseases of Common Exotic Pets Spring.
695 Advanced Equine Surgical Techniques Spring.
696 Basic and Therapeutic Horseshoeing Spring.
697 Advanced Techniques in Food Animal Surgery Spring.
766 Graduate Research Fall, spring, and summer.
768 Master's-Level Thesis Research Fall and spring.
769 Doctoral-Level Thesis Research Fall and spring.
782 Special Topics in Comparative Ophthalmology Fall.
799 Independent Studies in Epidemiology Fall and spring.

## DIAGNOSTIC LABORATORY

531 Regulatory Medicine Spring.
611 Mastitis Spring.
700 Special Projects in Diagnostic Endocrinology Fall and spring.
701 Special Projects in Infectious Diseases Fall and spring.
702 Special Topics in Infectious Diseases Fall and spring.
703 Doctoral Level Thesis Research Fall and spring.
704 Master's Level Thesis Research Fall and spring.

## MICROBIOLOGY, IMMUNOLOGY, AND PARASITOLOGY

315 Basic Immunology Lectures (also Biological Sciences 305) Fall.
316 Basic Immunology Laboratory (also Biological Sciences 307) Fall.
317 Pathogenic Microbiology (also Biological Sciences 308) Spring.
331 Medical Parasitology Fall.
510 Veterinary Parasitology Fall.
515 Veterinary Immunology Spring.
516 Infectious Diseases I: Bacteriology and Mycology Fall.
517 Infectious Diseases II: Virology and Viral Diseases Fall.
518 Infectious Diseases III: Infectious and Zoonotic Diseases Spring.
605 Special Projects in Microbiology Fall and spring.
606 Small Animal Infectious Diseases Spring.
[607 Virus Diseases of Cattle Fall.]
[609 A Health Program for Sheep Spring.]
615 Research Opportunities in Veterinary Medicine Fall, spring, and summer.
651 Clinical Parasitology of Avian Species Spring.
706 Immunology Seminar Series Fall and spring.
707 Advanced Work in Bacteriology, Virology, Immunology Fall and spring.
708 Selected Topics in Animal Virology Spring.
709 Laboratory Methods of Diagnosis Fall and spring.
710 Microbiology Seminars Fall and spring.
[713 Special Projects in Immunology: Topic to be announced Spring.]
[714 Special Projects in Immunology: Topic to be announced Spring.]
[715 Special Projects in Immunology: Topic to be announced Spring.]
716 Special Topics in Immunology: Topic to be determined Spring.
717 Special Topics in Immunology: Topic to be determined Spring.
718 Special Topics in Immunology: Topic to be determined Spring.
737 Advanced Work in Parasitology Fall and spring.
[767 Immunoparasitology Spring.]
783 Seminars in Parasitology Fall and spring.

## PATHOLOGY

535 Veterinary Pathology I Fall.
536 Veterinary Pathology II Spring.
539 Introduction to Laboratory Animal Medicine Spring.
540 Pathology Service Fall and spring.
549 Laboratory Animal Clinical Rotation Spring.
571 Clinical Pathology Spring.
613 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer.
635 Special Problems in Pathology Fall and spring.
[636 Wildlife Pathology Fall.]
[637 Postmortem Pathology Fall and spring.]
638 The Bottom Line Fall and spring.
639 Autotutorial in Laboratory Animal Medicine and Science Fall and spring.
[640 Principles of Toxicological Pathology Fall.]
641 Clinical Immunology Spring.
642 Public Policy and Laboratory Animal Science Spring.
643 The Use of Animal Models to Explore Physiologic and Pathologic Mechanisms in Animals and Man Fall.
[701 Pathobiology of Disease: Cell Growth, Differentiation, and Neoplastic Transformation Spring.]
[702 Pathobiology of Disease: Tumor Cell Biology Spring.]
[703 Pathobiology of Disease: Extracellular Matrix Spring.]
704 Pathobiology of Disease: Advanced Immunopathology Fall.
705 Pathobiology of Disease: Toxicologic Pathology Fall.
706 Pathobiology of Disease: Advanced Reproductive Pathology Fall.
707 Pathobiology of Disease: The Inflammatory Process Spring.
708 Pathobiology of Disease: Genetic Basis of Disease Spring.
709 Pathobiology of Disease: Advanced Clinical Pathology Spring.
[710 Pathobiology of Disease: Advanced Neuropathobiology Fall.]
[711 Pathobiology of Disease: Metabolic Bone Disorders Fall.]
[712 Pathobiology of Disease: Laboratory Animal Pathology Fall.]
736 Pathology of Nutritional Diseases Spring.
739 Advanced Work in Pathology Fall and spring.
749 Laboratory Animal Clinical Rotation Fall and spring.
788 Seminar in Surgical Pathology Fall and spring.
789 Seminar in Necropsy Pathology Fall and spring.
790 Special Topics in Pathology Fall.
793 Lectures in General Pathology Fall.
794 Lectures in Special Pathology Spring.
796 Medical Primatology Fall.

## PHARMACOLOGY

528 Pharmacology I Fall.
529 Pharmacology II Spring.
610 Introduction to Chemical and Environmental Toxicology (also Toxicology 610) Fall.
620 Advanced Clinical Pharmacology Spring.
[621 Toxicology (also Toxicology 621) Spring.]
622 Special Projects in Pharmacology Fall, spring, and summer.
629 Research Opportunities in Veterinary Medicine Fall, January, spring, and summer.
660 Safety Evaluations in Public Health Spring.
[700 Calcium and Other Second Messengers in Cell Activation Fall.]
701 Receptors and Ion Channels Spring.
703 Receptor Binding: Theory and Techniques (also Biological Sciences 790, Sec. 02) Spring.
704 CNS Neuropharmacology: Mechanisms-Synaptic Transmission Fall.
705 Mechanisms of Receptor-G Protein-Coupled Signal Transduction Spring.

### Special Projects and Research

[711 The Role of Calcium in Stimulus-Secretion Coupling Fall, spring, and summer.]
[712 The Receptor for Immunoglobulin E on Tumor Mast Cells Fall, spring, and summer.]
713 Mechanisms of Growth-Factor Action Fall, spring, and summer.
714 Central Nervous System Neurotransmitters Fall, spring, and summer.
716 Neurobiology of Seizure Disorders Fall, spring, and summer.
717 Single-Channel Recording Fall, spring, and summer.
718 Structure-Function of the Nicotinic Acetylcholine Receptor Fall, spring, and summer.
719 Computer Modeling of Drug-Receptor Interactions Fall, spring, and summer.

**720 Modulation of Nicotinic Acetylcholine Receptor Function by Substance P Fall, spring, and summer.**

**721 Molecular Mechanisms of Pharmacological Blockade of Voltage-Dependent Calcium Channels Fall, spring, and summer.**

**723 The Role of Calcium in the Control of Electrolyte Transport Fall and spring.**

**724 The Control of Hormone Secretion Fall and spring.**

### Special Topics

**741 Neuromodulation Fall, spring, and summer.**

**742 Receptor Mechanisms Fall, spring, and summer.**

**743 Neuropeptides Fall, spring, and summer.**

**744 Voltage-dependent Calcium Channels Fall, spring, and summer.**

**745 Neuropharmacology Fall, spring, and summer**

**746 Electrophysiological Techniques Fall, spring, and summer.**

**747 Amino Acid Neurotransmitters Fall, spring, and summer.**

**[748 Stimulus-Secretion Coupling Fall, spring, and summer.]**

**[749 Second Messengers in Cell Activation Fall, spring, and summer.]**

**[750 Cell Calcium Fall, spring, and summer.]**

**[751 Receptors in the Immune System Fall, spring, and summer.]**

**[752 Mediators of Inflammation Fall, spring, and summer.]**

**753 Clinical Pharmacology Fall.**

**754 G Proteins in Signal Transduction Fall, spring, and summer.**

**755 Calcium in the Control of Hormone Secretion Fall.**

**756 Mechanisms of Calcium Handling Fall and spring.**

**757 Intestinal Electrolyte Transport Fall and spring.**

**759 Receptor Binding Techniques Fall, spring, and summer.**

**760 Advanced Topics in Pharmacology Fall, spring, and summer**

**770 Graduate Research in Pharmacology Fall, spring, and summer.**

## PHYSIOLOGY

**Biological Basis of Sex Differences (Biological Sciences 214) Fall.**

**Histology: The Biology of the Tissues (Biological Sciences 313) Fall.**

**Cellular Physiology (Biological Sciences 316) Spring.**

**346 Introductory Animal Physiology, Lectures (also Biological Sciences 311) Fall.**

**348 Introductory Animal Physiology, Laboratory (also Biological Sciences 319) Fall.**

**Seminar in Anatomy and Physiology (Biological Sciences 410) Fall and spring.**

**Mammalian Physiology (Biological Sciences 458) Spring.**

**Undergraduate Research in Biology (Biological Sciences 499) Fall and spring.**

**525 Molecular and Cellular Physiology Fall.**

**526 Systems Physiology I Fall.**

**527 Systems Physiology II Spring.**

**528 Veterinary Ethics Fall and spring.**

**612 Research Opportunities in Veterinary Medicine Fall, spring, and summer.**

**Lipids (Biological Sciences 619 and Nutritional Sciences 602) Fall.**

**625 Problems in Dog and Cat Behavior Spring.**

**626 Problems in Equine Behavior Spring.**

**627 Acid-Base Relations (Biological Sciences 715) Fall, spring, and summer.**

**628 Graduate Research in Animal Physiology (also Biological Sciences 719) Fall and spring.**

**Plasma Lipoproteins (Biological Sciences 712) Spring.**

**[Physiology of Pregnancy (Biological Sciences 714) Spring.]**

**Seminar on Insect Physiology (Biological Sciences 716, also Entomology 685) Spring.**

**Structure and Function of Joints with Emphasis on Arthritis (Biological Sciences 717) Fall.**

**[Evolution of Color Vision (Biological Sciences 718) Spring.]**

**720 Special Problems in Physiology Fall and spring.**

**726 Systems Physiology I Fall.**

**727 Systems Physiology II Spring.**

**[752 Biological Membranes and Nutrient Transfer (also Biological Sciences 618) Spring.]**

**Animal Biotechnology (Biological Sciences 753) Fall.**

**758 Molecular Mechanisms of Hormone Action (also Biological Sciences 658) Spring.**

**759 Nutrition and Physiology of Mineral Elements (also Biological Sciences 615 and 659) Fall.**

**Fundamentals of Endocrinology, Lecture (Animal Science 427) Fall.**

**Fundamentals of Endocrinology, Laboratory (Animal Science 428) Fall.**

## FACULTY ROSTER

Antczak, Douglas F., Ph.D., U. of Cambridge (England) Assoc. Prof., Microbiology, Immunology, and Parasitology

Appel, Max J., Ph.D, Cornell U. Prof. Microbiology, Immunology, and Parasitology

Appleton, Judith A., Ph.D., U. of Georgia. Asst. Prof., Microbiology, Immunology, and Parasitology

Avery, Roger J., Ph.D., U. of Newcastle-upon-Tyne (England) Prof., Microbiology, Immunology, and Parasitology

Babish, John, Ph.D., Cornell U. Assoc. Prof., Pharmacology

Ball, Barry A., Ph.D., Cornell U. Asst. Prof., Clinical Sciences

Beck, Kathy A., D.V.M., Washington State U. Asst. Prof., Clinical Sciences

Bell, Robin G., Ph.D., Australian National U. Assoc. Prof., Microbiology, Immunology, and Parasitology

Bergman, Emmett N., Ph.D., U. of Minnesota. Prof., Physiology/(Section of Physiology)

Blue, Julia T., Ph.D., U. of Pennsylvania. Assoc. Prof., Clinical Sciences

Bowman, Dwight D., Ph.D., Tulane U. Asst. Prof., Microbiology, Immunology, and Parasitology

Bowser, Paul R., Ph.D., Auburn U. Assoc Prof., Avian and Aquatic Animal Medicine

Calnek, Bruce W., D.V.M., Cornell U. Prof., Avian and Aquatic Animal Medicine

Campbell, S. Gordon, Ph.D., Cornell U. Prof., Microbiology, Immunology, and Parasitology

Carmichael, Leland E., Ph.D., Cornell U. John M. Olin Professor of Virology, Microbiology, Immunology, and Parasitology

Casey, James W., Ph.D., U. of Chicago. Assoc. Prof., Microbiology, Immunology, and Parasitology

Center, Sharon A., D.V.M., U. of California at Davis. Assoc. Prof., Clinical Sciences

Cerione, Richard A., Ph.D., Rutgers U. Asst. Prof., Pharmacology

Cooper, Barry J., Ph.D., U. of Sydney (Australia). Assoc. Prof., Pathology

Corradino, Robert A., Ph.D., Cornell U. Assoc. Prof. Physiology/(Section of Physiology)

Cummings, John F., Ph.D., Cornell U. Prof., Anatomy

deLahunta, Alexander, Ph.D., Cornell U. Prof., Anatomy

Dobson, Alan, Ph.D., U. of Aberdeen (Scotland). Prof., Physiology/(Section of Physiology)

Dubovi, Edward J., Ph.D, U. of Pittsburgh. Assoc. Prof., Diagnostic Laboratory

Ducharme, Normand G., D.V.M., U. of Montreal (Canada). Assoc. Prof., Clinical Sciences

Erb, Hollis N., Ph.D., U. of Guelph (Canada). Assoc. Prof., Clinical Sciences

Farnum, Cornelia, Ph.D., U. of Wisconsin. Asst. Prof., Anatomy

Fewtrell, Clare, D.Phil., U. of Oxford (England). Assoc. Prof., Pharmacology

Flanders, James A., D.V.M., U. of California at Davis. Asst. Prof., Clinical Sciences

Fortune, Joanne E., Ph.D, Cornell U. Assoc. Prof., Physiology

Fox, Francis H., D.V.M., Cornell U. Prof., Clinical Sciences

French, Tracy W., D.V.M., Purdue U. Asst. Prof., Pathology

Fubini, Susan L., D.V.M., U. of Georgia. Asst. Prof., Clinical Sciences

Gilbert, Robert O., M. Med. Vet., U. of Pretoria (South Africa). Asst. Prof., Clinical Sciences
Gilmour, Robert F., Jr., Ph.D., SUNY—Upstate Medical Center. Assoc. Prof., Physiology
Gleed, Robin D., D.V.A., U. of Liverpool (England). Assoc. Prof., Clinical Sciences
Gould, Willard J. III, D.V.M., Cornell U. Asst. Prof., Clinical Sciences
Grohn, Yrjo T., Ph.D., College of Veterinary Medicine, Helsinki (Finland). Asst. Prof., Clinical Sciences
Guard, Charles L. III, Ph.D., Case Western Reserve U. Assoc. Prof., Clinical Sciences
Hackett, Richard P., Jr., D.V.M., Ohio State U. Assoc. Prof., Clinical Sciences
Hansel, William, Ph.D., Cornell U. Prof., Physiology/(Section of Physiology)
Harvey, H. Jay, D.V.M., Kansas State U. Assoc. Prof., Clinical Sciences
Henion, John D., Ph.D., SUNY at Albany. Assoc. Prof., Diagnostic Laboratory
Hermanson, John W., Ph.D., U. of Florida. Asst. Prof., Anatomy
Hintz, Harold F., Ph.D., Cornell U. Prof., Clinical Sciences
Hornbuckle, William E., D.V.M., Oklahoma State U. Assoc. Prof., Clinical Sciences
Horne, William A., Ph.D., Cornell U. Asst. Prof., Pharmacology
Houpt, Katherine A., Ph.D., U. of Pennsylvania. Prof., Physiology/(Section of Physiology)
Houpt, T. Richard, Ph.D., U. of Tennessee. Prof., Physiology/(Section of Physiology)
Jacobson, Richard H., Ph.D., Montana State U. Assoc. Prof., Diagnostic Laboratory
Kaderly, Robert E., Ph.D., Ohio State U. Assoc. Prof., Clinical Sciences
Kallfelz, Francis A., Ph.D., Cornell U. Prof., Clinical Sciences
Kern, Thomas J., D.V.M., U. of Missouri. Assoc. Prof., Clinical Sciences
King, John M., Ph.D, Cornell U. Prof., Pathology
Krook, Lennart P., Ph.D., Royal Veterinary Coll. at Stockholm (Sweden). Prof., Pathology
Lein, Donald H., Ph.D., U. of Connecticut. Assoc. Prof., Diagnostic Laboratory
Lewis, Robert M., D.V.M., Washington State U. Prof., Pathology
Lopez, Jorge W., Ph.D., U. of Illinois. Asst. Prof., Diagnostic Laboratory
Lowe, John E., D.V.M., Cornell U. Assoc. Prof., Diagnostic Laboratory
Lucio, Benjamin, Ph.D., Cornell U. Assoc. Prof., Avian and Aquatic Animal Medicine
Lust, George, Ph.D., Cornell U. Prof., Microbiology, Immunology, and Parasitology
McGregor, Douglas D., D.Phil., U. of Oxford (England). Prof., Microbiology, Immunology, and Parasitology
Maylin, George A., Ph.D., Cornell U. Assoc. Prof., Diagnostic Laboratory
Mechor, Gerald D., M.V.S., Western College of Veterinary Medicine. Asst. Prof., Clinical Sciences
Miller, William H., Jr., V.M.D., U. of Pennsylvania. Asst. Prof., Clinical Sciences
Minor, Ronald R., Ph.D., U. of Pennsylvania. Prof., Pathology
Mohammed, Hussni, O., Ph.D., U. of California at Davis. Asst Prof., Clinical Sciences
Moise, N. Sydney, M.S., Cornell U. Asst. Prof., Clinical Sciences
Naqi, Syed A., Ph.D., Texas A & M U. Prof., Avian and Aquatic Animal Medicine
Nathanielsz, Peter W., M.D., U. of Cambridge (England). Prof., Physiology
Nixon, Alan J., M.S., Colorado State U. Asst. Prof., Clinical Sciences
Noden, Drew M., Ph.D., Washington U. Prof., Anatomy
Norcross, Neil L., Ph.D., U. of Massachusetts. Prof., Clinical Sciences
Noronha, Fernando M., D.V.M., U. of Lisbon (Portugal). Prof., Microbiology, Immunology, and Parasitology
Nowak, Linda M., Ph.D., U. of Michigan. Asst. Prof., Pharmacology
Oswald, Robert E., Ph.D., Vanderbilt U. Assoc. Prof., Pharmacology
Parrish, Colin R., Ph.D., Cornell U. Asst. Prof., Microbiology, Immunology, and Parasitology
Pauli, Bendicht U., Ph.D., U. of Bern (Switzerland). Prof., Pathology
Phemister, Robert D., Ph.D., Colorado State U. Prof., Pathology
Playter, Robert F., D.V.M., Kansas State U. Prof., Clinical Sciences
Pollock, Roy V., Ph.D., Cornell U. Asst. Prof., Clinical Sciences
Quimby, Fred W., Ph.D., U. of Pennsylvania. Assoc. Prof., Pathology
Randolph, John F., D.V.M., Cornell U. Assoc. Prof., Clinical Sciences
Rebhun, William C., D.V.M, Cornell U. Assoc. Prof., Clinical Sciences
Reimers, Thomas J., Ph.D., U. of Illinois. Assoc. Prof., Diagnostic Laboratory
Rendano, Victor T., V.M.D., U. of Pennsylvania. Assoc. Prof., Clinical Sciences
Riis, Ronald C., D.V.M., U. of Minnesota. Assoc. Prof., Clinical Sciences
Robertshaw, David, Ph.D., Glasgow U. (England). Prof., Physiology
Sack, Wolfgang O., Ph.D., U. of Edinburgh (Scotland). Prof., Anatomy
Scarlett, Janet M., Ph.D., U. of Minnesota. Asst. Prof., Clinical Sciences
Schat, Karel A., Ph.D, Cornell U. Prof., Avian and Aquatic Animal Medicine
Schlafer, Donald H., Ph.D., U. of Georgia. Assoc. Prof., Pathology
Schryver, Herbert F., Ph.D., U. of Pennsylvania. Assoc. Prof., Clinical Sciences
Schwark, Wayne S., Ph.D., U. of Ottawa (Canada). Prof., Pharmacology
Scott, Danny W., D.V.M., U. of California at Davis. Prof., Clinical Sciences
Scott, Frederic W., Ph.D., Cornell U. Prof., Microbiology, Immunology, and Parasitology
Sears, Philip M., Ph.D., Ohio State U. Assoc. Prof., Diagnostic Laboratory
Seeger, Christoph, Ph.D., U. of Basel (Switzerland). Asst. Prof., Microbiology, Immunology, and Parasitology
Sharp, Geoffrey W. G., D.Sc., U. of London (England). Prof., Pharmacology
Shin, Sang J., D.V.M., Seoul National U. (Korea). Assoc. Prof., Diagnostic Laboratory
Short, Charles E., D.V.M., Auburn U. Prof., Clinical Sciences
Slauson, David O., Ph.D., U. of California at Davis. Prof., Pathology
Smith, Donald F., D.V.M., U. of Guelph (Canada). Prof., Clinical Sciences
Smith, Mary C., D.V.M., Cornell U. Assoc. Prof., Clinical Sciences
Spitsbergen, Jan M., Ph.D., Cornell U. Asst. Prof., Avian and Aquatic Animal Medicine
Straw, Barbara E., Ph.D., U. of Minnesota. Assoc. Prof., Diagnostic Laboratory
Summers, Brian A., Ph.D., Cornell U. Assoc. Prof., Pathology
Suter, Maja M., Ph.D., Cornell U. Asst. Prof., Pathology
Tapper, Daniel N., Ph.D., Cornell U. Prof., Physiology/(Section of Physiology)
Tennant, Bud C., D.V.M., U. of California at Davis. Prof., Clinical Sciences
Thompson, John C., Jr., Ph.D., Cornell U. Assoc. Prof., Clinical Sciences
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Weiland, Gregory A., Ph.D, U. of California at San Diego. Assoc. Prof., Pharmacology
Wertz, Etta M., D.V.M. Colorado State U. Asst. Prof., Clinical Sciences
White, Maurice E., D.V.M., Cornell U. Assoc. Prof., Clinical Sciences
Winter, Alexander J., Ph.D., U. of Wisconsin. Prof., Microbiology, Immunology, and Parasitology
Wootton, John F., Ph.D., Cornell U. Prof., Physiology
Yeager, Amy E., D.V.M., Cornell U. Asst. Prof., Clinical Sciences
Yen, Andrew, Ph.D., Cornell U. Assoc. Prof., Pathology

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8/89 45M BP/WP E80429G