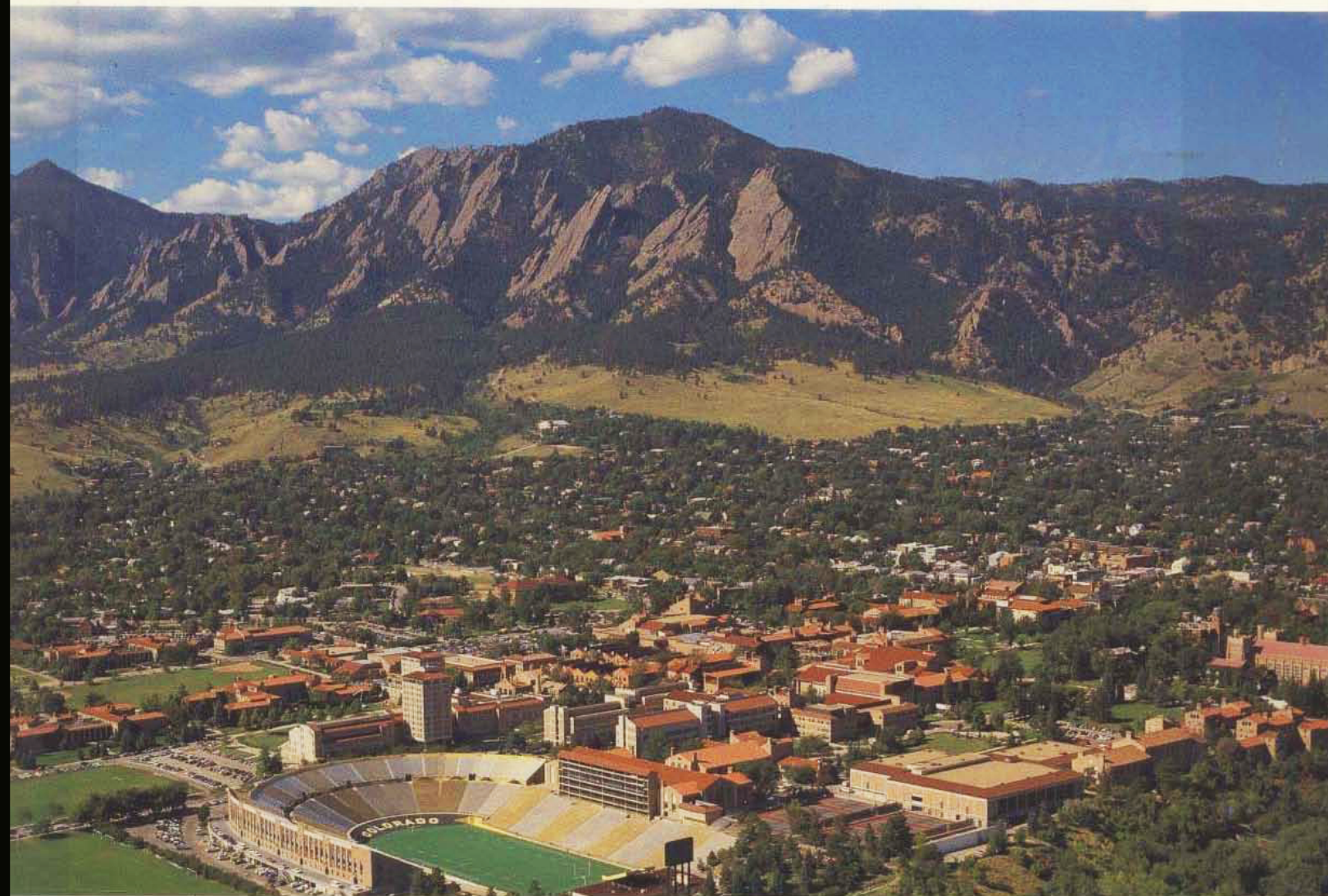


# **University of Colorado at Boulder 1988-89 Catalog**



**University of Colorado Catalog**

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# Introductory Notes

The *University of Colorado at Boulder Catalog* contains general University information; a summary of campus facilities, programs, and services; descriptions of colleges, schools, and individual departments; degree requirements; course descriptions; and a listing of administrative officers and faculty. Students should refer to this 1988-89 edition of the *Catalog* for current course descriptions and University policies. Students are subject to the degree, major, and certification requirements in effect at the time they formally enter a program. For additional information, students should consult their dean's office.

Because the *Catalog* is compiled well in advance of the academic year it covers, changes in programs and policies may well occur. Further, due to implementation of the new Student Information System, many registration dates and procedures remain tentative as this *Catalog* goes to press. Students are responsible for being aware of these changes; up-to-date information may be obtained by consulting departmental advisors, checking departmental

bulletin boards, and reading the *Schedule of Courses* and registration materials distributed each semester.

All *Catalog* information is subject to change without notice or obligation.

## New Four-Digit Course Numbering System

CU-Boulder is adopting a four-digit course numbering system in conjunction with the implementation of the new Student Information System in Summer 1988. A Course Number Translation Table, located just before the Course Descriptions section of this *Catalog*, shows three-digit course numbers and their corresponding new four-digit designations. Questions about course designations should be directed to the academic department offering the courses.

## Course Descriptions

Undergraduate courses are classified as lower division and upper division. Courses numbered in the 1000s and

2000s are lower-division courses that are introductory in nature and generally intended for first- and second-year undergraduate students. However, they are open to all undergraduates. Courses numbered in the 3000s and 4000s are upper-division courses, generally intended for third- and fourth-year students. In order to enroll for some upper-division courses, students must be at the junior or senior level. Courses numbered in the 5000s are primarily intended for graduate students but may be open to qualified undergraduates under some circumstances. Normally, courses numbered 6000, 7000, and 8000 are open to graduate students only; see college and school sections for special provisions.

The number following the course number (for example, -2, -3, -4) indicates semester hours of credit offered for the course. Students should consult the *Schedule of Courses* for up-to-date information regarding courses offered, corequisites and prerequisites, instructors, and times of classes.

## Affirmative Action/Equal Opportunity Policy

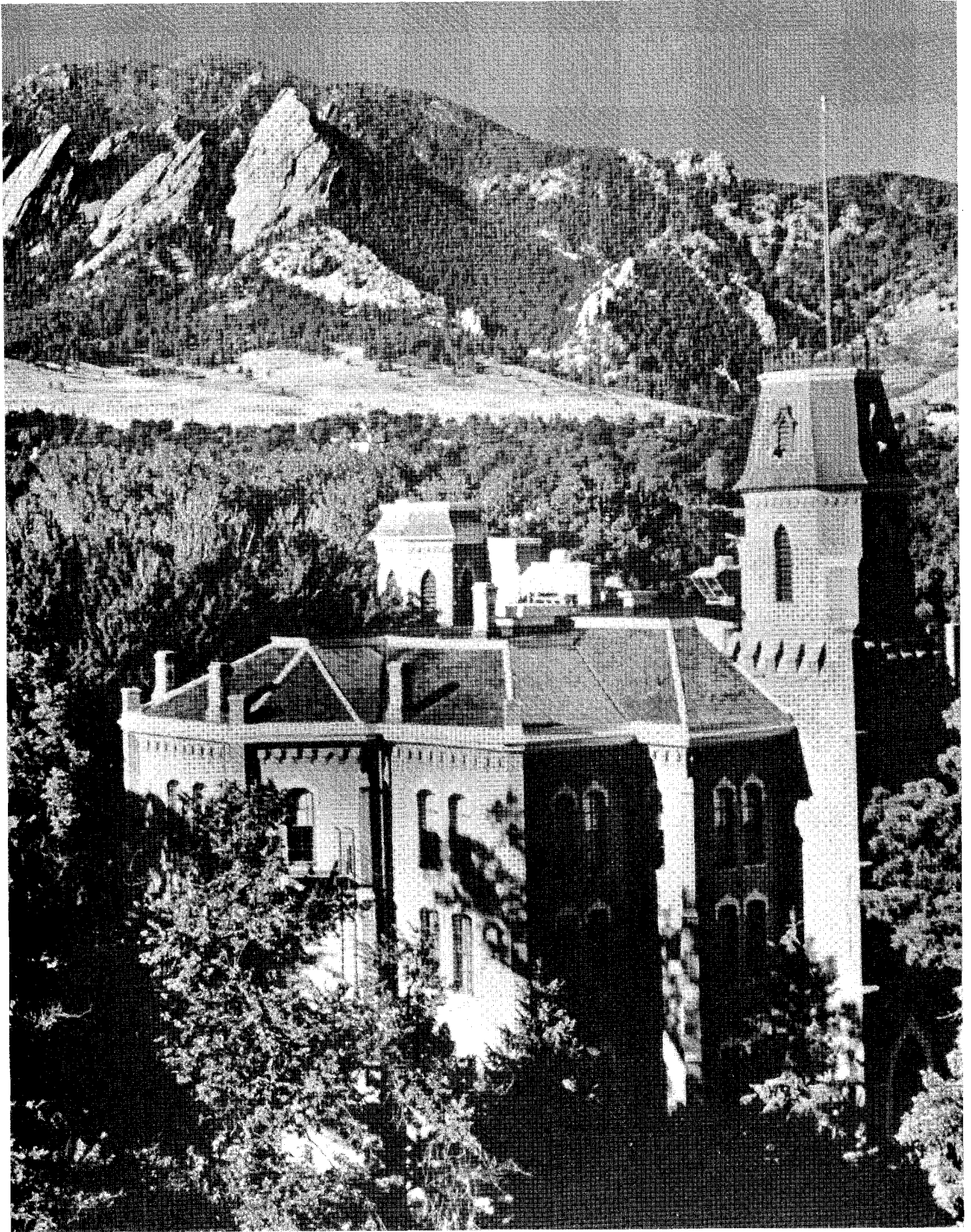
In its pursuit of excellence, the University of Colorado at Boulder affirms its commitment to the concept and the process of affirmative action. Central to the educational purpose of the institution is a need to reflect the diversity of our society; that obligation extends to faculty, students, and staff.

Regardless of race, color, creed, religion, national origin, physical limitation, veteran status, age, or sex, the University will provide affirmative action and equal opportunity in matters of employment, student admission, and programs, activities, and services offered to employees and students.

The University of Colorado at Boulder will remain firm in its commitment to diversity and the practice of affirmative action. There is a need not only to retain the principle, but also to develop and support specific goals and objectives toward that end. The educational purposes of the University will be served best when it reflects the full range and the full capacity of this country's society.

For further information on equal opportunity and affirmative action, write the Manager of Affirmative Action and Services, 1511 University Avenue, Campus Box 475, University of Colorado at Boulder, Boulder, Colorado 80309-0475, or call (303) 492-6706.





# The University of Colorado

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## UNIVERSITY OVERVIEW

At its first session in 1861, the Territorial Legislature of Colorado passed an act providing for a university at Boulder. The University was formally founded in 1876, the same year that Colorado became the Centennial State. Between 1861 and 1876, Boulder citizens donated land south of town and made gifts from \$15 to \$1,000 in order to match the \$15,000 appropriated by the state legislature for construction of the University. The cornerstone for Old Main, the first University building, was laid in 1875. The University opened its doors on September 5, 1877, with 44 students, a president, and one instructor. Today the University system includes the main campus at Boulder and campuses at Colorado Springs, Denver, and the Health Sciences Center in Denver. The campuses have a combined enrollment of approximately 40,000 students.

Each campus has a special function in Colorado higher education. The 600-acre Boulder Campus offers an educational atmosphere that is exceptional in the breadth of its programs, courses, students, faculty, and facilities and fulfills its role of leadership within the four-campus University system by being recognized as the leading comprehensive research university in the Rocky Mountain Region. The University of Colorado at Colorado Springs, situated on a 400-acre campus, provides programs and faculty to meet the university-level needs of the Pikes Peak area and southern Colorado. The University of Colorado at Denver, located in downtown Denver, serves the urban student and community with programs especially sensitive to the needs of the urban population and environment. The Denver Campus shares library, laboratory, classroom, and recreational facilities with Metropolitan State College and the Community College of Denver's Auraria branch on the Auraria Higher Education Center Campus. The 40-acre campus of the University's Health Sciences Center is also located in Denver. As well as professional schools, the Center includes the University Hospitals, the Children's Day Care Center, the Rocky

Mountain Development Center, the Children's Diagnostic Center for the evaluation of emotionally disturbed children, and several affiliated health research institutes.

CU is among the top 25 public universities in the country in gaining federal research support, according to the National Science Foundation. Research and related instructional programs within the University represent annual expenditures amounting to some \$114 million. Of this total, the expenditures on the Boulder, Colorado Springs, and Denver campuses are now over \$68 million per year. The sponsored research and instructional program of the Health Sciences Center in Denver totals more than \$46 million annually. Principal sources of these funds for research and training contracts and grants are various agencies of the federal government. The University's research activity is also supported by appropriations from the state of Colorado, private foundations, and private donors.

## University Administration

The University of Colorado is governed by an elected, nine-member Board of Regents, charged by the state constitution with the general supervision of the University and the exclusive control and direction of all its funds and appropriations, unless otherwise provided by law. The Board conducts its business at regular monthly meetings, in special meetings open to the public, and through committees. The president is the chief academic and administrative officer of the four-campus system and is responsible for providing academic leadership to the University. On each campus, a chancellor serves as the chief academic and administrative officer responsible for the conduct of campus affairs.

Faculty participation in campus governance takes place through the Faculty Senate and the Faculty Assembly. Student participation in governance is achieved through the University of Colorado Student Union (UCSU).

## Colleges and Schools

To meet the needs of its students, the University offers numerous fields of study. *The Board of Regents of the University of Colorado reserves the right to establish enrollment levels for all academic areas.* Colleges and schools on the four campuses are listed below.

### BOULDER CAMPUS

College of Arts and Sciences  
College of Business and Administration  
College of Engineering and Applied Science  
College of Environmental Design  
College of Music  
Graduate School  
Graduate School of Business Administration  
School of Education  
School of Journalism and Mass Communication  
School of Law  
School of Pharmacy

### COLORADO SPRINGS CAMPUS

College of Business and Administration  
College of Engineering and Applied Science  
College of Letters, Arts and Sciences  
Graduate School  
Graduate School of Business Administration  
Graduate School of Public Affairs

### DENVER CAMPUS

College of Business and Administration  
College of Design and Planning  
College of Engineering and Applied Science  
College of Liberal Arts and Sciences  
College of Music  
Graduate School  
Graduate School of Business Administration  
Graduate School of Public Affairs  
School of Education

### HEALTH SCIENCES CENTER

Graduate School  
School of Dentistry  
School of Medicine  
School of Nursing

## THE BOULDER CAMPUS

The mission of the University of Colorado at Boulder (CU-Boulder) is to lead in the discovery, communication, and use of knowledge through instruction, research, and service to the public. As a comprehensive university, CU-Boulder is committed to the liberal education of students and to a broad curriculum ranging from the baccalaureate through the postdoctoral levels. The educational experience of the Boulder Campus, therefore, is distinguished by the wide scope of its programs and course offerings, the notable reputation of its research facilities, the diversity of its student body, and the professionalism and dedication of its faculty.

The Boulder Campus has five colleges and four professional schools that offer more than 4,000 courses in over 140 fields of study. There are approximately 80 academic programs available at the bachelor's level, 60 at the master's level, and 50 at the doctoral level. These programs represent a full range of disciplines in the humanities, the social sciences, the physical and biological sciences, and the professions. CU-Boulder is fully accredited by the North Central Association of Colleges and Schools. See college and school sections of the *Catalog* for additional accreditation information.

In 1967 CU-Boulder became a member of the Association of American Universities (AAU). AAU membership consists of 56 leading graduate and research-oriented institutions of higher education. The University of Colorado at Boulder is the only AAU institution in the Rocky Mountain Region.

Research conducted in Boulder's academic departments is facilitated and supplemented by a structure of research institutes. These institutes are devoted both to the advancement of knowledge in particular areas and to graduate training. Many of these institutes have developed international reputations. Included among these well-known institutes are the Cooperative Institute for Research in Environmental Sciences (CIRES), the Institute for Behavioral Genetics (IBG), the Institute of Behavioral Science (IBS), the Institute of Cognitive Science (ICS), the Institute of Arctic and Alpine Research (INSTAAR), the Joint Institute for Laboratory Astrophysics (JILA), and the Laboratory for Atmospheric and Space Physics (LASP). For a detailed description of these institutes and other important research facilities associated with the University, see the Graduate School section of this *Catalog*.

The University's relationships with national agencies and laboratories

located in Boulder are also exceptionally productive. The teaching and research programs on the Boulder Campus are closely integrated with the National Center for Atmospheric Research (NCAR), including the High Altitude Observatory (HAO), the National Bureau of Standards (NBS), and the National Oceanic and Atmospheric Administration (NOAA), among others.

The educational environment of a research university is characterized by a broad range of experiences in many different settings. While the classroom is the location for most instructional activities, laboratories, seminars, and field work are also important features of the undergraduate and graduate CU experience. Some programs encourage off-campus internships and training, and study abroad programs are popular. For students whose interests cross traditional disciplinary lines, a number of interdisciplinary programs are available. The campus operates year-round on a semester system, with fall and spring semesters consisting of 16 weeks each, and a 10-week summer session.

With a total enrollment of approximately 22,000 students, CU-Boulder is the largest campus in the four-campus system. The student population comes from every state in the nation and more than 75 foreign countries. Many different ethnic, religious, academic, and social backgrounds are represented, making for an interesting and diverse student population that enriches each student's educational experience.

Full-time faculty members number 965, and 91 percent have Ph.D. or equivalent degrees. The faculty includes nationally and internationally recognized scholars with many academic honors and awards. Ten of the faculty are members of the National Academy of Sciences; six are members of the National Academy of Engineering; and eight are included in the membership of the American Academy of Arts and Sciences. Most faculty members, including full professors, teach both undergraduate and graduate classes. Faculty members incorporate their research and creative activities directly into the instructional programs.

## The Campus Setting

The University of Colorado at Boulder is located at the foot of the Rocky Mountains, at an altitude of 5,363 feet. The climate is temperate, with pleasant days and cool evenings. On the average, the area enjoys 300 days of sunshine each year. The campus covers 600 acres and includes 160 buildings constructed of rough-cut sandstone with

red tile roofs. The rural Italian architectural style evolved from a master plan developed by Philadelphia architect Charles Klauder in 1917. The Norlin Quadrangle, including the original Old Main building of 1876, is listed in the State and National Register of Historical Places.

Boulder County encompasses five ecological zones, from 5,000 feet above sea level (plains grassland) to 14,000 feet (alpine tundra). Downtown Boulder is only 20 miles from the Continental Divide and some of the most spectacular scenery in the United States.

The city of Boulder, an attractive community of 80,000 people, is committed to preserving its beautiful natural environment and provides its citizens with ample parks and open space. Contemporary environmental design and renovated historical buildings combine to give the city a pleasant, well-planned atmosphere. The natural beauty of the locale attracts a variety of individuals to the area: scientists, businesspeople, and professionals, as well as writers, artists, and craftspeople. Consequently, the city is a center of high technology enterprise, scientific research, and cultural activity.

Metropolitan Denver, with a population of 1.8 million, is 30 miles from Boulder. Denver offers the opportunities and resources of a large city and is easily accessible from the Boulder area by traveling on U.S. 36, also known as the Denver-Boulder Turnpike. Denver's Stapleton International Airport is served by most major carriers and is located 20 minutes northeast of downtown Denver. Denver and Boulder are connected by a public transportation system.

## Tours

Guided walking tours of the Boulder Campus leave from Regent Administrative Center 125 each weekday at 10:30 a.m. and 2:30 p.m. and provide a personal introduction to the campus environment. No advance reservations are necessary.

## Summer Session

Summer Session at CU-Boulder, an integral part of the University's year-round program, offers students a variety of opportunities for study, individual development, and recreational activity. Summer students can choose from more than 450 courses, allowing progress toward a degree in almost every area of study.

The principal summer session lasts 10 weeks; courses meeting for shorter terms (1-4, 5, or 8 weeks) are scheduled within the 10-week session.

## Boulder Campus Academic Programs

B—Bachelor's Level  
C—Certification  
D—Doctoral Level

JD—Juris Doctor  
M—Master's Level

### ARTS AND SCIENCES, COLLEGE OF

American Studies	B		
Anthropology	B	M	D
Applied Mathematics		M	D
Applied Physics		M	D
Art Education		M	
Art History	B	M	
Asian Studies	B		
Astrophysical, Planetary, and Atmospheric Sciences		M	D
Astrophysics			D
Basic Science		M	
Biological Sciences—EPOB	B	M	D
Biological Sciences—MCDB	B	M	D
Black Studies	B		
Central and East European Studies	B		
Chemical Physics			D
Chemistry	B	M	D
Chinese	B		
Classics	B	M	D
Communication (Pre-Communication) <sup>1</sup>	B	M	D
Communication Disorders and Speech Science	B	M	D
Comparative Literature		M	D
Computer Science Applications	B		
Creative Arts		M	
Dance	B	M	
Distributed Studies	B		
Economics (Pre-Economics)	B	M	D
English	B	M	D
Environmental Conservation	B		
French	B	M	D
Geography	B	M	D
Geology	B	M	D
Geophysics			D
German	B	M	
History	B	M	D
Humanities	B		
Individually Structured Major	B		
International Affairs	B		
Italian	B		
Japanese	B		
Kinesiology	B	M	
Latin American Studies	B		
Linguistics	B	M	D
Mathematical Physics			D
Mathematics	B	M	D
Philosophy	B	M	D
Physics	B	M	D
Political Science	B	M	D
Pre-Child Health Associate <sup>2</sup>			
Pre-Dental Hygiene <sup>2</sup>			
Pre-Journalism and Mass Communication <sup>2</sup>			
Pre-Medical Technology <sup>2</sup>			
Pre-Nursing <sup>2</sup>			
Pre-Pharmacy <sup>2</sup>			
Pre-Physical Therapy <sup>2</sup>			
Psychology	B	M	D
Religious Studies	B	M	
Russian	B		
Sociology	B	M	D
Spanish	B	M	D
Studio Arts	B		
Theatre	B	M	D
Women Studies	B		

### BUSINESS AND ADMINISTRATION, COLLEGE OF

Accounting	B	M	
Business Administration		M	D
Entrepreneurship and Small Business Management	B		
Finance	B	M	
Information Systems	B		

International Business	B		
Management Science		M	
Marketing	B	M	
Minerals Land Management	B		
Operations Management	B		
Organization Management	B	M	
Personnel-Human Resource Management	B		
Public Agency Administration	B		
Real Estate	B		
Tourism and Recreation	B		
Transportation and Distribution Management	B		

### EDUCATION, SCHOOL OF

Education	C <sup>3</sup>	M	D
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### ENGINEERING AND APPLIED SCIENCE, COLLEGE OF

Aerospace Engineering Sciences	B	M	D
Applied Mathematics	B		
Architectural Engineering	B		
Chemical Engineering	B	M	D
Civil Engineering	B	M	D
Computer Science	B	M	D
Electrical Engineering	B	M	D
Electrical Engineering and Computer Science	B		
Engineering		M	
Engineering Physics	B		
Mechanical Engineering	B	M	D
Telecommunications		M	

### ENVIRONMENTAL DESIGN, COLLEGE OF

Environmental Design	B		
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### JOURNALISM AND MASS COMMUNICATION, SCHOOL OF

Advertising	B		
Broadcast News	B		
Broadcast Production Management	B		
Journalism		M	
News-Editorial	B		
Public Relations	B		

### LAW, SCHOOL OF

Law			JD
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### MUSIC, COLLEGE OF

Music, Bachelor of Arts in	B		
Music	B	M	D
Music Education	B	M	
Musical Arts			D

### PHARMACY, SCHOOL OF

Pharmaceutical Sciences		M	D
Pharmacy	B		

For further information on the content of the programs listed above and the official degree designations, refer to the appropriate *Catalog* sections (references are included in the Index). Additional graduate and professional programs are located on other campuses of the University; see the Graduate School section of this *Catalog*.

<sup>1</sup>New students must apply as premajors; admission to the major is determined by work completed in the freshman and sophomore years.

<sup>2</sup>The College of Arts and Sciences offers a preprofessional program in this area in preparation for later application to professional school. Students admitted to a preprofessional area of study are not assured admission to the subsequent professional program and must submit a separate application to professional school at the appropriate time.

<sup>3</sup>Students interested in elementary or secondary school teaching may take programs approved for Colorado certification along with the liberal arts majors offered.



In addition to resident faculty of the University, leading scholars from around the nation and the world teach, give lectures, and participate in seminars and forums throughout the summer. Complementing summer session offerings, a rich calendar of events includes performances in repertoire by members of the Colorado Shakespeare Festival, musical productions presented at the Colorado Gilbert and Sullivan Festival, and performances by members of the Colorado Dance Festival and the Colorado Music Festival. Organized recreational activities are offered through the Recreation Center's Outdoor Program; the Outdoor Program includes mountain sports instruction in activities such as backpacking, rock climbing, and rafting. To order a *Summer Session Catalog*, write the Office of Admissions, Regent Administrative Center 125, Campus Box 7, University of Colorado at Boulder, Boulder, Colorado 80309-0007, or call (303) 492-2456. The *Summer Session Catalog* is usually available by mid-February.

## Continuing Education

The University's Division of Continuing Education provides educational programs for adults in the community and state that go beyond the Boulder Campus. Continuing Education offers credit and noncredit courses, as well as workshops and seminars taught by University-approved instructors. Some workshops and seminars also attract national and international enrollments. Methods of instruction include classroom learning, correspondence study, individualized instruction, and satellite teleconferencing.

These Continuing Education services are used by government and business organizations, students working to meet academic requirements, and individuals studying to improve skills, knowledge, or understanding in a large variety of subjects. Directed at nontraditional students, these learning activities are provided at a variety of times and locations most convenient to participants.

Self-supported through tuition and fees, the Division of Continuing Education offers courses in such fields as management, computer science, arts, humanities, social sciences, and human relations. Noncredit programs are offered in childhood education, paralegal education, commercial design, computer applications, and real estate. Many of these noncredit programs offer Continuing Education Units (CEUs), providing participants with a nationally recognized permanent record of completed courses.

For more information, write the Division of Continuing Education, 1221 University Avenue, Campus Box 178, University of Colorado at Boulder, Boulder, Colorado 80309-0178, or call (303) 492-5148 (toll free in Colorado 1-800-332-5839).

## CAMPUS FACILITIES AND RESOURCES

### Art Galleries and Collections

Through the Department of Fine Arts Exhibitions Program, the University of Colorado Art Galleries exhibit contemporary and historic artwork. The galleries are also the home of the Colorado Collection, a singularly valuable resource for the people of Colorado. This collection includes approximately 3,000 works of art. Among important artists represented in the collection are Durer, Rouault, Rembrandt, Tiepolo, Hogarth, Dubuffet, Picasso, Matisse, and Hiroshige.

During the academic year, the Department of Fine Arts hosts a number of visual arts activities. Each academic year, the Visiting Artist Program brings to campus 12 to 15 contemporary artists of national and international acclaim. These distinguished visitors present an event or lecture free and open to the public.

Regionally, a wide range of art is offered by the Denver Art Museum, and galleries in both Denver and Boulder present current regional and national work.

### Computing Resources

Academic Computing Services (ACS) maintains a Universitywide network of computing facilities in support of teaching and research. ACS resources include Digital Equipment Corporation VAX and MicroVAX computers, a Sequent Balance parallel processor, an AT&T 3B20S, and a Control Data Cyber 170/720; computing sites throughout the campus provide batch and timesharing access to centralized computers. Interactive network access is also available through more than 50 dial-up ports. Eighteen computing sites are equipped with a variety of personal computers for both classroom instruction and individual projects, with appropriate software available for checkout.

ACS also maintains two major networks (DCA and ISN), which provide data communications within the campus and gateways to national computing facilities and resources. BITNET and

ARPAnet make it possible to communicate and exchange files with scholars and researchers around the world. For a fee, students can link directly to campus computers and tap national databases, send electronic mail to Japan, or browse through the holdings of major libraries from their residence hall rooms.

Software available on ACS computers includes programming languages such as FORTRAN, PASCAL, COBOL, and BASIC, as well as mathematical and statistical packages and other applications programs. ACS offers computing assistance through student and professional advisors, seminars and workshops, online documentation, and articles in the ACS newsletter, *Digit*. In addition to the resources that ACS provides, a large number of departments support extensive computing facilities for special research and instruction.

### Events/Conference Center

The Events/Conference Center (ECC) is a multipurpose facility that provides an attractive, efficient, and comfortable setting for a wide variety of events offered for the benefit of the students, staff, and faculty of the University and for the community.

The ECC is used for events such as educational conferences, seminars and meetings, convocations, and commencement ceremonies, as well as cultural, entertainment, and athletic activities that enhance and further the objectives of the University.

The main arena of the ECC seats between 8,500 and 12,000, depending on event configuration. The conference level offers six air-conditioned, carpeted rooms, which range in capacity from 40 to 200.

The Center also has a complete teleconferencing capability with down-link satellite antennas, video monitors, video projector, and an 18' x 24' projection screen in the arena.

### Fiske Planetarium

Fiske is considered one of the finest planetarium facilities in the world. Seating 213 people in its star theatre, it is the largest such facility between Chicago and Los Angeles. The planetarium is equipped with a Zeiss Model VI star projector and an automated projection control system that operates hundreds of projectors and has the capacity to present over a half dozen prerecorded star shows at any given time. In addition to its use as a teaching facility for astronomy and other classes, the planetarium is used for star talks, star shows, and space science presentations to

school children and the general public in the Boulder-Denver area.

## Heritage Center

The University of Colorado Heritage Center is located on the third floor of Old Main, the oldest building on campus. Containing memorabilia documenting the history of the University of Colorado at Boulder, the center occupies seven rooms in Old Main. Exhibits include an account of the University's scientific projects that have contributed to the exploration of outer space, an architectural history of the Boulder Campus, a history of CU athletics, accounts of the careers of distinguished CU alumni, and an overview of the University's history.

## Language Laboratories

Language facilities on the Boulder Campus consist of three language laboratories with a total of 104 stations, a 35-station multimedia classroom studio, video viewing cubicles, a computer-assisted instruction area, an audio recording studio, an audio tape library with high-speed duplicators, and an equipment repair room. Located in Helms and under the direction of the College of Arts and Sciences, the facility is open to the entire University community.

## Libraries

The University Libraries play a central role in the support of study, teaching, and research at CU-Boulder. The Libraries system includes Norlin Library and five branch libraries: Business, Earth Sciences, Engineering, Math-Physics, and Music. The School of Law operates its own library (see the School of Law section for information about the Law Library). The combined collections of the Libraries contain more than 2 million volumes, over 1 million microforms, 90,000 AV items, 142,000 maps, and 150,000 photos. The Libraries also currently subscribe to almost 14,000 periodicals, journals, and serials.

Norlin Library houses the University's humanities, social sciences, and life sciences collections, general reference, and special collections. The Norlin Reference Department includes the card catalog and the largest concentration of on-line Public Access Catalog (PAC) terminals, the old card catalog, and a major collection of indexes and other reference tools. The department also provides a wide range of possibilities for free and fee-based computer searches.

The Government Publications Department has been a depository for United States government publications since 1879 and also collects state and foreign government documents. Recently selected as the regional United Nations depository, it collects as well from the European Communities and the Organization for Economic Cooperation and Development. The Government Publications Department's Report Center contains over one million government-sponsored research reports from such agencies as the Department of Energy, the National Aeronautics and Space Administration, the Department of Defense, and the National Technical Information Service.

The Rare Books Room in Norlin Library has approximately 35,000 volumes, including papyrus documents, medieval manuscripts, some of the earliest printed books from fifteenth-century Europe, English and American volumes from the eighteenth and nineteenth centuries, and one of the finest mountaineering collections in North America. The Western History/University Archives has extensive manuscript and photographic collections. The Audiovisual/Microforms Department has no print materials and equipment.

The Interlibrary Loan Department extends the services of the University Libraries by borrowing research materials not in its collection from other libraries for students, faculty, and staff. As a member of the Center for Research Libraries, the University Libraries also make a national collection available to CU-Boulder borrowers.

## Macky Auditorium Concert Hall

This 2,047-seat concert hall is used for musical concerts, dance performances, lectures, films, and meetings, and is the home of the Macky Auditorium Travel Film Series. Built in 1912, no major changes were made to the building until a 2.8 million dollar renovation project was completed in September 1986, making Macky one of Colorado's premiere concert halls. Call the box office, (303) 492-6309, for information on all events.

## Museum

The University of Colorado Museum houses extensive collections in anthropology, botany, geology, and zoology. It preserves specimens and objects from throughout the Rocky Mountain Region, making it a primary resource for faculty and student research. Its extensive program on foreign and domestic

exchanges of specimens and information has given the Museum an international reputation; three million specimens are available for study.

Through internships and assistantships, the Museum provides professional experience to students in the field and in the laboratory. Museum faculty members teach courses in museum studies, as well as in their areas of specialty, which include southwestern and Central American archaeology and ethnology, bryology and lichenology, malacology, entomology, vertebrate paleontology, and marine micropaleontology. Participation in museum-related research is encouraged by financial support to selected, qualified students through the Walker Van Riper Fund.

The exhibit halls, open daily to the public, present displays for education and enjoyment at all levels. The Hall of Earth contains minerals, rocks, and fossils, and focuses on local geology. The Hall of Life shows plants and animals of Colorado and the Rocky Mountain region. The Hall of Humanity contains a synopsis of North American Indian cultures, with emphasis on those of the prehistoric Southwest. The Museum presents four or five special exhibitions per year.

Museum hours are 9:00 a.m. to 5:00 p.m., Monday through Friday; 9:00 a.m. to 4:00 p.m. on Saturdays; and 10:00 a.m. to 4:00 p.m. on Sundays. Call (303) 492-6892 for more information.

## Music

Offering over 300 public concerts annually, the College of Music is a vital musical force in the Boulder-Denver metropolitan area. In addition to faculty and student recitals, the College features its own symphony orchestra, bands, and choirs in regular concerts. Music for many tastes is also provided through appearances of smaller performing organizations on the Boulder Campus, from the Jazz Ensemble to the Collegium Musicum, the University's early-music group.

Guest artists, speakers, and special events provide a vibrant and diverse musical atmosphere at the University. Acclaimed artists Renato Capocchi, Gunther Schuller, Nathaniel Merrill, Roberta Peters, and the Takacs String Quartet have appeared on campus, in addition to annual events like the Festival of Christmas and the Colorado Gilbert and Sullivan Festival directed by famed D'Oyly Carte star John Reed.

## Recreation Center

The Student Recreation Center, operated by the University of Colorado Student Union (UCSU), provides facilities for individual and group sports activities. One of the finest college facilities of its kind in the country, the building contains two swimming pools with an adjoining patio/sun deck, an ice skating rink, squash courts, handball and racquetball courts, tennis courts, a gymnasium, a fitness systems room, exercise rooms, men's and women's locker rooms with showers, lockers, and hair dryers, a first aid and therapy room, and two dry-heat saunas. Full fee-paying students are automatically members of the Recreation Center. Other students, faculty, staff, alumni, affiliates, citizens, and guests are assessed user fees for admittance to the Center. Free sports equipment may be checked out on a daily basis, and ice skates and some outdoor camping equipment are available for a nominal rental fee.

The Recreation Center also offers organized activities in outdoor sports (including rock climbing, rafting, and backpacking), intramural sports, non-credit sports instruction (such as aerobics, tennis, and swimming), and club sports.

## Sommers-Bausch Observatory

Sommers-Bausch Observatory on the Boulder Campus is equipped with 16-, 18- and 24-inch Cassegrain telescopes with ancillary equipment for photographic, spectrographic, and photometric stellar observations. The facilities at Sommers-Bausch are used by the

Department of Astrophysical, Planetary, and Atmospheric Sciences for undergraduate and graduate teaching and research. The Observatory is open to students and the public on Friday nights by special arrangement. Phone reservations are taken at (303) 492-5002.

## Theatre and Dance

Newly remodeled facilities for theatrical and dance presentations include the University Theatre, the beautiful outdoor Mary Rippon Theatre, Theatre 300, the Old Main Chapel, and the Charlotte York Irey Studio Theatre.

The Department of Theatre and Dance presents eight to ten major productions each academic year. Past productions included *Candide*, *The Elephant Man*, *Hamlet*, *Crimes of the Heart*, *Plenty*, *Agnes of God*, and *Trojan Women*, in which students performed with Academy Award-winning actress Celeste Holm in the leading role of Hecuba.

The Colorado Shakespeare Festival, presented each summer in the outdoor Mary Rippon Theatre, is produced by the Department of Theatre and Dance. One of the few repertory groups in the nation to have completed the entire Shakespearean canon, the Festival has had 30 years of distinguished history, and features the most advanced students in the CU-Boulder program. A company of actors, designers, technicians, and directors are selected from nationwide auditions. Recent guest artists have included directors Robert Benedetti, Libby Appel, and Robert

Cohen, and actor Tony Church of the Royal Shakespeare Company.

## University Memorial Center

The University Memorial Center (UMC) is a focal point for campus activities, programs, and services. An official state memorial dedicated to those who died in past wars, the UMC has also been designated a multicultural center designed to promote understanding among all cultures represented in the University and the community.

At the heart of the UMC are its programming facilities and services. The facility, host to over 7,000 meetings each year, is a forum for a variety of speakers, groups, seminars, concerts, and films. The UMC is the home of the University of Colorado Student Union (UCSU) and its many operations; it also provides office space for more than 50 student organizations. The services and facilities offered to 20,000 people using the building each day include a reception desk for campus information, the University Book Center, special meeting rooms, a copy center, a computerized ticket service, banking and check cashing facilities, a flower shop, a travel agency, a ski shop, a photography lab, and a games area. The UMC is the major resource for campus food service. It features two 450-seat dining areas and a kiosk-style cafeteria that includes a basic grill, a deli, full-meal service, a bakery, Mexican food, ice cream, and a salad, fruit, and soup bar. The UMC also furnishes a complete catering service with several private dining areas.



# University Policies, Programs, and Services

## ACADEMIC RECORDS

### Course Load and Class Level Definitions

The following are the most widely used general definitions of full-time course load. For further information and guidelines, students should see specific college and school sections of the *Catalog*. Students receiving financial aid, receiving veterans' benefits, or living in University housing should check with the appropriate office regarding course load requirements for eligibility purposes.

### UNDERGRADUATE COURSE LOAD

A full-time undergraduate student is one who is enrolled for 12 or more semester hours in the fall or spring semester or at least 6 semester hours in the summer term.

### GRADUATE COURSE LOAD

A full-time graduate student in the fall or spring semester is one who is enrolled for 5 semester hours in course work numbered 5000 or above, or at least 8 semester hours in a combination of undergraduate/graduate/professional course work acceptable for graduate credit, or any number of thesis hours. A maximum of 15 semester hours may be applied toward the degree during the fall or spring semester.

A full-time graduate student in the summer term is one who is enrolled for at least 3 semester hours in course work numbered 5000 or above, or 4 semester hours in a combination of course work, or any number of thesis hours. The maximum number of graduate credits that may be applied toward a degree during the summer session is 6 semester hours per 5-week term and 10 semester hours per 10-week summer session, not to exceed 10 semester hours for the total summer session.

### CLASS LEVEL

Class level is based upon the total number of semester hours passed, as follows:

Class	Semester Hours
Freshman	0-29.9
Sophomore	30-59.9
Junior	60-89.9
Senior	90 and above

The normal course load in most colleges and schools is 15 to 17 credit hours a semester.

### Good Academic Standing

Good academic standing in most colleges and schools requires a 2.00 grade point average (GPA). Students should consult the appropriate dean's office regarding college or school minimum GPA requirements and special policies on probation and dismissal.

### Grading System

The following grading system is standardized for all colleges and schools of the University. The addition of plus/minus grades was approved for the colleges and schools to implement at their discretion in the Spring of 1984. Each instructor is responsible for determining the requirements for a course and for assigning grades on the basis of those requirements.

Standard Grades	Credit Points Per Each Hour of Credit
A = superior/excellent	4.0
A- =	3.7
B+ =	3.3
B = good/better than average	3.0
B- =	2.7
C+ =	2.3
C = competent/average	2.0
C- =	1.7
D+ =	1.3
D =	1.0
D- = minimum passing	0.7
F = failing	0.0

### Grade Symbols

*IF* = incomplete—regarded as *F* if not completed within one year

*IW* = incomplete—regarded as *W* if not completed within one year

*IP* = in progress—thesis at the graduate level or School of Medicine courses

*H* = highest achievement for School of Medicine courses or for Honors Department

*P* = passing—under the Pass/Fail option, grades of *D-* and above convert to a *P*. Other specified courses may also be graded on a Pass/Fail basis.

*NC* = registration on a No-Credit basis

*W* = withdrawal or drop without discredit

*Y* = the class grades were not submitted by the time the final grades were processed

### EXPLANATION OF IF AND IW

An *IF* or *IW* is an incomplete grade. Policies with respect to *IF/IW* grades are available in the individual college and school dean's offices. Use of the *IF* or *IW* is at the option of the academic dean's office.

The student must ask for the incomplete grade. An incomplete grade is given only when students, for reasons beyond their control, have been unable to complete the course requirements. It is understood that a substantial amount of work must have been satisfactorily completed before approval for such a grade is given.

If an instructor decides to grant a request for *IF* or *IW*, the instructor sets the conditions whereby the course work will be completed. The instructor may set less time than one year for completion. The student is expected to complete the requirements within the established deadline and not retake the entire course.

However, the instructor, with approval of the department, determines if the course should be retaken. If a course is retaken, the student must re-register for the course and pay the appropriate tuition.

The final grade (earned by completing the course requirements or by retaking the course) does not result in deletion of the *IF* or *IW* from the transcript. A second entry is posted on the transcript to show the final grade for the course.

At the end of one year, *IF* and *IW* grades for courses that are not completed or repeated will be regarded as *F* or *W*, respectively. Requests for an



extension of time to complete the course beyond the one-year deadline will normally not be approved by the academic dean's office.

### GRADE POINT AVERAGE

The overall University of Colorado grade point average is computed as follows: total the credit hours and the credit points for all courses; then divide the total credit points by the total hours. Courses with grade symbols of *P*, *NC*, *Y*, *W*, *IP*, *IW*, and *IF* are excluded when totaling the hours. Grades of *F*, earned for courses graded on a Pass/Fail option, are included in the GPA. *IFs* that are not completed within one year are calculated as *F* in the GPA at the end of the one-year grace period.

If a course is repeated, all grades earned are used in determining the University GPA. Grades received at another institution are not included in the University of Colorado GPA. It is University of Colorado policy that the undergraduate GPA is calculated separately from graduate GPA.

Students should refer to their academic dean's office for individual grade point average calculations as they relate to academic progress and graduation from their college or school.

#### Example:

Grades Earned	Credit Points per Hour	Credit Hours	=	Credit Points in Course
A	4.0	4		16
A-	3.7	4		14.8
B+	3.3	4		13.2
P	—	3(exclude)		—
F	0.0	3		0.0
IW	—	4(exclude)		—
		15 Total Credit Hours		44.0 Total Credit Points

$$\frac{44.0}{15} = 2.93 \text{ GPA}$$

### GRADE REPORTS

Grade reports are normally available within two to three weeks after the end of the semester. Grade reports are automatically mailed at the end of fall semester to the student's local address. At the end of spring semester, the grade reports are mailed to the student's permanent address. Grade reports may also be picked up at Regent Administrative Center two to three weeks after the semester ends.

### Change of Major

A Change of Major Form must be obtained and completed in the academic department offering the desired major. Once the department approves the change, the form will be forwarded

and filed in the Office of Academic Records. If the desired major is offered by a CU-Boulder college or school other than that in which the student is enrolled, an Intrauniversity Transfer must be completed. See the Undergraduate Admission section of this *Catalog* for more information.

### Official Transcripts

The official transcript includes the complete academic record, undergraduate and graduate, of courses taken at all campus locations or divisions of the University of Colorado. It contains the signature of the Director of Academic Records and the official, embossed seal of the University. Official transcripts are primarily used to support applications for transfer to other academic institutions and for employment purposes.

Transcripts from the University of Colorado (all campuses) may be ordered in person or by mail from the Office of Academic Records, Transcript Section, Regent Administrative Center 125, Campus Box 68, University of Colorado at Boulder, Boulder, Colorado 80309-0068. Requests should include the following:

1. Student's full name (former and current names, if applicable)
2. Student number
3. Birthdate
4. The last term and campus the student attended
5. Whether the current semester grades are to be included when a transcript is ordered near the end of a term
6. Full name of the transcript recipient
7. Complete mailing address
8. Student's signature (This is the student's authorization to release the transcript to the designee.)

There is no charge for official transcripts, which are prepared only at the student's request. Typically, transcripts require a minimum of five to eight days to process. However, a transcript will be processed immediately (within 24 hours) for a \$3 fee per transcript. A student having financial obligations to the University that are due and unpaid will not be granted a transcript. Transcripts sent to students are labeled "issued to student." Copies of transcripts from other institutions cannot be furnished.

Official transcripts will not be available until approximately four weeks after final examinations. A transcript that is to have a degree recorded will not be available until approximately eight weeks after final examinations.

### Unofficial Transcripts

The unofficial transcript is also the complete academic record at the University of Colorado; it is primarily used for advising and counseling within the offices on campus and within the offices at other University of Colorado campuses. The unofficial copy does not carry the embossed seal of the University.

Whenever an unofficial transcript is needed, the student may pick up a copy at the appropriate academic dean's office with the following exceptions:

1. Graduate students pick up their copy at their major department office.
2. Arts and Sciences, Business, and nondegree students pick up their copy at Regent Administrative Center 125.
3. In cases when a dean's office cannot provide the unofficial transcript, students may pick up a copy at Regent Administrative Center 125.

A charge of \$1 is made for immediate service at Regent Administrative Center. There is no charge for copies delivered at the student's request to other University of Colorado offices.

### Credit by Examination

In certain limited instances, students enrolled in a degree program may earn additional credit by examination without otherwise registering for and taking certain courses approved for Credit by Examination. Information on participating colleges and schools and an application for Credit by Examination may be obtained from the Office of Academic Records in Regent Administrative Center 125. The application specifies procedures to be followed and provides spaces for the signatures required for approval; permission of the instructor, the department chair, the dean of the college or school in which the course is offered, and the student's dean (if different) is required for approval. The fee for each examination is not included in the regular tuition but is assessed separately at a fixed rate equivalent to the minimum resident tuition rate charged for 0-3.0 credit hours for the current semester. Fees are payable in advance and are nonrefundable.

### Variable Credit

All independent study courses and occasional other regular courses are offered on a variable credit basis. Students must designate the number of credit hours they wish to receive for the course at the time of Registration. Consult the *Schedule of Courses* for variable credit hour ranges for particular courses.

## Stops

A scholastic, dean's, financial, or miscellaneous stop may be placed against a student's record for a number of reasons. A stop may prevent that student from registering, returning to school, obtaining an official transcript, or receiving a diploma. The stop should be removed as soon as possible by contacting the campus office responsible for placing the stop. General inquiries may be addressed to the Office of Academic Records.

## Rights and Privacy Act

Periodically, but not less than annually, the University informs students of the Family Educational Rights and Privacy Act of 1974. The act was designed to protect the privacy of education records, to establish the right of students to inspect and review their education records in all offices, and to provide guidelines for the correction of inaccurate or misleading data through informal and formal hearings. Students also have the right to file complaints with the Family Educational Rights and Privacy Act (FERPA) Office concerning alleged failures by the institution to comply with the act.

Local policy explains in detail the procedures to be used by the institution for compliance with the provisions of the act. Copies of the policy can be found in the Government Publications Office in Norlin Library, the Law Library, and the Office of Academic Records on the Boulder Campus. Copies of the policy are also located in the libraries or offices of Admissions and Records on the other campuses.

The Director of Academic Records on the Boulder Campus and the Registrars on the other University campuses have been designated by the institution to coordinate the inspection and review of student education records located in various University offices. *Students wishing to review their education records must complete a request form in the office of the Director of Academic Records or Registrar for the appropriate campus.* Requests should list the item or items of interest. Records covered by the act will be made available within 45 days of a request.

Students *may not* inspect the following as outlined by the act: (1) financial information submitted by their parents, (2) confidential letters that they have waived their rights to review, or (3) education records containing information about more than one student, in which case the institution will permit access *only* to that part of the record that pertains to the inquiring student.

Records that may be inspected include *admissions, academic, and financial files and cooperative education and placement records.*

The following items of student information have been designated by the University of Colorado as public or directory information: name, address, telephone number, dates of attendance, registration status, class, major field of study, awards, honors, degree(s) conferred, past and present participation in officially recognized sports and activities, physical factors (height, weight) of athletes, date and place of birth. Such information may be disclosed by the institution for any purpose, at its discretion.

No other information regarding students' education records may be disclosed to anyone without the written consent of students, *except* (1) to personnel within the institution, (2) to officials of other institutions in which students seek to enroll, (3) to persons or organizations providing students financial aid (this includes the parents upon whom students are financially dependent; however, the University requests that parents who would like a transcript copy have the student obtain one for them), (4) to accrediting agencies carrying out their accreditation functions, and (5) to persons in an emergency to protect the health or safety of students or other persons.

Currently enrolled students may withhold disclosure of directory information under the Family Educational Rights and Privacy Act of 1974. To withhold disclosure, students should inquire at the appropriate campus office before the eleventh day of classes each term. The University of Colorado assumes that failure on the part of any student to specifically request the withholding of directory information indicates individual approval for disclosure.

Boulder Campus students should request the form that describes the Family Educational Rights and Privacy Act from the Office of Academic Records, Regent Administrative Center 125, University of Colorado at Boulder. Students on other campuses should inquire at their respective office of admissions and records.

## CAMPUS POLICIES

### Academic Integrity

A university's intellectual reputation depends on the maintenance of the highest standards of intellectual honesty. Consequently, commitment to those standards is a responsibility of every student and every faculty member at the University of Colorado.

Breaches of academic honesty include cheating, plagiarism, and the unauthorized possession of exams, papers, or other class materials that have not been formally released by the instructor.

### CHEATING

Cheating takes place in different ways, but basically, it involves dishonest behavior, such as copying from another person or obtaining any form of unauthorized help or assistance from any person or source.

### PLAGIARISM

In all academic areas, it is imperative that work be original or that explicit acknowledgment be given for the use of other persons' ideas or language. In a term paper, for example, failure to use quotation marks, even if a footnote source is provided, is plagiarism.

Students should consult with their instructors regarding specific standards or procedures appropriate in each given field.

### SANCTIONS

Breaches of academic honesty will result in disciplinary measures. These can include:

A failing grade for a particular assignment

A failing grade for a particular course  
Suspension for various lengths of time or permanent expulsion from the University

Breaches of academic honesty are under the purview of each college and school pursuant to the *Laus of the Regents*, Article V, Section C. For further information and for individual college and school policies, students should consult their dean's office.

### Alcohol and Other Drugs

The University complies with all federal, state, and local laws concerning alcohol and drugs. Students are responsible for becoming acquainted with the basic rules on alcohol and drugs and for observing them. University policies regarding alcohol consumption and drug use are described in several publications: *Students' Rights and Responsibilities Regarding Standards of Conduct*, available in the Office of Student Conduct, *A Guide to Residence Hall Living*, available at the Housing Department, and the *Student Handbook*, distributed to new students in the fall and spring. The University's Drug and Alcohol Education Committee, comprised of students, faculty, and staff, is an active

organization that develops and sponsors drug and alcohol education programs. In addition, Wardenburg Student Health Service provides individual and group counseling for students with substance abuse problems.

For further information on campus policies, call the Office of Student Conduct, (303) 492-5550; for policies within Campus Housing, call the Housing Department, (303) 492-6580; and for information on campus substance abuse programs, call Wardenburg Student Health Service, (303) 492-5654.

## Environmental Health and Safety

The administration of the University of Colorado at Boulder considers the safety of its students, faculty, staff, and the public to be of paramount importance, and every person is urged to cooperate fully to ensure that the campus and campus activities are safe. The Boulder Campus Environmental Health and Safety Department was established specifically to implement a safety program that includes radiation safety, hazardous waste management and disposal, waste water monitoring, laboratory safety and industrial hygiene, fire protection, safety design and planning, facility safety, sanitation, general campus premises safety, and accident prevention.

Contact the Environmental Health and Safety Department at (303) 492-6025 to discuss any safety or health matter and for assistance with a departmental safety program.

## Final Examination Policy

It is the policy of the University of Colorado at Boulder to adhere to the final examination schedule as published in the *Schedule of Courses* each semester. While it may be appropriate not to give a final in some cases, such as laboratory courses, seminars, and colloquia, final examinations should be given in all other undergraduate courses. Unless otherwise notified in writing during the first week of classes, students should assume that an examination will be given.

In addition to the principles stated above, the following guidelines should be followed by all faculty members and administrators in order to assure fairness and the best possible educational experience for students.

1. The scheduled final examination period should be considered an important part of the course and used as a final examination period or for additional instruction.

2. The final examination in a course should be given as scheduled and not at other times even if the faculty member and all students in a course agree to such a change.

3. The week of classes preceding the scheduled final examination period should be used primarily for continued instruction and may include the introduction of new material. No hourly examinations are to be given during the week preceding final examinations.

4. Individual students may be granted a variance from these policies provided the instructor is satisfied that (a) the exception is based on good and sufficient reasons (such as religious observances), and (b) such an exception for an early or late examination will not prejudice the interests of other students in the course.

5. When students have three or more examinations on the same day, they will be entitled to arrange an alternative examination time for the last exam or exams scheduled on that day. Such arrangements must be made no later than the end of the sixth week of the semester (i.e., at the end of the drop period). Students will be expected to provide evidence that they have three or more examinations to qualify for exceptions.

6. This policy applies to all undergraduate students, including seniors. Graduating seniors should not be exempted from final examinations. Such exemptions are inappropriate on both procedural and academic grounds.

## Personal Safety on Campus

The University of Colorado at Boulder is a community of scholars, students, and staff who support the learning process and academic freedom in an environment characterized by civility and respect for others. Harassment of an individual or a group could interfere with the freedom to pursue academic goals and is inconsistent with the mission of the University. Harassment is defined as behavior that ranges from intentional verbal abuse to physical assault. Students, faculty, and staff are encouraged to preserve the personal safety, freedom, and well-being of those who study, teach, or work at the University.

Students, faculty, and staff have the responsibility to refrain from, prevent, and report behavior that threatens or harms their colleagues and to assist victims. To promote personal safety, emergency telephones have been

located on campus. These phones provide for direct access to the police dispatcher. See the University's Parking and Traffic Map in the Parking Management Office for exact locations of these phones. Campus resources are available to aid victims in a confidential and sensitive manner. At the same time, action will be initiated against anyone found guilty of harassment, with due process provided for the accused.

Students, faculty, and staff are encouraged to report any incident of harassment to the administrator closest to the situation and/or the University Police at 492-6666. Other resources include the Office of Student Conduct at (303) 492-5550 and the Ombudsman Office at (303) 492-5077.

## Sexual Harassment

Sexual harassment is a form of misconduct that undermines the integrity of the conditions of employment, of teaching, and of faculty-student relationships. All employees, faculty, and students must be allowed to work, study, and teach in an environment free from unwanted sexual overtures. Further, sexual harassment is a prohibited practice when it results in discrimination for or against a staff member, faculty member, or student.

Sexual harassment is legally specified as any deliberate or repeated unsolicited or unwelcome verbal comments, gestures, or physical contact of a sexual nature (Title VII of the Civil Rights Act).

For information on grievance procedures regarding sexual harassment, contact the Ombudsman Office at (303) 492-5077 or the Office of Affirmative Action and Services at (303) 492-6706.

## Student Conduct

CU-Boulder's Standards of Conduct and the procedures for implementing them have been developed by a committee composed of students, faculty, and staff. In establishing these standards the University has taken into account students' rights as individuals as well as the general welfare of the University community. The University would be remiss in its responsibility to students and the community if it ignored behavior that violates the rights of others. It is also essential that everyone shares in the commitment to protect the integrity and personal safety of each member of the University community.

The intent of these standards is not for use in incidents involving trivial or minor matters. Rather, they are

intended for use in incidents threatening the basic functioning of the University or the personal safety of its members. As members of the University community, students are held accountable not only for civil and criminal laws but University standards as well. University sanctions can be imposed when policies are violated. The sanctions include, but are not limited to, warning, probation, suspension, and permanent expulsion.

Listed below are standards of conduct for which action may be taken if a violation occurs. While the specific intent to commit an act is an important consideration in determining guilt or innocence and appropriate sanctions, students are still responsible for their actions due to negligence.

1. Obstruction, disruption, or interference with teaching, research, disciplinary proceedings, or other University activities, including its public service functions or other authorized activities on University premises. This includes interfering with the freedom of expression of others on University premises or failure to comply with the lawful directions of University officials acting in performance of their duties.

2. Obstruction or interference with the freedom of movement of students, school officials, employees, and invited guests to all facilities of the University.

3. Prohibited entry to or use of University facilities, defined as unauthorized entry; use of University property or facilities for illegal purposes or purposes detrimental to the University.

4. Forgery, falsification, alteration, or use of University documents, records, or instruments of identification to gain any unentitled advantage.

5. Theft or damage to University property and the private property of students, school officials, employees, and invited guests when such property is located upon or within University buildings or facilities. This includes the possession of known stolen property.

6. Possession of firearms, explosives, or other dangerous weapons within or upon the grounds, buildings, or any other facilities of the University. This policy shall not apply to any police officer or other peace officer while on duty authorized by the University, or others authorized in writing by the Chief of the University of Colorado at Boulder Department of Police (UCPD) or his designee. (A dangerous weapon means any object or substance designed to inflict a wound, cause injury, or incapacitate. Weapons may include, but are not limited to, B-B guns, slingshots, martial arts devices, brass knuckles, bowie knives, daggers or similar knives, or switchblades. A

harmless instrument designed to look like a firearm, explosive, or dangerous weapon that is used by a person to cause fear in or assault another person is expressly included within the meaning of a firearm, explosive, or dangerous weapon. Weapons, e.g., for sporting purposes, may be stored with the UCPD.)

7. Harassment and/or hazing in all forms, which includes, but is not limited to, striking, laying hands upon, treating with violence, or offering to do bodily harm to another person; or other treatment of a demeaning, abusive, taunting, or alarming nature. (Behavior that offends the dignity of anyone could lead to disciplinary action. This includes, but is not limited to, demeaning behavior of an ethnic, sexist, or racist nature, or unwanted sexual advances or intimidations.)

8. Conduct that threatens or endangers the health or safety of any person, which includes, but is not limited to, physical abuse, physical restriction, and coercion. This applies on property owned or controlled by the University.

9. Sale, distribution, manufacture, use, or possession of illegal drugs within or upon the grounds, buildings, or any other facilities of the University.

10. Off campus: physical abuse, physical restriction, coercion, or harassment of any person; significant theft; sale or manufacture of illegal drugs (includes possession of sufficient quantity with intent to sell); damage, theft, or unauthorized possession of University property; and forgery, falsification, alteration, or use of University documents, records, or instruments of identification to gain any unentitled advantage.

Any time questions arise regarding the application of University standards or students feel that another person has subjected them to behavior that interferes in any manner with their rights, public or private, students are encouraged to talk with the staff member closest to the situation. Further information is available from the Office of Student Conduct, Willard Administrative Center 223, University of Colorado at Boulder, Boulder, Colorado 80309-0132, (303) 492-5550.

## EXPENSES

### Estimated Expenses

Expenses for students attending the University of Colorado at Boulder vary, depending on the following factors: whether the student lives on or off campus, the program of study, state residency (tuition classification),

family size, personal needs, and individual interests.

It is difficult, therefore, to provide exact statements of total expenses. The following approximate costs per academic year were established for undergraduate students attending the Boulder Campus in 1987-88. The Board of Regents reserves the right to change the costs for tuition and fees and room and board at any time, and costs will be higher for 1988-89.

	<i>In-state</i>	<i>Out-of-state</i>
Tuition and Fees	\$2,000	\$7,100
Room and Board (on campus)	\$3,100 - \$3,600	\$3,100 - \$3,600
Total	\$5,100 - \$5,600	\$10,200 - \$10,700

The cost of attending only fall or spring semester would be one-half of the amount shown above. Students planning to attend summer session should take into account estimated expenses indicated in the *Summer Session Catalog*, available from the Office of Registrations in mid-February. Additional costs would include transportation, books, supplies, special residence hall academic program fees, entertainment, health insurance, and any other personal needs or interest items or services. Some courses carry laboratory or other fees for practical activities. Consult the *Schedule of Courses* for notation of special fees.

## Tuition and Fees

### CONFIRMATION DEPOSIT

All new and readmitted undergraduate, graduate, and law applicants are encouraged to confirm their intent to enroll as soon as possible after receiving their admission notification and confirmation form. Admission must be confirmed by returning the completed confirmation form and the designated nonrefundable deposit *before* enrollment levels are reached. Students must submit the confirmation deposit (\$100 in-state or \$300 out-of-state) regardless of any financial aid that may be received. The deposit will be returned only in the event that it is received *after* enrollment levels are reached. Confirmation deposits are nontransferable and appear as credit on the Tuition and Fee Bill.

### MATRICULATION FEE

There is a one-time nonrefundable matriculation fee of \$15 for new degree students. This fee is assessed at the time of initial registration. These charges cover adding or dropping courses and official transcript orders. A nondegree student who is admitted to



degree status is assessed a \$15 matriculation fee at the time of the student's first registration as a degree student.

**TUITION PER SEMESTER**

Tuition and fees for 1988-89 have not yet been set. The rates *per semester* for the 1987-88 school year are listed below. Note that a surcharge of 1/15 of the full-time rate is assessed for each semester credit hour of 18 and over. Zero or fractional credit is regarded as 1 hour in assessing tuition and fee charges. No Credit (NC) courses are *not* free of charge; tuition for courses taken for No Credit is the same as for courses taken for credit.

registered on the Boulder Campus for 4 or more semester hours.

In addition to the fees above, all students are assessed a nonrefundable Student Information System fee of \$4 for each semester of attendance.

**Tuition and Fee Regulations**

**STUDENTS REGISTERED ON MORE THAN ONE CAMPUS**

Students registering for courses on more than one campus of the University for a single term pay tuition and fees to each campus at the rate appro-

appointed for less than full-time are not eligible for release time during assigned hours. For details, call the Student Accounts Receivable Department in the Bursar's Office.

**MASTER'S CANDIDATE FOR DEGREE**

Out-of-state students enrolled as master's "candidate for degree," who need only to take a comprehensive examination for a master's degree, will pay for 3 semester hours at 60 percent of the 3-semester-hour charge for out-of-state graduate students. In-state master's "candidate for degree" stu-

Undergraduate					
Semester Credit Hours	In-State		Out-of-State		
	Business, Engineering, Pharmacy	Other	Business, Engineering, Pharmacy	Other	
1-3	\$318	\$279	\$3,528	\$3,420	
4	424	372	3,528	3,420	
5	530	465	3,528	3,420	
6	636	558	3,528	3,420	
7	742	651	3,528	3,420	
8	848	744	3,528	3,420	
9-17	882	774	3,528	3,420	
18 and over, per credit hour	106	93	392	380	

Graduate						
Semester Credit Hours	In-State			Out-of-State		
	Business, MBA, Engineering, Pharmacy	Law	Other	Business, MBA, Engineering, Law, Pharmacy	Other	
1-3	\$ 342	\$ 363	\$306	\$1,146	\$1,110	
4	456	484	408	1,528	1,480	
5	570	605	510	1,910	1,850	
6	684	726	612	2,292	2,220	
7	798	847	714	2,674	2,590	
8	912	968	816	3,056	2,960	
9-17	1,026	1,089	918	3,438	3,330	
18 and over, per credit hour	114	121	102	382	370	

**FEES PER SEMESTER**

Fees for 1988-89 have not yet been set. Mandatory fees charged per semester for 1987-88 were as follows. Students enrolled in one class of 1-5 semester hours are charged the base fee of \$22.70. Students enrolled in more than one class, regardless of the number of credit hours, are assessed a maximum fee of \$133.45. These fees are assessed by the University of Colorado Student Union (UCSU).

All Boulder Campus students taking 6 or more semester hours or more than one course must be covered by a hospital-medical-surgical insurance plan as a condition of enrollment. Students who do not verify separate equivalent coverage or adequate personal financial resources on the Insurance Waiver Form available at registration will automatically be enrolled in the student group insurance plan at a cost of \$128.00, in addition to the full \$133.45 in UCSU student fees.

Approved Doctoral Candidate students wanting only the use of the Wardenburg Student Health Service will be assessed \$67.80.

Fees include a \$19.75 student athletic fee for Title IX activities. The Regents have assessed this fee for all students

appropriate to the number of credits for which they are registered on that campus. Students qualified to use the concurrent registration option to take courses on more than one campus for a single term will pay the applicable tuition and fee rates of the student's home campus for the total hours enrolled at all campuses.

**NONDEGREE STUDENTS**

Nondegree students with a prior baccalaureate degree will be assessed tuition at graduate student rates. Non-degree students without any prior baccalaureate degree will be assessed tuition at undergraduate rates.

**UNIVERSITY EMPLOYEES**

Any permanent employee may enroll for not more than 6 semester hours of credit and any permanent part-time employee for a proportionate number of hours of credit in any academic year (summer, fall, spring) without payment on a space-available basis beginning on Drop/Add day. Time taken to attend classes during normal working hours shall be made up and shall be limited to one course during any term. Persons

will pay for 3 semester hours at the graduate in-state rate.

**APPROVED DOCTORAL CANDIDATES**

A student admitted as an "Approved Doctoral Candidate" will be registered for 7 dissertation hours.

Students not making use of campus facilities may petition the Graduate School for 3-hour status. Consult the Graduate School for petition deadlines. Continuous registration for dissertation hours during fall and spring semesters will be required until completion of the dissertation defense. Doctoral dissertation rates will be charged at the graduate in-state rate. Out-of-state doctoral dissertation students pay 60 percent of the per hour rate for each semester hour of enrollment.

**In-State and Out-of-State Tuition Classification**

New students are classified as in-state or out-of-state for tuition purposes on the basis of information provided on the application for admission and other relevant information. Applicants may

be required to submit evidence substantiating their claim of in-state eligibility. Applicants who feel their initial classification is incorrect may address inquiries to the Tuition Classification Coordinator.

To be eligible for in-state classification, applicants or their parents (if the applicant is an unemancipated minor) must maintain legal residence in Colorado for the 12 months preceding the term for which in-state status is claimed. Students normally lose in-state eligibility if they or their parents (if the student is an unemancipated minor) maintain domicile outside Colorado for one year or more. Such students are responsible for notifying the Tuition Classification Coordinator of the loss of their in-state eligibility.

Active duty members of the armed forces of the United States on permanent duty station in Colorado, and their dependents (as defined by military regulations), are eligible for in-state classification regardless of domicile or length of residence.

## PETITIONING FOR IN-STATE CLASSIFICATION

Applicants and students who feel their classification is incorrect or who have become eligible for a change to in-state status must submit a petition with documentation in order to have their status changed. The necessary petition forms, deadlines for submission, and an explanation of the Colorado tuition classification statute are available from the Tuition Classification Coordinator, Regent Administrative Center 125, Campus Box 68, University of Colorado at Boulder, Boulder, Colorado 80309-0068, telephone (303) 492-6868. Students at other campuses should address their inquiries to the appropriate office of admissions or records.

## CLASSIFICATION NOTES

1. For tuition classification purposes, 21 is the age of majority in Colorado.

2. In-state classification becomes effective at the beginning of the first term after one year of legal residence in Colorado. Changes of classification never take effect midterm.

3. Students who willfully give false information to evade payment of out-of-state tuition or who fail to provide timely notice of their loss of in-state eligibility are subject to retroactive assessment of out-of-state tuition, as well as disciplinary and legal action.

4. Tuition classification is governed by Colorado statutes and by judicial decisions that apply to all state-funded institutions in Colorado and is subject to change without notice.

## Payment of Tuition and Fees

### UNIVERSITY BILLS

Students enrolling at the University of Colorado at Boulder are responsible for full payment of tuition, fees, and University Residence Hall charges (when applicable) noted on the Tuition and Fee Bill. The bill will include the following credits when applicable: financial aid awards, teaching assistant tuition adjustments, and advance payments or deposits. (Current deposits include confirmation deposits, registration deposits, and housing deposits.) *Housing deposits are not applied to the Tuition and Fee Bill until spring semester.* Failure to receive an official University Tuition and Fee Bill does not relieve any student of responsibility for payment by the published deadline. To avoid assessment of late charges (\$5-\$50), service charges (1 percent per month), a late registration fee (\$20-\$30), and possible disenrollment, payment of tuition and fees must be received at the University by the deadline published in the *Schedule of Courses*. Subsequent bills will reflect adjustments and additional charges made throughout the semester. For further information, call the Student Accounts Receivable Department in the Bursar's Office.

### REGISTRATION DEPOSIT

Either a registration or confirmation deposit must be paid before each student can register for a given semester. All continuing students are required to pay their registration deposit by a specified deadline in July in order to register for fall classes. (The registration deposit for spring semester is due by a specified deadline in December.) New freshman, new transfer, and readmitted students pay a nonrefundable confirmation deposit. The Board of Regents reserves the right to revise the deposit policy and amount without prior notice.

### DEFERRED PAYMENT PLAN

Students may apply for a deferred tuition payment plan by filling out a Tuition Deferment Agreement available at the Bursar's Office. The application must be completed and submitted to the Bursar's Office by the Tuition and Fee Bill deadline each semester. Students should consult the *Schedule of Courses* for specific instructions relating to deferred tuition application and related deadlines.

This plan allows the student to pay the Tuition and Fee Bill in two installments. At least one-half of the obli-

gation must be paid in the first installment. The deferred balance will be subject to a finance charge computed at a periodic monthly rate of 1 percent per month on the unpaid balance (equal to a maximum annual percentage rate of 12 percent) beginning the first day of class. Payments under the deferred tuition plan are due approximately the second and sixth week of classes. If either portion of the deferred payment is not received by the published deadline, the unpaid balance will be subject to late and/or service charges and the student may be subject to disenrollment. The Board of Regents reserves the right to revise or eliminate this program at any time. Tuition and Fee Bill balances of less than \$100 are not deferrable, and the deferred payment plan is not available for summer session.

### FAILURE TO MAKE PAYMENT

Failure to make the required payment by the stated deadline will result in any or all of the following actions:

1. The student may be disenrolled from the University, becoming ineligible for all University services (see Disenrollment Policies and Procedures below)

2. No grades will be issued for courses in progress

3. No transcripts, diplomas, certification, or registration materials will be issued for the student until the Tuition and Fee Bill is paid in full

4. A late payment charge (1 percent per month) on the unpaid balance will be assessed according to the following schedule.

Balance Due	Late Charge
\$ 1- 99.99	\$ 5
\$100-299.99	\$10
\$300-499.99	\$20
\$500-699.99	\$30
\$700-899.99	\$40
\$900 and over	\$50

5. A late registration fee of \$20 to \$30 may be charged to students who are disenrolled for not fulfilling their financial obligations and who desire to reregister. The late registration fee is separate and distinct from any penalty that may be assessed for late payment of tuition and fees. See Late Registration Fee below for exact amounts.

### PERSONAL CHECK POLICY

Any student writing a bad check to the University may be subject to disenrollment, to cancellation of registration, to late charges, and to service charges; a \$15 returned check charge will also be assessed, in addition to the amount due the University. The student

may also be liable for collection costs and prosecution under one of the following Colorado Criminal Statutes: 18-4-401, Theft by deception; 18-5-205, Fraud by check; 18-5-512, Issuance of a bad check. The University of Colorado at Boulder is a member of the Boulder Credit Bureau. Specific inquiries concerning reporting should be directed to the Collections Department of the Bursar's Office.

### **WITHDRAWAL POLICY REGARDING TUITION AND FEES**

To be valid, the withdrawal process must be completed at the Office of Registrations. Payment of the registration or confirmation deposit and submission of registration materials obligate the student to pay the full amount of tuition and fees for the semester. If a student withdraws from the University during fall or spring semester, the obligation will be as follows:

- a. Full amount of registration or confirmation deposit through the third Friday of instruction
- b. Forty percent of full tuition and mandatory fees from the third Friday of instruction through the fifth Friday of instruction, or the registration or confirmation deposit, whichever is greater
- c. Sixty percent of full tuition and mandatory fees from the fifth Friday of instruction through the seventh Friday of instruction, or the registration or confirmation deposit, whichever is greater; no refund thereafter

Students should refer to the current *Schedule of Courses* for any changes, as the Board of Regents reserves the right to revise this schedule at any time.

**Note:** Students who do not pay tuition and fees in full at the time of withdrawal must make arrangements for payment with the Collections Department in the Bursar's Office.

Refer to the appropriate *Summer Session Catalog* for information on the withdrawal policy and refund schedule for summer terms.

It is the responsibility of students to have all optional fees removed at the time of withdrawal. Otherwise, these fees will become a financial obligation.

### **DROP/ADD TUITION ADJUSTMENT**

Complete adjustment of tuition and fees will be made on Drop/Add changes as published in the *Schedule of Courses*.

### **LATE REGISTRATION FEE**

A late registration fee may be charged students who are authorized to register after their assigned registration

period. The late registration fee is \$20 for the first working day, \$25 for the second working day, and a maximum of \$30 beginning the third working day and thereafter. This fee is separate and distinct from any penalty that may be assessed for late payment of tuition and fees.

### **Student Responsibility for Payment**

1. Students are responsible for payment of their Tuition and Fee Bills.
2. Bills are produced for all students. However, *failure to receive the bill(s) does not relieve students of the obligation to know how much they owe the University and to pay by the published deadline(s).*

### **Disenrollment Policies and Procedures**

When students default on payments, official notification will be mailed by the Office of Registrations to their address of record. The letter will inform students that their account is overdue and that they have been disenrolled. Students will also be informed of the appeal and reinstatement procedures.

### **DISENROLLMENT**

Students who fail to meet their tuition and fee obligations by published deadlines will be subject to immediate disenrollment. A student who is disenrolled will:

1. not receive grades for courses in progress
2. not be issued transcripts or diplomas
3. still owe full tuition and fees, as well as late and service charges
4. not be allowed to register for future terms
5. not be eligible for any University services

### **REINSTATEMENT**

Students who are disenrolled may have to petition for reinstatement. Petitions must be received within the deadlines stated in the disenrollment letter. Only extraordinary circumstances beyond the student's control will be considered as a basis for petition. Lack of financial planning is not a basis for petition.

Students who are reinstated must pay any unpaid tuition and fees and may be assessed a late-payment charge, a service charge (1 percent per month), and a late registration fee.

Disenrolled students may have to reapply for admission to the University

of Colorado at Boulder to resume attendance. Any outstanding financial obligation must be paid before reapplying to the University or attempting to register.

### **Auditing**

All persons who wish to attend regularly scheduled classes and who are not registered students must obtain auditor's status. Auditors, whether in-state or out-of-state, pay in-state tuition for 3 semester hours per fall or spring semester and receive class instruction and library privileges only. An auditor's card must be presented to the instructor when requesting permission to attend a class. Cards may be obtained from the Student Accounts Receivable Department in the Bursar's Office in Regent Administrative Center after classes begin. To qualify as an auditor, an individual must be 21 years of age or older. Persons are not eligible to audit courses if they are under suspension from the University. Classes may be audited for fall or spring semester but not during summer session. Auditors may attend as many courses as they wish (except those courses with laboratories or where equipment is used), provided they have permission from the instructor.

If a regular degree student wishes to participate in a class without receiving credit, the student must register for the course for No Credit. Tuition for courses taken for No Credit is the same as for courses taken for credit. Auditors should note that the Office of Academic Records does not keep any record of courses audited; therefore, credit for these courses cannot be established. See Grading System, Drop/Add, and Auditing.

### **FINANCIAL AID**

The financial aid program at the University of Colorado at Boulder is designed to assist students who need help in meeting the cost of their education. Students who will require financial aid must submit aid applications. Approximately 11,000 students, or about 50 percent of the student body, annually receive need- and nonneed-based financial aid from federal, state, University, and private sources. In most cases, grants are supplemented by part-time employment (Work-Study) and/or long-term loans to meet the demonstrated need of recipients.

The Office of Financial Aid, located in the Environmental Design Building, is open from 9:00 a.m. to 4:00 p.m. (8:30 a.m. to 3:30 p.m. in the summer), Monday through Friday. During office hours, Aid Counselors are available on an

appointment basis to talk with prospective students and their parents regarding the financing of an education at CU-Boulder. Students who are unable to visit the office may call (303) 492-5091 for assistance.

Students who wish to apply for financial aid must submit a 1988-89 Family Financial Statement (FFS) to the American College Testing (ACT) Need Analysis Service. Applications should be available through local high school counselors or the CU-Boulder Office of Financial Aid around December 15, 1987. **The priority date for financial aid at CU-Boulder for the 1988-89 academic year is April 1, 1988.** The priority date for students applying for Spring 1989 is October 3, 1988.

FFS applications for the 1988-89 academic year received by ACT after April 1, 1988, will continue to be awarded on a rolling basis as long as funds are available. It is unlikely, however, that students who miss the priority date will be offered CU-Boulder awarded financial aid.

Funds awarded by CU-Boulder are limited and are made to students on the basis of their demonstrated financial need and date of application.

The Office of Financial Aid will begin making 1988-89 award/denial announcements in April 1988 for incoming freshman and new transfer students who meet the April 1 priority date and whose files are complete. Award/denial announcements for continuing CU-Boulder students will be mailed in early May 1988. Please note that a student's financial aid application will not be processed unless a student has been officially admitted to a degree-granting academic program at the University of Colorado at Boulder by April 1, 1988, or is eligible to continue in a degree-granting program. Spring 1989 applicants who have met the October 3, 1988, priority date and have been admitted by November 2, 1988, will be notified beginning December 15, 1988. Prospective students should *not* wait for formal acceptance to CU-Boulder before applying for financial aid, however. Priority dates must be observed regardless of admission status.

Students who apply for financial aid at CU-Boulder are responsible for knowing and complying with the Office of Financial Aid Satisfactory Progress Requirements. These requirements are separate and distinct from academic satisfactory progress policies of CU-Boulder colleges and schools.

## Federal Financial Aid Programs

The **Pell Grant** program provides grant assistance to undergraduate students who have no previous baccalaureate degree and who are enrolled for at least 3 hours in a degree or certificate program. Eligibility is based on financial need and is determined by the government.

The **State Student Incentive Grant (SSIG)** program is jointly funded by the federal government and participating states. It provides state scholarship/grant assistance to students who have high financial need. At CU-Boulder, undergraduate resident students are awarded this grant as the Colorado Student Incentive Grant.

The **Supplemental Educational Opportunity Grant (SEOG)** provides grant assistance to undergraduate students with no previous degree who demonstrate high need.

The **Perkins Loan** (formerly National Direct Student Loan or NDSL) provides low-interest loan funds to undergraduate and graduate students who demonstrate financial need. Currently, CU-Boulder awards Perkins Loans from its own funds, which are generated from former students repaying these loans. Repayment of the new loan begins six months after the student leaves school or ceases to be enrolled on at least a half-time basis. Students have up to ten years to repay the loan.

The **Guaranteed Student Loan (GSL)** program offers a federally subsidized, low-interest loan to undergraduate and graduate students who demonstrate financial need. The GSL program is a cooperative effort among lenders, guarantee agencies, and the federal government. Students are eligible for varying amounts of money during the course of their academic tenure, depending on their need level. Repayment of a GSL begins six months after the student leaves school or ceases to be enrolled on at least a half-time basis.

The **Parent Loan for Undergraduate Students (PLUS)** is a loan for parents of dependent students and independent graduate students. The PLUS has a slightly higher interest rate than the GSL, and repayment begins 60 days after disbursement of the loan. Student borrowers may have payments deferred. The maximum amount that can be borrowed each year is \$4,000. Students do not have to qualify based on need for this loan.

The **Supplemental Loan to Students (SLS)** is a loan exactly like the PLUS,

only it may be borrowed by independent students. In some cases, dependent students may borrow under this program, but exceptions must be fully documented and approved by a financial aid counselor.

The **College Work-Study** program provides employment opportunities for both graduate and undergraduate students. Job locations may be on campus or off campus in approved agencies. Work-Study is a need-based program and students must qualify for this source of assistance by the aid application process.

## Student Employment

The Office of Financial Aid assists students in obtaining part-time employment while attending CU-Boulder. Job opportunity information is posted on the job boards located in the office. Information about part-time hourly on-campus employment, regular Work-Study, and Full-Time Summer Work-Study is also available.

The Job Location and Development (JLD) program is located within the Office of Financial Aid. This program provides individualized job counseling and emphasizes locating and developing part-time off-campus employment opportunities for students. A financial aid application is not necessary for hourly employment but is required to be considered for Work-Study.

## Scholarships

Students seeking information about merit and need-based scholarships administered by CU-Boulder are encouraged to request a free copy of the publication entitled *Guide to Institutional Scholarships 1988-89*. The publication can be obtained by writing to the Office of Financial Aid, Environmental Design Building, Campus Box 106, University of Colorado at Boulder, Boulder, Colorado 80309-0106.

## HOUSING

### Residence Halls

Living on campus in a University Residence Hall is considered an important part of student life. Twenty-one well-maintained, comfortable residence halls accommodate almost 6,000 students in single rooms, double rooms, multiple occupancy rooms, and apartments. While most halls are coeducational, there are alternatives for those who prefer traditional men's or women's accommodations.

Each fall the residence halls welcome more than 3,000 entering freshmen to



their new home at the University. Subject to the availability of space, freshman men and women are required to live in a residence hall for two academic-year semesters (a summer term does not count as an academic semester), unless they are married or live with parents or relatives in the Boulder area and have permission to commute. Requests for permission to reside off campus for other reasons will be considered on their merits, taking into account the individual circumstances of the petitioner.

The residence halls provide a range of services and programs designed to support the intellectual, social, and personal growth of single student residents. For example, all residence halls have tutoring services available to residents at little or no cost. Further, minicourses are offered on subjects such as photography and pulmonary resuscitation, and a variety of programs are provided by Residence Hall and other University staff.

The Residence Hall Food Service offers good food in pleasant surroundings. Hours are planned to be convenient for most students' schedules, and self-serve salad bars are available at noon and evening meals. Steak nights, ice cream socials, and late-night coffee and cookie breaks during exam week are among the special activities planned during the semester.

For more information about University housing options and/or permission to reside off campus, prospective students may write the Assistant Director of Housing, 64 Hallett Hall, University of Colorado at Boulder, Boulder, Colorado 80310.

### **FARRAND AND SEWALL RESIDENTIAL ACADEMIC PROGRAMS**

Two residence halls, Farrand and Sewall, are locations for distinctive liberal arts programs. The Farrand Residential Academic Program, designed for students in the College of Arts and Sciences, is a coeducational program that offers 400 freshmen and sophomores the opportunity to enjoy the benefits of a small liberal arts college while taking advantage of the resources of a large university. The emphasis in Farrand is on participation in classes, in student government, in special programs, and in creative projects. Each semester students are required to take at least one course in Farrand Hall. For information, write the Director, Farrand Residential Academic Program, Campus Box 180, University of Colorado at Boulder, Boulder, Colorado 80309-0180, or call (303) 492-8848.

The Sewall Residential Academic Program is open to freshmen in all majors and provides students with the opportunity to participate in a coeducational residential community designed to integrate academic exploration and personal experience. The 330 freshmen living in Sewall are required to take one seminar each semester, in addition to their regular courses. The seminars, held in Sewall, are taught by CU-Boulder faculty who especially enjoy working with freshmen. For information, write the Director, Sewall Residential Academic Program, Campus Box 353, University of Colorado at Boulder, Boulder, Colorado 80309-0353, or call (303) 492-6004.

For more detailed information on the Farrand and Sewall programs, consult the College of Arts and Sciences section of this *Catalog*.

### **FRESHMAN ENGINEERING PROGRAM**

Freshman engineering students living in Aden, Brackett, Cockerell, and Crossman Halls may participate in the Freshman Engineering Program. Jointly sponsored by the College of Engineering and Applied Science and the Department of Housing, this program offers male and female residents an engineering-oriented tutoring service, use of computers, and professional counseling and advising.

### **OTHER ACADEMIC PROGRAMS IN THE RESIDENCE HALLS**

In the spring of 1987, a new council was formed to develop academic programs in CU-Boulder's Residence Halls. Some of the projects that have been funded include a music program in Nichols Hall; a great debate series; a preceptor program, primarily for Business students; a faculty luncheon program in the halls; and special faculty colloquia and Arts and Sciences courses that are presented directly in the halls. All programs attempt to facilitate greater interaction between faculty and students, and to foster the integration of students' academic life with their campus residence hall life. Interested students, faculty, and staff are encouraged to participate in the planning and submission of projects to the council.

### **ROOM AND BOARD RATES**

Residence Hall room and board rates per person, per semester for the 1987-88 academic year have been established as follows, subject to Board of Regents approval. A modest rate increase

should be expected for the 1988-89 academic year. Rates are slightly higher for the Sewall and Farrand Residential Academic Programs. There is also an additional fee for the Freshman Engineering Program.

Board and single room . . . . .	\$1,763 <sup>1</sup>
Board and double room . . . . .	\$1,524 <sup>1</sup>

### **APPLICATION FOR RESIDENCE HALL HOUSING**

As soon as possible after being accepted to the University, students should confirm their intent to enroll. Immediately after students have confirmed, they will be sent housing forms and a pamphlet describing the different housing options available. The housing forms should then be returned directly to the University Department of Housing; the earlier these forms are received, the better chance students have of being assigned to the residence hall of their choice. Freshmen who are admitted for the fall semester but confirm or submit housing materials late (usually after mid- to late-May) cannot be guaranteed space in a University residence hall.

*Application for and confirmation of admission to the University and application for housing are two separate transactions. Application for housing does not guarantee admission to the University nor does admission to the University guarantee that housing will be available.* For information regarding admission notification and confirmation procedures, see the Admission section of this *Catalog*.

An advance payment (\$100 in 1987-88), which will be applied toward spring semester room and board, is required to reserve residence hall accommodations. Students should note that residence hall facilities are reserved on a first-come, first-served basis.

All housing agreements are for the full two-semester academic year or remainder thereof. A liquidated damage fee is charged if the student withdraws from the residence hall during the period of the agreement.

### **Family Housing**

There is a variety of University-owned and operated buffet, one-, two-, and three-bedroom furnished and unfurnished apartments for student families. The University Family Housing Children's Center provides day care for the children of University housing residents, University staff, University students, and others in the community.

<sup>1</sup>Rates are subject to change.

Family housing residents have first priority. For information, write the Family Housing Office, 1350 Twentieth Street, University of Colorado at Boulder, Boulder, Colorado 80302.

## Off-Campus Housing

The UCSU Off-Campus Housing Office maintains listings of rooms, houses, and apartments for rent in the Boulder community and also lists students looking for roommates. Students are invited to come to the office, located in the University Memorial Center, Room 336, to obtain their own set of computerized rental listings (15 cents per page), to use the free telephones, and to talk with counselors about the Boulder housing market.

In addition, counselors are available to advise students about leases, security deposits, effective techniques for living with a roommate, and ways to avoid landlord/tenant problems. The office provides Boulder maps (\$1) and free copies of the Boulder Tenants' Guide, the Boulder Model Lease, the Roommate Survival Guide, and handouts on furniture rental, moving tips, grocery stores, local banking services, and other off-campus housing-related matters. Students interested in eating their meals on campus may choose from meal plans in the residence halls or in the University Memorial Center.

An Off-Campus Student Organization sponsors intramural teams, social events, and informal brown bag lunches where off-campus students can meet each other, have fun, and find a support base. To learn about the group or to serve on the planning committee, contact the Off-Campus Housing Office at (303) 492-7053, or visit the office Monday through Friday from 9:00 a.m. to 4:00 p.m. During July and August, the office is also open on Saturdays from 10:00 a.m. to 2:00 p.m.

Freshman students are reminded that they must obtain written permission from the University Housing Department before obtaining off-campus accommodations. See the Residence Halls section above.

## PROGRAMS

### Alumni Office

The Alumni Office welcomes student visits and student participation in the Student Organization for Alumni Relations (SOAR). The Office communicates regularly with alumni through publications and personal contacts. It maintains records of alumni; arranges alumni events at Homecoming, at Commencement, and with local alumni

groups throughout the United States; plans class reunions and awards programs; and sponsors an undergraduate alumni support group, alumni programs, and services for recent CU alumni. The Office also offers a variety of other alumni-related programs, including a scholarship program, a recruiting program, a continuing education program for alumni, travel opportunities, a program of involvement for parents of current CU students, and information on career opportunities for CU undergraduates.

By working with the Boulder Campus Chancellor, faculty members, staff, and students, the CU-Boulder Alumni Association creates better communication between the Boulder Campus and the total alumni body.

The alumni program is maintained by alumni support and by University funds. There are two categories of Alumni Association dues: \$15 per year for the first five years after graduation, and \$25 per year for all alumni and interested friends. Dues-paying members of the Alumni Association receive all editions of the *Colorado Alumnus*, published five times each year; *Summit* magazine, published three times each year; the Association's full-color calendar; the Annual Report; special announcements for programs and services; and other special communications.

All former students are encouraged to keep their addresses current with the Alumni Office in order to receive communications and notification of alumni activities, programs, and services.

### Artist Series

The Artist Series is more than one-half century old and continues to bring outstanding internationally known solo recitalists, touring orchestras, and opera and ballet companies to the Boulder campus. Claude Bolling, the Jazz Tap Ensemble, and the St. Paul Chamber Orchestra are just a few of the many performers who have come to Boulder in recent years.

Students are an important part of the Artist Series audience and are offered substantial savings on season subscriptions with a variety of easy payment plans. Additional information may be obtained at the Artist Series Box Office, Macky 107, telephone (303) 492-8008.

### Clubs and Organizations

Clubs and organizations of almost every description are active on the Boulder Campus, including many different academic, political, social, religious,

and recreational groups. More than 50 of these groups are supported by student fees. Rocky Mountain Rescue, the Prelaw Club, Amnesty International, and the CU World Citizens are examples of student-sponsored groups which, like other organized groups on campus, offer a variety of opportunities for individuals to become involved with others on timely issues.

All clubs and organizations provide an excellent way to become engaged in current events, student activities, and community service. For further information, interested students can consult the University of Colorado Student Union's *Club Guide*, their associate dean's office, an academic advisor, UMC bulletin boards, and campus newspapers.

## CU Opportunity Program

The CU Opportunity Program (CUOP) provides access and educational opportunity to students from ethnic minority backgrounds (e.g., Asian American, Black, Chicano, American Indian), migrant backgrounds, and educationally or financially disadvantaged backgrounds. CUOP offers a comprehensive educational support program that includes admissions and financial aid assistance; freshman core academic courses; tutorial services; and academic, personal, and career counseling. The program is distinctive in its approach to quality education, in its way of providing educational opportunity to undergraduates, and in its sense of educational values and academic commitment.

A network of support programs and professional staff members work to ensure CUOP students' success at the University. Programs providing educational support services are the CU Opportunity Program, Office of Admissions; University Learning Center; Multicultural Center for Counseling and Community Development; and the Educational Development Program.

### CU OPPORTUNITY PROGRAM, OFFICE OF ADMISSIONS

This program conducts recruitment efforts that provide minority and disadvantaged students with information about undergraduate educational opportunities available to them at the University. Students receive admissions counseling and financial aid advising to help ensure their applications to the University are processed in a correct and timely manner. Because all students have not had equal opportunities to prepare for university work, special admission consideration is available.

### UNIVERSITY LEARNING CENTER

The University Learning Center offers a comprehensive academic support program designed to ensure the academic competency expected of all University students. This includes an innovative academic program that offers introductory freshman courses; a study skills center for math and science, writing, and reading; individualized and small group tutoring; video and computer-assisted instruction; and weekly skills workshops.

### MULTICULTURAL CENTER FOR COUNSELING AND COMMUNITY DEVELOPMENT

The Center offers a broad array of counseling and community support activities, and tailors those activities to meet each student's educational, career, and personal goals. This student-centered counseling philosophy focuses on providing guidance to developing young adults who are in the process of defining their academic and personal lives.

### EDUCATIONAL DEVELOPMENT PROGRAM

This program offers a variety of precollegiate academic programs to minority junior and senior high school students from Colorado and throughout the Southwest. These programs provide students with early access to the University and opportunities to develop and excel in academic areas through intensive summer sessions. Three current projects include the American Indian Upward Bound Program, the Precollegiate Development Program, and the Talent Search Program. Additionally, this unit is helping to provide programs of computer-assisted instruction and computer literacy for precollegiate and collegiate populations.

For more information about the CU Opportunity Program at Boulder, call (303) 492-8316.

### Fraternities and Sororities

Over 3,000 students currently participate in CU-Boulder's 31 social fraternities and sororities. Emphasizing service, leadership, scholarship, and involvement in campus life, most of the organizations have houses off campus where members can live after their freshman year. The University is working through its Greek Liaison to establish an educational, growth-oriented environment for fraternity and sorority students that integrates them more fully into the campus community.

The Greek system is autonomous from the University and not subject to

its direct control. Additional information may be obtained by calling the Panhellenic and Interfraternity Council Office, (303) 492-6359, or the University Greek Liaison, (303) 492-5425.

### Honor Societies

One way in which outstanding student scholarship is recognized at the University of Colorado at Boulder is through national and local honor societies. The national honor society, Phi Beta Kappa, founded in 1776 at the College of William and Mary in Virginia, was established at CU-Boulder in 1904. Phi Beta Kappa recognizes outstanding scholastic achievement in the liberal arts and sciences. The campus also has a chapter of Sigma Xi, an honor society for scientists. Sigma Xi's goals are to advance scientific research, to encourage communication among scientists, and to promote the understanding of science.

Among other national honor societies with local chapters at Boulder are Beta Gamma Sigma (Business), Kappa Delta Pi (Education), Tau Beta Pi (Engineering), Kappa Tau Alpha (Journalism), Order of the Coif (Law), Pi Kappa Lambda (Music), and Rho Chi (Pharmacy). The criteria for membership in honor societies and their activities vary. For more information on both national and local societies, consult the individual college and school sections of this *Catalog* or associate deans' offices.

### Intercollegiate Athletics

The University of Colorado is a member of the Big Eight Athletic Conference and sponsors competition in a variety of intercollegiate sports. Competing at the national level in these sports, the Colorado Buffaloes pride themselves on many individual and team championships. Men's varsity sports include basketball, football, cross-country, track and field, skiing, golf, and tennis. Women's varsity sports include basketball, cross-country, track and field, skiing, tennis, and volleyball.

Folsom Field, a 52,000-seat stadium, serves as the home of the Colorado Buffalo football team. The basketball team practices and competes in the CU Events/Conference Center, a facility that seats over 11,000 people. The golf and tennis teams use local clubs as their headquarters, and the CU-Boulder ski team takes advantage of Colorado's many ski resorts. The women's volleyball team uses both the Events Center and Balch Fieldhouse for matches and practices. Boulder's diverse terrain and a running-conscious community combine to create a vigorous atmosphere

for track and cross-country training. Overall, the University provides a positive environment for students who enjoy and participate in intercollegiate athletics.

### International Education

The Office of International Education serves as a liaison for international activities among academic departments, administrative units, foreign universities and governments, and U.S. governmental agencies and foundations. This liaison stimulates and provides administrative support for students and faculty members who desire to study or to conduct research overseas, for foreign students, faculty members, and visitors who come to the University of Colorado, and for all members of the University community who wish to develop an international dimension in their teaching, research, or study.

Specific functions include expediting the exchange of students and faculty, arranging the programs of foreign visitors, promoting special relationships with foreign universities, and advising on international scholarships.

The Office of International Education maintains a small resource library on foreign study, travel, and work opportunities, including temporary summer jobs, volunteer internships, and career opportunities abroad. International Student Identification Cards and Eurail and Britrail passes are also available through the Office.

### STUDY ABROAD PROGRAMS

Study Abroad Programs, a branch of the Office of International Education, offers over 25 different study abroad programs around the globe. Some of these programs are of the traditional junior-year abroad variety and place a student directly in a foreign university for an academic year. Such programs are available at the Universities of Lancaster, East Anglia, and Reading, England; the University of Bordeaux, France; the University of Costa Rica, San José; the American University in Cairo, Egypt; the Universities of Regensburg, Stuttgart, and Tübingen, Germany; the Hebrew University in Jerusalem, Israel; the University of Seville, Spain; and Linköping University, Sweden. Engineering and commercial Spanish students may be particularly interested in programs at the Instituto Tecnológico y de Estudios Superiores in Monterrey, Mexico. Generally, students need to have completed a minimum of two years college work with a *B* average or better and have studied two years of the appropriate language.

For students unable to spend an academic year abroad, programs for a single semester are available with various emphases. Students may study beginning/intermediate intensive language in Chambéry, France, during the spring semester of each year. The London Semester Program, offered both fall and spring semesters, provides an interdisciplinary introduction to English culture. Students who wish the experience of a foreign institution may attend a single-semester program in San Jose, Costa Rica; Santiago, Dominican Republic; Rennes, France; and Seville or Alicante, Spain. Special summer and interim programs (e.g., art history in Italy, intensive language in Mexico, Germany, and Italy, and international finance in London) are organized with specific departments upon request.

All participants in University of Colorado study abroad programs remain enrolled at the University and all credit earned while abroad is considered resident credit. Most study abroad credits are recorded on a Pass/Fail basis, but are exempt from all Pass/Fail restrictions in the College of Arts and Sciences and most other colleges and schools. Financial aid from the University can be applied to program costs in most cases. Special study abroad scholarships are available to program participants.

More information about study abroad programs is available at the Office of International Education or by calling (303) 492-7741.

## FOREIGN STUDENT AND SCHOLAR SERVICES

The University of Colorado has welcomed foreign students and scholars for many years. Currently more than 800 foreign students and over 120 post-doctoral scholars and visiting faculty members from more than 75 countries are on campus. Foreign Student and Scholar Services, a part of the Office of International Education, provides information and assistance to foreign students and visiting scholars regarding University regulations and procedures, immigration requirements, liaison with sponsors and home governments, and any other matters that are of special concern to students and scholars from other countries. All foreign students and visiting foreign scholars are urged to check in at Foreign Student and Scholar Services upon first arrival at the University and to maintain contact with the staff during their stay at the University. For further information about foreign students and scholars, call (303) 492-8057.

## International English Center

The University's International English Center (IEC) provides intensive English-language instruction to students from all parts of the world. Eight-week sessions offer classes at all levels of English-language proficiency and in all language skills. The program is designed to prepare international students for academic study at colleges and universities in Colorado or elsewhere in the United States. At advanced proficiency levels, IEC students are permitted to enroll concurrently in selected credit courses as additional preparation for a degree program.

The IEC's fast-paced schedule is particularly appropriate for University of Colorado applicants who have been informed by the Office of Admissions that they are academically qualified but cannot be granted admission because of inadequate English-language proficiency. Such students are automatically eligible for study at the IEC. For IEC students who have not applied to CU or any college or university in the United States, the IEC provides academic-placement assistance.

Full information may be obtained from the International English Center by mail (Campus Box 63), in person at the IEC offices at 1230 Grandview Avenue, or by telephone, (303) 492-5547.

## Orientation

Orientation activities are important in introducing new students to campus programs and services. Students are given the opportunity to receive academic advising; to meet faculty, staff, and other students; and to obtain information on student services and recreational activities. Because each college has its own unique orientation program, students should call or write their respective college for more information.

In addition, each fall entering freshman, transfer, and graduate students are invited to participate in New Student Welcome, a program of events especially planned to familiarize new students with the campus. A feature of the program is the Chancellor's Convocation, a ceremony officially honoring the entering freshman class.

## President's Leadership Class

The President's Leadership Class (PLC), one of the highest honors that can be bestowed upon entering first-year students at CU-Boulder, is a specially designed three-year program

focusing on the development of leadership skills through exposure to government, education, business, science, and the arts. The program enhances University education by offering practical learning experience in the community. Approximately 60 outstanding first-year students participate annually.

PLC provides merit scholarships of approximately \$1,000 a year over a three-year period, and PLC scholars earn college credit for two of the three years that they are in the program. Participants are selected on the basis of academic and extracurricular excellence, with emphasis on their potential for contributing to the University and community. For more information, write the Executive Director, President's Leadership Class, Campus Box 7, University of Colorado at Boulder, Boulder, Colorado 80309-0007, or call (303) 492-8342.

## Senior Auditor Program

During fall and spring semesters, the University of Colorado at Boulder offers a Senior Auditor Program to residents of the state who are 55 years of age or over. Senior auditors attend classes on a tuition-free, space-available basis. No record is kept of attendance; no examinations are taken for credit; and class participation is at the discretion of the instructor. Senior auditor privileges include the use of the University Libraries. For information, call (303) 492-8484.

## UCSU

One of the nation's most influential student governments, the University of Colorado Student Union (UCSU) enables students to make policies and control many Boulder Campus facilities and programs. UCSU's budget of \$12 million, collected and generated by student fees, is exceeded only by student governments at the University of California, Berkeley and Michigan State University. UCSU operates facilities such as the Wardenburg Student Health Service, the University Memorial Center (UMC), the Recreation Center, and the campus radio station (KUCB). UCSU also offers students access to a resource test file, off-campus housing assistance, legal counseling, and other services.

UCSU is divided into three branches: executive, legislative, and judicial. The UCSU executives, elected every year by fee-paying students, head the executive branch. In representing the students, the executives work with the Board of Regents and the CU administration on University policies and decisions.

Support staff includes student administrators who work in key administrative offices and serve as liaisons between the student body and the administration.

The legislative branch of UCSU includes the executive council and seven joint boards. Each of the colleges and schools holds a seat on the 20-member executive council; the remaining 10 seats are occupied by elected representatives-at-large. The joint boards on which executive council members serve include the Environmental, Recreation, Health, Finance, Cultural Events, UMC, and Access in Radio boards.

The Appellate Court is UCSU's judicial branch. The seven students appointed by the Executive Branch to serve on Appellate Court are responsible for interpreting the UCSU Constitution and ruling on specific appeals brought before them.

## Undergraduate Research

CU-Boulder offers several ways for undergraduate students to participate directly in research and creative work. Through such involvement, students acquire knowledge and skills seldom attained through classroom experience alone. Project results sometimes are presented at national professional meetings or published in scholarly journals.

**Independent Study.** Independent Study course work provides students the opportunity to become involved in a project of their own choice. Projects could include writing a play, doing laboratory research, or designing a space-shuttle experiment. The number of credit hours earned depends on the scope of the project. In all cases, work is done under the supervision of a faculty member and should be arranged as early in the semester as possible. Departmental and faculty approval is required, and add deadlines must be observed. Students should consult with associate deans' offices about any special provisions.

**Arts and Sciences Honors Program.** Students in the program have the opportunity to collaborate with faculty on research and creative endeavors in any area of the College. Some students select highly individualized projects, while others become involved with major on-going research programs. Each student who wishes to graduate with honors is required to complete a senior thesis. The thesis is usually a research paper or creative essay, but might be an art exhibit or a dance concert, depending on the project. The thesis experience stresses intellectual independence and introduces students to

proper research methods and creative techniques in preparation for graduate or professional work. See the Honors Program section of this *Catalog* for detailed information.

**Undergraduate Research Opportunity Program (UROP).** UROP sponsors undergraduate students who wish to work in partnership with a faculty member on a research or creative project. UROP involves students in all areas of research—from writing proposals, to conducting research or pursuing creative work, to analyzing data and presenting results. Interested students must identify a project and a faculty sponsor and then submit a proposal. Projects are designed around an aspect of the faculty sponsor's research or involve research or creative work of the student's own design. Proposals are evaluated on a competitive basis, and awards are determined by the UROP Advisory Committee. Students are awarded up to \$600 in stipends and/or expense allowances to support their projects. A limited number of \$2,000 summer research fellowships is offered to enable students to spend the entire summer engaged in research.

## Veterans Affairs

The Veterans Affairs Office assists eligible students in receiving Veterans Administration Educational Benefits. As a condition of receiving benefits, prospective students must be accepted to a degree program at CU-Boulder, or acceptance must be imminent. CU-Boulder is approved for veterans benefits under the following programs.

**G.I. Bill, Chapter 34.** The student must have served at least 181 days of active duty service beginning prior to January 1, 1977.

**Veterans Educational Assistance Program (VEAP), Chapter 32.** Service must have begun between January 1, 1977, and June 30, 1985, and student must have participated in the program while in the service.

**New GI Bill, Chapter 30.** Service began on or after July 1, 1985, and student must have participated in the program.

If the veteran was discharged from the military service before January 1, 1979, a *certified copy of the DD-214* is required (certified copies of discharges may be obtained from any County Clerk and Recorder's Office without charge); if the veteran was discharged after this date, a *certified copy of Copy 4 of the DD-214* is required. If the veteran has used benefits before, a DD-214 is not necessary. These benefits terminate 10 years from the date of honorable discharge. Benefits under the GI Bill

(Chapter 34) expire December 31, 1989, except for those veterans who served on active duty through June 30, 1988 (or June 30, 1987, with at least a 4-year obligation to the National Guard or Selected Reserve).

Dependents' Educational Assistance Act, Chapter 35. Students between the ages of 18 and 26 who feel they are eligible to receive educational benefits because of the death of a parent in active military service, or due to a parent's service-connected disability, should establish their eligibility with their local VARO. Children and spouses of 100 percent disabled veterans may also qualify. The applicant must bring the VA File Number and a certified copy of their birth certificate to the Veterans Affairs Office in order to initiate the educational benefits. Those students eligible for Social Security benefits under the Quayle Amendment should contact the Veterans Affairs Office or their local Social Security Office.

**Selected Reserve Educational Assistance Program, Chapter 106.** The student may be eligible if he or she enlists, reenlists, or extends an enlistment in the Selected Reserve for a period of six years beginning on or after July 1, 1985. The student must provide the Veterans Affairs Office with a Notice of Basic Eligibility, DD-2384, from the Reserve Unit.

A student may request advance payment by completing the proper forms at the Veterans Affairs Office at least 60 days before the start of the term. A student must not have used the benefits in the 30 days preceding the term.

The Veterans Affairs Office has a counselor on the staff to assist students with planning academic schedules in relation to VA regulations. Students and prospective students are always welcome at the office, 229 Willard Administrative Center, telephone (303) 492-7322.

## REGISTRATION

Students should refer to the academic calendar and detailed information in the *Schedule of Courses* or *Summer Session Catalog* for specific details on dates and deadlines that apply to the registration process. Specific registration procedures are sent to new freshman, new transfer, and readmitted students when they have confirmed their intent to enroll. Continuing students are notified each semester of times, places, and requirements for registration.

The following registration policies are intended to serve as general guidelines. Therefore, students should consult college and school sections of this *Catalog*



and individual deans' offices for additional information on special requirements and procedures. *The University of Colorado at Boulder does not guarantee that a student will be enrolled in all courses requested.*

Registration generally involves three steps: requesting courses, paying a deposit toward tuition and fees, and obtaining a completed Class Schedule and Tuition and Fee Bill. The Class Schedule and Tuition and Fee Bill will be available before the first day of classes.

For further information, call the Office of Registrations, (303) 492-6970.

## Credit/No Credit

Students who wish to take course work for No Credit should indicate this at the time of registration or during the drop/add period; no changes in credit registration will be permitted after this time. Tuition is the same whether or not credit is received in a course.

## Drop/Add

*Special Note:* Specific drop/add deadlines for each fall and spring semester will be announced in that semester's *Schedule of Courses* and registration instructions. Summer deadlines are published in the *Summer Session Catalog*.

1. Students will be allowed to drop and add courses up to the end of the thirteenth day of classes in a fall or spring semester with no signatures required. For Adds, this deadline will be in effect unless enrollment levels are reached before this date. There are no Adds allowed after this date. Students may drop classes during this initial period without being assessed tuition and fees for that course. Individual colleges and schools may have further restrictions on this time period.

2. After the initial deadline, the instructor's signature is required to drop a course. Courses dropped after this deadline will appear on the transcript with a grade of *W*. No tuition adjustment is made for courses dropped after this deadline.

3. After the 13-day drop/add deadline, students must be passing their course at the time it is dropped. Students who are failing their course will not be permitted to drop.

4. Six weeks after classes begin, a course may not be dropped unless there are documented circumstances clearly beyond the student's control (for example, accident or illness). In addition to obtaining the instructor's signature, students must petition their dean's office for approval to drop the

course. Petitions normally will not be approved after this date.

5. Students dropping all of their courses should refer to the Withdrawal section below for further information.

## Pass/Fail (P/F)

1. Students should refer to college and school sections to determine the number of Pass/Fail semester credit hours that may be taken in a given semester or credited toward a bachelor's degree and special requirements or procedures to request Pass/Fail enrollment.

2. Any student who wishes to register for a course on a Pass/Fail basis should do so during the registration or drop/add period. Changes to or from a Pass/Fail basis may be made only during that period.

3. All students who register on a Pass/Fail basis appear on the class roster, and a letter grade is assigned by the instructor. When grades are received in the Office of Registrations, those courses that require a *P/F* designation are automatically converted. Grades of *D-* and above convert to grades of *P*. Grades of *F* convert to a letter grade of *F*.

4. Exceptions to the Pass/Fail regulations are permitted for certain courses that are offered only on a Pass/Fail basis.

## Time Out Program (TOP)

The Time Out Program is a planned leave program for currently enrolled University of Colorado at Boulder students who are in good standing in their college or school and whose dean approves their leave. Students may leave for a minimum of one semester or a maximum of one year to pursue academic or nonacademic interests, and they do not need to reapply to the University. With prior approval from their dean, students may take courses at another campus of the University of Colorado or at another college or university while on TOP.

TOP will guarantee participating students a place in their current college or school and in their current major when they return to classes. Certain restrictions do apply, however, for some colleges and schools. In addition, students may apply for transfer to a different college or school upon returning to CU-Boulder, providing they observe all policies, procedures, and deadlines. Students will be informed of registration procedures by mail.

Additional information and TOP applications can be obtained from the Registration Information Window in the

foyer of Regent Administrative Center. A nonrefundable \$20 program fee is required at the time of application to TOP. The TOP application must be submitted no later than the six-week drop deadline for the semester the student begins TOP. Call (303) 492-8673 for further information.

## Withdrawal

1. The Office of Registrations is responsible for coordinating the withdrawal program. Before classes start, students should refer to the *Schedule of Courses* for withdrawal procedures. Once classes begin, students must complete a withdrawal interview in the Office of Registrations.

2. Failure to withdraw officially may result in a failing grade being recorded for every course taken in that term and makes a student liable for the full amount of assessed tuition and fees for that term. See Payment of Tuition and Fees for further information on charges and refunds (if applicable).

3. Students who want to drop their only or last class should see the *Schedule of Courses* or the *Summer Session Catalog* for withdrawal procedures.

4. Students will not be permitted to withdraw from the University after the last day of classes in any semester.

5. Rules for withdrawing may vary with each college and school. Students anticipating a withdrawal should consult with their dean's office and with the *Schedule of Courses* or *Summer Session Catalog* for specific withdrawal procedures. More information is available in the Office of Registrations, Regent Administrative Center 125, (303) 492-8673.

6. Students who withdraw and then wish to return to the University must reapply for admission or, if eligible, return through the Time Out Program. For further details read the information in this *Catalog* under Time Out Program or Admission—Former Boulder Campus Students.

## Faculty and Staff Registration

### APPLYING FOR FACULTY AND STAFF TUITION BENEFIT

All permanent faculty and staff who wish to apply for the 1-6 free credit hours they are granted each year must take a copy of their current Personnel Action Form (PAF) to the Student Accounts Receivable section of the Bursar's Office, Regent 150. Nondegree students must turn in a Nondegree Student Application (available in Student Accounts Receivable) as well as their

current PAF each semester that they would like to enroll.

Faculty and staff students who are applying to a degree program should follow the regular application procedures of the Office of Admissions. However, in order to apply for the 1-6 free credit hours, they should submit their application form and current PAF to the Student Accounts Receivable section. After one semester, new degree students will become continuing students and will be set up automatically to register for each semester, although application for any of the remaining 1-6 free credit hours must be made each semester.

Faculty and staff should refer to the current *Schedule of Courses* or call the Office of Registrations at (303) 492-6970 for registration dates and additional information.

## Intercampus Registration

Boulder Campus students who wish to take course work on another campus of the University of Colorado may be able to register on that campus independent of Boulder Campus registration. However, those students must apply for admission to and follow the registration procedures established by the other campus. Students should check with their dean's office for approval. Arts and Sciences students may not register at the University of Colorado at Denver or the University of Colorado at Colorado Springs except in the summer.

## Concurrent Registration

Boulder Campus students who are unable to obtain courses required for their degree program on the Boulder Campus may exercise the concurrent registration option. Students enrolled for a minimum of one course on the Boulder Campus may be allowed to register for up to two courses or 6 credit hours, whichever is greater, on another University of Colorado campus. The course work must be required for their degree program, they must have their dean's permission, and enrollment levels must not have been reached on the host campus.

Students taking required courses in the College of Business and Administration or in the Graduate School of Business Administration may only exercise the concurrent registration option if they are in their graduating semester; students who are two semesters from graduating and who cannot obtain a course necessary to complete the prerequisite sequence may also be allowed to use this option. The course must be

required for graduation and not be offered on the Boulder Campus, or the course must conflict with another required course in which the student is enrolled. Students from other colleges and schools who wish to take Business courses must have the approval of the Boulder Campus College of Business and Administration in addition to the approval of their own college or school before submitting the concurrent registration form.

Boulder students exercising this option will pay tuition for their total credit hours at Boulder Campus rates. Concurrent registration forms and instructions are available at the Registration Information Window, Regent Administrative Center 125, between 9:00 a.m. and 4:30 p.m., after the drop/add period has begun at the host campus.

## Late Registration

Students in certain categories will be allowed to register late (on the first day of Drop/Add) for any given semester. These categories, however, cannot be designated until the first day of Drop/Add. Late registration will then continue on a day-by-day basis until enrollment levels are met, or until the Drop/Add deadline, whichever comes first.

Students who fail to complete registration and/or pay or waive (if eligible) their registration deposit during the assigned registration period will be subject to a late registration fee if late registration is held for their category.

Graduate students registering as Candidate for Degree or for thesis hours must register during the assigned registration period or be subject to the late registration fee if late registration is held for their category.

## Commencement

Graduation ceremonies are held in May, August, and December, and are open to the public with no tickets required. The August Commencement is held outdoors, weather permitting, and the May and December ceremonies are held in the Events/Conference Center on campus. At each commencement, the President of the University, the Chancellor of the Boulder Campus, and other featured speakers deliver commencement addresses, honorary degrees are awarded, and degrees are conferred. Details are sent to graduating students approximately one month before each ceremony. For further information, call the Commencement Office, (303) 492-7205.

Only Doctoral and Law graduates receive their diplomas at Commencement. All other graduates may pick up

their diplomas in the Office of Registrations approximately two and one-half months after the ceremony. Diplomas not picked up at that time will be mailed to students at their permanent address.

## SERVICES

### Academic Media Services

Academic Media Services (AMS) produces, acquires, and distributes films, videotapes, slides, graphics, and audio materials to support classroom activities. The unit's media library contains 7,000 titles. Video and audio programs are produced in AMS studios for classroom use and for commercial radio and television stations in Denver. The AMS graphics unit creates and duplicates slides, prints, overhead transparencies, and Photo ID cards.

AMS also maintains television receivers, video and audio equipment, and an intracampus cable television system for classroom instruction. Two television channels broadcast classes from the Boulder Campus to sites along the Front Range. In addition, AMS provides a repair service for personal computers and audiovisual equipment. All services are available to CU-Boulder students for a modest fee.

### Career Services

Career Services is the central campus unit offering career planning, cooperative education/internship, and career placement assistance. Located on the ground floor of Willard Administrative Center, Career Services is open year-round and serves University alumni as well as students. Specific services are listed below.

#### CAREER PLANNING

**Individual Career Counseling.** Individual career counseling is available to help students make informed career plans and decisions, and to develop strategies for conducting a job search. Counselors are available on an appointment basis.

**Videotaped Practice Interviews.** Students develop skills and techniques useful in interviews for employment and graduate or professional school admissions. A videotaped mock interview, in which the counselor plays the role of the interviewer, helps the student understand the interview process and prepare for it. The student and the counselor review the tape and evaluate the student's interview strengths and weaknesses.

**Career Resource Library.** Information about thousands of occupations,

educational institutions, and apprenticeship/internship opportunities is located in the library. Many other career-related books and resources are also available, including job vacancies, job market studies, employer directories, job search literature, and employer information (recruiting brochures, annual reports, etc.). The library is open Monday through Friday from 8:00 a.m. to 5:00 p.m.

**Workshops.** Workshops are held throughout the year to sharpen students' job-hunting and career-planning skills. Topics include skills and interests analyses, resume writing, job search strategies, interviewing, choosing a major, and career planning. Students are encouraged to attend the appropriate workshop before seeing a counselor.

**Alumni Career Network.** Over two thousand CU alumni have volunteered to assist students and fellow alumni with their careers. These alumni offer informational interviews, internships, job leads and referrals, "shadow experiences," and other forms of personalized career assistance. The alumni file is located in the Career Library and students are welcome to look through it at any time.

## COOPERATIVE EDUCATION/ INTERNSHIPS

The Cooperative Education/Internship Program offers students the opportunity to gain preprofessional work experience while still in school. The intent of the program is to provide academically relevant work experience that complements students' studies and enhances their career potential. Part-time and full-time placements are available.

**The Co-op Process.** Co-op counselors help students through all the details of gaining a Co-op or internship placement: counseling, interviewing, helping students compete for placement, and following up with placement evaluations once students have been employed. Readmission procedures are also taken care of by the counselors. All students are required to attend a two-hour orientation session to familiarize themselves with Co-op philosophy and procedures.

The Co-op office coordinates on-campus interview schedules with prospective Co-op candidates. Students who apply to employers not interviewing on campus learn of opportunities through the Career Library. Students are also referred to opportunities through a computer matching system.

Cooperative education opportunities are open to students from all colleges, at both the undergraduate (sophomore and above) and graduate level. To be

eligible for Co-op, a student must be enrolled full-time in a degree program at the University's Boulder Campus and must have a grade point average of 2.00 or better. Second-semester sophomores and above are encouraged to apply.

## PLACEMENT SERVICES

These services are available to all graduating students.

**On-Campus Interviewing.** Many employers come on campus to interview candidates for career positions throughout the country. They are interested in students from all areas of study, but focus largely on business and engineering graduates. Students are encouraged to come in early in their senior year to take advantage of this opportunity.

**Computerized Job Match.** A computer system is available to help refer seniors, graduate students, and alumni to prospective employers who list vacancies. This service also sends a monthly newsletter to employers listing candidates available.

**Job Vacancy Bulletin.** The publication is printed weekly, January through August, and lists jobs in all fields related to K through 12 education throughout the country. It is available on a subscription basis.

**Placement Credentials.** Students can place letters of recommendation on file with the credentials service and have them sent out when needed to support their applications for graduate or professional schools and for educational employment.

Career development should be an integral part of a student's higher education. Students are encouraged to use these services throughout their university experience. Fees are charged for Co-op and Placement Services. Telephone (303) 492-6541.

## Child Care

The University Family Housing Children's Center, which includes a preschool-compatible program, is located adjacent to the Boulder Campus. The professionally staffed and state-licensed center serves primarily the children of University Family Housing residents. The Center is open from 7:00 a.m. to 5:30 p.m., five days a week. Further information and rates may be obtained by calling (303) 492-6185.

## Communication Disorders Clinic

The Communication Disorders Clinic offers comprehensive evaluation and treatment of communication disorders

for students and members of the Boulder-Denver community. The Clinic's speech-language program diagnoses and treats disorders such as pronunciation dysfunctions, stuttering, and various voice disorders. The Child Language Center provides a mainstreamed preschool setting for children who are normally developing and for those with speech and language delays. Audiological services offered by the clinic include hearing evaluation, sale of hearing aids, instruction on hearing aid use, and speech reading instruction. For more information about the Clinic's programs and services, call (303) 492-5375.

## Counseling Services

The Multicultural Center for Counseling and Community Development (MCCCD) offers programs and activities for all members of the University. MCCCD is a resource for students, faculty, and staff of all ethnic and sociocultural backgrounds, enabling them to seek assistance, clarify and resolve problems, and identify needed resources. MCCCD services are listed below.

**Individual Counseling and Therapy.** The Center offers counseling to individuals, couples, and families in order to meet a variety of career, academic, and personal needs. People seek assistance for many reasons, from developing a sense of competence in a new environment, to meeting increased academic or social demands; from making career decisions, and resolving interpersonal conflicts, to participating in an individualized student development plan. In addition to professional staff counselors, undergraduate paraprofessional peer counselors provide academic counseling and serve in an active student outreach effort.

**Groups and Workshops.** The group counseling and workshop program provides small group experiences and workshops in skill development and personal growth. Issues and concerns addressed by the groups include academic improvement, test anxiety, assertiveness, minority and cultural support, parenting, and career and personal exploration. In addition, educational workshops are offered throughout the year on stress management, eating disorders, drug and alcohol awareness, relationship skills, perfectionism, and grief and loss.

**Center for Educational and Career Transition.** The Center provides educational, personal, and career counseling for students, faculty, and staff, and for persons considering returning to the University of Colorado.

**Ethnic Advocacy.** Ethnic advocacy programs provide resources, information, and consultation assistance on minority issues for students, faculty, and staff populations. Consultation assistance includes the teaching of cross-cultural awareness and sensitivity to diversity, as well as communication and counseling skills.

Throughout their college careers, ethnic minority students can work one-to-one with a counselor or receive assistance from trained peer counselors. Such assistance helps students effectively reach their career, academic, and personal goals within the framework of an enriched academic community.

**Orientation Programs.** University orientation programs are designed to assist new students in making a transition to university life and are offered every semester including summer session.

**Consultation.** Consultation is designed to support the efforts of those who work in the University community. A team of consultants works with academic departments, staff units and student groups in resolving conflicts, building collegial cooperation, and improving management and supervision, as well as in team building, short- and long-term planning, and other specific requests.

**Testing.** The administration and interpretation of career, self-assessment, and English skills tests are available through the Center. The tests include the Strong-Campbell Interest Inventory (SCII), Colorado Educational Interest Inventory (CEII), Harrington-O'Shea Career Interest Inventory, Myers-Briggs Type Indicator, and the Michigan Test of English Language Proficiency.

**Contacting MCCCD.** Center resources and services may be requested by visiting Willard Administrative Center, Room 134, anytime between 8:00 a.m. and 5:00 p.m., Monday through Friday, or by calling (303) 492-6766 or 492-5667. A receptionist will direct your inquiry to the appropriate staff professional and/or set up an appointment for you. In the event of an emergency during working hours, a professional is available for immediate assistance.

All Center services are free of charge unless otherwise indicated. All contacts are confidential.

## Disabled Students Services

The purpose of the Office of Services to Disabled Students (OSDS) is to assist

disabled students in taking part in the academic, social, and cultural life of the University. Services are provided on an individual basis and include assistance with admission, registration, housing, financial aid, counseling, parking, and personal needs. On-campus transportation serves students who are permanently or temporarily disabled. In addition, attendant services are available to assist physically disabled students. OSDS also provides reader services for blind students and interpreters for deaf students, as well as a TTY-TDD phone system for the hearing impaired.

The Learning Disabilities (LD) Program, another service of OSDS, is designed to support the academic work of students with learning disabilities. Structured around a diagnostic prescriptive model, the LD program assists students with learning disabilities so that they can better adapt to the academic environment.

For further information about services to disabled students, call OSDS at (303) 492-8671, or write OSDS, Willard Administrative Center 18, Campus Box 133, University of Colorado at Boulder, Boulder, Colorado 80309-0133.

## Ombudsman Office

The Ombudsman Office facilitates communication, understanding, problem solving, and effective conflict management among the constituents of the University—students, faculty, staff, and administrators.

Ombudsman duties include hearing concerns, complaints, and grievances; investigating such concerns; referring individuals to other University resources when appropriate; mediating complaints if necessary; making findings of repeated or serious breakdowns in the University environment; and offering recommendations to University constituents regarding redesign of areas where breakdowns occur.

The Ombudsman Office maintains impartiality and confidentiality in working with individuals and operates independently of the usual administrative authorities. The staff is familiar with the organizational structure of the University and can provide current information about campus services, programs, policies, and procedures.

For more information, please contact the Ombudsman Office in Willard Administrative Center 302, Campus Box 112, (303) 492-5077.

## Parking Management Office

Parking availability at CU-Boulder is limited. Anyone wishing to park a vehicle in a campus lot must purchase a parking permit from the University Police Parking Management Office (PMO) located at 1511 University Avenue. Students buying permits must present their Photo ID or class schedule and a current vehicle registration at the time of purchase. Student permit fees range from \$24 to \$40 per semester and most permits are sold during Schedule and Bill Pickup at the start of each semester.

Faculty and staff permits range from \$6 to \$10 per month, and are available by cash payment or payroll deduction. Call (303) 492-3550 for permit information.

Bicycles parked on campus must be registered with PMO at a cost of \$4 for four years. Bicycles bearing valid registrations from other jurisdictions may be registered with PMO at no charge. Unregistered bicycles parked on campus may be impounded. Bicycle registrations are sold at the Events/Conference Center at the start of each semester and thereafter at the bicycle registration booth southeast of the Music building. Call (303) 492-2322 for bicycle information.

Parking regulations are revised annually, and are strictly enforced. Vehicles in violation of the regulations may be ticketed or towed. Those operating vehicles on campus are advised to obtain and review a copy of the latest regulations for complete parking and traffic information. Call (303) 492-7384 for information.

## Photo ID Cards

Continuing students are required to show their Photo ID cards to register; and all students must show their Photo ID to obtain student services such as those provided by the University Libraries, Wardenburg Student Health Service, and the Recreation Center.

New students can have their ID cards made any time after they have confirmed their admission to a degree program at CU-Boulder. Students must present some type of photo identification to receive a University of Colorado Photo ID card. Photo ID cards are issued at Folsom Stadium in Room 129 (between gates 4 and 5), from 11:00 a.m. to 4:00 p.m., Monday through Friday, and are usually produced in 15 minutes. While the initial Photo ID card is free, the charge for a replacement is

\$7. Students need to have cards validated at Schedule and Bill Pickup. (Meal stickers placed on ID cards are provided by Residence Hall dining rooms.)

## Research and Testing

The Office of Research and Testing is located in Willard Administrative Center 214. The Office handles qualifying tests for undergraduate and graduate school admissions, the College-Level Examination Program (CLEP), faculty course questionnaires that include student ratings of courses and instructors, and institutional research on recruiting and retaining students. An optical scanning machine is available to score course examinations, research surveys, and other standard answer forms.

Monthly College-Level Examination Program (CLEP) tests are given in General Biology, General Chemistry, General Psychology, Introductory Macroeconomics, Introductory Microeconomics, Introductory Sociology, and Calculus with Elementary Functions. Students who pass at the 67th percentile nationwide may receive University credit. For further information, call (303) 492-7067.

## Retention Services

The Retention Services Office uses the findings of Boulder Campus studies and national retention research to find out why students leave or stay in school in order to plan action programs that will contribute to student satisfaction with the University. Retention Services staff members work with the faculty and staff of campus academic programs, residence halls, student organizations, campus services, and the administration to plan policies, procedures, and programs that promote an improved campus environment and the retention of capable students to graduation.

For further information, students may write the Retention Services Office, Willard Administrative Center 222, Campus Box 132, University of Colorado at Boulder, Boulder, Colorado 80309-0132, or call (303) 492-7933 or 492-5601.

## Student Health Service

Wardenburg Student Health Service is a comprehensive health care facility for CU-Boulder students. Fully accredited by the Joint Commission on the Accreditation of Hospitals, Wardenburg handles over 60,000 patient contacts per year. All students enrolled for 6 or more semester hours, or more than one course, are assessed a student fee by

the University of Colorado Student Union that entitles them to use the facilities. Students carrying one class of 5 or fewer semester hours, and student spouses, must pay a separate user fee. Visits with physicians or their assistants are covered by the fee, and psychiatric evaluation and counseling (first visits only) are available at reduced rates. There are additional fees for ongoing psychiatric care, annual check-ups, minor surgical procedures, after hours care, admission to the infirmary, specialty referrals, some health education programs, laboratory, X-ray, physical therapy, and prescription services.

**Outpatient Services.** Care is offered in medicine, minor surgery, and gynecology, and by referral from the medical staff to Wardenburg's specialty clinics in allergy, dermatology, neurology, and orthopedics. The Psychiatric Department offers individual and group therapy, biofeedback training, and drug and alcohol counseling. Wardenburg also has a health education outreach program and nutritional counseling to promote healthier living through health awareness and education.

**After Hours Care.** A physician and the infirmary staff are at Wardenburg after clinic hours and on weekends, except during academic breaks and summer session. The Psychiatric Department has a physician on call for psychiatric emergencies.

**Ancillary Services.** Wardenburg has in-house laboratory, X-ray, and physical therapy services.

**Pharmacy Services.** Prescriptions may be filled at competitive rates in the Apothecary, which is operated by the University of Colorado School of Pharmacy.

**Vacation Periods.** The outpatient clinics are open during some University holidays, the academic breaks, and summer session. However, the infirmary, after hours care, and specialty clinics are closed. Students who require medical care when Wardenburg is closed may receive it elsewhere in Boulder at their own expense.

**Medical History.** All students entering the University for the first time are requested to complete a medical history form that will be mailed to them or may be obtained from Wardenburg Student Health Service.

**Immunization Policy.** University of Colorado administrators and health officials have complied with the recommendation of the Colorado State Health Department requiring college students to show proof of immunity to rubeola (measles) and rubella (German measles). All new students will receive an Immunization Card in their admission confirmation packet. The card must be

completed and returned to Wardenburg Student Health Service. Students who need vaccinations may receive them at no charge. Failure to comply with this policy will result in a medical hold on Registration for the following semester. Students who prefer to sign a waiver for medical, religious, or personal reasons may be suspended from classes during an outbreak/epidemic as determined by campus health officials.

**Student Health Insurance.** The University of Colorado, through Prudential Life Insurance Company offers a major medical insurance plan designed to provide comprehensive health coverage. The cost of this policy is very reasonable and often provides better coverage less expensively than that obtainable from family plans. The insurance plan provides coverage not only at Wardenburg but anywhere in the world. Students are automatically enrolled in the insurance plan. The insurance plan can be waived by filling out a waiver form at Registration indicating that the student either has other insurance coverage or is financially able to cover any unexpected medical bills. Parents should check their own policies to determine at what level and to what age their college student is covered.

## University Learning Center (ULC)

The University Learning Center offers academic support services designed to assist students in improving their learning potential and to assist faculty and graduate teaching assistants in enhancing their teaching effectiveness.

**Tutorial Services.** The Tutorial Services Program offers training to all tutors at CU-Boulder, provides free individual and group tutoring to CUOP students, and serves as a referral tutoring service for the Learning Disabilities Program, as well as for all University students.

**Faculty Teaching Excellence Program.** The goal of the Faculty Teaching Excellence Program is to improve undergraduate education through faculty development. The program works with faculty through a lecture series, videotape consultation, the publication of monographs on teaching and learning, a *Compendium of Good Ideas on Teaching*, and an annual colloquy on teaching.

**Graduate Teacher Program.** The Graduate Teacher Program (GTP) provides training, individual consultation, and videotape consultation to all graduate teaching assistants. The GTP also coordinates the TA Coach Program, publishes a newsletter on teaching (*The*



Tutor), and prints the *GTP Handbook* on teaching.

**Norlin Learning Center.** As part of the ULC, the Center offers freshman courses in writing and self-paced algebra, English as a Second Language, and labs for the ULC writing and math courses.

**Academic Skills Program.** The Academic Skills Program offers all students free one-hour workshops on time management, notetaking and listening, critical reading, concentration, procrastination and motivation, and writing processes. An Apple IIe computerized self-paced speed-reading course is also available.

**Location.** The ULC Administrative Office, Tutorial Services, the Graduate Teacher Program, and the Faculty Teaching Excellence Program are located in Willard 309, (303) 492-5474. Other ULC facilities and the academic offices are located in Norlin Library, lower level, room E1B-36, (303) 492-1416.



# Undergraduate Admission

The Office of Admissions welcomes inquiries regarding undergraduate application procedures. Through the admission process, the University seeks to identify applicants who will successfully complete a collegiate academic program. Admission is based on many criteria, such as evaluation of work taken at other educational institutions, graduation from high school or its equivalent through the General Educational Development (GED) Test, results of the Scholastic Aptitude Test (SAT) or the American College Test (ACT), and letters of recommendation from school officials reflecting each applicant's motivation and potential for academic growth. In addition, careful attention is given to applicants' written comments concerning their background and academic goals.

Inquiries relating to undergraduate admission to the University of Colorado at Boulder may be addressed to:

Office of Admissions  
Regent Administrative Center 125  
Campus Box 7  
University of Colorado at Boulder  
Boulder, Colorado 80309-0007

Telephone inquiries may be directed to (303) 492-6301.

For admission requirements to the Graduate School, see the Graduate School section and individual college and school sections of this *Catalog*.

## VISITING THE CAMPUS

Prospective students and their parents are welcome to visit the campus at any time, Monday through Friday, from 9:00 a.m. to 4:30 p.m. (8:30-4:00 during the summer). Guided walking tours of the campus leave from Regent Administrative Center 125 each weekday at 10:30 a.m. and 2:30 p.m. While on the tour, visitors will meet with a representative from the Office of Admissions to learn more about CU and its programs. Interviews are not required and are not used for admission purposes.

In addition, participation in one of the numerous campus visitation programs specially designed for prospective students is an excellent way to become acquainted with the campus. These programs are described below.

## Visitation Programs

The Be a CU Student for a Day programs offer prospective students the opportunity to visit the campus on a school day, take a tour, attend classes with current CU students, and have lunch with campus representatives in a residence hall. These programs are held throughout the academic year and are planned for February 3, 12, 17, and 26, March 2, 11, 16, and 30, April 8, 13, 22, and 27, October 5, 14, 19, and 28, and November 2, 11, 16, and 30, 1988; February 3, 8, 17, and 22, March 1, 10, 15, and 29, and April 5, 14, and 19, 1989.

The CU Sampler programs, held on selected Saturdays, also introduce prospective students and their parents to the campus and its academic programs. Highlights include a sample lecture, a campus tour, student/faculty panel discussions, lunch in a residence hall, and a chance to meet with faculty advisors and financial aid, housing, and other campus representatives. The programs are planned for February 13, July 16, and October 29, 1988, and February 11 and July 15, 1989.

For the student who aspires to a career in engineering, the Engineering Open House is held once in the fall. Students and their parents are provided the opportunity to meet the Dean, tour engineering facilities, explore engineering career options, and have lunch in a residence hall. The date for 1988 is November 12.

Inquiries regarding the above programs should be directed to the Office of Admissions, Regent Administrative Center 125, Campus Box 30, University of Colorado at Boulder, Boulder, Colorado 80309-0030, telephone (303) 492-6301. Reservations are required for each program.

## IMPORTANT INFORMATION FOR ALL APPLICANTS

### Credentials

To be considered for admission, applicants must submit complete and official credentials as required by the

desired program of study. Students may not disregard any part of their previous educational background. *Failure to submit transcripts from all institutions previously attended will be cause for cancelling the admission process or for dismissal.* All credentials presented for admission to CU-Boulder become the property of the University and may not be returned to the applicant.

## Application and Admission Notification

Applications for Fall 1988, as well as Spring and Summer terms 1988, may be submitted starting in September 1987. Applicants will be notified of admission decisions on a rolling basis beginning October 1 for Spring and November 1 for Summer and Fall.

Applications received and completed (including all required credentials) by the dates listed below will receive full and equal consideration for admission. *After these dates, consideration can be given only if places are still available.*

### Deadline Dates for Equal Consideration of Applications

	Fall and Summer 1988	Spring 1988
Freshmen	March 1, 1988	November 15, 1987
All Others	April 1, 1988	November 15, 1987

Early application with complete credentials is encouraged in order to be considered for admission before enrollment levels are reached.

## Confirmation Procedures

Applicants selected for admission are sent the appropriate forms to confirm their intent to enroll and are encouraged to return them with the designated nonrefundable deposit *as soon as they have decided to enroll.* Admission becomes complete only after the Office of Admissions receives and processes the signed confirmation form and the deposit. Confirmation forms and deposits received by the dates listed below or by later dates assigned by the Office of Admissions will be accepted. *After these dates, they can be accepted only if places are still available.*

### Deadline Dates for Assured Acceptance of Confirmations

	Fall and Summer 1988	Spring 1988
Freshmen	May 1, 1988	December 15, 1987
All Others	June 1, 1988	December 15, 1987

## Preprofessional Programs

Admission to a preprofessional area of study, such as Pre-Journalism and Mass Communication or Pre-Nursing, does not guarantee later admission to a professional program; a student must submit a separate application to professional school at the appropriate time.

Students interested in one of the undergraduate health sciences programs offered at the University of Colorado Health Sciences Center (UCHSC) in Denver (Child Health Associate, Dental Hygiene, Medical Technology, Nursing, and Physical Therapy) may complete preprofessional work on the Boulder Campus where special preprofessional advising is available. Admission preference to all UCHSC programs is given to Colorado residents. The Physical Therapy Program is open *only* to Colorado residents and students from the Western Interstate Commission for Higher Education (WICHE) states of Alaska, Hawaii, Idaho, Nevada, Oregon, and Wyoming.

Normally, students who are not Colorado residents can obtain at Boulder the preprofessional courses required for entrance to health sciences programs in other states, as well as those for entrance to Colorado programs that are open to nonresidents. For more information, see the description of Prehealth Sciences in the College of Arts and Sciences section of this *Catalog*.

## Teacher Certification

Through the School of Education, students interested in elementary or secondary school teaching may take programs approved for Colorado certification in connection with the liberal arts programs offered at CU-Boulder. Interested students should see an advisor in the School of Education during their first semester at the University.

Elementary teacher certification includes kindergarten through sixth grades. Secondary teacher certification includes teaching endorsements in drama, English, selected foreign languages, mathematics, science, and social studies.

Persons holding a baccalaureate degree who seek *initial* teacher certification must submit the required application and credentials to the School of Education. Certified teachers with a baccalaureate degree who seek only a

*renewal* of the certificate currently held and who do not require institutional endorsement or recommendation may qualify for the University's nondegree student classification (see the Non-degree Students section of this *Catalog*).

Refer to the School of Education section of this *Catalog* for further information about teacher certification. Interested students may also write the School of Education, Office of Teacher Education, Campus Box 249, University of Colorado at Boulder, Boulder, Colorado 80309-0249, for application and deadline information.

## FRESHMAN STUDENTS

### How to Apply

1. The student should obtain a prospective student brochure with accompanying application materials from the Office of Admissions, Regent Administrative Center 125, Campus Box 7, University of Colorado at Boulder, Boulder, Colorado 80309-0007, telephone (303) 492-6301. Colorado residents may obtain this brochure from their high school counselors. (Students from other countries who are not citizens or permanent residents of the United States must request special application materials from the CU-Boulder Office of Admissions.)

2. A complete application must include the following credentials:

- An application for admission
- A nonrefundable \$30 application fee (check or money order, not cash, made payable to the University of Colorado)
- A transcript of all high school work completed, which must also include rank-in-class and courses in progress for the entire year

d. Required entrance test scores (SAT or ACT)

e. A copy of GED Test scores and a Certificate of High School Equivalency with an official transcript of any high school work completed (grades 9 through 12) if the applicant is not a high school graduate

f. The required audition if the student is applying to the College of Music

Applicants who are currently attending high school should give the completed applications to their counselors. The application must include the nonrefundable \$30 fee, transcript, and rank-in-class information in a single mailing packet. An incomplete application may be returned to the student.

3. The fact that college entrance test scores (SAT or ACT) are not available does not mean an applicant should

delay sending the application and credentials. However, if final official test scores are available at the time of application, they may be posted on the official high school transcript in place of or in addition to being reported directly by the testing service.

## College Entrance Tests

Prospective students in high school take the college entrance test at the end of the junior year or early in the senior year. *The University of Colorado accepts either the SAT or the ACT for admission.* A student who is not satisfied with the first test score results is urged to retest at the earliest possible date. For admission purposes, the University will consider the highest scores. *Achievement tests are not required.*

National Test Dates for 1987-88 are as follows:

### Scholastic Aptitude Test (SAT)

#### Saturday

November 7, 1987	March 19, 1988 <sup>1</sup>
December 5, 1987	May 7, 1988 <sup>1</sup>
January 23, 1988	June 4, 1988 <sup>1</sup>

### American College Test (ACT)

#### Saturday

October 24, 1987	April 16, 1988 <sup>1</sup>
December 12, 1987	June 11, 1988 <sup>1</sup>
February 27, 1988 <sup>1</sup>	

For further information regarding college entrance tests, consult with a high school counselor, write or call the Office of Admissions, or write to the following:

### College Board (SAT)

CN6200

Princeton, New Jersey 08541-6200

### American College Test (ACT)

Registration Department

P.O. Box 414

Iowa City, Iowa 52243

## Admission Criteria

Prospective freshmen are considered on an individual basis relative to a prediction of academic success in the college to which they apply. The strongest predictors are appropriate course preparation, grades earned in those courses, rank-in-class, and the results of either the SAT or the ACT. Admission committees review these and other factors that have a bearing on academic success; only those students for whom success can be predicted are offered admission. Some of the colleges typically have more qualified freshman applicants than there are places. Therefore, admission is competitive, and students with the highest qualifications are selected.

<sup>1</sup>These test results may be received too late for applicants who wish to enroll for the following summer or fall term.

Students who meet the criteria specified on page 39 and who have completed or will have completed the high school course units noted are assured admission if they maintain consistent or improving grades and as long as space remains available in the college to which they apply. Applicants whose records reflect nontraditional grading systems, unusual curricula, no rank-in-class information, or high school equivalency through the GED Test will receive careful consideration and are urged to apply. Further, many students whose qualifications are somewhat less than those specified, or who have not completed all of the suggested courses, may be admitted on an individual basis.

### Minimum Academic Preparation Standards (MAPS)

Effective with students who graduate from high school in 1988 or later, CU expects new students to have completed courses that meet certain minimum academic preparation standards (MAPS). The MAPS for specific CU-Boulder colleges are included in the Assured Admission Criteria on page 39. Further information may be found on page 38.

### Advanced Placement Program

The University participates in the Advanced Placement Program of the College Board. Students receiving scores of 3, 4, or 5 on Advanced Placement examinations are generally granted college credit. Official scores must be sent to the University directly from the College Board. For detailed information regarding applicability of Advanced Placement credit to CU-Boulder degree programs, refer to the chart on page 34.

### Applicants Not Granted Admission

An applicant who is not granted admission as an entering freshman may wish to consider transferring to the University after successful study elsewhere. The Office of Admissions urges such students to complete at least one full year of college-level course work at another college or university, with special attention to courses that will be sound academic preparation for future transfer to the University of Colorado at Boulder.

## TRANSFER STUDENTS

Applicants are considered transfer students if they have enrolled for any college-level course work (at another institution, at another campus of the University of Colorado, or as a nondegree student at the Boulder Campus), full-time or part-time, since graduation from high school. College-level course work taken while still in high school does not qualify an applicant as a transfer student. To be considered for admission, transfer students must report all previous college work and have a high school diploma or its equivalent.

Generally, transfer applicants who will have completed less than one year of college-level work by the time they plan to enroll at CU-Boulder must qualify on the basis of freshman admission criteria in order to be admitted.

### How to Apply

1. Obtain a prospective student brochure with accompanying application materials from the Office of Admissions.

2. A complete application must include the following required credentials:

- a. An application for admission
- b. A nonrefundable \$30 application fee (check or money order, not cash, made payable to the University of Colorado)
- c. A transcript of all high school work completed
- d. Required entrance test scores (SAT or ACT)
- e. A copy of GED Test scores and a Certificate of High School Equivalency with an official transcript of any high school work completed (grades 9-12) if the applicant is not a high school graduate
- f. Two official transcripts from each college or university attended (except from the University of Colorado)

Note: Former CU-Boulder degree students who have previously submitted their high school transcripts, ACT or SAT test scores, and all college transcripts to the Boulder Campus Office of Admissions need not do so again.

### Assured Transfer Opportunities

Colorado residents who are first- or second-year students at Adams State College, Colorado Mountain College, Lamar Community College, Morgan Community College, Northeastern Junior College, Otero Junior College, or Trinidad State Junior College may

inquire at their own Office of Admissions or at the CU-Boulder Office of Admissions regarding assured transfer opportunities. Students who wish to contract for upper-division placement at CU-Boulder through this program should be aware that academic criteria are established by the faculty of each college and school on the Boulder Campus and will vary according to discipline and year of proposed transfer.

### Admission Criteria

Transfer students are selected for admission on an individual basis. A good college grade point average is not, by itself, a guarantee of admission because the courses a student has taken in college are as important as the grade point average. Furthermore, grade point average requirements may vary from term to term, depending on the overall quality of the applicant group and the number of transfer spaces available for a given college or school.

All transfer students must submit SAT or ACT scores and a high school transcript. Students who are not high school graduates must also submit copies of a certificate of high school equivalency and GED scores in addition to the above documents. Except where noted, work in progress is not considered in computing the cumulative grade point average.

### COLLEGE OF ARTS AND SCIENCES

Transfer students with a cumulative college grade point average of 2.00 or better will be considered for admission on an individual basis. A student who is claiming exemption from the College of Arts and Sciences foreign language graduation requirement on the basis of satisfactory completion of Level III (third-year high school level) foreign language in high school must submit an official high school transcript directly to the Office of the Dean of the College of Arts and Sciences within the first year in the College.

### COLLEGE OF BUSINESS AND ADMINISTRATION

Transfer students with a cumulative college grade point average of 2.75 or better will be considered for admission on an individual basis. Transfer students must have completed 15 semester hours (or 22.5 quarter hours) of college-level work before applying, and preference will be given to those applicants who will have completed courses (including calculus) equivalent to those

## Advanced Placement Program Credit

### CREDIT TOWARD GRADUATION REQUIREMENTS BY COLLEGE OR SCHOOL

✓ Credit will apply to degree programs in the specific college or school

Advanced Placement Examination Title	Examination Score	CU-Boulder Course Equivalent	Semester Hours	Arts & Sciences	Business & Administration	Engineering & Applied Science	Environmental Design	Journalism & Mass Communication	Music	Pharmacy
<b>BIOLOGY</b> Biology	5,4	EPOB 1210 and 1220	6	✓	✓	a	✓	✓	✓	d
<b>CHEMISTRY</b> Chemistry	5,4 3	CHEM 1111 and 1131 CHEM 1111	8 4	✓	✓	b	✓	✓	✓	c
<b>CLASSICS</b> Vergil	5,4 3	CLAS 2114 and 3224 CLAS 2114	6 3	✓	✓	g	✓	✓	✓	✓
Catullus—Horace	5,4 3	CLAS 2114 and 3124 CLAS 2114	6 3	✓	✓	g	✓	✓	✓	✓
Vergil and Catullus—Horace	5,4	CLAS 2114, 3124, and 3224	9	✓	✓	g	✓	✓	✓	✓
<b>COMPUTER SCIENCE</b> Computer Science	5 4	CSCI 1300 CSCI 1200	4 3	✓ ✓	✓ ✓	d d	✓ ✓	✓ ✓	✓ ✓	✓ ✓
<b>ENGLISH</b> English Composition and Literature	5,4,3	ENGL 1200, 1300, and 1400	6	✓	✓	f	✓	✓	✓	✓
English Language and Composition	5,4 3	UWRP 1150 and 1250 UWRP 1150	6 3	✓	✓	g	✓	✓	✓	✓
<b>FINE ARTS</b> Studio Art	5,4,3	FINE 1012 and 2002	6	✓	✓	g	✓	✓	✓	✓
Art History	5,4,3	FINE 2009, 2109, 2209, and 2309	6	✓	✓	✓	✓	✓	✓	✓
<b>FOREIGN LANGUAGE</b> French Language	5,4 3	FREN 2120 and 3020 FREN 2120	5 3	✓	✓	d	✓	✓	✓	✓
French Literature	5,4 3	FREN 3110 and 3120 FREN 3120	6 3	✓	✓	✓	✓	✓	✓	✓
German Language	5 4 3	GRMN 3010 and 3020 GRMN 2060 GRMN 2010	6 4 4	✓	✓	d	✓	✓	✓	✓
German Literature	5 4,3	GRMN 3110 and 3120 GRMN 2010	6 4	✓	✓	✓	✓	✓	✓	✓
Spanish Language	5 4 3	SPAN 3000 SPAN 2110 and 2120 SPAN 2110	6 6 3	✓	✓	d	✓	✓	✓	✓
<b>HISTORY</b> American History	5,4	HIST 1015 and 1025	6	✓	✓	✓	✓	✓	✓	✓
European History	5,4	HIST 1020	3	✓	✓	✓	✓	✓	✓	✓
<b>MATHEMATICS</b> Math—Calculus AB	5  4,3	MATH 1300 and 2300 APPM 1350 and 1360 (Engineering) MATH 1300	10 8 5	✓ c ✓	✓ c ✓	e ✓ e	✓ c ✓	✓ c ✓	✓ c ✓	✓ c ✓
Math—Calculus BC	5,4  3	MATH 1300 and 2300 APPM 1350 and 1360 (Engineering) MATH 1300	10 8 5	✓ c ✓	✓ c ✓	e ✓ e	✓ c ✓	✓ c ✓	✓ c ✓	✓ c ✓
MUSIC Music History	5 4,3	MUSC 1830 and 2750 MUSC 1830	6 3	✓	✓	d	✓	✓	✓	✓
<b>PHYSICS</b> Physics B	5,4,3	PHYS 2010	5	✓	✓	g	✓	✓	✓	d
Physics C—Mechanics	5,4,3	PHYS 1110	4	✓	✓	✓	✓	✓	✓	✓
Physics D—Electricity and Magnetism	5,4	PHYS 1120	4	✓	✓	✓	✓	✓	✓	✓

a Does not apply. Computer Science majors, bioengineering, and premedical options check with faculty advisor.

b Chemistry 1111 fulfills departmental requirements in all areas. Chemistry 1131 fulfills Chemical Engineering and Computer Science requirements.

c Does not apply.

d Check with faculty advisor in major department.

e Acceptable for Applied Mathematics majors only.

f Does not apply to Computer Science majors.

g Does not apply. Computer Science majors check with faculty advisor.



taken by CU-Boulder Business freshmen and sophomores. These courses are listed in the model degree program in the College of Business and Administration section of this *Catalog*.

### COLLEGE OF ENGINEERING AND APPLIED SCIENCE

Transfer students with a cumulative college grade point average of 2.75 or better will be considered for admission on an individual basis. The College of Engineering and Applied Science expects transfer applicants to have taken course work relevant to an engineering curriculum. Prospective transfer students are expected to have completed at least one year of college-level calculus and at least one semester of calculus-based physics and one semester of chemistry or two semesters of calculus-based physics before their enrollment at Boulder. Chemical Engineering students should have completed two semesters of college chemistry.

### COLLEGE OF ENVIRONMENTAL DESIGN

Transfer students with a cumulative college grade point average of 2.75 or better will be considered for admission on an individual basis. Applicants who are considering transfer into the program must complete college-level course work in physics with laboratory (for the architecture emphasis) or in science with laboratory (for other emphases). They should also complete college-level course work in expository writing or English composition, calculus (for the architecture emphasis) or statistics (for the planning emphasis), and a fine arts studio course such as free-hand drawing or painting.

### COLLEGE OF MUSIC

Colorado resident transfer students with a cumulative college grade point average of 2.00 or better will be considered for admission on an individual basis. In addition, the College of Music requires an audition. Audition dates for all applicants and admission information for nonresident applicants may be found in the College of Music section of this *Catalog*.

### SCHOOL OF JOURNALISM AND MASS COMMUNICATION

Applicants must have a minimum of 60 semester hours (or 90 quarter hours) of appropriate college-level course work passed or in progress, with an overall grade point average of at

least 2.50 and an average of 2.50 in all Journalism and Mass Communication courses completed or in progress. Applicants with fewer than 60 semester hours must apply to the College of Arts and Sciences, Pre-Journalism and Mass Communication major.

### SCHOOL OF PHARMACY

Admission consideration is for the Fall Semester only, and applications will be accepted until enrollment levels are reached. Applicants who have completed two years of appropriate college-level course work with a grade point average of 2.00 or better by Fall 1988 will be considered on an individual basis. Applicants with fewer than two years of appropriate course work must apply to the College of Arts and Sciences, Pre-Pharmacy major.

### Minimum Academic Preparation Standards (MAPS)

Effective with students who graduate from high school in 1988 or later, CU expects new students to have completed courses that meet certain minimum academic preparation standards (MAPS). The MAPS for specific CU-Boulder colleges are included in the Assured Admission Criteria on page 39. Further information may be found on page 38.

### Transfer of College-Level Credit

The Office of Admissions performs an initial evaluation of transfer credit after an applicant has been admitted and has confirmed intent to enroll. A complete evaluation of transfer credit will not be made until all official credentials have been received.

The evaluation is made using the official transcripts sent directly from each one of the applicant's previous colleges to the University. Official transcripts must exhibit the official seal and signature of the registrar. Transcripts that are marked "Student Copy," "Issued to Student," or "Unofficial" are not accepted as official.

The initial evaluation will not reflect course work that is in progress at the time of confirmation. In order to complete the admission and transfer of credit process, *all* transcripts of attempted work must be received by the Office of Admissions as soon as possible. Transfer students should arrange to have their final official

transcripts sent directly to the Office of Admissions after completion of their last term and before enrollment at CU-Boulder.

After an evaluation of transfer credit has been completed, a Statement of Advanced Standing is issued by the Office of Admissions.

There is no guarantee that all transfer credit will apply to a specific degree program. The dean's office of each college and school has ultimate responsibility for supervising the student's degree program and for determining how transfer credit applies to a specific degree program. Since graduation requirements at CU-Boulder vary from college to college, a reevaluation of transfer credit is required if a student changes colleges or schools after enrolling.

Listed below are some general guidelines for accepting transfer credit.

### MINIMUM GRADES FOR TRANSFER

Only courses taken at a college or university of recognized standing with grades of C- (1.70) or better will be accepted for transfer. Grades of Pass, Satisfactory, and Honors are accepted for transfer; however, each college and school at CU-Boulder places a limitation on the number of Pass hours that may be applied toward a degree.

### CREDIT FROM TWO-YEAR COLLEGES

Each college and school at CU-Boulder determines the maximum number of semester hours that may transfer from a two-year postsecondary institution. Limits vary from college to college.

### CREDITS FOR CORRESPONDENCE WORK

Each college and school determines the maximum number of credits taken through correspondence programs that will be accepted toward a baccalaureate degree.

### COLLEGE-LEVEL WORK TAKEN CONCURRENTLY WITH A HIGH SCHOOL PROGRAM

College-level work that does not apply toward high school graduation will be considered for transfer. Generally, postsecondary work applying toward high school graduation will not transfer.

## ADVANCED PLACEMENT EXAMINATIONS

Credit for College Board Advanced Placement Examinations cannot be evaluated from college or high school transcripts; score reports from the College Board must be submitted directly to the University for evaluation. In general, examinations with a score of 3 or better will be considered for credit. For further information, refer to the chart under Freshman Students.

## COLLEGE-LEVEL EXAMINATION PROGRAM

Credit for College Board Subject Examinations of the College-Level Examination Program (CLEP) in General Biology, General Chemistry, General Psychology, Introductory Macroeconomics, Introductory Microeconomics, Introductory Sociology, and Calculus with Elementary Functions may be granted for a score at or above the 67th percentile. This credit will be applied toward degree requirements at the discretion of the student's dean. Not all colleges accept CLEP credit in all subjects. Refer to the appropriate college dean's office for the policy of that college.

Credit for CLEP Subject Examinations cannot be evaluated from college or high school transcripts; score reports must be submitted directly from the College Board. CLEP General Examinations are not accepted for credit at CU-Boulder.

## MILITARY CREDIT

Credit for military schooling is evaluated upon receipt of Form DD 214, "Service Separation Certificate." Only work that has received an upper-division baccalaureate recommendation by the American Council on Education (ACE) will be awarded credit. This work, however, will be transferred and recorded at the lower-division level. Foreign language credit taken through the State Department, Department of Defense, or Defense Language Institute will be assigned the recommended ACE credit.

## CREDIT BY EXAMINATION

This option provides limited opportunities for students to take an examination and earn credit for a course without registering for or taking the course. Specific courses must be approved for Credit by Examination. Students may want to exercise this option if they do not receive transfer credit for a course they have taken at a previous college. Information on participating colleges and schools, requirements, and an

Application for Credit by Examination are available at the Office of Academic Records, Regent Administrative Center 125, Campus Box 68, University of Colorado at Boulder, Boulder, Colorado 80309-0068, telephone (303) 492-8611. Permission of the instructor, the department chair, the dean of the college or school in which the course is offered, and the student's dean (if different) is required for approval. An examination fee is charged.

## TRANSFER COURSE WORK NOT ACCEPTED BY THE UNIVERSITY

The following course work will not transfer and will not count toward a degree at Boulder.

1. Courses identified by CU-Boulder as remedial, i.e., necessary to correct academic deficiencies, such as remedial courses in English, mathematics, reading, science, and developmental reading.

2. Vocational-technical courses that are offered at two-year and proprietary institutions. Exceptions may be granted only by the CU-Boulder dean responsible for the student's curriculum. When exceptions appear to be warranted, appropriate department heads make recommendations to their respective deans regarding credit for such courses.

3. Courses in religion that constitute specialized religious training or that are doctrinal in nature.

4. Credits earned for work experience or through a cooperative education program.

## TRANSFER CREDIT CONVERSION

Many campuses operate on the quarter system, with the academic year divided into three terms. Other campuses, including CU-Boulder, operate on a two-term or semester system. Course credits from quarter system institutions must be converted from quarter hours to semester hours or credits. One quarter credit is equivalent to two-thirds of a semester credit. To calculate how many semester hours are equivalent to a certain number of transferable quarter hours, multiply the number of quarter hours by two-thirds and round off the total to the nearest tenth. For example, 4 quarter hours  $\times \frac{2}{3} = 2.67$  or 2.7 semester hours of credit. Or, 3 quarter hours  $\times \frac{2}{3} = 2$  semester hours of credit.

## INTRAUNIVERSITY TRANSFER STUDENTS

Students who do not meet the admission criteria for the college or school of their first choice, such as the College

of Business and Administration, the College of Engineering and Applied Science, or the School of Journalism and Mass Communication, may be eligible for admission to another college or school for which they do have the necessary preparation, e.g., the College of Arts and Sciences. After completing the required courses, students may then apply and be considered for Intra-university Transfer (IUT) to another college or school on the Boulder Campus. To apply for an IUT, students must obtain an application from the college or school to which they wish to transfer.

For more information on recommended course work in preparation for Intrauniversity Transfer and other criteria, students need to consult college and school sections of this *Catalog* or talk with an academic advisor in the program to which they plan to transfer. Most colleges and schools do not accept Intrauniversity Transfer students for summer session; interested students should consult with the associate dean of the college or school to which they wish to transfer. It is important to note that admission to a college through the IUT process is competitive, and not all students who apply are admitted. Decisions are based on course preparation, hours completed, grade point average, and other criteria the specific college or school deems appropriate.

## OTHER APPLICANTS

### Foreign Students

The University invites applications from qualified foreign students. Approximately 800 foreign students from 80 countries study at CU-Boulder. Applications for admission are processed by the Office of Admissions. Assistance after admission is provided by Foreign Students and Scholar Services, located in the Office of International Education. Intensive English instruction is offered by the International English Center. Boulder offers a full range of services to foreign students, including a host family program, orientation, special programs and activities for foreign students, and personal attention to individual needs.

Foreign students are considered to be those applicants who will apply for or who already have a temporary nonimmigrant United States visa or immigration status.

Students who have established permanent resident status in the United States are *not* considered foreign students. These students should follow application and admission procedures

for undergraduates or graduates as described elsewhere in this *Catalog*.

Foreign students who wish to pursue full-time programs of study at the undergraduate or graduate levels should write or call the Office of Admissions, Regent Administrative Center 125, Campus Box 65, University of Colorado at Boulder, Boulder, Colorado 80309-0065, telephone (303) 492-6665, to obtain foreign student application forms and instructions. Prospective graduate students should also write to the specific department in which they are interested. The letter should be addressed to the specific department, University of Colorado at Boulder, Boulder, Colorado 80309. Consult the *Catalog* directory for departmental telephone numbers and addresses.

### FOREIGN NONDEGREE STUDENTS

Students who hold temporary nonimmigrant visas and temporary immigration status may gain admission as nondegree students only with the approval of an advisor in Foreign Student and Scholar Services in the Office of International Education. The University of Colorado at Boulder does not issue Forms I-20 or assume any immigration responsibility for nondegree students. Therefore, foreign nondegree students must maintain appropriate immigration status independent of the University.

Foreign nondegree applicants should write or call Foreign Student and Scholar Services, Environmental Design Building, Campus Box 123, University of Colorado at Boulder, Boulder, Colorado 80309-0123, telephone (303) 492-8057, to obtain the appropriate application and instructions.

### Former Boulder Campus Students

CU-Boulder degree students who are not currently enrolled at the Boulder Campus must submit a new application for admission. Students who have attended any college or university since their last attendance at CU-Boulder should refer to the Transfer Students (How to Apply) section of this *Catalog*.

Degree students who withdraw from CU-Boulder during the fall or spring semester must reapply for admission. Degree students who withdraw from CU-Boulder during the summer session need not reapply to continue into the fall semester, unless they were not enrolled as degree students for spring semester. Those summer students who were not enrolled as degree students for the spring semester should check

with the Office of Admissions for information on reapplying.

A nonrefundable \$30 application fee is required. If the student is changing from a previous college or school, the change should be noted on the application. Otherwise, it will be assumed that the student is returning to the same field of study. If a college or school change is requested for which the student is not eligible, the student will need to request consideration for his or her previous program.

### Nondegree Students

The nondegree student classification meets the needs of those students who wish to take University courses but who do not currently intend to work toward a degree at the University of Colorado. With the exception of high school students who have the approval of the Office of Admissions, nondegree students must be 18 years of age or older and have a high school diploma or its equivalent to qualify for admission. Except for summer session, students who have attended a college or university must be in good standing at all collegiate institutions attended.

In the fall and spring semesters, permission to register for regularly scheduled Boulder Campus courses is contingent upon availability of space. Nondegree students are not permitted to enroll in College of Business and Administration courses during the regular academic year. However, summer session nondegree students are allowed to take business courses subject to completion of appropriate prerequisites.

Nondegree students may take course work through the Colorado Consortium for Independent Study. Students register for this option through the Division of Continuing Education.

Nondegree students may register for courses on a Pass/Fail basis, with the exception of Boulder Evening and Individualized Instruction courses. Courses that are taken Pass/Fail will be counted in the hours of Pass/Fail permitted according to the rules of the college or school to which students are admitted if they change to degree status.

Nondegree students who have completed 6 semester hours of credit must maintain a 2.00 cumulative grade point average. Failure to maintain the required grade point average will result in suspension.

For fall and spring semesters, nondegree students are usually registered through the Division of Continuing Education. Further information may be obtained by writing or calling the Division of Continuing Education, Campus Box 178, University of Colorado at

Boulder, Boulder, Colorado 80309-0178, telephone (303) 492-5148.

Prospective nondegree students for the summer session may obtain further information from Summer Admission and Registration Information, Campus Box 7, University of Colorado at Boulder, Boulder, Colorado 80309-0007, telephone (303) 492-2456. High school juniors who are interested in attending CU-Boulder the summer before their senior year are encouraged to apply for summer session as nondegree students. High school records will be reviewed to determine the student's readiness to enroll in college-level courses.

Foreign students who want to apply to the University as nondegree students should read the Foreign Students section above. Students interested in teacher certification should refer to the School of Education section of this *Catalog*.

### NONDEGREE STUDENTS TRANSFERRING TO A DEGREE PROGRAM

Students who are currently enrolled or have been enrolled at any CU campus as a nondegree student may apply for admission to an undergraduate degree program by submitting an undergraduate admission application to the Office of Admissions with complete credentials and the nonrefundable \$30 application fee.

Applicants must have earned a high school diploma or its equivalent, and all previous college-level work must be reported on the application. A high school transcript and ACT or SAT scores (if not already on file in the Office of Admissions) and two official transcripts from all colleges and schools attended (outside the University of Colorado system) must be sent directly to the Office of Admissions. Nondegree students planning to transfer to a degree program should also refer to the Transfer Students section above. High school nondegree students who have not completed any college-level course work since graduation from high school should refer to the freshman section above. If college-level course work has been completed since graduation from high school, the transfer section should be consulted.

A degree-seeking applicant may transfer a maximum of 12 semester hours taken as a nondegree student, with the approval of the appropriate dean's office. It is extremely important that nondegree students who wish to transfer credits to a Boulder Campus degree program actively seek academic advising from the appropriate dean's office. Acceptance of credit toward

degrees at the University changed in 1970. Nondegree students enrolled before that date may transfer credit in accordance with provisions in effect between January 1969 and August 1970. Transfer of credit to another college or university is within the discretion of the degree-granting institution.

Students wishing to transfer to a graduate degree program should refer to the Graduate School section of this *Catalog*.

## Second Undergraduate Degree Applicants

Students may apply for second undergraduate degrees at the University of Colorado at Boulder, but should explore the various options in graduate study available at the University before doing so. Students applying for a second undergraduate degree must follow transfer admission guidelines, and those students who are admitted must keep in mind that all college and major requirements must be met in order to complete degree programs satisfactorily. Restrictions mandated by general University policies, as well as specific college and school policies, include the following:

- a. Applicants may not apply to the major in which they received their first undergraduate degree.
- b. Applicants must apply to a specific major. Applications for an Open Option or Undetermined major will not be considered.
- c. Credit hours earned as a non-degree student at the University of Colorado may not be used toward major degree requirements for a second degree in the College of Arts and Sciences.
- d. Students who have already completed a degree in *any* business area cannot be considered for a second undergraduate degree in Business. These students and other students thinking of applying for a second undergraduate degree in the College of Business and Administration are strongly encouraged to investigate graduate study. Nondegree students may take undergraduate business courses only during the summer term.

e. Second undergraduate degree applicants in Environmental Design are encouraged to investigate graduate programs offered at the University of Colorado at Denver before applying for a second undergraduate degree.

f. The School of Education offers graduate degrees and Teacher Certification programs only.

## Students From Other CU Campuses

Students who wish to transfer to Boulder from another University of Colorado campus (Colorado Springs, Denver, Health Sciences Center), from CU Study Abroad, or from CU Continuing Education should refer to the Transfer Students section of this *Catalog*. These students must send a high school transcript, ACT or SAT scores (regardless of the amount of college course work completed), and two official transcripts from each college or university attended (outside the University of Colorado system) to the Office of Admissions.

## MINIMUM ACADEMIC PREPARATION STANDARDS (MAPS): POLICIES CONCERNING DEFICIENCIES

Students who graduate from high school in the spring of 1988 and later normally will be required to complete in secondary school the Minimum Academic Preparation Standards (MAPS) of the CU-Boulder college to which they are applying (see Assured Admission Criteria chart). In some cases, however, students who are otherwise admissible may be admitted even though they have not met the MAPS. In those instances, students will be required to complete the appropriate MAPS courses through courses taken at the University of Colorado at Boulder, courses taken at other institutions of higher education, completion of additional high school credits, or approved credit-by-examination programs.

The policies of the Boulder Campus with respect to completing MAPS

course work after enrollment are as follows (as of January 1988).

1. If a student needs only *one course* to complete the MAPS, the appropriate course will be included in the minimum hours required for graduation, if that course is normally counted toward graduation in the student's degree program.

2. All missing MAPS course work *beyond the first course* will require additional hours for graduation.

3. When more than one MAPS course must be completed, the college will count as the first course the one which has the most credit hours attached to it; thus, if a student must make up two courses, one in a 4-hour course and one in a 3-hour course, the 3-hour course will be used for the additional credit, while the 4-hour course will be counted in the minimum required hours applied toward graduation.

4. All course work toward fulfillment of the MAPS must be taken for a letter grade.

5. Students are required to enroll in and complete at least one MAPS course each term, beginning in the first term of enrollment, until such time as all MAPS are completed. This policy applies to new freshmen, to transfer students, and to students transferring from other academic units on the Boulder Campus and from other campuses of the University. Failure to comply with this requirement will result in suspension at the end of the term in which the student ceases to complete missing MAPS units.

6. All students who first enroll in one academic unit at CU-Boulder and who subsequently transfer to another unit will be required to meet the MAPS specified for the new unit, irrespective of their completion of MAPS units in their previous college or school.

7. Double degree students must meet MAPS requirements of both degree-granting units.

8. Students must consult with a CU-Boulder academic advisor (during orientation for Arts and Sciences students) to determine which specific courses may be used to meet a MAPS requirement.

*Note:* For additional information, students should consult their dean's office.

**CRITERIA FOR ASSURED ADMISSION OF FRESHMEN  
ACADEMIC YEAR 1988-89  
(Includes Minimum Academic Preparation Standards—MAPS)**

College	Arts and Sciences	Business and Administration	Engineering and Applied Science	Environmental Design	Music
<b>Class Rank</b>	Top 30 percent	Top 25 percent	Top 20 percent	Top 25 percent	Top 50 percent
<b>SAT or ACT</b>	1,050 combined (Verbal 500, Math 550) 25 composite (English 21; Math 26; average of nonmath scores, 25)	1,050 combined (Verbal 500, Math 550) 25 composite (English 21; Math 26; average of nonmath scores, 25)	1,150 combined (Verbal 500, Math 650) 28 composite (Math 30)	1,100 combined 25 composite	1,000 combined 23 composite
<b>Course Units</b> (1 unit=1 year)	<p><b>English</b> (including at least two years of composition) . . . . . 4</p> <p><b>Mathematics</b> (college preparatory) . . . . . 3</p> <p><b>Natural Science</b> (two years of laboratory science including physics or chemistry) . . . . . 3</p> <p><b>Social Science</b> (including one unit in U.S. or world history and one unit in geography) . . . . . 3</p> <p><b>Foreign Language</b> (high school level proficiency in a single foreign language; four years recommended) . 3</p> <p><b>Total</b> . . . . . 16</p> <p><i>One-half unit of geography and one-half unit of world history may substitute for one unit of geography for those who use U.S. history to meet the history requirement.</i></p>	<p><b>English</b> (including at least two years of composition) . . . . . 4</p> <p><b>Mathematics</b> (including at least two years of algebra and one year of geometry) . . . . . 4</p> <p><b>Natural Science</b> (two years of laboratory science) . . . . . 3</p> <p><b>Social Science</b> . . . . . 2</p> <p><b>Foreign Language</b> (high school level proficiency in a single foreign language) . . . 2</p> <p><b>Academic Elective</b> (students are urged to select a course that includes oral communication such as speech, debate, or theatre) . . 1</p> <p><b>Total</b> . . . . . 16</p>	<p><b>English</b> (composition, literature, and grammar) . . . . . 4</p> <p><b>Mathematics</b> (including at least two years of algebra, one year of geometry, and one year of advanced math such as trigonometry, analytic geometry, or elementary functions) . . 4</p> <p><b>Natural Science</b> (one year of physics and one year of chemistry) . . . . . 3</p> <p><b>Social Science</b> . . . . . 2</p> <p><b>Foreign Language</b> (high school level proficiency in a single foreign language) . . . 2</p> <p><b>Academic Elective</b> . . 1</p> <p><b>Total</b> . . . . . 16</p> <p><i>Freshmen are expected to begin mathematics study at the calculus/analytic geometry level.</i></p>	<p><b>English</b> (composition, literature, and grammar) . . . . . 4</p> <p><b>Mathematics</b> (college preparatory) . . . . . 3</p> <p><b>Natural Science</b> (including physics and/or biology) . . . . 3</p> <p><b>Social Science</b> . . . . . 3</p> <p><b>Foreign Language</b> (high school level proficiency in a single foreign language) . . . 2</p> <p><b>Academic Elective</b> . . 1</p> <p><b>Total</b> . . . . . 16</p>	<p><b>English</b> . . . . . 4</p> <p><b>Mathematics</b> . . . . . 3</p> <p><b>Natural Science</b> . . . . 3</p> <p><b>Social Science</b> . . . . . 2</p> <p><b>Foreign Language</b> (high school level proficiency in a single foreign language) . . . 2</p> <p><b>Academic Elective</b> . . 1</p> <p><b>Total</b> . . . . . 15</p> <p><i>Freshmen must pass an audition in their applied music area. See the Music section of this Catalog for audition dates. Two years of piano training are recommended.</i></p>



# College of Arts and Sciences

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## INFORMATION ABOUT THE COLLEGE

*Everly B. Fleischer, Dean*

### History and Purpose

The College of Arts and Sciences is the oldest academic division of the University, dating from 1878. Offering one of the most extensive liberal arts and sciences programs in the country, the College recognizes that its students have a wide variety of educational goals.

The objectives of the College are based on the belief that all students, no matter how specific and professional their aims, should have sufficient knowledge of other areas to be able to see their own disciplines in the proper perspective. At the same time, all students, no matter how broad and general their educational objectives, should have sufficient grasp of at least one field to enable them to deal with its problems in depth and with sophistication.

Pursuant to these beliefs, the College requires all of its students to undertake work in general education courses which are designed to broaden their knowledge. Students are also required to present a considerable body of work in at least one major field of study.

Liberal education cannot, however, be conceived solely in terms of courses taken and proficiency attained. Contact with members of the faculty outside the classroom and with other students in informal discussion, independent study and research, and participation in the broader intellectual and cultural life of the academic community are factors that significantly enrich the student's education. All students in the College of Arts and Sciences should avail themselves of the many opportunities to enhance their University experience.

### Academic Advising and Orientation

All freshmen in the College of Arts and Sciences are assigned a faculty

advisor for their first year. All new students are required to attend special orientation and advising programs on campus before enrollment.

*Students in the College are expected to assume responsibility for planning their academic programs in accordance with College rules and policies and departmental major requirements. To assure that they are successful in this process, they are urged to consult regularly with advisors in the Dean's Office and in their major department concerning academic progress and objectives.*

## DEGREES AND DEGREE REQUIREMENTS

Effective in the summer of 1988, the College will have two sets of degree requirements. One will be required of students who begin their undergraduate study at any institution of higher education in the summer of 1988 or thereafter; the other will be required of those who began their undergraduate study before the summer of 1988. No portion of either curriculum may be substituted for a portion of the other.

### General Requirements for Students Who Begin Their Undergraduate Study in the Summer of 1988 and Thereafter

1. A total of 120 hours passed.
2. A 2.00 (C) grade point average in all University of Colorado work.
3. Forty-five semester hours of upper-division work (courses numbered in the 3000s and 4000s). Note that all courses transferred from junior or community colleges carry lower-division credit.
4. Completion of the last 30 semester hours in University of Colorado courses on the Boulder Campus as a degree student in the College of Arts and Sciences. Courses taken at the Colorado Springs Campus or at the Denver Campus (excluding Metropolitan State courses) in the summer count toward resident credit.
5. For the Bachelor of Arts degree, students will be allowed to exceed the

College's maximum of 45 hours in a single department by up to 6 hours (for a total of 51 hours), provided that all of the excess hours are taken either in designated departmental honors courses and/or honors thesis credit. The maximum semester hours for the B.F.A. and the B.S. in Kinesiology are described in this *Catalog* under the Fine Arts and the Theatre and Dance Departments (B.F.A.) and under the Kinesiology Department (B.S.).

6. Completion of a major. Students are subject to the major requirements in force when they declare a major. See Majors and Major Requirements below.

7. Completion of the General Education Requirements (see below).

## GENERAL EDUCATION REQUIREMENTS

### Skills Acquisition

These requirements are designed to assure that each student has attained a minimum level of competency in each of the areas listed: foreign language, quantitative reasoning and mathematical skills, written communication, and critical thinking.

**1. Foreign Language.** Students must demonstrate Level-III proficiency in a foreign language by successfully completing three years of a single modern or classical language in high school. Students who do not complete this requirement in high school must complete a third-semester course at the University. See individual foreign language department writeups in this *Catalog* for information on how foreign language course work will apply to baccalaureate degree programs.

**2. Quantitative Reasoning and Mathematical Skills.** Students are required to demonstrate minimum competence in quantitative reasoning and mathematical skills by the end of the freshman year. The requirement may be fulfilled either by passing an approved examination or by passing specifically designated Core Curriculum Courses.

**3. Written Communication.** All students are required to take a diagnostic test to demonstrate their writing proficiency in the second semester of their sophomore year. Those students who

do not write at a level appropriate to the upper division must pass in the first semester of their junior year an upper-division writing course designed specifically to address their writing deficiencies. As an alternative, students may elect to take a writing workshop in their major should such a workshop be available.

**4. Critical Thinking.** Students must take 3 hours of course work at the upper-division level which requires them to practice sustained critical thinking and to demonstrate such thinking in both written form and oral discussion. Courses designated as fulfilling this requirement will be found in the Skills Acquisition section of the Core Curriculum Courses.

### Content Areas of Study

Content Areas of Study are designed to assure that all students acquire a broad general education. The Core Curriculum Courses published each term designate courses which fulfill these goals.

**1. Historical Context.** Six hours of course work addressing the European experience and its historical context.

**2. Cultural and Gender Diversity.** Three hours of course work in which the primary purpose is to acquaint students with a non-Western culture (or some important aspect of one) and/or with scholarship on women, gender, race, or ethnicity.

**3. United States Context.** Six hours of course work in which the subject matter of the course is taught with a strong emphasis on increasing students' understanding of the United States.

**4. Literature and the Arts.** Six hours of course work in which students study some form of literature (broadly understood) and/or some genre or aspect of the fine or performing arts (whether in a practical or theoretical manner).

**5. Natural Science.** Thirteen hours of course work in which students gain an understanding of the physical and biological sciences. At least one laboratory or field experience must be included in the requirement. The requirement consists of two parts:

a. A sequence of courses taught in a single department and in which there is demonstrable progression in the sequence.

b. Courses designed specifically for General Education. If students choose to continue in the same department in which they fulfilled part a, they must elect upper-division courses.

Students majoring in the physical and/or biological sciences will be exempt from this requirement.

**6. Contemporary Societies.** Six hours of course work in which the primary purpose is to expose students to analysis of contemporary societies.

**7. Ideals and Values.** Three hours of course work in which students inquire into the nature of human ideals and values—their diversity, their conditions, and various modes of justification—or inquire into some specific sphere of human value (e.g., moral, religious, aesthetic, political, environmental).

*Students may not use the Pass/Fail option for courses taken to fulfill General Education requirements, including courses taken to complete the Skills Acquisition requirements, the Content Areas of Study, or the Minimum Academic Preparation Standards.*

## General Requirements for Students Who Began Their Undergraduate Study Before Summer 1988

1. A total of 124 semester hours passed.

2. A 2.00 (C) grade point average on all University of Colorado work.

3. Forty semester hours of upper-division work (courses numbered in the 3000s and 4000s). Note that all courses transferred from junior or community colleges carry lower-division credit.

4. Completion of the last 30 semester hours in University of Colorado courses on the Boulder Campus as a degree student in the College of Arts and Sciences. Courses taken at the Colorado Springs Campus or at the Denver Campus (excluding Metropolitan State courses) in the summer count toward resident credit.

5. Not more than 45 semester hours in a single department, except for B.F.A. and B.S. degrees.

6. Completion of a major (see Majors and Major Requirements below).

7. Completion of the Area Requirements (see below).

For specific information concerning the B.F.A. degree, see the departmental listing for Fine Arts or Theatre and Dance. Information regarding the B.S. degree may be found under the Kinesiology Department. Students are subject to the general degree requirements in effect at the time they first enter the College of Arts and Sciences and are subject to the major requirements in force when they declare a major.

### AREA REQUIREMENTS

Candidates for liberal arts degrees are expected to be literate in their own language, to have at least a minimal acquaintance with a language other

than their own, and to be familiar with the subject matter and the methodology of the three broad areas of learning represented by the humanities, the natural sciences, and the social sciences. These expectations generate the requirements of the College.

All students pursuing a bachelor's degree in the College of Arts and Sciences are required to complete the area requirements listed below. Students pursuing a Bachelor of Science degree, however, are not required to complete the foreign language requirement.

Each student must present two two-semester course combinations in each of the following areas:

1. Humanities
2. Natural Sciences
3. Social Sciences

The faculty of the College of Arts and Sciences has authorized a set list of courses to be used in fulfilling the College area requirements. This list is known as the College List.

Students may satisfy the area requirements in one of two ways:

1. By taking a first-year combination of courses from those designated on the College List, followed by two second-year courses for which the first combination is prerequisite. Both sets of courses must normally come from the same department; exceptions are printed in the list.

2. By taking one first-year combination in one department and a second first-year combination in a different department.

Completion of a Level-III high school course in any modern or classical foreign language is recommended for entrance to the College of Arts and Sciences for those students seeking the B.A. or B.F.A. degree. Students failing to meet this expectation must complete it in one of the following ways:

a. Completion of an appropriate third-semester college course in a single foreign language.

b. Demonstration of third-semester proficiency or its equivalent by examination in any foreign language.

Questions about placement should be referred to the appropriate foreign language department. Students who elect to enroll in a foreign language course below their placement level may be denied credit for the course.

*Students are strongly urged to start their college-level language study immediately upon enrollment in the College, either by continuing a language previously studied or by beginning a new language.*

Students planning to go on to graduate work are advised to complete the fourth semester of a foreign language in

preparation for the language requirements of graduate schools.

*Students may not use the Pass/Fail option for courses taken to fulfill the College of Arts and Sciences area requirements, including the courses taken to complete the foreign language requirements.*

## ACADEMIC POLICIES

### Cooperative Education

Students in the College of Arts and Sciences may receive up to 6 semester hours of credit for a department or college sponsored cooperative education program or internship. Each internship project must be approved by the Dean of the College before the student's enrollment in the course in order for the student to receive credit. Students are encouraged to contact their major department office for information regarding the possibility of enrolling in a cooperative education program in their major. Internships are graded on a P/F basis only. Participation in an internship does not affect the total semester hours of P/F a student may apply toward a degree.

### Limitations on Course Work

1. No student may normally take more than 45 hours in one department. Exceptions are:

a. Students who enroll in any college in the summer of 1988 and thereafter may exceed the 45-hour limitation in the major by up to a total of 6 hours (for a total of 51 hours) provided that all of the excess hours are taken in designated departmental honors courses and/or in honors thesis credit.

b. The limitation for the Bachelor of Fine Arts degree is 67 hours in the major.

c. The limitation for the Bachelor of Science degree is 50 hours in the major.

2. Students may count toward the fulfillment of requirements for the Bachelor of Arts and Bachelor of Fine Arts degrees a total of 30 semester hours in the following categories, subject to the following restrictions:

a. Up to 30 total hours in curricula leading to degrees other than the B.A. (e.g., Business, Engineering, and the other professional colleges and schools).

b. Up to 8 semester hours in activities courses (applied music and ensembles). This limitation is included in the 30 total semester hours above.

c. Up to 6 semester hours in designated courses in English as a Second Language (ESLG 1110 through 1320). This limitation is included in the 30 total semester hours above.

3. Students must complete the last 30 semester hours of their course work in residence on the Boulder Campus in the College of Arts and Sciences. Course work taken in the summer at the Colorado Springs and Denver Campuses (excluding Metropolitan State courses) is also counted as resident credit.

Work from accredited institutions of higher education that has been completed with a grade of C- (1.70) or better may be transferred to the University of Colorado. All courses transferred from junior or community colleges carry lower-division credit. A maximum of 60 semester hours (or 90 quarter hours) taken at junior or community colleges may be applied toward the bachelor's degree in the College of Arts and Sciences. No courses taken at a junior or community college will be credited toward graduation at the University of Colorado after a student has completed a total of 60 semester hours of course work at all institutions attended. Courses transferred from four-year institutions will carry credit at the level the course was taught at the previous institution.

4. The normal course load is 12-17 credit hours per semester.

### ROTC Credit

All ROTC courses certified as acceptable college-level course work by the faculty of the College of Arts and Sciences or of other colleges and schools on the Boulder Campus will be counted for elective credit in the College, subject only to the limitation of semester hours allowed to Arts and Sciences students in course work taken outside of the College (currently 30 in the B.A. and B.F.A. programs).

The following ROTC courses are approved for Arts and Sciences credit:

- AIRR 3010-3020. No credit for either of these courses if a student has credit in MGMT 3000.  
 AIRR 4010-4020. Students may not receive credit for either course if they have credit in PSCI 4191.  
 MILR 1101-1102  
 MILR 2031-2041. No credit for either of these courses if a student has credit in MGMT 3000; students may count credit in MILR 2031-2041 as part of the 30 maximum hours allowed outside the College of Arts and Sciences.  
 MILR 4072. Students who earn credit in COMM 4240 may not receive credit for MILR 4072 and vice versa.  
 MILR 4082  
 NAVR 1020  
 NAVR 2010  
 NAVR 3010  
 NAVR 3101

## Majors

All Arts and Sciences students pursuing a bachelor's degree must declare a major by the end of their sophomore year (i.e., in the semester in which they are completing their 60th semester hour of work, including transfer work). See page 7 for a listing of bachelor's programs. Formal application must be made to the department or program in which the student intends to major. Admission to certain majors may be limited, and students are advised to consult with departmental advisors regarding criteria for admission.

Departments are responsible for advising their majors and also for certifying the completion of the student's major program for graduation. The College will assume no responsibility for difficulties arising out of the student's failure to establish and maintain contact with the major department or program.

### Areas of Interest

The College also sponsors programs—but not undergraduate majors—in the following areas of interest:

Astrophysical, Planetary, and Atmospheric Sciences (APAS)  
 Bibliography  
 Chicano Studies  
 Conflict and Peace Studies  
 Film Studies  
 History and Philosophy of Science  
 Honors  
 Medieval Studies  
 Museum

Course work in these areas is open to all interested students, regardless of major.

### Major Requirements

1. A minimum of 30 semester hours in the major area (for the B.F.A., a minimum of 50 hours).

2. Thirty semester hours with a grade of C- (1.70) or higher in the major area.

3. A 2.00 (C) grade point average in all major work attempted.

4. Eighteen semester hours of upper-division courses in the major, all with grades of C- (1.70) or higher.

5. Special requirements as stipulated by the major department.

6. No more than 8 semester hours of Independent Study.

Students are subject to those major requirements in effect at the time the student formally declares a major.

### Cross-Listed Courses

Students who matriculated in the College of Arts and Sciences during Summer 1981 and thereafter and who take

courses that are cross-listed in two or more departments will receive credit in the department in which they have the most semester hours, irrespective of the department in which they formally took the course.

## Double Majors

Students pursuing either the B.A. or B.F.A. degree may graduate with more than one major (e.g., Biological Sciences and French) within the degree by completing all requirements for both majors. A minimum of 124 total semester hours is required for double majors who enroll in any college before summer 1988. A minimum of 120 hours is required for all others. In both cases, all other requirements must be fulfilled.

## Double Degrees

Two degrees (e.g., B.A. and B.S.) may be earned from CU-Boulder if the following conditions are fulfilled:

1. The student is enrolled in both Arts and Sciences and the college or school granting the second degree during the last 30 hours of residence.
2. The student presents a total of at least 150 semester hours passed.
3. For the B.A. and B.F.A. degrees, the student presents a total of 94 semester hours of liberal arts course work.
4. The student has completed at least 30 semester hours of liberal arts course work at the University of Colorado.
5. The student has completed all area or general education and major requirements of the College of Arts and Sciences.
6. Both degrees must be awarded at the same time.
7. The student who decides to complete a single degree in the College must be a declared Arts and Sciences student in the last 30 hours of residence.

## Second Baccalaureate Degrees

A student who has been awarded a baccalaureate degree, either from this College or elsewhere, may be granted a second baccalaureate degree provided the following conditions have been fulfilled:

1. All general requirements (including the area requirements or general education requirements) for the degree to be awarded by the College of Arts and Sciences have been met. (See the two sections titled General Requirements for the Bachelor's Degree.)
2. The major in the B.A., B.F.A., or B.S. is different from the major in the first degree earned.

3. At least 30 semester hours of passing work in the new major or subject field, including 18 semester hours of upper-division work, are taken in this College after admission to a second degree program. Courses taken as a nondegree student will not count in these minimum requirements.

## Open Option

The Open Option category accommodates students who are not ready to choose a major when they enter the University. The selection of Open Option allows students who are undecided about a major the freedom to sample from the extensive range of offerings in the College. With proper program planning most of the courses taken during the freshman and sophomore years will apply toward the area or general education requirements of the College. Every Open Option student must declare a major by the end of the sophomore year.

## Graduate Degree Programs

Curricula leading to advanced degrees are offered by most of the departments in the College of Arts and Sciences (see page 154). Students should consult the Graduate School section of this *Catalog* for admission and degree requirements of the Graduate School. Curricula for graduate programs are listed alphabetically in this section. For more information, see Seniors at the University of Colorado in the Graduate School portion of this *Catalog*.

## ACADEMIC STANDARDS

### Repetition of Courses

When a student takes a course for credit more than once, all grades are used in determining the grade point average. In determining the number of hours completed for graduation requirements, however, the hours which are earned in a course for which there are two or more passing grades are counted only once unless a course description specifically states that it can be taken more than once for credit.

### Attendance

Successful work in the College of Arts and Sciences is dependent upon regular attendance in all classes. Students who are unavoidably absent should make arrangements with instructors to make up the work missed. Students who, for illness or other good reason, miss a final examination must notify the

instructor or the Office of the Dean no later than the end of the day on which the examination is given. Failure to do so may result in an *F* in the course.

## Probation

Good academic standing in the College requires a grade point average of 2.00 (*C*) on all University of Colorado work. Grades earned *at another institution* are not used in calculating the grade point average at the University of Colorado. This provision applies as well to Metropolitan State College courses taken by enrolling on the Denver Campus of the University. However, grades earned in another school or college *within the University of Colorado* will be used in determining the student's scholastic standing and progress toward the degree in the College of Arts and Sciences. Students whose cumulative grade point average falls below 2.00 are placed on probation. Those students who enroll in any term, excluding summers, in the calendar year after being placed on probation are expected to raise their grade point to a 2.00 overall at the end of that term. CU-Boulder's summer session does not count as a probationary semester, nor are students dismissed as a result of summer work.

If students who have been placed on probation elect to remain out of school for a full calendar year, they may return to the University in good standing, but will be placed on probation again at the end of the semester in which they return if their cumulative grade point average is still below 2.00 at that time.

## Scholastic Dismissal

Students who are still below a 2.00 cumulative average after exercising their semester of probation will be *dismissed* and will not be able to register for University of Colorado daytime courses on any campus during any regular academic year, August to May.

Students *dismissed* from the College will be eligible for readmission when they have achieved a cumulative 2.00 average by virtue of work done in the University of Colorado's summer session (any of the three campuses) and/or Division of Continuing Education (Boulder Evening or correspondence courses). They may also return as transfer students when they have overcome their deficiencies by enrolling at another institution (i.e., by achieving an overall 2.00 average in the University of Colorado work *plus* all work taken elsewhere *since dismissal*). Dismissed students pursuing this option will have two semesters after readmission to bring

their University of Colorado average up to 2.00 or they will be dismissed again.

Students who have made up their grades and desire to be readmitted must reapply to the University through the Office of Admissions. Readmission is subject to enrollment limitations.

## ACADEMIC EXCELLENCE

### Dean's List

Students in the College of Arts and Sciences who have completed at least 12 semester hours of work in any single semester with a GPA of 3.50 or better are included on the Dean's List, which is posted each semester in the Van Ek Administrative Center in the Old Main Building.

### Graduation with Honors

The award of honors at graduation (*cum laude*, *magna cum laude*, *summa cum laude*) is determined by the Honors Program of the College and is based on several criteria. Honors are not conferred on a graduate simply by virtue of high grades in courses. Students should consult the Honors Program listing in this *Catalog* or contact the Honors Program, Norlin Library.

### Graduation with Distinction

Students who do not graduate with honors from the College of Arts and Sciences may graduate with distinction if they have taken at least 30 semester hours at the University of Colorado at Boulder and if their cumulative grade point average is 3.75 or higher, both at the University of Colorado and in all collegiate work completed. The average includes all grades except *P*.

### Phi Beta Kappa

Phi Beta Kappa, founded at the College of William and Mary in 1776, is the nation's oldest and most prestigious honor society. The CU-Boulder chapter was established in 1904. Upper-division students whose undergraduate academic records fulfill certain requirements are eligible for election to membership in recognition of outstanding scholastic achievement in the liberal arts and sciences. Students are notified by mail of their nomination to this honor society; students do *not* apply for Phi Beta Kappa membership.

## CREDITS AND ENROLLMENT

### Advanced Placement Program

See the Admission section of this *Catalog*.

### College-Level Examination Program (CLEP)

The College of Arts and Sciences accepts a limited number of hours of CLEP credit from *subject* (not general) examinations toward its bachelor's degree programs. In addition, certain CLEP examinations may be used to meet MAPS. No more than 30 total semester hours of CLEP will apply. CLEP credit may not be used in the final 30 semester hours presented for a degree. For information as to what subject examinations have been approved for credit and for MAPS, students should contact the College of Arts and Sciences Dean's Office or Testing Services, Willard 214. More detailed information regarding the College-Level Examination Program may be found in the Research and Testing section of this *Catalog*.

### Independent Study

With the approval of the department, students may register for Independent Study only during the Drop/Add period in each semester. No more than 8 semester hours of Independent Study may be credited toward the major and no more than 16 semester hours may be credited toward the degree.

A student may not use Independent Study projects in partial fulfillment of the College's area or general education requirements.

Students may not register for more than 8 semester hours of Independent Study credit during any term.

### Correspondence Study

A maximum of 30 semester hours of correspondence work may count toward the degree. Arts and Sciences courses offered by the CU-Boulder Division of Continuing Education carry resident credit.

### Senior Thesis

A senior student may register for as many as 6 semester hours of Senior Thesis in the major with the approval of the departmental honors committee and the chair of the department. The title of this project and the credit hours

awarded will be entered on the student's transcript. For students who entered any college before summer 1988, the hours awarded for Senior Thesis will count toward the major and must be included in the maximum 45 semester hours allowable in the major toward the degree. For students who entered any college in summer 1988 and thereafter, Senior Thesis hours may be used to exceed the 45-hour limit up to a maximum of 6 hours.

### Pass/Fail

For students who enter any college in summer 1988 and thereafter, the total number of Pass/Fail hours will be two courses or 6 semester hours, whichever is less. Only juniors and seniors may elect the Pass/Fail option, with a limit of one course per semester.

Students who entered any college before summer 1988 may exercise the Pass/Fail option by taking up to 16 semester hours of elective credit on a Pass/Fail basis; for transfer students, the limit is 1 hour for every 8 attempted at the University of Colorado at Boulder. Students may take a maximum of 6 hours Pass/Fail each semester, including the one before graduation.

Students in the College of Arts and Sciences may not use the Pass/Fail option for courses taken to fulfill the area or general education requirements, courses used to satisfy the foreign language requirement, courses used to fulfill MAPS, or courses used to complete the minimum requirements for the major.

### Credit/No Credit

Credit/No Credit changes must occur during the Drop/Add period.

### Withdrawal

See the Registration section of this *Catalog* for specific withdrawal procedures and Universitywide policies.

Students in Arts and Sciences who withdraw after the sixth week of classes in a fall or spring semester will not be allowed to enroll in classes for the following semester. Summer session is not counted as a regular semester. In addition, students who withdraw two semesters in a row will have a Dean's Stop placed on their registration if they attempt to return to CU-Boulder before one full academic year has elapsed (not including their semester of withdrawal). Students may never withdraw after the last day of classes (i.e., the day before final examinations begin).

These policies also apply to Arts and Sciences students who are enrolled in Continuing Education courses.

## Appeals and Petitions

Students are advised that they have the right to appeal decisions of academic dishonesty and to petition for exceptions to the academic policies stated in this *Catalog*. Appeals should be directed to the Committee on Academic Ethics. Petitions should be submitted to the Appeals Committee on Academic Rules and Policies. Both committees are located in the Office of the Dean of the College of Arts and Sciences.

## SPECIAL ACADEMIC PROGRAMS

### Residential Academic Programs

#### FARRAND: A RESIDENTIAL PROGRAM IN THE LIBERAL ARTS

The Farrand Program offers 400 freshmen and sophomores the opportunity to combine some of the advantages of a small liberal arts college with the benefits of a major research university. Small classes offered in the residence hall, informal contact with faculty and campus visitors, academic advising and personal counseling services, and special programs addressed to the students' interests make Farrand an academic as well as a residential program, with a community atmosphere created by living and learning together.

Farrand students are required to take certain courses that provide the core of the academic experience shared by all of the students. During the freshman year the Farrand curriculum develops the basic skills of writing, logical analysis, and critical thinking, while providing a comprehensive survey of Western art and culture through such courses as introduction to the humanities, mathematics, and a freshman seminar designed especially for Farrand. The focus of the second year is on social issues, cultural differences, and foreign affairs.

The Farrand courses constitute about one-third of a student's course work during the first two years. The remaining two-thirds is comprised of courses selected from the regular on-campus offerings.

While the academic component comes first, the Farrand Program is not an honors program. Farrand students participate in all the usual student activities: intramurals, intercollegiate athletics, fraternities and sororities. In

addition, Farrand offers the opportunity to participate in a very active student government group.

The program is sponsored jointly by the College of Arts and Sciences and the Boulder Campus Housing Administration and is designed for students who are enrolled in the College. It is administered by codirectors: an academic director selected from the faculty of the College of Arts and Sciences and a hall director experienced in the operation of a large residence hall.

There is a charge for the program which is in addition to regular tuition, fees, room, and board.

Inquiries concerning any aspect of the academic program may be directed to the Academic Director, Farrand Residential Academic Program, Campus Box 180, University of Colorado at Boulder, Boulder, Colorado 80309-0180, telephone (303) 492-8848.

#### SEWALL HALL RESIDENTIAL ACADEMIC PROGRAM

The Residential Academic Program in Sewall Hall provides qualified academically committed freshmen with the opportunity to participate in a unique residential community experience at the University of Colorado at Boulder. Limited to 320 students, this coeducational program combines many of the advantages of a small liberal arts college with the vast resources of the University.

Students who live in Sewall take one Sewall seminar each semester. These seminars are limited to 20 students; vary in content with emphasis on the natural sciences, social sciences, humanities, and fine arts; and stress critical enquiry and creative participation. The special Sewall classes normally carry 3 semester hours of credit, count toward a degree, and satisfy College and/or elective requirements. In addition to the seminars, many of the large lecture classes at the University offer special laboratory and recitation sections for Sewall students.

The Director of the Sewall Program, who is a member of the University faculty, provides academic assistance to the students in planning their individual programs, in choosing courses, and in making contact with their major departments. The Director also offers personal counseling and helps students find the proper University resources to help them with their problems.

Participants in the Residential Academic Program are fully involved in regular campus life, take the majority of their classes with the rest of the University, and are encouraged to join in all-University activities. The major emphasis at Sewall is participation—in

classes, in student government, in special programs and performances, and in creative projects. Students, faculty, administrators, and staff enjoy close working relationships.

All entering freshmen accepted at the University of Colorado at Boulder are eligible to apply for the Residential Academic Program. Students entering the Colleges of Business or Engineering may have some difficulty in selecting and fitting into their schedules a Sewall class because of the specific requirements demanded by these colleges. This does not mean these students should not participate in the Sewall Program or be discouraged from applying, as most students are able to work something out. Applications will be included in the housing materials sent to all freshmen upon admission. Applications will be considered in the order in which they are received; prompt application is recommended. There is an extra charge for participation in the program in addition to regular tuition and room-and-board fees.

Students who have academic questions should address them to the Academic Director, Sewall Residential Academic Program, Campus Box 353, University of Colorado at Boulder, Boulder, Colorado 80309-0353, telephone (303) 492-6004.

## Academic Programs

### AFRICAN AND MIDDLE EASTERN STUDIES

The undergraduate program in African and Middle Eastern Studies has been discontinued.

### AMERICAN STUDIES

*Degree . . . . . B.A.*

The College of Arts and Sciences, through its various departments and its American Studies Committee, offers a broad interdisciplinary program of courses relating to American thought and culture. American Studies also includes a major track in Women Studies.<sup>1</sup>

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
At least two semester introductory American Studies courses AMST 2000. Themes in American Culture: 1600-1900, and AMST 2010 Themes in American Culture: 1865 to Present, or equivalent . . . . .	6

<sup>1</sup>See Women Studies



At least 6 upper-division credit hours from *three* of the following primary fields: Anthropology, Art History, Economics, English, Geography, History, Journalism, Political Science, Sociology. Courses must contain a substantial amount of American related material. Courses will be chosen in consultation with the Program Director . . . . . 18

AMST 4950, 4960 Senior Seminar in American Studies (two semesters) . . . . . 6

At least 6 upper-division credit hours in the history, culture, or language of a non-American civilization . . . . . 6

## ANTHROPOLOGY

*Degrees* . . . . . B.A., M.A., Ph.D.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
ANTH 1030 and 1040 Principles of Anthropology . . . . .	6
ANTH 2010 Introduction to Physical Anthropology . . . . .	3
ANTH 2100 Frontiers of Cultural Anthropology . . . . .	3
ANTH 2200 Introduction to Archaeology . . . . .	3
Electives . . . . .	15
Students planning to pursue graduate work in Anthropology are advised to take ANTH 4530/5530 and ANTH 4000/5000.	

### GRADUATE DEGREE PROGRAMS

*Prerequisites.* To be admitted as regular degree students, applicants should have a minimum undergraduate grade point average of 3.00 (4.00=A) or a Master of Arts degree. Graduate Record Examination scores for verbal and quantitative aptitude tests are required. Letters of recommendation and evidence of previous anthropologically oriented experience and work are carefully considered. Students with less than 18 semester hours of previous course work in anthropology are considered deficient and will be asked to present a correspondingly greater number of hours for a degree.

*Application.* Inquiries concerning applications should be directed to the graduate secretary. Completed applications are reviewed once each year and are due by March 15. Students with no previous graduate work should apply for entrance into the M.A. program which, if successfully completed, will prepare them for the Ph.D. program. Students who have or will have completed an M.A. degree in anthropology by the time of their admission may apply for direct admission into the Ph.D. program.

### Course Requirements

All entering graduate students must have had the equivalent of Quantitative Methods in Anthropology (ANTH 4000/

5000) or take the course during their first semester in residence.

To qualify for a graduate degree, all students must complete at least three seminars, one each from any of the following four categories: cultural anthropology, physical anthropology, archaeology, or anthropological linguistics. The seminars that meet this requirement are listed in the department's Graduate Handbook.

Other specific course requirements will be established through a qualifying interview and consultation with the Department Chair and an academic advisor.

M.A. students are normally expected to write a thesis (Plan I); exceptions to this (Plan II) require approval of the Chair.

Students may have primary specialization in any of the major subfields of anthropology: archaeology, cultural, physical, and linguistic anthropology. Further specialization in applied anthropology, medical anthropology, and other areas is possible as students progress through the program.

In general, no matter what the student's special interests, the department expects graduate students to retain a breadth of competence in anthropology through the master's degree with specialization intensifying with progress toward the Ph.D. degree.

Additional information about other specific areas of specialization and other requirements for the degree may be obtained by writing directly to the Department of Anthropology.

## ASIAN STUDIES

*Degree* . . . . . B.A.

The Asian Studies Committee offers a broad interdisciplinary undergraduate major in Asian studies. In addition, a number of departments offer graduate training with an emphasis on Asia.

Students planning to major in Asian Studies are encouraged to consider study abroad in Asia. The University offers year-long programs in Kobe, Japan, and Taipei, Taiwan. Short-term programs are available on a regular basis in India and Nepal. Any other Asian country may be the location of foreign study with prior approval from the Asian Studies Program and the Office of International Education.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

*Major Requirements* . . . . . *Semester Hours*  
Choose to complete *one* of two options:

*Option I*  
Chinese or Japanese language courses . . . . . 15  
Other courses to include the following: . . . . . 30  
ASIA 1010, 1020 Asian Humanities:  
    S. Asia, E. Asia . . . . . 6  
ASIA 4830 Senior Project in Asian Studies . . . . . 3  
At least two courses in the social sciences  
(anthropology, history, economics, political science) on Asia  
*Note:* Under other courses, 18 credits must be upper division; 6 of the 18 may be upper-division Chinese or Japanese language courses.

*Option II*  
Asian Studies courses to include the following: . . . . . 45  
ASIA 1010, 1020 Asian Humanities:  
    S. Asia, E. Asia . . . . . 6  
ASIA 4830 Senior Project in Asian Studies . . . . . 3  
At least two courses in the social sciences  
(anthropology, history, economics, political science) on Asia  
*Note:* Of these Asian Studies courses at least 24 credits must be upper division. Students must receive a grade of C or higher in all courses taken to fulfill major requirements.

*Honors.* A student with an outstanding record (minimum grade point average of 3.30 overall and 3.50 in Asian Studies courses) may petition for graduation with honors in Asian Studies. Students should see the student advisor for more details.

Courses that may be counted toward fulfillment of degree requirements are determined by the Asian Studies Committee and the Dean of the College of Arts and Sciences. Not all courses listed below are offered every academic year. An advanced student may be allowed by the instructor to enroll in one of the graduate offerings listed here.

<i>Anthropology</i>	<i>Semester Hours</i>
ANTH 3140 Ethnography of China, Japan, and Korea . . . . .	3
ANTH 3150 Culture and Society in South Asia . . . . .	3
ANTH 4760/5760 Ethnography of Southeast Asia and Indonesia . . . . .	3
<i>Asian Studies</i>	
ASIA 1010 Asian Humanities: South Asia . . . . .	3
ASIA 1020 Asian Humanities: East Asia . . . . .	3
ASIA 1840 Independent Study . . . . .	1-3
ASIA 2840 Independent Study . . . . .	1-3
ASIA 3840 Independent Study . . . . .	1-3
ASIA 4830 Senior Project in Asian Studies . . . . .	3
ASIA 4840 Independent Study . . . . .	1-3
<i>Fine Arts History</i>	
FINE 2409 Introduction to Asian Art . . . . .	3
FINE 4449/5449 Art of India and Southeast Asia . . . . .	3
FINE 4459/5459 The Arts of Japan . . . . .	3
FINE 4469/5469 The Arts of China . . . . .	3
FINE 4669 Asian Arts in Context: Study Abroad . . . . .	3
FINE 5919 Graduate Seminar: Selected Topics in Art History (Asian Arts) . . . . .	3
<i>History</i>	
HIST 1408 Introduction to Indian History . . . . .	3
HIST 1608 Introduction to Chinese History . . . . .	3
HIST 1708 Introduction to Japanese History . . . . .	3
HIST 2718 History of Japan Through Cinema . . . . .	3
HIST 2717 Asian-American History . . . . .	3
HIST 3019 Selected Readings in Asian and African History . . . . .	3
HIST 3718 Selected Readings in Japanese History . . . . .	3
HIST 3628 Selected Readings in Recent Chinese History . . . . .	3
HIST 4428 History of Modern India . . . . .	3
HIST 4618 History of Traditional China . . . . .	3
HIST 4619 Women in Asian History . . . . .	3
HIST 4628 Rise of Revolutionary China . . . . .	3

HIST 4648 History of Modern Chinese Intellectual Thought . . . . .	3
HIST 4718 Ancient and Medieval Japanese History . . . . .	3
HIST 4728 Modern Japanese History . . . . .	3
HIST 4738 Japan at War . . . . .	3
HIST 4748 Modern Japanese Intellectual History . . . . .	3
HIST 6618 Readings in Chinese History . . . . .	3
<i>Music</i>	
MUSC 2770 World Music . . . . .	3
<i>Oriental Languages and Literatures</i>	
CHIN 1010 First-Year (Beginning) Chinese 1 . . . . .	5
CHIN 1020 First-Year (Beginning) Chinese 2 . . . . .	5
CHIN 1900 Independent Study . . . . .	1-3
CHIN 2110 Second-Year (Intermediate) Chinese 1 . . . . .	5
CHIN 2120 Second-Year (Intermediate) Chinese 2 . . . . .	5
CHIN 2900 Independent Study . . . . .	1-3
CHIN 3110 Third-Year (Advanced) Chinese 1 . . . . .	3
CHIN 3120 Third-Year (Advanced) Chinese 2 . . . . .	3
CHIN 3210 Introduction to Classical Chinese . . . . .	3
CHIN 3220 Readings in Classical Chinese . . . . .	3
CHIN 3900 Independent Study . . . . .	1-3
CHIN 4110 Readings in Modern Chinese Literature 1 . . . . .	3
CHIN 4120 Readings in Modern Chinese Literature 2 . . . . .	3
CHIN 4230 Seminar: Classical Chinese . . . . .	3
CHIN 4811 Chinese Poetry in Translation . . . . .	3
CHIN 4821 Chinese Fiction in Translation . . . . .	3
CHIN 4831 Chinese Drama in Translation . . . . .	3
CHIN 4900 Independent Study . . . . .	1-3
JPNS 1010 First-Year (Beginning) Japanese 1 . . . . .	5
JPNS 1020 First-Year (Beginning) Japanese 2 . . . . .	5
JPNS 1900 Independent Study . . . . .	1-3
JPNS 2110 Second-Year (Intermediate) Japanese 1 . . . . .	5
JPNS 2120 Second-Year (Intermediate) Japanese 2 . . . . .	5
JPNS 2211 Language and Patterns of Thinking and Behavior in Japanese Culture . . . . .	3
JPNS 2900 Independent Study . . . . .	1-3
JPNS 3110 Third-Year (Advanced) Japanese 1 . . . . .	3
JPNS 3120 Third-Year (Advanced) Japanese 2 . . . . .	3
JPNS 3900 Independent Study . . . . .	1-3
JPNS 4110 Readings in Classical and Modern Japanese 1 . . . . .	3
JPNS 4120 Readings in Classical and Modern Japanese 2 . . . . .	3
JPNS 4811 Classical Japanese Literature . . . . .	3
JPNS 4821 Modern Japanese Literature . . . . .	3
JPNS 4900 Independent Study . . . . .	1-3
<i>Philosophy</i>	
PHIL 3060 Chinese Philosophy . . . . .	3
<i>Political Science</i>	
PSCI 4052 Political Systems of China, Japan, and Korea . . . . .	3
PSCI 4072 Government and Politics in Southeast Asia . . . . .	3
PSCI 4092 Governments of South Asia . . . . .	3
PSCI 4252 International Relations of China, Japan, and Korea . . . . .	3
<i>Religious Studies</i>	
RLST 2620 World Religions: Eastern . . . . .	3
RLST 3200 Hinduism . . . . .	3
RLST 3300 Indian Buddhism . . . . .	3
RLST 3400 Japanese Religions . . . . .	3
RLST 3600 Islam . . . . .	3
RLST 3800 Chinese Religion . . . . .	3
RLST 4200/5200 Topics in Hinduism . . . . .	3
RLST 4250/5250 Topics in Buddhism . . . . .	3
RLST 4270/5270 Zen Buddhism . . . . .	3
RLST 4650/5650 Islam in the Modern World . . . . .	3
RLST 4700/5700 Confucianism . . . . .	3
RLST 4750/5750 Taoism . . . . .	3
RLST 4760/5760 Sufism: Islamic Mysticism . . . . .	3
<i>Theatre and Dance</i>	
THTR 5061 Asian Theatre Studies . . . . .	3

## ASTROPHYSICAL, PLANETARY, AND ATMOSPHERIC SCIENCES

*Degrees . . . . . M.S., Ph.D.*

Although an undergraduate major is not offered, APAS courses may be used in Distributed Studies and Computer Science Applications major programs. Lists of courses recommended for these majors may be obtained in the departmental office.

### GRADUATE DEGREE PROGRAMS

The curriculum and research in the Department emphasize three major areas: astrophysics, planetary and atmospheric sciences, and plasma physics.

The Department offers both M.S. and Ph.D. degrees. During the first two years of graduate study, before specializing, students generally obtain a broad background through courses regarded as basic to all three areas. Many students take graduate-level courses in the Department of Physics (e.g., electromagnetism and quantum mechanics). Depending upon the student's preparation and interests, the basic courses are chosen from the following list:

APAS 5110 Internal Processes in Gases  
 APAS 5150 Introductory Plasma Physics  
 APAS 5400 Introduction to Fluid Dynamics  
 APAS 5410 Fluid Instabilities and Waves  
 APAS 5540 Mathematical Methods  
 APAS 5920 and 7920 Reading and Research  
 APAS 7160 Intermediate Plasma Physics

Descriptions of more specialized courses in the three major areas follow. Students interested in applying to this program are invited to write to the Chair, Department of Astrophysical, Planetary, and Atmospheric Sciences, Campus Box 391, University of Colorado at Boulder, Boulder, Colorado 80309-0391.

### Geophysics

The Department participates in the interdepartmental Ph.D. program in Geophysics. For further information, refer to the discussion of the Geophysics program under the Graduate School section of this *Catalog*.

### Astrophysics (Including Solar Physics)

The Department offers a broad range of courses and research in this area, leading to the Ph.D. degree. Graduate-level courses are offered in the following subjects:

APAS 5700 Stellar Structure and Evolution  
 APAS 5710 High Energy and Interstellar Astrophysics

APAS 5720 Galaxies and Cosmology  
 APAS 5730 Stellar Atmospheres and Radiative Transfer  
 APAS 6000 Seminar in Astrophysics  
 APAS 7420 Geophysical and Astrophysical Fluid Dynamics

Research in observational and theoretical astrophysics is conducted in the following areas:

Stellar atmospheres, radiative transfer, and stellar winds  
 Solar physics  
 Interstellar and intergalactic medium  
 Stellar interiors, pulsations, and neutron stars  
 Cosmic X-ray sources  
 Galactic evolution, quasars, and active galaxies  
 Radio astronomy  
 Plasma astrophysics  
 Astrophysical fluid dynamics  
 Laboratory and atomic astrophysics  
 UV and X-ray space astronomy  
 Instrument and detector development

The Department operates a 24-inch Cassegrain-Coude and 16- and 18-inch Cassegrain telescopes, available for photographic, photometric, and spectrographic observations, as well as for instrument and detector development. Opportunities for graduate research are also found with the University's Laboratory for Atmospheric and Space Physics (LASP), Joint Institute for Laboratory Astrophysics (JILA), and a new Center for Astrophysics and Space Astronomy (CASA) established within the APAS Department. (See descriptions under the Graduate School section.) In addition, research is carried out with national laboratories and international collaborators: High Altitude Observatory (HAO) in Boulder (solar physics), Kitt Peak National Observatory in Tucson (optical astronomy), National Radio Astronomy Observatory (NRAO) in Virginia, the Very Large Array (VLA) in New Mexico, the NASA International Ultraviolet Explorer satellite (IUE) and Infrared Astronomical Satellite (IRAS), and Boulder-Sydney Agreement in Astrophysics in Sydney, Australia (solar physics and radio astronomy).

Students from the Department of Physics may, with appropriate approval, complete Ph.D. degrees in the Astrophysics Program.

### Atmospheric and Planetary Sciences

Research and courses related to the physics and dynamics of the Earth's atmosphere, planetary atmospheres of other planets, and planetary interiors are available in programs leading to the M.S. and Ph.D. degrees. Graduate-level courses in these areas are:

APAS 5050 Atmospheric Physics and Dynamics  
 APAS 5220 Nonlinear Dynamics  
 APAS 5300 Introduction to Magnetospheres  
 APAS 5400 Introduction to Fluid Dynamics  
 APAS 5410 Fluid Instabilities and Waves

APAS 5560 Radiative Processes in Planetary Atmospheres  
 APAS 5961 Theories of Climate and Climate Variability  
 APAS 7200 Dynamics and Photochemistry of the Upper Atmosphere  
 APAS 7240 Physics of Planetary Airglows  
 APAS 7300 Advanced Magnetospheric Physics  
 APAS 7420 Geophysical and Astrophysical Fluid Dynamics  
 APAS 7430 Fluid Turbulence and Nonlinear Processes

Research in theoretical, observational, and laboratory atmospheric and planetary science is conducted in the following areas:

Atmospheric dynamics, planetary circulations, wave propagation, hydrodynamic instability, experimental geophysical fluid dynamics, physical oceanography, and climate dynamics  
 Atmospheric photochemistry, radiative transfer, upper atmospheric dynamics and transport of radiatively active species (ozone), effects of solar variability, dynamical-photochemical coupling, and diurnal and seasonal variations  
 Planetary aeronomy, airglow and aurora, UV and IR spectroscopy, noctilucent clouds, structure and composition of planetary atmospheres (Venus, Mars, Jupiter and Saturn), and planetary magnetospheres  
 Satellite monitoring of the Earth's atmosphere and environment, including remote sensing of mesospheric ozone, stratospheric trace species, convection, outgoing radiation, magnetospheric dynamics, and hydromagnetic behavior of the Earth's core

Graduate research opportunities exist with individual faculty members, as well as jointly with affiliated research programs such as the Center for Atmospheric Theory and Analysis (CATA), a collaborative arrangement among researchers at the University, the National Center for Atmospheric Research (NCAR), and the National Oceanic and Atmospheric Administration (NOAA); the Laboratory for Atmospheric and Space Physics (LASP), involved in space investigations of the Earth and planets; and the Cooperative Institute for Research in the Environmental Sciences (CIRES), a research organization co-sponsored by the University and NOAA. Research facilities include an atmospheric sciences laboratory, operating a Pyramid 90X super minicomputer linked to the University computing network and thereby to NCAR, archived and direct transmissions of satellite and meteorological data, a fully equipped laboratory for investigations in geophysical fluid dynamics, and complete access to the NCAR Cray supercomputing facility and extensive data base. Financial support is available in connection with all of the aforementioned research activities.

## Plasma Physics

A complete program of courses and research is available for students specializing in theoretical or experimental plasma physics leading to M.S. or Ph.D.

degrees in APAS or physics or a Ph.D. in astrophysics. Courses offered are:

APAS 4400 Introduction to Controlled Fusion  
 APAS 5140 Experimental Plasma Physics  
 APAS 5150 Introductory Plasma Physics  
 APAS 5220 Nonlinear Dynamics  
 APAS 7150 Magnetohydrodynamics  
 APAS 7160 Intermediate Plasma Physics  
 APAS 7170 Advanced Plasma Physics

Research in theoretical and experimental plasma physics is carried out in the following areas:

Fundamental processes in plasmas  
 Kinetic theory of plasmas  
 Plasma turbulence  
 Plasma diagnostics  
 Nonlinear dynamics  
 Nonlinear optics of plasmas  
 Toroidal magnetic confinement  
 Electron-beam-plasma interaction  
 Solar plasmas, radio emission from the Sun, and solar wind

Collaborative research is pursued with the mathematics and physics departments, with major institutions in Boulder and the U.S., and with international research organizations. These include the National Center for Atmospheric Research (NCAR), with access to the Cray computers; the Los Alamos Scientific Laboratory; and several University groups. A departmental plasma laboratory is equipped with modern diagnostic instrumentation and a variety of plasma research devices.

Graduate assistantships and postdoctoral positions are available.

## DEPARTMENTAL REQUIREMENTS

Those wishing to pursue graduate work in APAS leading to candidacy for an advanced degree should read carefully Requirements for Advanced Degrees in the Graduate School section of this *Catalog*. The following are special departmental requirements.

### Master's Degree

*Prerequisites.* A thorough undergraduate preparation in physics and mathematics. Courses should include thermodynamics, mechanics, electricity and magnetism, atomic physics, and mathematics at least through differential equations.

*Qualifying Examination.* The Graduate Record Examination aptitude tests and advanced test in physics are used in place of a qualifying examination, and this examination normally is taken before the time of entry into Graduate School.

*Preliminary Examination.* Students in the Department of Astrophysical, Planetary, and Atmospheric Sciences will be given a written preliminary examination prior to the beginning of the spring semester of their first year. This examination will test fundamental knowledge in physics and mathematics. Students

are required to overcome any academic deficiencies within a year in order to remain in the program.

*Course Requirements.* Under Plan I, a student must present a thesis plus 24 semester hours of course work, at least 12 of which must be in APAS courses numbered 5000 or above. The remaining graduate-level hours will normally be in physics and mathematics. Under Plan II, additional hours of approved graduate courses must be presented for a total of 30 semester hours, of which at least 16 must be in APAS courses numbered 5000 or above. The master's examination under Plan I covers the thesis and related topics. Under Plan II the examination, which is more comprehensive, may be either written or oral or both. Master's examinations are given after other degree requirements have been completed, but may be given during the last semester of residence if the student is making satisfactory progress on required courses. Students are encouraged to follow Plan I except under special circumstances.

## Doctor's Degree

*Prerequisites.* See prerequisites above.

*Qualifying Examination.* See above.

*Preliminary Examination.* See above.

*Course Requirements.* A minimum of 30 semester hours of work in courses numbered 5000 or above is required; however, the overall emphasis is on independent study and research.

*Language Requirement.* Graduate School language requirement.

*Examinations.* Students in a Ph.D. program are required to pass the preliminary examination described under Master's Degree, pass a comprehensive examination which is designed to test the student's scientific judgment and initiative as well as mastery of the knowledge and skills necessary for research, and satisfactorily defend the thesis before a faculty committee. Students entering the Department are supplied with a detailed description of these examinations.

## BIBLIOGRAPHY

Several courses in Bibliography (see College of Arts and Sciences in the Course Description section of this *Catalog*) are offered to students who wish to develop competence in the use of information tools for their study and career needs.

## BIOLOGICAL SCIENCES

The Division of Biological Sciences consists of the Department of Environmental, Population, and Organismic

Biology and the Department of Molecular, Cellular, and Developmental Biology. Several programs leading to the B.A. degree with a major in Biological Sciences are available. Each department defines and administers its own programs separately.

## Biology—Environmental, Population, and Organismic

Degrees . . . . . B.A., M.A., Ph.D.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
EPOB 1210 and 1220 (Lectures), and EPOB 1230 and 1240 (Labs), General Biology and Laboratory . . . . .	8
(MCDB 1050 and 1060 Introduction to MCD Biology can be substituted. NASC 1230 and 1240 Biology—A Human Approach will not carry credit toward the 38 hours required for the EPOB major but will fulfill the requirements of completing General Biology.)	
EPOB 3200 Genetics . . . . .	3
(MCDB 3400 Molecular Genetics will not be accepted as a substitute)	
EPOB 3020 Principles of Ecology . . . . .	3
In the plant sciences, <i>one</i> of the following courses is required:	
EPOB 3500 Plant Kingdom; EPOB 3510 Plant Anatomy and Development; EPOB 3520 Flowering Plant Systematics; EPOB 3530 Essentials of Plant Physiology . . . . .	4
In animal sciences, <i>one</i> of the following courses is required:	
EPOB 3720 Principles of Comparative Vertebrate Anatomy; EPOB 3650 Embryology and EPOB 3660 Developmental Biology Laboratory; EPOB 3700 Comparative Animal Physiology . . . . .	5
(Students who have taken <i>both</i> Introduction to Human Anatomy and Human Physiology are exempted from the animal science requirement. Students may not present both EPOB 3420 Introduction to Human Anatomy, and EPOB 3720 Comparative Vertebrate Anatomy, or both EPOB 3430 Human Physiology, and EPOB 3700 Comparative Animal Physiology, to fulfill the requirement of 38 hours for an EPOB major. Students may, however, use both anatomy courses or both physiology courses as electives, provided they do not have more than 45 EPOB credits.)	
EPOB 4000 level or above; at least 6 hours . . . . .	6
These 6 hours must be taken in the EPOB Department on the Boulder Campus, may include a maximum of 3 hours of Independent Study or Independent Research, and may not include EPOB 4000 or 4010. At least 3 of these 6 hours must be regular course work.	
Additional course work to total . . . . .	38
<i>Ancillary Courses</i>	
Complete one year of college chemistry:	
CHEM 1111 General Chemistry 1 and CHEM 1071 Introduction to Organic and Biochemistry, or CHEM 1111 General Chemistry 1 and CHEM 1131 General Chemistry 2 or CHEM 1151 Honors General Chemistry 1 and CHEM 1171 Honors General Chemistry 2 . . . . .	9-12
Complete one year of college physics:	
PHYS 2010 General Physics 1 and PHYS 2020 General Physics 2 or PHYS 1110 General Physics 1 and PHYS 1120 General Physics 2 and PHYS 1140 Experimental Physics 1 . . . . .	9-10

Complete one semester of college calculus:  
MATH 1300 Analytic Geometry and Calculus 1  
or APPM 1350 Calculus for Engineers 1 . . . . . 5

*Note:* Certain courses taken in other departments may be counted toward the 38 hours required for the EPOB major. Such courses should be strongly related to the student's vocational goals. No more than 12 semester hours of courses taken in other departments may be presented. (If MCDB 1050 and 1060 are used to fulfill the general biology requirement, those 8 hours will be counted as part of the 12-hour limit for courses taken outside the department.) A listing of the only acceptable courses may be obtained from the EPOB Office, Ramaley 122.

For transfer students, a minimum of 12 hours in EPOB courses on the Boulder Campus is required.

### GRADUATE DEGREE PROGRAMS

The Department of Environmental, Population, and Organismic Biology offers degree programs leading to the M.A. and Ph.D. in a wide range of areas of biological inquiry. Offerings include animal behavior, plant and animal physiology, plant and animal systematics, ecology, aquatic biology, population biology, population genetics, neurobiology, microbiology, and behavioral genetics. Modern laboratory facilities for graduate study are in the Ramaley Biology Building. In addition, the Department has strong ties with the Institute of Arctic and Alpine Research (INSTAAR) and with the Institute of Behavioral Genetics (IBG). INSTAAR operates the Mountain Research Station, an alpine field laboratory 25 miles from campus. Certain specialized facilities, such as scanning and transmission electron microscopes, are available through the Department of Molecular, Cellular, and Developmental Biology. Graduate research support is available in the form of fellowships, teaching assistantships, and research assistantships. The department has a small endowment (the Alexander Fund and the Kathy Lichty Fund) to help defray field research expenses of graduate students.

### Graduate Admission

Admission materials may be obtained from the departmental office. Completed applications are due in the departmental office by February 1 for consideration for fall semester admission. A complete application includes a statement of intent, letters of recommendation, transcripts, and GRE scores. Applications for spring semester admission are discouraged. Although there are no formal course prerequisites for

admission, background and training in biology are expected. Students admitted without a sufficient background in chemistry, physics, or mathematics are expected to make up those deficiencies during their first year of graduate study.

### The M.A. I Program

A master's degree with thesis is offered for students interested in continuing training as professional biologists after completion of the degree. For some students the M.A. I provides a basis for work on a Ph.D. at the University of Colorado or at another institution, although the M.A. is not required for admission to the Ph.D. program. Prospective students are urged to consult with the faculty member who would be their advisor concerning whether application for the M.A. I or Ph.D. program is appropriate. Applicants should communicate with potential advisors before February 1. Applications for the M.A. I program are considered on a competitive basis; the department has a policy of limiting the number of admittees to those for whom financial support is available. Twenty-four hours of course work, including 6 hours of thesis credit, are required for the degree. In addition to a thesis based on original research, students are required to take comprehensive examinations, as described for the M.A. II.

### The M.A. II Program

A nonthesis master's degree program is offered for students interested in obtaining a greater knowledge of biology but not interested in degree work beyond the M.A. This program is suitable for secondary school teachers and others whose career choices do not require a research thesis. Applications for the M.A. II program are considered on a noncompetitive basis; students with records indicative of an ability to do master's level course work are accepted. A faculty sponsor is also required before admission can be granted; applicants are encouraged to communicate with potential sponsors before February 1. In addition to 26 hours of course work, the student must complete 4 hours of independent study or research leading to a paper to be presented to the faculty sponsor. Before completion of the degree the student must take a comprehensive examination, which consists of four half-day written examinations; one of these examinations will be in general biology. The other three may be chosen from (1) biology of special taxa; (2) anatomy, morphology, and physiology; (3) genetics and evolution; (4) taxonomy and systematics; (5) animal behavior; and

(6) ecology. Financial support is not guaranteed for M.A. II students.

### Doctoral Program

The Ph.D. is a research degree, involving the production of a major piece of original research (the thesis). Most recipients of the Ph.D. from EPO Biology go on to teach in a university setting or to do research in private or government laboratories. Since the area of work chosen for the Ph.D. is likely to determine the student's career options, applicants are urged to communicate directly with potential thesis advisors and to visit the department before completing the application. Applications are considered on a competitive basis and financial support in the form of fellowships or assistantships is made available to Ph.D. students. Ph.D. students are expected to form an advisory committee of five faculty members (including one from outside EPO Biology) soon after beginning their studies. This committee will aid the student in designing a research program and in making choices concerning course work. By the end of the third semester of graduate work, the Ph.D. student takes preliminary examinations which are similar to the M.A. comprehensive (see above). If these are successfully completed, the comprehensive examination should then be scheduled as soon as possible. The comprehensive exam covers the student's area of research and is based in large part on a proposal for thesis research prepared by the student. Upon completion of the thesis a final examination is administered by the advisory committee.

The only specific course work requirement for the Ph.D. is four 6000-level graduate seminars. A total of 30 hours of course work must be taken, although independent study credit may be included in this total. Ph.D. students are required to teach at least one year; this is generally done by serving as a departmental teaching assistant.

## Biology—Molecular, Cellular, and Developmental

Degrees . . . . . B.A., M.A., Ph.D.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

Major Requirements	Semester Hours
MCDB 1050 and 1060 Introduction to MCD	
Biology or EPOB 1210 and 1220 General	

Biology and EPOB 1230 and 1240	
General Biology Laboratory . . . . .	8
MCDB 3120 Cell Biology and 3140 Cell Biology Laboratory . . . . .	5
MCDB 3400 Molecular Genetics . . . . .	4
MCDB 4650 Developmental Biology and 4660 Developmental Biology Laboratory . . . . .	5
Electives in MCDB . . . . .	9
CHEM 1111 and 1131 General Chemistry . . . . .	10
or CHEM 1151 and 1171 Honors General Chemistry . . . . .	12
CHEM 3311 and 3331 Organic Chemistry and CHEM 3321 and 3341 Laboratory in Organic Chemistry . . . . .	8
or CHEM 3351 and 3371 Organic Chemistry for Chemistry Majors and CHEM 3361 and 3381 Laboratory in Organic Chemistry for Chemistry Majors . . . . .	10
CHEM 4711 General Biochemistry . . . . .	3
PHYS 1110 and 1120 <sup>1</sup> General Physics and PHYS 1140 Experimental Physics . . . . .	9
or PHYS 2010 and 2020 General Physics . . . . .	10
MATH 1300 Analytic Geometry and Calculus I . . . . .	5

Students interested in MCD Biology should consult with an advisor in the Department. Recent changes in the list of available courses and other pertinent information for majors are described in a brochure available from the departmental office.

### GRADUATE DEGREE PROGRAMS

Opportunities for graduate study and original research are available in a variety of areas:

**Molecular Biology:** Gene regulation, virology, nucleic acid-protein interactions, bacteriophage control mechanisms, chromosome structure and function, chromosome replication, control of bacterial replicons, and protein synthesis in cultured cells.

**Cell Structure and Function:** Cytoskeleton, biophysical cytology, flagellar and centriolar assembly, cell biology of plant cell wall synthesis, cell division in green algae, and high voltage electron microscopy.

**Developmental Biology:** Mechanisms and regulation of morphogenesis and cell growth, genetic control of development, developmental genetics of *Drosophila* and *Caenorhabditis*, and cellular aging.

**Membrane Biology and Neurobiology:** Mitochondrial biogenesis, spatial arrangement of cytomembranes, sensory and developmental neurobiology.

**Entrance Requirements and Prerequisites.** The graduate programs of the Department of Molecular, Cellular, and Developmental Biology are sufficiently flexible to accommodate students with a wide range of training. Students with bachelor's degrees in any of the biological, biochemical, or physical sciences are encouraged to apply. Background necessary for the program includes the equivalent of undergraduate courses in cell biology, developmental biology,

genetics, organic chemistry, chemical thermodynamics, differential and integral calculus, and general physics.

These requirements are intentionally stated in terms of areas of knowledge rather than as credits in specific courses. Students accepted with deficiencies may demonstrate mastery of the required areas by taking appropriate undergraduate courses, by passing advanced-standing examinations, or by successfully completing graduate-level courses that require the undergraduate courses as prerequisites.

**Areas of Study.** All students will be expected to develop competence in five areas: (1) *biochemistry*, including biochemical phenomena associated with cellular and molecular biology; (2) *genetics*, including molecular mechanisms of gene function, regulation of gene activity, genetic control of development, and chromosome behavior; (3) *cell structure and function*, including interaction of organelles, molecular organization, ultrastructure, biosynthesis, growth and reproduction; (4) *developmental systems and mechanisms*, including types of developmental phenomena and the morphological and molecular mechanisms involved; and (5) *current research techniques* of experimental biology.

### Doctoral Program

**Course of Study.** The faculty of the Department offer a variety of courses to help graduate students acquire knowledge in the various areas of study. Further, students are required to work in at least three different laboratories to broaden their education and to help them identify the field of greatest interest for their thesis work.

**Examination Sequence.** At the time of entrance a counseling committee examines each student's background and interests and recommends courses for the first year in residence.

A preliminary evaluation is held at the end of the student's second semester in residence to determine eligibility for continued graduate study and to identify areas of weakness, if any.

The comprehensive examination, which is normally scheduled during the student's fourth regular semester in residence, consists of two parts: a written research proposal and an oral examination designed to test the student's mastery of the broad field of knowledge related to his or her overall degree program.

**Language.** Before taking the comprehensive exam, students must satisfy the language requirement established by the Graduate School.

<sup>1</sup>Corequisite of MATH 2300

**Thesis.** The principal elements in graduate training are defining a thesis problem, investigating this problem with a coherent piece of research that constitutes a substantial contribution to knowledge, and writing a report on this work in the form of a thesis submitted to a departmental committee for approval. After completion of the thesis, each candidate for the Ph.D. degree is required to take a final oral examination on the thesis and related topics, and to present a public seminar.

**Teaching.** Two semesters of apprentice teaching are required of each candidate for the Ph.D. degree. Normally this obligation is met during the student's second or third year of graduate study.

**Course Requirements.** A minimum of 30 semester hours of courses numbered 5000 and above is required. Specific courses depend on the student's background and field of specialization.

In view of the strong research orientation of the fields involved, the Department does not accept applications from students seeking the M.A. as a terminal degree. The Master of Arts degree, either with a thesis (Plan I) or without (Plan II), is awarded under special circumstances. Candidates must pass the preliminary examination and a comprehensive final examination. There is no foreign language requirement. For Plan I a thesis based on original research must be submitted. Final determination of whether a student will follow Plan I or Plan II is made by the Department.

## BLACK STUDIES

*Degree* . . . . . B.A.

The Black Studies Program is multidisciplinary and offers courses in the humanities and social sciences. Some of these courses will satisfy the area requirements in the College of Arts and Sciences. Its primary purpose is to explore, analyze, and experience various aspects of African-American life, history, and culture; the program is enhanced by courses, seminars, and colloquia which focus on the African and Caribbean experience as well. The program offers a major which leads to the B.A. in Black Studies.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
BLST 2000 Introduction to Black Studies	3
BLST 4500 Research Methods in Black Studies	3
BLST 4950 Senior Seminar in Black Studies	3

At least 3 credit hours are required from each of the categories below:

Literature	3
BLST 2600 Introduction to African Literature	
BLST 2722 Survey of African-American Literature 1	
BLST 2732 Survey of African-American Literature 2	
Music, Art, and Dance	3
BLST 2400 African-American Dance 1	
Social Sciences	3
BLST 2030 Behavioral Analysis 1	
BLST 2040 Behavioral Analysis 2	
Additional course work in a subject area chosen by the student and approved by the Black Studies Program	15

## CENTRAL AND EAST EUROPEAN STUDIES

*Degree* . . . . . B.A.

All schedules for students majoring in Central and East European Studies must be approved by the advisor of the program.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
Courses numbered 2000 or above dealing with problems of Central or Eastern Europe or the Soviet Union, which are offered by any department in the College of Arts and Sciences; e.g., Economics, Geography, History, Political Science, Slavic Languages, and Sociology	48
Demonstrated proficiency in German, Russian, Polish, Serbo-Croatian, or any other Central European language	

**Note:** The specific courses that may be counted to meet these requirements are to be determined by the advising committee for the Bachelor of Arts in Central and East European Studies and the Dean of the College of Arts and Sciences.

## CHEMISTRY AND BIOCHEMISTRY

*Degrees* . . . . . B.A., M.S., Ph.D.

## BACHELOR'S DEGREE REQUIREMENTS

A student can earn a Bachelor's degree in Chemistry in one of two ways: with the Chemistry option or with the Biochemistry option.

<i>Major Requirements</i>	<i>Semester Hours</i>
CHEMISTRY OPTION	
Students must present credits in the following courses or their equivalents.	
CHEM 1111 and 1131 General Chemistry or CHEM 1151 and 1171 Honors General Chemistry (Honors CHEM 1151 and 1171 are recommended for the student with advanced high school training in mathematics or physics.)	10-12
CHEM 3351 and 3371 Organic Chemistry for Chemistry majors	6
CHEM 3361 and 3381 Laboratory in Organic Chemistry for Chemistry majors	4
CHEM 4181 Instrumental Analysis	4

CHEM 4511 and 4531 or 4551 Physical Chemistry	6
CHEM 4561 Experimental Physical Chemistry	3
<i>Note:</i> A minimum of 33 semester hours in chemistry is required for a degree.	
PHYS 1110 and 1120 General Physics	8
PHYS 1140 Experimental Physics	1
MATH 1300, 2300, and 2400 Analytical Geometry and Calculus	14

All students, but especially students intending to enter graduate school in chemistry, should take advanced courses. Recommended courses are the following: CHEM 4901, 4011 or 5011, 4711, 4731, 5161 or 5171 or 5181, or a third semester of physical chemistry.

## BIOCHEMISTRY OPTION

Students must present credits in the following courses or their equivalents.

CHEM 1111 and 1131 General Chemistry	10
or CHEM 1151 and 1171 Honors General Chemistry	12
(Honors CHEM 1151 and 1171 are recommended for the student with advanced high school training in mathematics or physics.)	
CHEM 3311 and 3331 Organic Chemistry	6
CHEM 3321 and 3341 Laboratory in Organic Chemistry	2
CHEM 4411 or 4511 Physical Chemistry	3
CHEM 4531 or 4551 Physical Chemistry	3
CHEM 4711 and 4731 General Biochemistry	6
CHEM 4761 General Biochemistry Laboratory	4
PHYS 1110 and 1120 General Physics	8
PHYS 1140 Experimental Physics	1
MATH 1300, 2300, and 2400 Analytical Geometry and Calculus	14
MCDB 1050 and 1060 Introduction to MCD Biology or EPOB 1210 and 1220 General Biology and EPOB 1230 and 1240 General Biology Laboratory	8
MCDB 3400 Molecular Genetics	4

All Biochemistry option students, and especially students intending to enter graduate school in the biological sciences, should take additional advanced courses. Especially recommended are the following: CHEM 4901, 4181, and 4011. Also courses in the biological sciences, such as MCDB 3120, 4650, 4720, and 4410, and EPOB 3200 and 3700.

**ACS Certification.** The American Chemical Society maintains a certification program in which a student graduating with a specified minimum program is certified to the society upon graduation. To be certified, a graduate must satisfy requirements in addition to the minimum for graduation. A list of these requirements may be obtained from the Department office.

**Chemistry Honors Program.** Opportunity is provided for qualified Chemistry and Biochemistry option majors to participate in the Chemistry Honors Program and graduate with honors (*cum laude*, *magna cum laude*, or *summa cum laude*) in chemistry. Students interested in the Honors Program should contact the departmental honors advisor during their junior year.

**Transfer students** who plan to take a Chemistry or Biochemistry option major must complete at the Boulder Campus a



minimum of 9 credit hours of upper-division work covering at least two of the subdisciplines: organic, physical, analytical, inorganic, and biochemistry.

A more detailed listing of the bachelor's degree requirements, together with advising information and alternate course options, is available at the Department of Chemistry and Biochemistry office.

### GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in chemistry leading to candidacy for an advanced degree should read carefully Requirements for Advanced Degrees in the Graduate School section. For information on the doctoral program in Chemical Physics offered jointly with the Department of Physics, see Chemical Physics under Interdepartmental Programs in the Graduate School section of this *Catalog*. Following are some of the special departmental requirements. Copies of more detailed rules are distributed to graduate students.

*Prerequisites.* An undergraduate major in chemistry, biochemistry, or a related field is desirable since entering graduate students are required to take examinations and complete selected course work covering the major fields of chemistry and biochemistry. GRE scores are required for fellowship competition; they are strongly recommended but not required for admission to the Department. They may be waived under special circumstances.

### Master's Degree

*Language.* A student must demonstrate proficiency in a foreign language at a level comparable to a third-semester undergraduate course. This requirement may be satisfied either by having received a satisfactory grade in a third-semester course or by an equivalent grade in the Graduate Student Foreign Language Test (GSFLT). Organic chemistry majors must satisfy this requirement in German; students in other fields may fulfill the requirement in French, German, Japanese, or Russian.

*Examinations.* Preliminary examinations are given during registration week of the fall semester. These examinations are offered in five fields: analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry. They cover undergraduate-level material, and their purpose is to determine qualifications for advanced study. A student must take examinations in physical chemistry and at least two other subjects. The grades earned in any three of these examinations will

be used to determine what courses the student must take.

Candidates must pass master's final oral examinations at the time of completion of their work.

*Course Requirements.* There are two methods of obtaining a master's degree from the Department of Chemistry and Biochemistry. Plan I requires 24 credit hours including 15 to 20 credit hours of formal course work, 4 to 9 credit hours in research courses, the completion of research investigation, and the presentation of a thesis. Plan II requires 30 credit hours including 24 credit hours of formal course work plus 6 credit hours of research, but no thesis; Plan II is available only with departmental approval.

### Doctor's Degree

*Language.* The language requirement is similar to that for the master's degree except that the level of proficiency required is that of a fourth-semester undergraduate course.

*Examinations.* Entering students take the series of preliminary examinations described for the master's degree. These examinations are used in an advisory capacity. During the first four to six semesters, Ph.D. students must pass a comprehensive examination consisting of a series of cumulative exams, prepare a written proposal, and pass an oral examination. Students entering with a master's degree start the comprehensive examinations in their second semester; others start them in their third semester. A final oral examination is primarily a defense of the candidate's thesis.

### CHICANO STUDIES

The Chicano Studies Program at the University of Colorado offers all students a conceptual means by which bilingualism and biculturalism may be understood. It also offers a context for the analysis and appreciation of ethnoracial pluralism in the United States. The undergraduate program provides students majoring in related disciplines an extensive knowledge and insight into the largest single language minority in the country. It also provides an academic context for the study of the Chicano experience in both an historic and demographic/structural framework.

The Department encourages students to include in their studies the study abroad programs offered in Mexico in order to gain deeper understanding of the culture and attitudes of Mexico and their carryover into the United States, especially the Southwest. Study abroad

information appears in this *Catalog* under International Education in the University Policies, Programs, and Services section.

### CLASSICS

*Degrees . . . . . B.A., M.A., Ph.D.*

Upon consultation with the undergraduate advisor, the major in Classics is tailored to the student's interests in the field. Major programs can be arranged with a concentration in either Latin or Greek or a combination of the two, or a broadly based program in classical antiquities (mythology, literature, philosophy, religion, art, archaeology, and history). Prospective majors should consult with the undergraduate advisor and the departmental major list.

### COMPLETION OF MAPS

Beginning Fall Semester 1988, a Level-III high school foreign language course is required as one of the Minimum Academic Preparation Standards for admission to the University. This requirement may also be satisfied by demonstrating equivalent proficiency through placement testing or by satisfactorily completing CLAS 3113 (Greek) or CLAS 2114 (Latin). For details on completion of MAPS, see page 38.

### COMPLETION OF ARTS AND SCIENCES LANGUAGE REQUIREMENT

Until Fall Semester 1990, completion of a Level-III high school language course will fulfill the College graduation requirement in foreign language. This requirement may also be satisfied by completing CLAS 2114 or by demonstrating equivalent proficiency by placement test. Students who have studied Latin in high school and wish to continue with the language will be placed according to the results of their placement examinations taken during student orientation. Students may not receive credit for a course at a lower level than that into which they are placed. Questions concerning language placement should be directed to the Classics Department office.

### BACHELOR'S DEGREE REQUIREMENTS

<i>Major Requirements</i>	<i>Semester Hours</i>
Track I	
Greek, Latin . . . . .	36
Electives (General Classics and Honors courses dealing with the ancient world, ancient history, classical archaeology) . . . . .	6
Track II	
CLAS 1100 Greek Mythology . . . . .	3
CLAS 3610 From Paganism to Christianity . . . . .	3
CLAS 1110 Masterpieces of Greek Literature in Translation and CLAS 1120 Masterpieces of	

Roman Literature in Translation or two 4000-level courses in translation of literature . . . . .	6
Classical Archaeology at 4000 level . . . . .	6
Maximum of 6 credit hours may be substituted for required General Classics courses (with permission of Undergraduate Advisor)	
Electives (from General Classics, Greek or Latin, or from Honors courses dealing with the ancient world) . . . . .	6
Ancient History (selected from the following History courses: 1051, 1061, 3011, 3051, 4021, CLAS 4031, 4071, 4081, 4091. CLAS 4051 and 4761 may be substituted for any of the history courses) . . . . .	12
CLAS 2114 and one higher course, or CLAS 3113 and one higher course . . . . .	6

## GRADUATE DEGREE PROGRAMS

### Master's Degree

The candidate may choose to emphasize Greek, Latin, classical antiquities, classical humanities, or the teaching of Latin.

The student choosing to emphasize Greek or Latin as a major will be required to take a qualifying examination to demonstrate ability in translating Greek or Latin.

The student choosing to emphasize classical antiquities or classical humanities will be required to take a qualifying examination to determine a breadth of knowledge in the general area of classical Greek and Roman culture. It is expected that the student opting for the teaching of Latin either has achieved accreditation at the secondary level or is planning to do so through the regular School of Education program. The M.A. degree alone does not satisfy the state requirements for certification.

**Language Requirement.** The Department requires a reading knowledge of one modern language for those students emphasizing the study of Greek or Latin. A student concentrating on one of the classical languages must demonstrate competence in the other classical language appropriate for a student with two years of college Latin or Greek.

**Degree Requirements.** Candidates for the M.A. degree in Latin or Greek will be required to take written comprehensive examinations in the following fields:

1. The language (translation test), literature, and history of either Rome or Greece. This examination will be both comprehensive and detailed.
2. The literature and history of Rome or Greece. This examination will test the candidate's general survey knowledge of these fields.

Candidates for the M.A. Plan I (24 hours including thesis) will take an oral examination in defense of the thesis. Candidates for the M.A. Plan II (30 hours without thesis) must have departmental approval.

Candidates for the M.A. degree with emphasis upon either classical antiquities or classical humanities will be required to complete at least one graduate-level course in either Greek or Latin with a grade of *B*, will be required to take written comprehensive examinations, and must take Plan II (30 hours without thesis).

Candidates for the M.A. degree with emphasis on the teaching of Latin will take an oral comprehensive examination based on the courses taken and a reading list. Thirty hours of course work, including two Latin workshops and a Special Project, will be required.

### Doctor's Degree

The candidate may choose to emphasize Greek and Latin languages and literatures or classical archaeology and history. For those selecting the languages and literatures emphasis, the following are required:

1. A qualifying examination to demonstrate ability to translate (with dictionary) Greek and Latin texts.
2. A reading knowledge of two modern foreign languages; one must be German and the other is to be approved by the Department.
3. Successful completion of at least four graduate seminars.
4. Comprehensive examinations. The candidate will be tested in Greek and Latin languages (translation tests) and will write examinations on a major classical author and one of the following special fields: art and archaeology, history, linguistics, mythology and religion, paleography, or philosophy. There will be an oral examination in which the student is expected to demonstrate overall factual knowledge of the field of classics.
5. The candidate must write a Ph.D. dissertation, which is a contribution to knowledge, and complete an oral examination on the dissertation.

For those selecting the archaeology and history emphasis, the following are required:

1. A qualifying examination to demonstrate ability to translate (with dictionary) texts in the major language, either Latin or Greek.
2. A reading knowledge of two modern foreign languages; one must be German and the other is to be approved by the Department.
3. Successful completion of at least four graduate seminars.
4. Comprehensive examinations. The candidate will be tested in the Greek or Latin language (translation tests) and will write examinations in classical archaeology, history, and on a major classical author. There will be an oral

examination in which the student is expected to demonstrate his or her overall factual knowledge of the field of classics.

## COMMUNICATION

*Degrees . . . . . B.A., M.A., Ph.D.*

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
Optional courses	
Two of the following courses may be counted toward the 30-hour major requirement, if taken before any upper-division courses are attempted. For advanced students these courses will be counted as elective credit only:	
COMM 1020 Introduction to Communication . . . . .	3
COMM 1240 Introduction to Organizational Communication . . . . .	3
COMM 2200 Public Speaking . . . . .	3
COMM 2500 Information Theory: Background of Contemporary Developments . . . . .	3
Courses required of all majors:	
COMM 2030 Interpersonal Communication . . . . .	3
COMM 2150 Small Group Communication . . . . .	3
COMM 3200 Principles and Practices of Argumentation . . . . .	3
Upper-division electives. Majors must elect 15-21 hours from the following list:	
COMM 3350 Laboratory in Interpersonal Communication . . . . .	3
COMM 4000 Special Topics . . . . .	3
COMM 4030 Advanced Interpersonal Communication . . . . .	3
COMM 4200 Persuasion . . . . .	3
COMM 4210 Psychology of Communication . . . . .	3
COMM 4230 Nonverbal Dimensions of Communication . . . . .	3
COMM 4240 Organizational Communication . . . . .	3
COMM 4260 Communication and Conflict . . . . .	3
COMM 4270 Intercultural Communication . . . . .	3
COMM 4500 Human Communication Theory . . . . .	3
COMM 4840-4900 Independent Study . . . . .	3
COMM 4930 Senior Internship . . . . .	1-6

Students are encouraged to take three to five courses specifically related to the major in other departments or disciplines such as Business (available to Arts and Sciences students in summer terms only), English, Journalism and Mass Communication, Political Science, or Theatre and Dance.

New students must enter the Pre-Communication program. Pre-Communication students receive departmental advising and priority admission to lower-division communication courses.

Communication major status and priority admission to advanced courses is granted to students only after they have demonstrated acceptable progress toward a degree. Students may apply and will normally be admitted to the Communication major only after they have accumulated 24 "progress" points, to be determined as follows.

One point will be awarded for each of the following: declaring a Pre-Communication major; each semester (15 or more hours) satisfactorily completed;

each half-point in the cumulative grade point average, e.g., GPA 2.50=5 points; each semester of foreign language requirement completed (max: 3); each semester of the college humanities requirement completed (max: 4); each semester of the college natural science requirement completed (max: 4); each semester of the college social science requirement completed (max: 4); each communication course completed (max: 10); and each "honor point" earned in the major (one credit hour with a grade of B=1 honor point; a grade of A=2 honor points.)

The above advanced standing requirements apply only to students admitted prior to Fall 1988. New advanced standing requirements will be determined by the Communication Department.

*Note:* The minimum conditions for graduation would entail at least 38 "progress" points. A student who completes the foreign language requirement completed in high school and who earns a 4.00 GPA might earn as many as 30 points by the end of the first semester.

Students with an interest in Communication are encouraged to see a departmental advisor each semester to discuss progress toward major status and/or completion of degree requirements.

**GRADUATE DEGREE PROGRAMS**

Admission to the graduate program in Communication is suspended. M.A. and Ph.D. programs are expected to reopen in the fall of 1988. Contact the Department for current admission requirements and curriculum information.

**COMMUNICATION DISORDERS AND SPEECH SCIENCE (CDSS)**

*Degrees . . . . . B.A., M.A., Ph.D.*

The Bachelor of Arts degree with a major in Communication Disorders and Speech Science provides a broad general education, develops concepts basic to human communication and normal language processes, and provides an understanding of disorders of speech, hearing, and language. This material serves as necessary background for entrance into professional training at the graduate level.

**BACHELOR'S DEGREE REQUIREMENTS**

Completion of general requirements and the major requirements listed below:

*Major Requirements Semester Hours*  
Majors must present a minimum of 36 semester hours of course work listed in the schedule below.

**Sequence A (Freshman or Sophomore Year)**

*Fall*  
EPOB 3420 Introduction to Human Anatomy (Prereq., EPOB 1210 and 1220, MCDB 1050 and 1060, or NASC 1230 and 1240) . . . . . 5  
CDSS 3106 General Phonetics . . . . . 3  
*Spring*  
CDSS 4560 Language Development (Prereqs., PSYC 1001 and LING 2000) . . . . . 3

**Sequence B (Sophomore or Junior Year)**

*Fall*  
CDSS 2500 Voice and Diction . . . . . 3  
*Spring*  
CDSS 3006 Introduction to Speech and Hearing Sciences . . . . . 3  
CDSS 3120 Anatomy and Physiology of the Speech and Hearing Mechanisms (Prereq., EPOB 3420) . . . . . 4  
*Note:* Before entering the third year of study, students should have completed at least 6 semester hours of psychology and biology.

**Sequence C (Junior or Senior Year)**

*Fall*  
CDSS 4502 Speech Disorders 1 . . . . . 4  
CDSS 4704 Audiology 1 . . . . . 3  
CDSS 4918 Observation and Cotherapy . . . . . 1  
*Spring*  
CDSS 4512 Speech Disorders 2 . . . . . 4  
CDSS 4714 Audiology 2 . . . . . 3  
CDSS 4918 Observation and Cotherapy . . . . . 1  
(only one semester of CDSS 4918 is required and may be taken in either the fall or spring)

**Sequence D (Senior Year)**

Courses in Sequence D are available to students who have completed Sequences A, B, and C. Sequence D is not required for a B.A. degree in Communication Disorders and Speech Science and need not be taken in its entirety.

*Fall*  
CDSS 2304 American Sign Language 1 . . . . . 3  
Graduate-level course . . . . . 2-3  
*Spring*  
CDSS 2314 American Sign Language 2 . . . . . 3  
Graduate-level course . . . . . 2-3

**GRADUATE DEGREE PROGRAMS**

The graduate curriculum in Communication Disorders and Speech Science leads to either a master's or a doctoral degree. The programs in speech-language pathology and audiology are accredited by the American Speech-Language-Hearing Association (ASHA).

Prospective students should read Requirements for Advanced Degrees in the Graduate School section of this *Catalog* and request additional information from this Department.

**Master's Degree**

The master's program in communication disorders emphasizes clinical training and experiences. The program leads to certification by ASHA and the Colorado State Department of Education in speech-language pathology and/or audiology. Students having an undergraduate degree in speech-language pathology and audiology can expect to spend two calendar years to complete the program. Those without such background are required to make up undergraduate deficiencies which normally require at least an additional year. Full-time graduate study is required. Students not seeking clinical certification may place major emphasis on speech-hearing science.

**Doctor's Degree**

The doctoral program demands demonstrated expertise beyond the academic knowledge and clinical skills required for clinical certification. Supervisory, administrative, instructional, and research activities are provided to acquaint the student with problems and concepts at a higher level of activity and responsibility.

Wide latitude prevails in planning individual programs. It is expected that students will have some professional experience before entering the program, and that they will have specific academic or professional goals in mind. Student degree plans are individually prepared through the joint efforts of the student and an advisory committee.

Ph.D. candidates must take a four-course sequence in statistics and computer science in addition to the Graduate School foreign language requirement, which can be satisfied with American Sign Language.

**COMPARATIVE LITERATURE**

*Degrees . . . . . M.A., Ph.D.*

**GRADUATE DEGREE PROGRAMS**

Students wishing to pursue graduate work in Comparative Literature leading to candidacy for an advanced degree should read the information provided in the Graduate School section of this *Catalog* and the guidelines for the M.A. and Ph.D. degrees in this field. These guidelines contain the most recent information on program requirements and are available from the Comparative Literature Program, Campus Box 292.

All entering students must submit GRE scores, a sample course paper, and statements describing intellectual goals and language preparation. Normally,

entering students will have majored in a national literature; applicants who have majored in a related field or have substantial training in literature may also apply.

**Master's Degree**

*Prerequisites.* Upon entrance to the program, students must have pursued one foreign language to the point of being able to take courses at the 4000 level and have completed a second-year college course in a second foreign language.

*Requirements.* Students take the Proseminar in Comparative Literature and Introduction to Literary Theory in their first two semesters. Half the required credit hours are in courses offered by the Program in Comparative Literature. At least 9 hours are in courses numbered 4000 or above in the department of the student's primary literature, and at least 3 hours are in the department of the secondary literature (6 hours if the primary literature is English).

*Examinations and Thesis.* There are two options for the M.A. degree. Students may elect to write a thesis, in which case they must take a minimum of 24 hours of course work and 6 hours of M.A. thesis credit. Students intending to enter the Ph.D. program must choose this option. Students who do not intend to proceed to the Ph.D. may elect to take 30 hours of course work. Upon completion of the course requirements for the M.A., all students must take a comprehensive exam.

**Doctor's Degree**

*Prerequisites.* An M.A. degree in Comparative Literature, in a national literature (which may be English), or in a cognate discipline (e.g., philosophy). Students must have a reading knowledge in two languages and have begun study of a third. One of these three must be an ancient language.

*Requirements.* Students take the Proseminar in Comparative Literature and Introduction to Literary Theory in their first two semesters. Students also take the Colloquium in Comparative Literature, normally in their second or third year. Students will complete a minimum of 30 hours of graduate course work. Half the required credit hours are in courses offered by the Comparative Literature Program. At least 9 hours are in graduate courses in the department of the primary literature, and 6 hours are in the department of the secondary literature. Students must satisfy their language requirements by the beginning of their third semester of study.

*Examinations and Thesis.* All Ph.D. candidates take a comprehensive examination and a final examination. The final examination is an oral defense of the dissertation, which will be conducted by the student's advisory committee after all other requirements for the Ph.D. have been completed.

**COMPUTER SCIENCE APPLICATIONS**

A Computer Science Applications major has been established as a part of the Distributed Studies major program. This major requires a minimum of 60 semester hours: 30 hours in computer science, and 30 hours in a participating department. Fifteen hours in each department must be upper-division course work. Students must have a 2.00 grade point average and 30 hours of C grade or better, including the 15 hours of upper-division work, in each department. A senior project is a recommended option for this major.

No first-year course in foreign language or English composition may be used to fulfill the major requirements.

Students applying for a second B.A. degree may not use courses from a completed major program, either from CU-Boulder or another college or university, in a Computer Applications major.

For additional information on the program, as well as a list of departments participating in the major, consult the College of Arts and Sciences Dean's Office.

**BACHELOR'S DEGREE REQUIREMENTS**

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
CSCI 1200 Introduction to Programming 1	3
CSCI 1210 Introduction to Programming 2	3
CSCI 2204 Discrete Structures 1	3
CSCI 2214 Discrete Structures 2	3
CSCI 2250 Data Structures and Algorithms	3
CSCI 3245 Survey of Programming Languages	3
CSCI 3263 Computer Systems	3
CSCI 3287 Database and Information Systems	3
CSCI 4208 Senior Project	3
CSCI 4218 Senior Project	3
and completion of 30 hours in an Arts and Sciences department that is participating in this program, 15 hours of which must be upper division.	

For information on the B.S. degree offered in Computer Science, see the College of Engineering and Applied Science section.

**CONFLICT AND PEACE STUDIES**

Conflict and Peace Studies offers a program in the causes and resolution of international, national, and domestic conflict. Under the conjoint sponsorship of the Departments of History, Philosophy, Political Science, and Sociology, the program provides a broad interdisciplinary curriculum of courses, seminars, and independent study both in the natural and social sciences and in the humanistic disciplines. In addition to promoting the historical and theoretical understanding of conflict and peace, the program also aims at advancing, through field research, first-hand knowledge of the sources of conflict and of its resolution through mediation, arbitration, human interaction, and the generation of alternative solutions. The program's combination of theoretical and practical learning allows students to prepare for careers related to problems of conflict and peace.

Although no formal major is offered in Conflict and Peace Studies, students may design an Individually Structured Major within the guidelines set forth by the Dean of the College of Arts and Sciences. An Individually Structured Major allows students a great deal of flexibility for intensive study of issues relating to conflict and peace.

**DISTRIBUTED STUDIES PROGRAM**

*Degree . . . . . B.A.*

Students working toward the B.A. degree may elect a two- or three-area in the Distributed Studies Program. The areas that may be used in the program are limited to those in which a departmental major for the B.A. is offered. Astrophysical, Planetary, and Atmospheric Sciences is acceptable only as a secondary area.

Students wishing to pursue a two-area major must complete 30 hours of course work in each department; 15 hours in each department must be upper-division course work. Students must have a 2.00 grade point average and 30 hours of C grade or better, including the 15 hours of upper-division course work, in each department.

In a two-area major, each department must approve the student's program, and therefore either department may deny the student's proposal.

Students pursuing a three-area major must designate one area as primary and the other areas as secondary. In the primary area, 30 hours of work including 15 hours of upper-division work

must be completed. A grade point average of 2.00 in the primary area and 30 hours of C grade or better, including the 15 hours of upper-division work, are required.

In the secondary areas the student must complete 15 hours in each of the departments, including 8 hours of upper-division work in each department. A grade point average of 2.00 is required in each of the secondary areas, as well as 15 hours of C grade or better, including the 8 hours of upper-division work in each department.

No first-year course in a foreign language or English language (composition) may be used to fulfill the requirements of the Distributed Studies major.

Students applying for a second B.A. degree may not use courses from a completed major program, either from CU-Boulder or another college or university, in a Distributed Studies major.

## ECONOMICS

*Degrees . . . . . B.A., M.A., Ph.D.*

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
Pre-Economics Major	
ECON 2010 Principles of Microeconomics and ECON 2020 Principles of Macroeconomics . . . . .	8
MATH 1070 Mathematics for Social Sciences and Business, MATH 1080 Calculus for Social Science and Business, and either ACCT 2000 Introduction to Financial Accounting or CSCI 1200 Introduction to Programming 1 . . . . .	9
or MATH 1070 Mathematics for Social Science and Business and MATH 1300 Analytic Geometry and Calculus 1 . . . . .	8
or MATH 1100 College Algebra and Trigonometry and MATH 1300 Analytic Geometry and Calculus 1 . . . . .	10
or MATH 1300 Analytic Geometry and Calculus 1 and MATH 2300 Analytic Geometry and Calculus 2 . . . . .	10
<i>Note:</i> First-year students interested in Economics will be assigned a Pre-Economics major code. Application for admission to the Economics major should be made during the sophomore year, after completion of ECON 2010, ECON 2020, and two of the above mathematics courses. Admission to the major is competitive and requires a minimum grade point average of 2.50 in these prerequisite courses.	
Economics Major	
ECON 2010 Principles of Microeconomics and ECON 2020 Principles of Macroeconomics . . . . .	8
MATH 1070 Mathematics for Social Science and Business, MATH 1080 Calculus for Social Science and Business, and either ACCT 2000 Introduction to Financial Accounting or CSCI 1200 Introduction to Programming 1 . . . . .	9
or MATH 1070 Mathematics for Social Science and Business and MATH 1300 Analytic Geometry and Calculus 1 . . . . .	8
or MATH 1100 College Algebra and Trigonometry and MATH 1300 Analytic Geometry and Calculus 1 . . . . .	10
or MATH 1300 Analytic Geometry and Calculus 1 and MATH 2300 Analytic Geometry and Calculus 2 . . . . .	10

ECON 3818 Introduction to Statistics with Computer Applications . . . . .	4
ECON 3070 Intermediate Microeconomic Theory and ECON 3080 Intermediate Macroeconomic Theory . . . . .	6
ECON 4808 Introduction to Mathematical Economics . . . . .	3
Electives (may include ACCT 2000 or CSCI 1200) . . . . .	12

*Note:* Transfer students majoring in Economics must complete at least 12 semester hours of upper-division economics courses at Boulder.

## GRADUATE DEGREE PROGRAMS

### Master's Degree

1. *Admission Requirements:* An applicant for admission as a regular degree student must:

- a. Hold a baccalaureate degree from a college or university of recognized standing, or have done work equivalent to that required for such a degree and equivalent to the degree given at this University. The undergraduate GPA must be at least 2.75 (2.00 = C).
- b. Have at least 16 semester credit hours in economics.
- c. Submit Graduate Record Examination scores for Aptitude and Economics. For foreign applicants, a TOEFL score of 500 or above is also required for admission to the graduate program.
- d. Arrange for the submission of four letters of recommendation.

Students who do not meet the requirements for admission as regular degree students may be recommended for provisional degree status. (See the Admission and Graduate School sections of this *Catalog* for further information.)

2. *Required Courses* (Grade of B- or better required in each course):

- a. Theory: ECON 6070 Applied Microeconomic Theory and ECON 6080 Applied Macroeconomic Theory; or ECON 7010 and 7020.
- b. Quantitative Methods: ECON 6818 Econometric Methods and Applications or ECON 7818 Intermediate Econometrics.

The graduate advisor may permit substitution of courses taken outside the Department for the required courses, if, in the advisor's judgment, at least the same body of material was covered at an equivalent level. However, when such substitution is for ECON 6070, 6080, and/or ECON 6818, the student must take and pass the final examinations in ECON 6070, 6080, and/or ECON 6818 with grade B- or better to effect the substitution. A course syllabus will be prepared for each of these required courses.

M.A. candidates are required to attempt the courses or examinations in theory and quantitative methods within

two academic years and be passed within two and one-half academic years from the date that they enrolled in the graduate program. Passing the Ph.D. preliminary examinations in theory and quantitative methods also satisfies this M.A. requirement.

For any student entering the Ph.D. program from the Master's program, the preliminary examinations for the Ph.D. must be attempted within three academic years and passed within three and one-half years from the date the student enrolled in the graduate program. The Graduate Review Committee is empowered to make exceptions for regular and provisional students in M.A. and Ph.D. programs.

3. *Credit Hours:*

Plan I

- a. Minimum of 24 semester hours of graduate work, including a thesis to count for 4 semester hours;
- b. Minimum of 9 semester hours, *exclusive* of thesis, must be in courses at the 7000 level or above;
- c. Must maintain a B or better average in all work presented for degree.

Plan II

- a. Minimum of 30 semester hours of graduate work;
- b. Minimum of 12 semester hours must be in courses at the 7000 level or above.
- c. Must maintain a B- or better average in all work presented for the degree.
- d. No thesis requirement.

4. *Comprehensive-Final Examination:*

Each candidate for a master's degree is required to take a comprehensive final examination after the other requirements for the degree have been completed. This examination may be given near the end of the candidate's last semester of residence while the candidate is still taking courses, provided that satisfactory progress is made.

- a. Plan I candidates must take an oral examination covering the thesis and other work presented for the degree. (See Rules of the Graduate School for details concerning coverage of work not done in formal courses and in seminars in economics.)
- b. Plan II candidates will be examined in two fields. In each of the fields the candidate must have had a minimum of 6 semester hours of course credit, of which at least 3 semester hours must be at the 7000 level or above. If the two fields are in economics the course credits for one of them may be transferred credits from another university. One of the two fields

may be in a discipline other than economics if the course work for both fields has been taken at any campus of the University of Colorado.

One of the fields may be individually structured to meet a particular need, provided the candidate's plan is approved by the student's advisor and the campus departmental graduate advisor. An individually structured field may be based wholly or partly upon the candidate's work in an Independent Study (ECON 8909). If a field is based wholly on an Economics Internship the examination for the field may be oral, written, or both, at the option of the examining committee. Otherwise, the examination in each field consists of a three-hour written examination. This requirement may be satisfied by passing the Ph.D. comprehensive examinations in two fields. The Ph.D. preliminary exams in micro- and macroeconomic theory may be offered as a comprehensive exam for a field in economic theory for the M.A. degree.

### Doctor's Degree

1. *Admission Requirements:* An applicant for admission as a regular degree student must:

- a. Hold a baccalaureate degree from a college or university of recognized standing, or have done work equivalent to that required for a degree from this University. For those applicants who do not have a master's degree in economics, the undergraduate grade point average must be at least 2.75 (2.00 = C).
- b. Have completed intermediate micro and macro economic theory courses, introductory calculus, and introductory statistics.
- c. Submit Graduate Record Examination scores for Aptitude and Economics. For foreign applicants, a TOEFL score of 500 or above is also required for admission to the graduate program.
- d. Arrange for the submission of four letters of recommendation.

It is not necessary to have an M.A. degree to be admitted to the Ph.D. program; qualified applicants may be admitted directly to the Ph.D. program and may obtain the M.A. degree while working toward the Ph.D.

Application deadlines for foreign students are April 1 for summer and fall terms and November 1 for spring term. There is no deadline for U.S. applicants; however, anyone who wishes to be considered for an assistantship should apply by February 1.

### 2. *Course Requirements:*

- a. Core courses in microeconomic theory (7010, 7030), macroeconomic theory (7020, 7040), and quantitative economic methods (7808, 7818) must be completed with a grade of B- or better. In addition, history of economic thought (7000) must be completed with a grade of B- or better before the student will be admitted to dissertation candidacy. Transferred courses must be approved, except for courses from CU-Denver, which are automatically approved. At least one-half of the core requirements must be filled on the Boulder Campus.
  - b. After entry into the Ph.D. program, all remaining core requirements must be taken on the Boulder Campus.
  - c. Not more than 12 hours of credit (exclusive of dissertation credit) from a single faculty member may be counted toward Ph.D. requirements.
  - d. Students must apply to the curriculum committee in order to take independent study in the Ph.D. program. Not more than three hours of independent study taken from a single faculty member may be counted toward a degree. Not more than three hours of independent study may be counted toward field course requirements. Independent study to count toward a field course requirement must be approved by the curriculum committee in advance. No more than six hours of independent study may be counted toward the Ph.D. requirements.
  - e. Before admission to candidacy, a minimum of 12 hours of course work must be completed each 12 months by all full-time students in the Ph.D. program. Students who plan to register for fewer than 12 hours must obtain permission for part-time status from the Graduate Advisor.
- ### 3. *Preliminary Examinations:*
- a. The student must pass written preliminary examinations covering microeconomic theory, macroeconomic theory, and quantitative economic methods. Microeconomic theory and macroeconomic theory preliminary examinations must be taken in one examination period.
  - b. Preliminary examinations are given regularly in August and January.
  - c. Normally students will be expected to attempt at least part of the preliminary examinations by the beginning of the second year.
- d. An examination attempted and failed must be taken again and passed in the next examination period.
  - e. Students must pass all preliminary examinations within two and one-half years of beginning the Ph.D. program.
  - f. The graduate advisor is empowered to make scheduling exceptions for part-time students in the Ph.D. program.
- ### 4. *Comprehensive Examinations:*
- a. The student must pass a written examination in each of two or three fields of specialization.
  - b. These examinations must be attempted within four years of entry into the Ph.D. program.
  - c. These examinations cannot be attempted before satisfying field course requirements with a grade of B- or better and the foreign language requirements. Field course work may be taken at any University of Colorado campus. Comprehensive examinations may be taken and completed before satisfying the University foreign language requirement following a successful petition to the Associate Dean of the Graduate School for an exception. Admission to candidacy will not be granted, however, until after the language requirement has been satisfied.
  - d. Comprehensive examinations are given regularly in August and January. In case of failure in one or more fields, the unsatisfactory examination may be attempted once more during a regularly scheduled comprehensive examination.
  - e. A minimum of 6 semester hours of course work at the 7000 level or above is required in each field of specialization.
  - f. In place of one of the standard fields the student may offer a combination field when the material in certain courses spans two or more areas or when courses from different areas are complementary in meeting the specialization objectives of the student. Courses may be included from outside the Economics Department on approval of the Curriculum Committee. Students offering a special field are responsible for obtaining the written agreement of at least two faculty members who will be involved in evaluating their competence in the field.
  - g. Students who present two fields (other than history of economic thought) for comprehensive examinations must complete (in lieu of a



third field) three elective courses with a grade of B- or better. Students who present history of thought (7000, 8000) as one of their fields of specialization must complete four elective courses with a grade of B- or better. Elective courses must include courses from at least two fields other than the two presented for comprehensive examinations and must include at least two formal economics courses at the 7000 level at any campus of the University of Colorado. (The term "formal course" as used here includes seminars but excludes independent study.)

- h. Doctoral students electing a field of specialization in economic development are required to complete a minimum of 9 credit hours of course work at the 7000 level or above, selected from the areas of General Economic Development and the following allied fields:

Agricultural and Rural Economics  
Resources and Environment  
International Trade and Finance  
Comparative Economics  
Other field studies approved by the Development Committee. Economics 8774 must be taken as part of the required 9 hours. The examining committee in development shall consist of one faculty member from the general development field and two from the allied fields.

Students must satisfy the Graduate School's foreign language requirement. Students whose native language is English must demonstrate at least second-year college proficiency in a foreign language of their choice; students whose native language is not English will demonstrate sufficient ability in English to meet the requirement if they pass their courses and complete their graduate work.

See the Graduate School section of this *Catalog* concerning registration and residency requirements and time limits for completing the Ph.D. degree.

## ENGLISH

Degrees . . . . . B.A., M.A., Ph.D.

### Students Majoring in English

Expository writing courses (freshman composition) do not apply toward the major. English courses taken *P/F* will not fulfill major requirements. Transfer students must take a minimum of 18 hours in English at the University of Colorado and must have English courses taken at other colleges evaluated by the Department of English. Courses taken in other departments will not count in the English major.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

*Major Requirements* . . . . . *Semester Hours*  
Choose to complete one of two programs.

### Program I: Standard Plan

A minimum of 36 credit hours must be earned in the Department of English, 24 of which must be upper division.

<i>Lower-Division Requirements</i>	
ENGL 2002 Writing About Literature . . . . .	3
<i>Upper-Division Requirements</i>	
1. One 3-credit hour course in each of the following:	
Major Author (Chaucer, Shakespeare, Milton: ENGL 3542, 3552, 3562, 3572, 3582) . . . . .	3
English Literature before 1800 (ENGL 3502, 4502, 4512, 4522, 4532, 4542, 4552) . . . . .	3
English Literature after 1800 (ENGL 3512, 4222, 4342, 4462, 4562, 4572, 4602, 4612) . . . . .	3
American Literature (ENGL 3652, 3662, 4652, 4662) . . . . .	3
New Directions (ENGL 3702, 3712, 3722) . . . . .	3
Senior Seminar (ENGL 4722, 4732, 4742, 4752, 4762, 4772, 4782, 4792, 4802) . . . . .	3

### Program II:

Creative Writing Plan	
A minimum of 36 credit hours must be earned in the Department of English, 18 of which must be upper division.	
Total requirements:	
Creative Writing workshops (9 of which must be upper division) . . . . .	18
English and American literature (9 of which must be upper division) . . . . .	18

*Note:* Students will be admitted to workshops after submitting manuscripts and receiving the instructor's consent. Each workshop may be taken three times for credit. Admission to the program is *not* automatic. Students who have taken at least 6 hours of writing courses may be considered for admission; transfer students must have 3 hours of writing with the program before being considered; students should apply no later than the second semester of the junior year. Students must have an English Department faculty sponsor and must submit a manuscript of 8-10 pages to the admissions committee for approval.

### Departmental Honors

Students interested in pursuing a special program leading to graduation with departmental honors should confer with the Director of Undergraduate Studies as soon as possible, but definitely no later than the beginning of spring term in their junior year.

### Students Who Contemplate Teaching

Sheets listing the curriculum required for a teaching certificate for secondary schools may be obtained in Room 247,

Education Building. Students should consult Mrs. Cline, Mr. Olson, or Dean Di Stefano, who supervise the English education program. Since requirements for Education and English make a very tight schedule, students should seek early advising to complete their college requirements.

## Undergraduate English Awards and Prizes

*The Katherine Lamont Scholarship.* The Lamont scholarship is a \$300 annual award to a continuing English major in recognition of sustained excellence and exceptional scholarly performance in the major. Applications are made through the University's Office of Financial Aid by March 1.

*The Harold D. Kelling Essay Prize.* The Kelling Prize is a \$100 cash award for the best essay on literature submitted by an undergraduate currently enrolled in the University. The essay must have been written for an English class and should be submitted to the English Department before April 15.

## GRADUATE DEGREE PROGRAMS

### Admission Requirements

*Master's Degree in English Literature.* Satisfactory scores on verbal and advanced literature parts of the GRE, plus at least 24 semester hours in English (exclusive of composition, creative writing, and speech). These hours should include the equivalent of a survey of English literature. Sixteen of the 24 hours must be in upper-division courses.

*Master's Degree in English With Emphasis in Creative Writing.* Candidates seeking this degree must meet all of the above-listed minimum admission requirements. In addition, each student must submit a manuscript of at least 10 pages of poetry or a minimum of 25 pages of fiction for evaluation. The candidate must meet the additional requirements specified in the brochure, *Master of Arts Degree in English With Emphasis in Creative Writing*, issued by the department.

*Doctor's Degree in English.* Satisfactory scores on verbal and advanced literature parts of the GRE; either an M.A. degree in English or at least 30 hours of postgraduate English course work beyond the B.A. degree. Entering graduate students with no degree beyond the B.A. will normally be admitted to the M.A. program. They may later apply for admission to the Ph.D. program.

## Degree Requirements

Students wishing to pursue graduate work in English should note Requirements for Advanced Degrees in the Graduate School section of this *Catalog* and should write the Department for a more complete description of the graduate programs in English.

## ENVIRONMENTAL CONSERVATION

*Degree* . . . . . B.A.

The Environmental Conservation (EC) major is a program administered by the Department of Geography, which receives program advice from representatives of the Departments of Economics and EPO Biology.

Environmental Conservation, although similar to majors in environmental studies elsewhere, stresses conservation, i.e., a reasoned use of the natural environment so that utilization does not impair the environment's capacity for self-renewal. The major combines the study of technique and philosophy, natural and social science, with course options from 10 areas: biology, computer science, economics, English, geography, geology, physics, political science, quantitative methods, and sociology.

To complement the curriculum, the Geography Department offers Environmental Conservation majors internship opportunities, in which students earn academic credit in GEOG 3930 Internship, while working in selected positions with private and public agencies and firms.

Students should consult with the secretary in Guggenheim 110 for further information.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
Students must complete 33 hours from the following courses:	
ECON 2010 Principles of Microeconomics . . . . .	4
ECON 2020 Principles of Macroeconomics . . . . .	4
EPOB 1210/1230 General Biology 1 (with lab) . . . . .	4
EPOB 1220/1240 General Biology 2 (with lab) . . . . .	4
EPOB 3020 Principles of Ecology . . . . .	3
GEOG 1001 Environmental Systems— Climate and Vegetation . . . . .	4
GEOG 1011 Environmental Systems— Landforms and Soils . . . . .	4
Two of the following: GEOG 3391 Conservation of Natural Resources; GEOG 3412 Conservation Practice and Resource Management; GEOG 3422 Conservation Thought . . . . .	6
<i>Skills Courses Group</i> (must include one introductory computer course and one other course from the following):	
EPOB 3520 Flowering Plant Systematics . . . . .	4
EPOB 4410 Biometry . . . . .	4

ECON 4808 Introduction to Mathematical Economics . . . . .	3
ENGL 3152 Report Writing . . . . .	3
GEOG 3053 Cartography 1 . . . . .	4
GEOG 3063 Maps and Mapping . . . . .	3
GEOG 4013 Introduction to Quantitative Methods in Human Geography . . . . .	3
GEOG/GEOL 4023 Statistics for Earth Sciences . . . . .	3
GEOG 4063 Geographic Interpretation of Aerial Photos . . . . .	3
GEOG 4093 Remote Sensing of the Environment . . . . .	3
GEOG 4173 Research Seminar . . . . .	3
Any introductory statistics course . . . . .	3
<i>Elective Courses Group</i> (9 hours; select any courses from this group)	
EPOB 3170 Arctic and Alpine Ecology . . . . .	3
EPOB 4660 Insect Biology (with laboratory) . . . . .	4
EPOB 4030 Limnology . . . . .	3
EPOB 4100-4140 Advanced Ecology . . . . .	3
EPOB 4750 Ornithology . . . . .	3
EPOB 4760 Mammalogy (with laboratory) . . . . .	4
ECON 3535 Natural Resource Economics (for nonmajors) . . . . .	3
ECON 3545 Environmental Economics (for nonmajors) . . . . .	3
ECON 4535 Natural Resource Economics . . . . .	3
ECON 4545 Environmental Economics . . . . .	3
GEOG 3251 Mountain Geography . . . . .	3
GEOG 3321 Geocology of Alpine and Arctic Regions . . . . .	3
GEOG 3351 Biogeography . . . . .	3
GEOG 3930 Internship . . . . .	3
GEOG 4371 Forest Geography: Principles and Dynamics . . . . .	3
GEOG 4381 Forest Geography Laboratory . . . . .	1
GEOG 4430 Seminar: Conservation Trends . . . . .	3
GEOG 4501 Water Resources and Water Management of Western United States . . . . .	3
GEOG 4511 Surface Hydrology . . . . .	4
GEOG 4732 Population Geography . . . . .	3
GEOG 4742 Environments and Peoples . . . . .	3
PHYS 2070 Energy in a Technical Society . . . . .	3
PHYS 2080 The Physics of Contemporary Social Problems . . . . .	3
PSCI 4201 The Environment and Public Policy . . . . .	3
SOCY 1002 Introduction to Demography and Human Ecology . . . . .	3

*Note:* A double major of Environmental Conservation and Geography is not permissible. All transfer credit toward the Environmental Conservation major must be evaluated. As of Fall 1982, transfer credit will only be accepted for one of the two required courses in the GEOG 3391, 3412, 3422 sequence.

## FILM STUDIES

Photography and cinematography are attracting increasing interest as media of communication and artistic expression. Various departments of the College offer courses dealing wholly or to a significant degree with film as an art form, film history, film in contemporary society, and the art of still photography. Frequent showings of important films are presented on campus for educational purposes by the International Film Series and the Avant-Garde Cinema program.

Students who are interested in the study of film should consult the Film Studies listing in the current *Schedule of Courses* and its supplement issue each semester, as well as the listings in the Course Description section of this *Catalog*.

## FINE ARTS

*Degrees* . . . . . B.A., B.F.A., M.A., M.F.A.

Majors are available for the B.A. and B.F.A. degrees in Art History and Studio Arts. Students are encouraged to consult with an undergraduate advisor in the appropriate area in order to obtain advice and current information.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

*Major Requirements* . . . . . *Semester Hours*

### Art History (34-45 semester hours in the major)

Any two of the following: FINE 1002 or 1012 Basic Drawing; FINE 1202 or 1212 Basic Painting; or FINE 1504 or 1514 Basic Sculpture . . . . . 4-6  
Any four lower-division art history (2009 to 2409) . . . . . 12  
Any six upper-division art history . . . . . 18

### Studio Arts (33-45 semester hours in the major)

FINE 1002 or 1012 Basic Drawing . . . . . 2 or 3  
FINE 1202 or 1212 Basic Painting . . . . . 2 or 3  
FINE 1504 or 1514 Basic Sculpture . . . . . 2 or 3  
Any three lower-division art history (2009 to 2409) . . . . . 9  
Any two upper-division art history . . . . . 6  
Upper-division Fine Arts elective (minimum) . . . . . 12

### Studio Arts—Art Teacher Certification (41-45 semester hours in the major)

Any three lower-division art history (2009 to 2409) . . . . . 9  
Any two upper-division art history (4009 to 4929) . . . . . 6  
FINE 1002 or 1012 Basic Drawing . . . . . 2 or 3  
FINE 1161 or 1171 Beginning  
Photography 1 . . . . . 2 or 3  
FINE 1202 or 1212 Basic Painting . . . . . 2 or 3  
FINE 1504 or 1514 Basic Sculpture . . . . . 2 or 3  
FINE 2085 or 2095 First Year Handbuilding  
or Wheelthrowing . . . . . 3  
FINE 3646 Art in the Elementary Schools . . . . . 3  
FINE 3666 Art Materials Workshop . . . . . 2  
FINE 3676 Art Materials Workshop: Weaving . . . . . 2  
FINE 3686 Art in the Secondary Schools . . . . . 2  
FINE 3774 Jewelry Design . . . . . 3  
Studio concentration (consult department  
for combinations) . . . . . 6-9  
Teacher Education Program (see School  
of Education for specific requirements) . . . . . 28

## BACHELOR OF FINE ARTS DEGREE REQUIREMENTS (50-67 CREDITS)

### Art History

Majors must complete the minimum B.A. degree requirements plus an additional 16-33 credits in Fine Arts electives.

## Studio Arts

It is recommended that majors complete the 3-credit-hour basics (FINE 1012, 1212, and 1514) rather than the 2-credit-hour basics (FINE 1002, 1202, and 1504).

The upper-division art history requirement is the same as for the B.A. degree.

Students must complete three studio courses (9 credit hours) outside their major studio concentration. Students must also complete FINE 4117 B.F.A. Seminar, a 2-credit hour course offered only on a Pass/Fail basis.

The remaining 5 credits, required to reach the minimum of 50 for the degree, should be in either lower- and/or upper-division Fine Arts electives.

*Note:* B.A./B.F.A. candidates must complete a minimum of 9 out of 15 credits on the Boulder Campus in the major.

## Studio Arts—Art Teacher Certification

Majors must complete the 3-credit-hour basics (FINE 1012, 1171, 1212, and 1514) rather than the 2-credit-hour basics (FINE 1002, 1161, 1202, and 1504); students should also complete FINE 1047 plus one lower-division Fine Arts course rather than the two lower-division courses.

In addition to the remaining B.A. degree requirements, students must complete the B.F.A. Seminar (FINE 4117), offered only on a Pass/Fail basis.

## HONORS

Students may graduate with departmental or general honors. Those interested in pursuing this program should contact the Honors Department or the Fine Arts Department Honors Representative as early as possible.

## SPECIAL PROGRAMS

*Art History Program in Italy.* Art history faculty annually conduct this program which offers 6 semester hours of credit during a six-week term. Course offerings, which vary each year, include Ancient Etruscan and Roman Art; Late Medieval and Early Renaissance Art; the Later Quattrocento and the High Renaissance; and the Later Renaissance and Mannerism. Centered in Florence, the course includes numerous visits to other Italian towns and cities.

Inquiries regarding this and other programs should be directed to the Office of International Education.

*Colorado Collection.* The Colorado Collection contains old master, modern, and contemporary prints; drawings; paintings; sculptures; and photographs.

Art history graduate students use this collection for research, and faculty use it for instructional purposes. Housed for the state of Colorado by the Department of Fine Arts, this collection includes approximately 3,000 works with an estimated value of \$2 million. Part of the collection, focusing on the works by old masters and modern artists, is exhibited in the Fine Arts Galleries on a rotating basis.

*Exhibitions Program.* The Department of Fine Arts operates the University of Colorado Art Galleries, which exhibit the work of visiting artists and other contemporary artists. Shows and performances have received National Endowment for the Arts funding, and some of the artists who have been presented are Eric Fischl, Alfred Jensen, Robert Kushner, Sol LeWitt, Ree Morton, Martha Rosler, Theodora Skipitares, and William Wegman. Bachelor of Fine Arts shows, Master of Fine Arts shows are also held in the galleries, which provide 5,000 square feet of space.

*Visiting Artist Program.* Artists of national and international reputation interact with graduate and advanced undergraduate students and discuss their studio work at seminar meetings. Artists present a public lecture during their visit, providing continuous input of significant developments and a comprehensive view of contemporary issues in the arts.

*Slide Collection.* An extensive collection of slides representing art from pre-historic to modern times is maintained by the Department of Fine Arts. This collection is especially strong in the areas of African, Asian, European, Islamic, Medieval, North American, Oceanic, and Pre-Columbian art.

*Thesis Collection.* A collection of work donated by M.F.A. candidates from the thesis exhibition is also owned by the department.

*Special Note:* Students must be aware that work left in studios and/or exhibited in the Sibell-Wolle Fine Arts Building is at their own risk and the Department will not be held responsible for loss or damage.

## GRADUATE DEGREE PROGRAMS

### Master of Arts Degree (Art Education)

*Prerequisites.* The following are required for admission to regular graduate status:

1. The baccalaureate degree in art or art education from an approved college or school of art and valid certification for teaching art (see 3 below).

2. At least 30 semester hours of acceptable work in art, including some background in the history of art.

3. It is preferred that teaching experience precede the beginning of graduate study, but experience may be obtained during the period in which one is studying for the master's degree. A teacher certification program may also be pursued concurrently with the master's program with the approval of the art education faculty.

4. Submission of slide portfolio (minimum of 10 examples) representing creative work.

5. Review of undergraduate scholastic achievement.

### PLAN I (WITH THESIS) COURSE REQUIREMENTS

Minimum of two semesters of acceptable graduate work (24 hours) beyond the bachelor's degree, consisting of:

1. *Minimum* of 3 hours in FINE 5646 (Seminar in Art Education) and 3 hours in FINE 5686 (Seminar in Current Issues in Art Education), or equivalent in approved Independent Study. *Note:* Students are expected to enroll in FINE 5646 *each time* it is offered unless the advisor approves a change.

2. Specified course work (14 hours), of which 6 hours may be devoted to a minor in an academic area outside the Fine Arts department, as approved by the art education faculty.

3. Master's thesis (FINE 6956) totaling 4 hours.

4. The final examination will be oral and must be scheduled during the semester in which the student expects to graduate; this oral examination will deal primarily with the thesis.

### PLAN II (WITHOUT THESIS) COURSE REQUIREMENTS

Students must receive written approval for this program and will complete a minimum of 6 hours of course work beyond the requirements for Plan I in place of the thesis enrollment. A nonthesis project will only be approved if the student can satisfactorily show the research project cannot be appropriately reported in regular thesis form.

A written comprehensive final examination of approximately three hours in the field of art education and general theory of art must be taken not more than one semester in advance of the graduation date.

### Master of Arts Degree (Art History)

*Prerequisites.* The following are required for graduate work:

1. A baccalaureate degree from an approved college with a minimum cumulative grade point average of at least 3.00.

2. A satisfactory score on the Graduate Record Examination.

3. A broad general background in history, literature, and philosophy.

4. Two semesters (minimum) of art history surveys or equivalent.

*Examinations.* The *qualifying examination*, covering western art history at the elementary level in the student's intended area of specialization, will be given within two months of acceptance into the program. If necessary, additional course requirements beyond the minimum may be required based on the results. If the examination is clearly inadequate, a second examination will be required at a later date. If the results of the second examination are unsatisfactory, the student will be dropped from the program.

The *final examination*, approximately six hours in length, will be given to all candidates.

### PLAN I (WITH THESIS) COURSE REQUIREMENTS

1. Three semesters of acceptable graduate work (minimum of 30 credits) spent in residence. Summer residence alone is unacceptable.

- FINE 6919 Tools of Research, 3 hours, must be completed during the first semester.
- Minimum of 15 hours (5009-level) in the field of art history, of which 6 hours must be in seminar course work.
- Minimum of 6 hours in a minor field or fields to be determined by the needs of the student for thesis preparation.
- FINE 6959 Master's Thesis, 4 hours.

2. Thesis: see thesis requirements under Master of Arts and Master of Science in the Graduate School section of this *Catalog*.

3. After acceptance of the final draft of the thesis, an oral examination will take place dealing with the subject matter of the thesis and any areas of weakness which may have been found in the written comprehensive.

### PLAN II (WITHOUT THESIS) COURSE REQUIREMENTS

Students must complete a minimum of 3 hours of course work beyond the requirements for Plan I in place of the thesis enrollment.

A nonthesis project (3 hours) must also be completed. This major study

project (FINE 6909) must be approved by the entire art history faculty.

### Master of Fine Arts Degree (Creative Arts)

*Prerequisites.* The following are required for admission to the graduate program:

1. Bachelor's degree from an approved college or school of art with a minimum grade point average of 2.75.

2. Minimum of 34 semester hours of acceptable work in art, of which 12 credits must be in fine arts history.

3. Submission of slide portfolio (must include 20 examples) representing creative work.

4. *Integrated Media Arts* students should submit portfolios of creative work to include slides, video and/or audio tapes, film, etc., as appropriate (especially for documentation of performance and/or installations) for screening by the Integrated Media Arts Committee for presentation to the full graduate faculty.

5. *Exception:* students who have not fulfilled the aforementioned entrance requirements may, on recommendation of the Department, be granted provisional status.

### COURSE REQUIREMENTS

1. Minimum of four semesters (54 hours, of which 36 must be taken in residence on the Boulder Campus) of acceptable graduate work beyond a bachelor's degree consisting of:

- 14 hours in "nonstudio" art
  - 6 of these must be in art history (5000-level courses), or a combination of FINE 5087 (Selected Topics in Contemporary Arts) plus one art history course.
  - Remaining 8 hours: Visiting Artist Program (FINE 5118) - 3 hours. *Minimum of five* additional hours to be taken in art history, criticism, art seminars, and/or art education. Non-studio hours completed *outside* the department may be taken at the 4000 level.

b. Thirty-four hours in studio art, of which a minimum of 12 must be completed in the area (painting, drawing, sculpture, etc.) of concentration.

c. FINE 6957 (M.F.A. Creative Thesis), 6 hours.

2. Course work must be completed at the 5000 level.

3. *Photography* students must enroll in FINE 5181 (Graduate Photography)

each semester, with the exception of the thesis semester.

4. *Printmaking* students are required to complete a 60-hour program. Course requirements must be completed during the first two years; the final year is devoted exclusively to the creative thesis.

5. *Integrated Media Arts* studio course requirements are those established by the Graduate Committee and graduate faculty at large. The requirement that 12 hours of graduate work in studio be taken in the area of admission shall be met as approved by the advisor assigned by the Graduate Committee. Suggested courses that presently exist in the Department of Fine Arts graduate program include:

- FINE 5097 Special Topics
- FINE 5107 Special Topics
- FINE 5140 Video
- FINE 5171 New Directions in Photography (subject matter varies each semester)
- FINE 5504 Graduate Sculpture
- Any graduate-level studio course currently listed may be used to meet the 12-hour requirement upon the approval of the advisor. It is anticipated that other courses will be added to the suggested list as this track develops. Courses outside the Department of Fine Arts in the College of Arts and Sciences may be petitioned to meet the 12-hour requirement as approved by the advisor and the Graduate Committee.

The nature of this program suggests that a student seek broad and varied course work throughout the University. Any regular, special, or independent study course in any department, institute, center, or other special unit can be presented to the advisor, with supporting rationale, as good and reasonable for study for this program.

### YEAR-END REVIEW

After completing 18 semester hours of work, students must make application for a year-end review. The mandatory review will be conducted by a faculty Year-End Review Committee during the semester when the student reaches 24 semester hours. Hours in excess of 24 accumulated before the end of the semester in which the review occurs will not be counted towards the degree. No student who has accumulated more than 40 hours without a year-end review will be allowed to continue in the program. The year-end review must take place at least one year prior to the thesis show.

On the basis of this review the Year-End Review Committee will determine whether students may continue in the program, and will identify specific requirements for further work in both studio and nonstudio course work.

*Printmaking students* will be reviewed when they have completed 30 semester

hours. At that time students may petition to be allowed to complete the program in two years.

### TRANSFER OF CREDIT

Procedures for transferring credit from other graduate programs are governed by the regulations of the Graduate School. Credit, not to exceed 18 semester hours, must first be approved by faculty in the student's major area.

### Change in Area of Concentration

Students who wish to change their area of concentration after admission must reapply to the Department.

### GRADUATION

Before registering for Thesis 6957 (M.F.A.) or Thesis 6959 (M.A.), students must meet with their thesis committee and obtain written permission to register.

1. M.F.A. thesis work must take the form of original creative work of acceptable professional standards.
2. In conjunction with the thesis exhibition there will be an oral comprehensive examination and the candidate will provide a critical written statement concerning the work.
3. Upon the successful completion of the oral examination, the candidate's written statement plus 10-15 slides (representing work in the exhibition) is to be filed with the Department of Fine Arts. The written statement must conform to departmental requirements. The slides become part of the slide collection which is housed in the Department of Fine Arts.
4. The committee may request a contribution of original work.

## FRENCH AND ITALIAN

### French

*Degrees . . . . . B.A., M.A., Ph.D.*

### COMPLETION OF MAPS

Beginning Fall Semester 1988, a Level-III high school foreign language course is required as one of the Minimum Academic Preparation Standards for admission to the University. This requirement may also be satisfied by demonstrating equivalent proficiency through placement testing or by satisfactorily completing FREN 2110. For details on completion of all MAPS, see page 38.

### COMPLETION OF ARTS AND SCIENCES LANGUAGE REQUIREMENT

Until Fall Semester 1990, completion of a Level-III high school language course will fulfill the foreign language requirement for graduation.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

Thirty hours beyond the second year with a 2.00 average or better. Thirteen of these hours must be at the 4000 level. The successful completion and oral defense of a senior essay is required. See departmental brochure for details.

<i>Major Requirements</i>	<i>Semester Hours</i>
FREN 2110 Second-Year Grammar Review and Reading 1 . . . . .	4
FREN 2120 Second-Year Grammar Review and Reading 2 . . . . .	3
<i>(See advisor for approval of alternate fourth semester course)</i>	
FREN 3010 French Phonetics and Pronunciation . . . . .	3
FREN 3050, 3060 French Composition . . . . .	6
FREN 3110, 3120 Main Currents of French Literature . . . . .	6
Literature/Civilization or Linguistics courses at the 3000 or 4000 level (13 hours must be at the 4000 level) . . . . .	15
<i>Note: Students must complete 37 hours beyond the first year with a 2.00 average or better. Students presenting four years of high school French for admission must complete 30 hours beyond the second year.</i>	
<i>Business French Option</i>	
This option requires not only French courses listed below but the following related courses: 15 hours from the College of Business and Administration and 15 hours from other departments in the College of Arts and Sciences, as listed below.	
FREN 3010 French Phonetics and Pronunciation . . . . .	3
FREN 3030 French for Business 1 . . . . .	3
FREN 3050, 3060 French Composition . . . . .	6
FREN 4050 French for Business 2 . . . . .	3
Five or more other courses at the 3000 or 4000 level for a total of 15 hours (6 hours must be at the 4000 level). FREN 4010 and 4020 are particularly recommended . . . . .	15
<i>Courses in the College of Business and Administration</i>	
<i>Fall, Junior Year</i>	
ACCT 2000 Introduction to Financial Accounting . . . . .	3
<i>Spring, Junior Year</i>	
MKTG 3000 Principles of Marketing . . . . .	3
<i>Fall, Senior Year</i>	
BSLW 3000 Business Law . . . . .	3
<i>Spring, Senior Year</i>	
FNCE 3050 Basic Finance . . . . .	3
ORMG 3300 Introduction to Management and Organization . . . . .	3
<i>(These courses must be taken in sequence during the junior and senior year as indicated unless taken in summer school.)</i>	
Complete 6 hours from the following list:	
CSCI 2310 Fundamentals of Computer Science 1 . . . . .	3
CSCI 2320 Fundamentals of Computer Science 2 . . . . .	3
ECON 3403 International Economics and Policy . . . . .	3
ECON 4111 Money and Banking . . . . .	3
ECON 4413 International Trade . . . . .	3
ECON 4423 International Finance . . . . .	3
ECON 4774 Economic Development: Theory and Problems . . . . .	3
GEOG 4712 Political Geography . . . . .	3

HIST 4412 Twentieth-Century Europe . . . . .	3
HIST 4223 French Revolution and Napoleon . . . . .	3
HIST 4126 Diplomatic History of the U.S. Since 1920 . . . . .	3
MATH 2510 Introduction to Statistics . . . . .	3
PSCI 2012 Introduction to Comparative Politics: Developed Political Systems . . . . .	3
PSCI 2022 Introduction to Comparative Politics: Developing Political Systems . . . . .	3
PSCI 2112 Governments of Great Britain and France . . . . .	3
PSCI 2222 Introduction to International Relations . . . . .	3
PSCI 4142 International Relations . . . . .	3
PSCI 4162 American Foreign Policy . . . . .	3
PSCI 4172 International Organization . . . . .	3
PSCI 4182 International Law . . . . .	3
PSCI 4192 International Behavior . . . . .	3
Complete 9 more hours from the courses listed above or other upper-division courses in French. Required 9 hours may also be completed in other upper-division foreign language courses. Summer session courses in the College of Business and Administration and other related courses may be accepted for credit upon approval of the major advisor.	

*Note:* Prerequisites before admission to the Business French option include enough French to be admitted to 3000-level courses, and ECON 2010-2020.

### STUDY ABROAD

For students interested in study abroad, Boulder offers a year-long study abroad program at the University of Bordeaux, a semester program in Rennes, France, and a semester program in Chambéry for near-beginners. Further information is available from the Office of International Education. The Ayer Romance Language Scholarship is available for majors going on study abroad programs. The Lamont Scholarship is awarded to a major in alternate years.

### GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in French leading to candidacy for an advanced degree should read carefully Requirements for Advanced Degrees in the Graduate School section of this *Catalog*. A graduate teaching exchange is available to students who have earned a master's degree. The Lamont Scholarship is awarded to a graduate student in alternate years.

### Master's Degree

*Prerequisites.* The following are prerequisite to graduate study in French:

1. A reading, speaking, writing, and auditory comprehension ability in French (all candidates must have a reading knowledge of one foreign language in addition to the major language).
2. A general knowledge of French literature and civilization.

## Doctor's Degree

*Prerequisites.* Excellence in reading, speaking, writing, and auditory comprehension in French; a general knowledge of French literature and civilization. Reading knowledge of two other foreign languages.

*Required Courses.* The Department allows students to specialize in literature or in linguistics. Each track differs from the other in its requirements. See the Department's guidelines for Ph.D. candidates.

*Language Requirement.* A reading knowledge of a modern foreign language other than that used for the Graduate School communication requirement, except if the same language is studied through 4000-level courses offered by the appropriate department. This language may be one of the following: German, Spanish, Italian, Russian; other languages will be considered depending upon the student's area of research.

## Italian

*Degree* . . . . . B.A.

### COMPLETION OF MAPS

Beginning Fall Semester 1988, a Level-III high school foreign language course is required as one of the Minimum Academic Preparation Standards for admission to the University. This requirement may also be satisfied by demonstrating equivalent proficiency through placement testing or by satisfactorily completing ITAL 2110. For details on completion of all MAPS, see page 38.

Students interested in study abroad will find further information under the International Education section of this *Catalog*. The Ayer Romance Language Scholarship is available for majors going on study-abroad programs. The Lamont Scholarship is awarded to a major in alternate years. While there are no University of Colorado sponsored programs for the academic year in Italy, there are a number of programs sponsored by other universities. A summer program for students of all levels is available in Perugia. For further information inquire at the Office of International Education.

For comparative literature and linguistics courses with an Italian emphasis, see those sections.

The primary goals of the Italian major program are to provide mastery of the language skills (listening, speaking, reading, writing) and to promote an understanding of the Italian literary and

cultural tradition within Western civilization. At the same time, the major provides the necessary background for advanced professional study and specialization.

Students wishing to major in Italian are required to have a thorough advising session with the Italian program director/advisor. In this session the student's program of study will be outlined in detail. Students are required to see the director/advisor in the event that any of their major courses are canceled so that substitutions and revisions in their programs can be made. The Department will not approve a major in Italian unless the student has been advised by the director/advisor.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
ITAL 2110-2120 Second-Year Italian Reading, Grammar, and Composition . . . . .	6
ITAL 3120-3130 Readings in Italian Literature . . . . .	6
ITAL 3210-3220 Advanced Conversation and Composition . . . . .	6
ITAL 4110 Dante: <i>Inferno</i> and <i>Purgatorio</i> . . . . .	3
ITAL 4200 Italian Culture and Civilization . . . . .	3
or	
ITAL 4250 History of Italy: 1815 to Present . . . . .	3
6 hours of elective credit at the upper-division level . . . . .	6

*Note:* Students will be offered the option of a senior project for 1 credit hour, in which direction and advising will be given, in order to fill in gaps in their studies. A student is required to complete 30 credit hours of course work beyond the first year of Italian.

## GEOGRAPHY

*Degrees* . . . . . B.A., M.A., Ph.D.

The Department of Geography offers theoretical and practical work in physical geography, including climatology, geomorphology, and biogeography; conservation of natural resources, including environmental education and conflict analysis; human geography, including urban, social, economic, political, historical, cultural, and population geography; and regional analysis, including mountains, natural hazards, and specific regional courses. To complement its curriculum, the Department offers Geography and Environmental Conservation majors internship opportunities, in which students earn academic credit in GEOG 3930 Internship, while working in selected positions with private and public agencies and firms.

The Department of Geography offers B.A., M.A., and Ph.D. degree programs in geography, and an interdisciplinary B.A. in Environmental Conservation (see separate listing).

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
GEOG 1001 Environmental Systems—Climate and Vegetation . . . . .	4
GEOG 1011 Environmental Systems—Landforms and Soils . . . . .	4
Two of the following: GEOG 1982 World Regional Geography; GEOG 1992 Introduction to Human Geography; GEOG 2002 World Geographic Problems . . . . .	6
Complete two additional courses (one class from each of the following two lists).	
<i>Skills:</i>	
GEOG 3053 Cartography I . . . . .	4
GEOG 3063 Maps and Mapping . . . . .	3
GEOG 4063 Geographical Interpretation of Aerial Photographs . . . . .	3
GEOG 4093 Remote Sensing of the Environment . . . . .	3
GEOG 4173 Research Seminar . . . . .	3
<i>Statistics:</i>	
GEOG 4013 Quantitative Methods in Human Geography . . . . .	3
GEOG 4023 Statistics for Earth Science . . . . .	3
MATH 2510 Introduction to Statistics . . . . .	3
EPOB 3030 Introduction to Biological Statistics . . . . .	3
ECON 3818 Statistics with Computer Applications . . . . .	3
ANTH 4000 Quantitative Methods in Anthropology . . . . .	3
PSYC 2101 Statistics and Research Methods in Psychology . . . . .	4
PSCI 4074 Quantitative Research Methods . . . . .	3
SOCY 3061 Statistics . . . . .	3
Total . . . . .	6-7
Additional electives . . . . .	12

Students should consult the departmental office for further information and referral to departmental advisors.

## GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in geography leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section of this *Catalog*. Graduate-level course work at the Boulder Campus may be combined with graduate courses offered at the Denver and Colorado Springs campuses. Additional information should be obtained from the Department of Geography. The following are departmental requirements.

### Master's Degree

*Prerequisites.* For admission without deficiency, the requirements are approximately 20 semesters hours of geography, including introductory courses in both human and physical geography; an undergraduate major in geography is not required. It is desirable that the student have course work in at least two areas outside geography in cognate fields in the social sciences and natural sciences. Graduate students are encouraged to have some background in college mathematics, statistics, and computer skills. Without the



kind of background described above, it is likely that admission will be on a "provisional" status.

**General Requirements.** The minimum requirements for an M.A. in geography may be fulfilled by one of two options.

1. Plan I: By completing 24 semester hours of graduate work, including a master's thesis, which carries 6 credit hours, i.e., 18 hours of course work and 6 hours of thesis work.

2. Plan II: By completing 30 semester hours of graduate work, including a 2-to-4-credit-hour research report, usually taken as Independent Study. This research will involve preparing a paper of publishable quality, or writing a critical review of published works, or preparing an original map, or developing curriculum materials or similar scholarly work.

All grades offered for a degree must average at least 3.00 (a B average).

### Doctor's Degree

**Prerequisites.** The minimum requirements for admission to the Ph.D. program are normally a master's degree or significant published research or equivalent standing.

**General Requirements.** The Ph.D. degree is not conferred merely upon the satisfactory completion of a course of study. The candidate must also demonstrate proficiency in some broad subject of learning, and be able to critically evaluate work in the field, show the ability to work independently in the chosen field, and make an original contribution of significance to the advancement of knowledge.

Thirty semester hours of course work numbered 5000 or above is the minimum requirement; ordinarily the number of hours will be greater than this. Thesis credit hours may not be used to fulfill the 30-hour requirement. At least 20 of these hours must be taken at the University of Colorado; up to 10 semester hours from another institution may be transferred upon approval.

A B average or higher must be maintained in all course work.

Six semesters of residence are required beyond the bachelor's degree, of which four must be at the University of Colorado; this may include two semesters for the master's degree. Students with a University of Colorado master's degree in Geography, with departmental approval, may apply all credit hours from 5000 or above courses (except thesis credits) to the Ph.D. requirements.

## GEOLOGICAL SCIENCES

Degrees . . . . . B.A., M.S., Ph.D.

The major program in Geology is designed mainly for students who are interested in a career in the geosciences. It consists of a Geology option and a Geophysics option, both leading to a B.A. degree. The Geology option offers broad training in the geosciences, and the Geophysics option is especially designed for those students who wish to pursue a career in geophysics. Both options provide a strong basis for graduate study (the B.A. degree is not a professional degree, and employment opportunities without graduate training are limited). Students who are uncertain as to which option best suits their needs should consult a departmental advisor.

The undergraduate program emphasizes course work in theoretical, laboratory, and field oriented aspects of the geological sciences. The University of Colorado at Boulder lies adjacent to the Rocky Mountains, a natural laboratory for the study of geologic materials and processes. The Department has one of the most active field programs for undergraduates in the country.

### BACHELOR'S DEGREE REQUIREMENTS

All majors are required to take the following courses:

<i>Major Requirements</i>	<i>Semester Hours</i>
GEOL 1010 Introduction to Geology 1 . . . . .	4
GEOL 1020 Introduction to Geology 2 <i>or</i>	4
GEOL 1530 Geological Development of Colorado	4
and the West . . . . .	4
GEOL 3010 Introduction to Mineralogy . . . . .	4
GEOL 3020 Petrology . . . . .	4
GEOL 3120 Structural Geology 1 . . . . .	4
GEOL 4110 Field Geology . . . . .	4
PHYS 1110 General Physics . . . . .	4
PHYS 1120 General Physics . . . . .	4
PHYS 1140 Experimental Physics . . . . .	1
MATH 1300 Analytic Geometry and Calculus 1 . . . . .	5
MATH 2300 Analytic Geometry and Calculus 2 . . . . .	5
CHEM 1111 and 1131 General Chemistry <i>or</i> . . . . .	10
CHEM 1151 and 1171 Honors General	12
Chemistry . . . . .	12

Students electing the *Geology Option* are required to take the following additional courses:

GEOL 3310 Sedimentology . . . . .	3
GEOL 3410 Paleobiology . . . . .	3
GEOL 3420 Stratigraphy . . . . .	3
GEOL 4130 Geophysics and Tectonics <i>or</i> . . . . .	4
GEOL 4530 Introduction to the Physics of	3
the Solid Earth . . . . .	3

Students electing the *Geophysics Option* are required to take the following additional courses:

GEOL 4530 Introduction to the Physics of	3
the Solid Earth . . . . .	3
PHYS 2130 General Physics . . . . .	3
PHYS 2140 Methods of Theoretical Physics . . . . .	3
PHYS 2150 Experimental Physics . . . . .	3
PHYS 3120 Analytical Mechanics . . . . .	3
PHYS 3310 Electricity and Magnetism 1 . . . . .	3
MATH 2400 Analytic Geometry and Calculus 3 . . . . .	5
APPM 2360 Linear Algebra and Differential	3
Equations . . . . .	3

Each of the two options has other specific requirements. Information on required courses and other departmental requirements may be obtained from the departmental office.

Students who do not plan a career in the geosciences, or who would like to combine a basic knowledge of geology with that of some other field, should consider using geology as one subject in a Distributed Studies major.

Transfer students must satisfactorily complete a minimum of 12 semester hours of advanced work (3000-level or above) in the Department of Geological Sciences in Boulder if they wish to obtain a degree in Geology from the University of Colorado at Boulder. Before registering for the first time, or within the first week of the semester, such students must see a member of the departmental Academic Progress Committee so as to have previous course work in geology, math, and allied sciences evaluated.

### Geology Honors Program

Opportunity is provided for qualified Geology majors to participate in the Geology Honors Program and graduate with honors (*cum laude*, *magna cum laude*, or *summa cum laude*) in Geology. Students interested in the Honors Program should contact the departmental honors advisor during their junior year.

### GRADUATE DEGREE PROGRAMS

Students interested in graduate work in the geological sciences should read carefully the detailed information regarding admission, registration, and degree requirements that is available from the departmental office. A brief summary follows.

All students applying for admission must take the Graduate Record Examination. Results of this examination will be used both for determining admittance and for initial academic counseling.

Entering students will normally have completed at least 24 semester hours of basic courses in geological science and two semesters each of chemistry, physics, and calculus. In some cases, exceptional undergraduate preparation in other fields of science, mathematics, or engineering will substitute for part of the 24 hours in geological science.

Initial counseling will be provided on an individual basis by the departmental Committee on Academic Progress. Thereafter each student will acquire an advisory committee which will provide guidance throughout the degree program.

### Master's Degree

Candidates for the master's degree in Geological Sciences must complete at least 24 semester hours of graduate course work including a thesis (Plan I), or 30 semester hours of graduate course work without a thesis (Plan II). The Plan II program requires at least 3 hours of GEOL 6960 under the supervision of the advisory committee. At least 12 semester hours course work (Plan I) and 16 semester hours course work (Plan II) must be at the 5000 level. See Graduate School specifications for further information.

### Doctor's Degree

Candidates for the doctoral degree must complete at least 30 semester hours in course work numbered 5000 or above, of which at least 20 must be taken at CU-Boulder. In addition to course work, candidates must take a total of at least 30 hours of 8990 doctoral dissertation hours, with not more than 10 of these in any one semester and not more than 10 before the comprehensive examination is passed.

Doctoral candidates are required to demonstrate second-year college proficiency in a foreign language of their choice.

The Department of Geological Sciences participates in the interdepartmental Ph.D. program in Geophysics. For more information about this program, consult the Graduate School section of this *Catalog*.

## GERMANIC LANGUAGES AND LITERATURES

*Degrees* . . . . . B.A., M.A.

The primary goals of the undergraduate German major program are to provide mastery of language skills (understanding, speaking, reading, writing) and to promote an understanding of the German literary and cultural tradition within its place in Western civilization. The German major is thus a liberal arts major. At the same time the major provides the necessary background for advanced professional study and specialization.

The Department sponsors programs in Germany for undergraduate students. Students with at least four semesters may apply for a junior year program in Regensburg, Stuttgart, or Tübingen, Federal Republic of Germany. There is also a summer program in Kassel. Further information on these programs may be obtained from the Office of International Education.

### COMPLETION OF MAPS

Beginning Fall Semester 1988, a Level-III high school foreign language course is required as one of the Minimum Academic Preparation Standards for admission to the University. This requirement may also be satisfied by demonstrating equivalent proficiency through placement testing or by satisfactorily completing GRMN 2010. For details on completion of all MAPS, see page 38.

### COMPLETION OF ARTS AND SCIENCES LANGUAGE REQUIREMENT

Until Fall Semester 1990, completion of a Level-III high school language course will fulfill the College graduation requirement in foreign language.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
Complete 35 minimum semester hours (at least 23 of these must be upper division) or 30 hours if all the hours are at the upper-division level.	
GRMN 3010-3020 Advanced Conversation and Grammar, Advanced Conversation and Composition (or equivalent) . . . . .	6
GRMN 4010-4020 Advanced Composition, Conversation, and Stylistics, 1 and 2 (or equivalent) . . . . .	6
Majors must take at least two of the following courses on the Boulder campus:	
GRMN 4230 German Civilization 1 . . . . .	3
GRMN 4240 German Civilization 2 . . . . .	3
GRMN 4330 The Age of Goethe . . . . .	3
GRMN 4340 Seminar in German Literature . . . . .	3
GRMN 4370 Introduction to German Literary History 1 . . . . .	3
GRMN 4380 Introduction to German Literary History 2 . . . . .	3

*Note:* Courses at the 1000 level will not be counted toward the 35 hours. Also, German literature and culture courses in English translation normally do not count toward the 35 hours.

### GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in Germanic languages and literatures leading to candidacy for the M.A. degree should read carefully Requirements for Advanced Degrees in the Graduate School section, and the departmental memorandum for the M.A. degree.

### Master of Arts

*Prerequisites.* For students seeking admission to the M.A. program in German the following are required:

1. The ability to speak, read, and write German and to comprehend spoken German.

2. Knowledge of the main currents and masterpieces of German literature and civilization.

3. A reading knowledge of one foreign language other than German. Students lacking such knowledge when entering the program must demonstrate that they have made up this deficiency by passing an examination or by completing appropriate course work in a foreign language before they can be admitted to candidacy for the M.A. degree.

*Examinations.* For information concerning the comprehensive examination and the master's thesis, consult the departmental Memorandum for M.A. Candidates.

### Scandinavian Program

Courses are offered in Norwegian, Swedish, and Scandinavian culture and civilization in English. The language courses satisfy Arts and Sciences language requirements for the B.A. and B.F.A. degrees. A fourth-semester Swedish or Norwegian course satisfies the Graduate School language requirement for the Ph.D. In addition, there is an exchange program with Linköping University in Sweden. At least two semesters of Swedish are required for application to the program. No degree is offered in the Scandinavian Program.

## HISTORY

*Degrees* . . . . . B.A., M.A., Ph.D.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
Must complete History course work with a grade C or better (18 hours must be upper division) . . . . .	30
HIST 1015 and 1025 History of U.S. to 1865 and History of U.S. since 1865 or HIST 1035 and 1045 Honors History of U.S. to 1865 and Honors History of U.S. since 1865 . . . . .	6
Complete one of the following course sequences:	
HIST 1010-1020 Western Civilization; HIST 1051-1061 World of Ancient Greeks, Rise and Fall of Ancient Rome; HIST 1030-1040 Honors Western Civilization; HIST 1113-1123 History of England; or any two of the following introductory courses: HIST 1038 Latin American History; HIST 1208 African History; HIST 1308 Middle Eastern History; HIST 1408 Indian History; HIST 1608 Chinese History; HIST 1708 Japanese History; HIST 1009 Third World History . . . . .	6
Complete one course at the 3000-level entitled Selected Readings or Research Seminar (senior history majors may, with instructor's permission, substitute a 6000-level course entitled Readings) . . . . .	3
Complete one course in Third World History—Asian, African, Middle Eastern, or Latin American—at either the lower- or upper-division level . . . . .	3

*Note:* Not more than 45 semester hours in History will apply to graduation requirements. Students must have a grade point average of at least 2.00 in the major in order to graduate. Students may receive credit for HIST 1020 and/or 1015-1025 by obtaining a score of 4 or better on the High School Advanced Placement history test(s). (CLEP tests are *not* accredited.) Transfer students majoring in History must complete at least 12 semester hours of upper-division history courses at the University of Colorado at Boulder.

## GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in History leading to candidacy for an advanced degree should read carefully Requirements for Advanced Degrees in the Graduate School section. Following are special departmental requirements. Additional information should be obtained from the Department of History.

*Admission requirements.* For purposes of admission to the graduate program, the verbal portion of the Graduate Record Examination is required and a score in the 80th percentile or above shall normally be required for admission. Ph.D. applicants who do not have an M.A. degree from the Department must also take the GRE advanced history test of the GRE and receive a score in the 70th percentile or above.

### Master's Degree

*Prerequisites.* As general preparation for graduate work in history, it is desirable that a student has a broad liberal arts education as well as a major in History. Candidates for graduate degrees may be required to pursue such fundamental courses in history as the Department deems necessary to provide a suitable historical background.

*Residence.* While it is possible to obtain the M.A. degree in two full semesters of residence, more time is generally necessary.

*Degree Requirements.* The required qualifying examination is met by a satisfactory score on the Graduate Record Examination. A total of 24 semester hours of course work plus 4 to 6 hours in M.A. Thesis, or 30 semester hours of course work without a thesis, is required for the degree. A comprehensive examination must be passed in the major field of concentration before the degree is granted. Candidates should request from the Department of History the set of instructions for M.A. candidates.

### Doctor's Degree

*Prerequisites.* Students who wish to work toward the Ph.D. degree in History must indicate familiarity with certain fields of history, acquaintance with the fundamental tools of historical scholarship, and the ability to do original work. The departmental preliminary evaluation for the Ph.D. program shall be the successful completion of the M.A. degree in History (or its equivalent) and the positive recommendation of the Graduate Admissions Committee that the student be admitted to the program.

*Residence.* At least three years of graduate study, two of which must be spent in residence, are required for the Ph.D. degree.

*Degree Requirements.* A total of 30 credit hours, 20 of which must be taken at this University, and a dissertation are required for the degree. One foreign language is required; however, students must be able to use those languages essential to research and advanced study in their respective fields.

A comprehensive written and oral examination, a dissertation which is an original contribution to knowledge, and an oral examination on the dissertation must be successfully completed. Candidates should request from the Department of History the set of instructions for doctoral candidates.

## HISTORY AND PHILOSOPHY OF SCIENCE

The College of Arts and Sciences offers courses in the history and philosophy of science. These courses are NASC 3410-3420-3430-3440 and PHIL 3410-3420-3430-3440. The four semesters cover four distinct time periods: Ancients to Copernicus, Copernicus to Newton, Newton to Einstein, and twentieth century. Of related interest is HIST 4314, History of Science from the Ancients to Sir Isaac Newton.

The History and Philosophy of Science Committee sponsors a series of lectures by visiting scholars as well as a biweekly seminar by both visiting and local scholars. Each spring there is a regional conference on the History and Philosophy of Science. Cassette tape recordings of the lectures and seminars are available for loan from the committee office.

No formal major is offered in the history and philosophy of science, but interested students may design their own majors in this area through the Individually Structured major, with the aid of a faculty advisory committee and the approval of the Dean of the College of Arts and Sciences. Information may

be obtained from the Committee on the History and Philosophy of Science.

Students are also encouraged to consider a distributed major in the appropriate departments: a major in either history or philosophy with courses on the history and philosophy of science, or a major in one of the scientific disciplines with courses in the history and philosophy of science as electives. In addition, physics majors pursuing Plan 2 may take history and philosophy of science to satisfy the interdisciplinary requirement.

An M.A. program in the History and Philosophy of Science is available in the Department of Philosophy.

## HONORS PROGRAM

The Honors Program is designed to provide special educational opportunities for particularly able and highly motivated students. It is open to well-prepared freshmen, as well as to students who enter the program at a later stage. The Honors Program offers a guide to a carefully constructed curriculum in the liberal arts, thoughtful advising, close contact with faculty and with other honors students, and an opportunity to write an honors thesis.

Faculty teaching honors seminars are carefully selected for special interests and enthusiasm, for teaching ability in small discussion classes, and for insistence on high standards. The emphasis is on working. These are seminars designed for the student who welcomes challenge, who knows that the mind expands only with effort, and who willingly accepts the opportunity. Honors courses will strive to be integrative. They will encourage students to combine and synthesize concepts and methodologies from other courses and disciplines. Many honors courses will be consciously interdisciplinary, but all will stimulate students to structure their total academic experience into a meaningful framework.

The Honors Program is also responsible for determining which students merit the award of the bachelor's degree with honors: *cum laude*, *magna cum laude*, and *summa cum laude*. These awards are made on the basis of special honors work and not simply on the basis of grades earned in courses.

The student may participate in either departmental honors or College honors, or both. Departmental honors may require a junior or senior honors seminar, an independent research project, and/or directed readings. Each department has information pertaining to its own particular program. College honors is designed to help students explore areas outside their major fields and to

broaden the basis of their liberal education. Each year over 50 honors courses in a wide variety of areas are offered; each course is limited to an enrollment of 15 students. Candidates are required to take a Senior Seminar.

Detailed information concerning the Honors Program may be obtained in the Honors Office in Norlin Library. Qualified students may register for courses in the Honors Program at the Honors Office in Norlin Library. Freshmen are accepted for honors work on the basis of achievement in high school; students currently enrolled are accepted on the basis of academic achievement at the University of Colorado. While honors students are expected to have a grade point average of at least 3.30, it should be emphasized that no student who shows ability and promise is excluded from consideration. This is a program of excellence and commitment in which the best teaching faculty is committed to serve the most highly motivated students for the benefit of those students and the larger society.

## HUMANITIES

*Degree* . . . . . B.A.

The Humanities major takes an interdisciplinary approach to the arts. In addition to taking courses which combine the study of literature, music, film, and the visual arts, all students must do work in depth in the literature of a single language (English, French, German, etc.). Beyond these requirements students may select a secondary field of concentration as listed below. Since the program is tailored as much as possible to the individual student's interests, majors should see their departmental advisor each semester. Departmental advisors for the major are Professors Palmer, Hill, Gordon, and Minor. Early completion of the foundation courses, HUMN 1010 and 1020, is essential.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
HUMN 1010 and 1020 Introduction to Humanities . . . . .	12
Upper-division humanities courses . . . . .	15
Language/literature courses (These must be within a single language—English or a foreign language, ancient or modern. First-year courses in a foreign language may not be counted) . . . . .	24
Courses chosen from any one of the following areas: foreign language literature (course work in translation may not be counted), fine arts, music, dance, theatre, film, philosophy, other disciplines . . . . .	12

*Note:* All students must have their schedules approved each semester by a departmental advisor.

## INDIVIDUALLY STRUCTURED MAJOR

*Degree* . . . . . B.A.

An Individually Structured major may be designed by a student during the sophomore year in consultation with a three-member faculty advisory committee. It must be approved by the Dean of the College of Arts and Sciences, and once approved, it may be amended only with approval of the student's committee and the Dean. The proposal must include a Senior Thesis (ARSC 4909) for a maximum of 6 semester hours of credit. This major cannot be used as part of a double major program. Guidelines and proposal applications, as well as advising, are available in the College of Arts and Sciences Dean's Office.

## INTERNATIONAL AFFAIRS

*Degree* . . . . . B.A.

With the increasing importance to the United States of world issues, employment opportunities in government and in international organizations, agencies, and business have expanded enormously. Today there is an urgent need for college graduates with strong backgrounds in international affairs. To meet this need the University of Colorado offers a comprehensive and flexible interdisciplinary program in international affairs leading to the degree Bachelor of Arts.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the requirements in the three categories listed below.

### 1. Core courses:

Completion of 41 hours, 34 hours with grade C or better (none may be taken Pass/Fail), distributed as follows:

<i>Major Requirements</i>	<i>Semester Hours</i>
<i>Lower Division (17 hours)</i>	
ECON 2010 Principles of Microeconomics . . . . .	4
ECON 2020 Principles of Macroeconomics . . . . .	4
PSCI 1101 The American Political System . . . . .	3
PSCI 2012 Introduction to Comparative Politics: Developed Political Systems or PSCI 2022 Introduction to Comparative Politics: Developing Political Systems . . . . .	3
PSCI 2222 Introduction to International Relations . . . . .	3
<i>Upper Division (24 hours)</i>	
ANTH 4500 Cross-Cultural Aspects of Socioeconomic Development or ANTH 4510 Applied Cultural Anthropology or ANTH 4580 Power: Anthropology of Politics . . . . .	3
ECON 3403 International Economics and Policy . . . . .	3
ECON 4714 Comparative Economic Systems or ECON 4774 Economic Development: Theory	3

and Problems or ECON 4784 Policies of Economic Development . . . . .	3
GEOG 4712 Political Geography . . . . .	3
HIST 4412 Twentieth-Century Europe or three additional hours of history in student's area of concentration . . . . .	3
PSCI 4142 International Relations or PSCI 4192 International Behavior . . . . .	3
PSCI 4162 American Foreign Policy or HIST 4126 Diplomatic History of the U.S. Since 1920 . . . . .	3
PSCI 4172 International Organization or PSCI 4182 International Law . . . . .	3

### 2. Area Requirement:

Completion of 12 hours of upper-division courses concentrating on the whole or part of a region outside the United States. These courses should be chosen in consultation with a member of the advisory committee. None may be taken Pass/Fail. A minimum course grade of C is required.

### 3. Language Requirement:

A third-year proficiency in a foreign language appropriate to the area of concentration. This requirement may be met by completion of two third-year, university-level grammar courses in the language with a grade of C or better, or by certification from the appropriate department of such competence.

### Recommendations:

- All International Affairs majors should have a *good* command of the English language.
- Students should choose electives with a view to their relevance to this program.
- During the semester prior to graduation, each student must complete a Statement of Major Status to be obtained from the office of the College of Arts and Sciences.
- Students in the International Affairs Program are encouraged to consider the possibility of participating in one of the study abroad programs directly or indirectly affiliated with the University of Colorado. Students wishing to participate in such a program should contact their advisor and the chair of the Committee on International Affairs to work out an appropriate program. Some variation in the general requirements will be permitted in these cases.

The specific courses that may be counted to meet the requirements in this program are determined by the Committee on International Affairs and the Dean of the College of Arts and Sciences.

## KINESIOLOGY

*Degrees* . . . . . B.S., M.S.

Semester hours and grade point requirements for the degree Bachelor of Science in Kinesiology are the same as those for the B.A. degree listed under

the College of Arts and Sciences, General and Major Requirements. There is no foreign language requirement.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of the general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
<i>Bachelor of Science Degree: Kinesiology Track</i>	
KINE 1010 Introduction to Kinesiology	2
KINE 3500 Human Development and Movement Behavior	3
KINE 3710 Psychosocial Aspects of Exercise, Sport, and Physical Activity	3
KINE 3720 Motor Learning and Performance	3
KINE 4540 Analysis of Human Movement	4
KINE 4650 Exercise Physiology	3
KINE 4670 Exercise Science Laboratory Techniques	3
KINE 4680 Exercise Management	3
KINE 4700 Introduction to Research in Kinesiology	3
EPOB 1210-1240 General Biology 1 and 2 with Labs or MCDB 1050 and 1060 Introduction to MCDB	8
CHEM 1051, 1071 Introduction to Chemistry and Introduction to Organic and Biochemistry or CHEM 1111 and 1071 General Chemistry and Introduction to Organic and Biochemistry or CHEM 1111 and 1131 General Chemistry	8-10
UWRP 1050 and 1150 Directed Writing and Expository Writing or 1150 Expository Writing or 1250 Argumentative Writing	3-6
PHYS 2010 General Physics	5
EPOB 3420 Introduction to Human Anatomy	5
EPOB 3430 Human Physiology	5
Electives chosen from the following	5
PHED Professional Activity Courses (2010-2150)—3 semester credit hours total may be completed	
PHED 2300 Advanced First Aid	
KINE 3420 Nutrition and Health	
PHED 3460 Introduction to Special Physical Education	
PHED 4290 Tests and Measurements in Physical Education	
KINE 4450 Disabilities and Motor Development	
KINE 4460 Prevention and Management of Sports Injuries	
KINE 4480 Perspectives on Aging	
KINE 4660 Selected Topics in Exercise Physiology	
KINE 4930 Internship	
Recommended electives: PHYS 2020; CHEM 3321, 3331; CHEM 4711, 4731; MATH 1300, 2300; PSYC 4303, 4052; MCDB 3120, 3200; ASEN 3018; CSCI 2310, 2320	

*Note:* The primary aim of the Kinesiology program is to provide students with a scholarly understanding of the multidimensional aspects of the study of human movement and performance. This degree plan is designed for students wishing to prepare for graduate work or careers in such areas as fitness management, cardiac rehabilitation, or corporate or industrial fitness. Students in this program are strongly urged to follow the College of Arts and Sciences foreign language requirement.

*Teaching Certification Program in Physical Education*  
Four individual/dual activities chosen from:  
PHED 2010 Conditioning . . . . . 1  
PHED 2020 Golf . . . . . 1  
PHED 2030 Gymnastics . . . . . 1

PHED 2040 Badminton	1
PHED 2050 Recreational Sports	1
PHED 2060 Tennis	1
PHED 2070 Track and Field	1
PHED 2080 Activities of Low Organization (required if planning to take Elementary School PE)	1
PHED 2090 Adapted Activities	2
Four team sports chosen from:	
PHED 2100 Basketball	1
PHED 2110 Field Hockey	1
PHED 2120 Flag Football/Speedway	1
PHED 2130 Soccer/Speedball	1
PHED 2140 Softball	1
PHED 2150 Volleyball	1
Required courses:	
KINE 1010 Introduction to Kinesiology	2
PHED 2300 Advanced First Aid	2
PHED 2310 Seminar in Teaching	1
PHED 2790 Kinesiological Anatomy	3
PHED 2800 Kinesiological Physiology (students may not receive credit for both PHED 2790 and EPOB 3420 or for PHED 2800 and EPOB 3430)	3
PHED 2500 Survey of Contemporary Health	3
PHED 3460 Introduction to Special Physical Education	3
KINE 3500 Human Development and Movement Behavior	3
KINE 3710 Psychosocial Aspects of Exercise, Sport, and Physical Activity	3
KINE 3720 Motor Learning and Performance	3
PHED 4130 Curriculum and Administration in Physical Education	3
PHED 4290 Tests and Measurements in Physical Education	3
KINE 4460 Prevention and Management of Sports Injuries	3
KINE 4540 Analysis of Human Movement	4
PHED 4580 Methods of Teaching P.E. (Secondary School) or PHED 4170 Physical Education in the Elementary School	3
KINE 4650 Exercise Physiology	3
KINE 4680 Exercise Management	3
KINE 4700 Introduction to Research in Kinesiology	3
PHED 4830 Student Teaching in Physical Education	6
EDUC 3303 Oral Communication for Teachers or COMM 2200 Oral Competency or CDSS 2500 Voice and Diction	2-3
EDUC 4102 Foundations of American Education	3
EDUC 4112 Educational Psychology and Adolescent Development	3
EDUC 4122 Principles and Methods of Secondary Education	3
EDUC 4412 Teaching Reading and Writing in the Content Areas	3
EDUC 4463 Teaching Exceptional Children in the Regular Classroom or PHED 3460 Introduction to Special Physical Education	2-3
Student Teaching	

*Note:* Students must apply for admission to the Teacher Certification Program and also take and pass the California Achievement Test (CAT) in Math, English, and Speech, before taking EDUC 4122. A cumulative GPA of 2.50 is required for admission to the Teaching Certification Program. Other recommended courses: PHED 1140, 1150, 1160, 2510, 2910, 4190, 4490, KINE 3420, 4450, DNCE 1000, 1010.

## GRADUATE DEGREE PROGRAM

To obtain materials for application and for any additional information, address inquiries to the graduate coordinator of the Department of Kinesiology.

## Departmental Requirements

Students may follow Plan I or Plan II for the degree program. The minimum requirement for Plan I may be fulfilled by presenting 30 semester hours of approved graduate work including 4-6 semester hours of thesis. The minimum requirement for Plan II may be fulfilled by presenting 33 semester hours of approved graduate course work including 1-3 semester hours of research project. Candidates for the master's degree may select Plan II only on the recommendation of the Department.

## Master of Science Degree (Kinesiology)

*Prerequisites.* Entering graduate students must have an undergraduate preparation equivalent to the basic core course requirements in kinesiology at the University of Colorado or make up undergraduate deficiencies. Satisfactory scores on the Graduate Record Examination tests are also required for admission to the Department's graduate program for regular or provisional degree status. These scores should be submitted at the time of application for admission to pursue a graduate degree.

*Deficiencies.* If the undergraduate preparation does not include required basic core courses, the student may be allowed to pursue graduate study with the understanding that certain deficiencies must be completed. The nature and extent of these deficiencies will be determined by the graduate coordinator and the graduate committee of the Department.

Deficiencies in any area of the undergraduate major may be met by completing approved course work in the subject or by satisfactory examination. Courses taken to meet deficiencies may not be counted toward the master's degree. Graduate courses taken before removing deficiencies may be accepted for graduate degree credit only if prior approval of the graduate coordinator has been granted.

*Program Option Requirements.* Students may elect to specialize in one of the three following program options: exercise science, motor behavior, or general. Courses in the stated program option are to be selected in consultation with the student's graduate advisor.

*Basic Requirements.* In addition to the specific program options, the following are required of all students for the Master of Science degree: KINE 5830 (Applications of Statistics to Kinesiology), KINE 6830 (Methods of Research in Kinesiology); a minimum cumulative

grade point average of 3.00 in all graduate work undertaken; satisfactory performance on the comprehensive examination; and requirements for advanced degrees as stipulated by the Graduate School. For students enrolled in Plan I, KINE 6950 (Thesis) is required; for students enrolled in Plan II, additional course work and KINE 6840 (Research Project) are required.

*Comprehensive Examination.* All candidates are required to complete an oral examination covering the thesis or research project, as well as a written comprehensive examination covering course work leading to the degree.

## LATIN AMERICAN STUDIES

*Degree* . . . . . B.A.

Colorado's proximity to Mexico and the long-standing mutual influences of the United States and Latin America make Latin American Studies a timely and interesting field. The Latin American Studies program offers a broad and flexible interdisciplinary approach designed to provide a comprehensive rather than a narrow, single-discipline understanding of Latin America. The curriculum leads to the Bachelor of Arts degree with a major in Latin American Studies.

### BACHELOR'S DEGREE REQUIREMENTS

1. Satisfaction of the regular College requirements for the Bachelor of Arts degree.

2. A demonstrated proficiency in Spanish or Portuguese (successful completion of at least one upper-division Spanish or Portuguese course).

3. At least 48 hours in courses pertaining to Latin America, to be distributed among as many of the following fields as possible: anthropology, art history, economics, geography, Hispanic literature, history, and political science. Not more than 24 hours in one department may count toward the major. Majors are encouraged to include a study-abroad semester or summer (Mexico, San José, Costa Rica; or Lima, Peru) in their academic program.

4. The senior seminar (LAMS 4815), normally given during the fall semester.

5. All schedules for students majoring in Latin American Studies must be approved by the advisor of the program. Prospective majors in Latin American Studies should consult with the advisor at the first opportunity.

6. The specific courses that may be counted to meet the requirements in this program are determined by the Committee on Latin American Studies

and the Dean of the College of Arts and Sciences. Special offerings in the Honors Program and Comparative Literature may be applied with the advisor's consent.

Other related courses may be counted toward the major in Latin American Studies with the approval of the advisor.

### CERTIFICATE IN LATIN AMERICAN STUDIES

A certificate is awarded to students who have demonstrated strong preparation in Latin American Studies accompanying a major in another area. Students who satisfy the following requirements are eligible for the certificate in Latin American Studies:

1. A demonstrated proficiency in Spanish or Portuguese (successful completion of at least one upper-division Spanish or Portuguese course).

2. At least 24 hours in courses pertaining to Latin America with not more than 9 hours applicable from any one department. Substitutions must be approved by the advisor of Latin American Studies.

3. LAMS 3804, 4815, or a substitution approved by the advisor of the program.

### LINGUISTICS

*Degrees* . . . . . B.A., M.A., Ph.D.

The undergraduate major stresses the study of language as a basic human faculty and as a changing social institution. It provides a general education valid in its own right or as a background for further studies in linguistics or in other areas in which language plays a role such as social sciences, communication, computer science, law, or education.

The core of the major is a set of courses, taught in the Linguistics Department, on the nature of language. In addition, the major draws on courses offered in other areas of the University.

Majors in Linguistics must complete a total of 45 hours of study in general linguistics, a natural language, and appropriate language-related electives. Language study, and some of the elective hours, may be taken in other departments. The hours in general linguistics are intended to give students an introduction to the basic theory which underlies the scientific study of language. The study of a natural language is intended to give students a conscious awareness of the phenomena that linguistic science describes and seeks to explain. The language-related electives are intended to acquaint students with

other theoretical or disciplinary perspectives on the phenomena studied in linguistics.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

1. *Course Work.* Students must complete the following courses in general linguistics with a grade of C (2.00) or better.

<i>Major Requirements</i>	<i>Semester Hours</i>
LING 2000 Introduction to Linguistics . . . . .	3
LING 1000 Language or LING 2200 Language in Its Social Context . . . . .	3
LING 3430 Semantics or LING 3500 Language and the Public Interest . . . . .	3
LING 4030 Linguistic Phonetics . . . . .	3
LING 4410 Phonology . . . . .	3
LING 4420 Morphology and Syntax . . . . .	3
LING 4570 Introduction to Diachronic Linguistics . . . . .	3
	21

2. *Natural Language.* Students must complete with a grade of C (2.00) or better a minimum of 15 semester hours of study of a natural language. Ordinarily the language chosen will be a language which the student does not know natively. All hours offered in satisfaction of this requirement must be in a single language and at the 2000 level or above. The natural language requirement is waived for foreign students whose native language is not English.

3. *Electives.* A minimum of 9 elective hours must be completed with a grade of C (2.00) or better:

One course chosen from	
ANTH 4810 Language and Culture . . . . .	3
COMM 4210 Psychology of Communication . . . . .	3
CDSS 3006 Introduction to Speech and Hearing Sciences . . . . .	3
PHIL 3490 Philosophy of Language . . . . .	3
PSYC 4220 Psycholinguistics . . . . .	3
SOCY 3121 Sociology of Language . . . . .	3
Two courses in linguistics (in addition to the 21 hours above)	
Linguistic electives . . . . .	6
	9

Language study and some courses in the major may be completed in University or University-affiliated study abroad programs, and such study is recommended. Students interested in doing part of their major work in a study abroad program should discuss the matter with their advisor before going abroad. For information on study abroad programs, consult the Office of International Education.

*Graduation with Honors.* The Honors Program in Linguistics offers the opportunity for highly motivated undergraduates to undertake a deeper and more individualized study of linguistics than is provided by the regular B.A. curriculum. Linguistics majors with an overall grade point average of 3.30 or higher



are eligible to participate in the program. Honors that may be earned are *cum laude* (with honors), *magna cum laude* (with high honors), and *summa cum laude* (with highest honors).

Students interested in pursuing departmental honors are encouraged to consult with the departmental undergraduate advisor by the beginning of their junior year to ensure that they will be able to meet the requirements for departmental honors before graduation.

## GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in Linguistics should read carefully Requirements for Advanced Degrees in the Graduate School section of this *Catalog* and the detailed degree requirements available from the Department office. A brief summary of M.A. and Ph.D. requirements is given below.

**Prerequisites.** Applicants should hold a recognized baccalaureate degree. They should have considerable knowledge of a language other than their native language. This knowledge may have been gained by formal study or by use of the language in a country, community, or institution where it is the usual means of communication. The Department may require formal study of a foreign language by graduate students whose proficiency in this area is less than the equivalent of the college junior level. GRE aptitude scores are required from United States residents; scores are also required from native speakers of English who wish to be considered for fellowship aid. TOEFL scores are normally required from foreign applicants.

## Master's Degree

Completion of an M.A. degree will normally call for a minimum of three semesters of study. Students with 12 or more semester hours of linguistics courses are expected to undertake a Plan I degree, which includes a thesis. The course requirements in Plan I are 24 semester hours of graduate courses, including 4-6 thesis hours. Students with less background in linguistics, or who wish an emphasis on TESOL, may be permitted by the Department to undertake a Plan II degree. The course requirements in Plan II are 30 semester hours of graduate courses. Both degree plans also require that students pass an examination of reading knowledge of French, German, or another approved language and a comprehensive examination.

## Doctor's Degree

In order to be admitted to the Ph.D. program a student must have completed course work equivalent to LING 5030 Linguistic Phonetics, LING 5410 Phonology, LING 5420 Morphology and Syntax, LING 5430 Semantics and Pragmatics, and LING 5570 Introduction to Diachronic Linguistics. Students enrolled in the M.A. program may apply to the Ph.D. program upon completion of these requirements whether they have completed the M.A. or not. Students who enroll in the Ph.D. program before finishing an M.A. may apply for the M.A. degree upon passing the doctoral preliminary examination, provided that all requirements for the M.A. except the comprehensive examination have already been met.

Students admitted to the Ph.D. program elect to pursue either cognitive linguistics or general linguistics. It is also desirable that students select a specialization as early as possible. In either area it is possible to specialize in phonetics/phonology, morphology/syntax, semantics/pragmatics, or text and discourse analysis. In cognitive linguistics, additional specialization in language acquisition, natural language processing, speech processing, and psycholinguistics is available. Students who elect general linguistics may choose among the additional alternatives of typological comparison, historical linguistics, Amerindian linguistics, or African linguistics.

## MATHEMATICS

*Degrees . . . . . B.A., M.A., M.S., Ph.D.*

## UNDERGRADUATE PROGRAMS

The Department of Mathematics offers degree programs leading to the B.A. degree in Mathematics in the College of Arts and Sciences and the B.S. degree in Applied Mathematics in the College of Engineering and Applied Science.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
Completion of mathematics course work including three semesters of calculus and 18 hours of mathematics courses numbered above 3000. The 18 hours must include MATH 3130 and 6 hours of mathematics courses numbered above 4000 (MATH 4570 or 5570 may not be counted in these 6 hours) . . . . .	30

*Note:* Mathematics majors may not use mathematics courses to satisfy

either the Humanities or the Natural Science requirement of the College.

**Residency requirement:** For the B.A. degree in Mathematics, all students must have completed at least 9 semester hours of upper-division mathematics courses, with grades of C- or better, taken in the College of Arts and Sciences on the Boulder Campus. Additional courses transferred from other universities or from other campuses of the University of Colorado that are used to meet the minimum 18-hour upper-division requirement must be approved by the Department of Mathematics. (In particular, MATH 300, 302, 303, 304, 311, 325, 326, 383, 398, 405, 406, 412, 415, 461, 467, 495, 496, 497, 499 at CU-Denver, or their equivalents, cannot be used toward the minimum requirement of 18 upper-division hours.) Courses accepted as mathematics credit but excluded from the minimum 18-hour upper-division requirement will still count in the 45 maximum hours allowed in mathematics.

After completing one semester of calculus with a grade of C or better, no Mathematics major may take MATH 1010, 1020, 1070, 1080, 1100, 1110, 1120, or 2510 for credit toward a degree in Mathematics. No student may obtain more than 9 hours of credit in Mathematics courses numbered below 1300. Undergraduate students planning to do graduate work in mathematics should take MATH 3140 and MATH 4310-4320 and should fulfill the College of Arts and Sciences language requirement with German, French, or Russian. Students seeking the B.A. degree may choose a program with emphasis on preparation for graduate work, one with a background in computer science, one with emphasis on preparation for secondary teaching, or one emphasizing applied mathematics.

Students seeking information regarding the B.S. degree should refer to the Applied Mathematics section in the College of Engineering and Applied Science portion of this *Catalog*. Students should obtain a major requirement sheet from the Department of Mathematics office.

## GRADUATE DEGREE PROGRAMS

The Department of Mathematics offers programs leading to the degrees of M.A. or Ph.D. in Mathematics and M.S. or Ph.D. in Applied Mathematics. The Ph.D. in Mathematical Physics is also offered in cooperation with the Department of Physics. (Mathematical Physics is listed under Interdepartmental Programs in the Graduate School section of this *Catalog*.) Students interested in any of these programs should read carefully the material describing

the University requirements in the Graduate School section of this *Catalog*.

The prerequisite for graduate work in mathematics is at least 30 semester hours in mathematics, including two semesters of advanced calculus, a semester of linear algebra, and a semester of either higher algebra or differential equations.

The basic requirements for the various degrees are summarized here, and full details are available in the Department office. For fulfillment of all course requirements, mathematics courses must be numbered 5000 or higher.

To earn an M.A. degree under the thesis plan, a student must complete 27 semester hours of course work and from 4 to 6 semester hours of thesis work. For the nonthesis plan, 30 semester hours of course work are required.

For the M.S. degree, 30 semester hours of credit are required. Of these, from 6 to 12 semester hours must be in an approved minor program outside the Mathematics Department. From 4 to 6 semester hours may be obtained from thesis work.

To earn an M.A. degree or an M.S. degree, a student must pass a master's examination based on the particular program of the student.

Before being admitted to candidacy for a Ph.D. degree in Mathematics, a student must pass examinations in real analysis, modern algebra, and a third topic chosen by the student, with approval required. The basic requirements for a Ph.D. degree in Mathematics are as follows: demonstrating a reading knowledge of two languages (French, German, or Russian), completing the Graduate School requirements for languages and course and thesis hours, writing a thesis that contains substantial original contributions to mathematics, and passing a final examination.

The program for the Ph.D. degree in Applied Mathematics is interdisciplinary, having many faculty from other departments authorized to supervise thesis work. To be admitted to candidacy for this degree, students must first pass a combined written examination on two of these areas—partial differential equations, numerical analysis, and mathematical statistics. They must then pass an oral comprehensive examination in their special field of interest. The basic requirements for a Ph.D. degree in Applied Mathematics are as follows: demonstrating a reading knowledge of two languages (French, German, or Russian), exhibiting scientific breadth (details on this requirement are available from the Department office), completing the Graduate School requirements for languages and course

and thesis work, writing a thesis containing substantial original contributions to applied mathematics, and passing a final examination.

## MEDIEVAL STUDIES

The Committee on Medieval Studies is founded on the conviction that the European Middle Ages represents a cultural unity in which the Roman church, the medieval Latin language, the concept of the Holy Roman Empire, and the polarity of East and West created institutions transcending the normal boundaries of nation, language, and scholarly discipline. Medieval Studies is therefore necessarily interdisciplinary; and the committee's function is to make possible and encourage such interdepartmental cooperation.

The following courses in various departments are available to those students whose area of specialization within a given department is the medieval period and who wish to broaden their knowledge of medieval culture. With the approval of the major department, a coherent group of these courses may be accepted as a related field of study and as part of the requirements for an advanced degree. For additional details concerning these courses, see departmental listings.

<i>Medieval Culture</i>	<i>Semester Hours</i>
MEDV 4020/5020 Introduction to Medieval Culture . . . . .	3
COML 5830 Literature and History: Medieval Pilgrimage and Literature . . . . .	1-3
COML 5420 Medieval Literature . . . . .	1-3
ENGL 5855 Tutorials in Medieval Studies . . . . .	variable credit
ENGL 7855 Advanced Medieval Studies . . . . .	variable credit
FINE 4029/5029 Art of Islam . . . . .	3
FINE 4039/5039 Byzantine Art . . . . .	3
FINE 4109/5109 Early Christian and Early Medieval Art . . . . .	3
FINE 4119/5119 Romanesque Art . . . . .	3
FINE 4129/5129 Gothic Art . . . . .	3
FINE 4139/5139 Italian Gothic Art . . . . .	3
FREN 5250 Medieval and Renaissance Readings . . . . .	2
HIST 4521 Intellectual History of Medieval Europe . . . . .	3
HIST 4013 Constitutional and Legal History of England to 1485 . . . . .	3
HIST 4314 History of Science From the Ancients to Sir Isaac Newton . . . . .	3
HIST 4318 The Medieval Middle East . . . . .	3
HIST 6511 Readings in Medieval History . . . . .	3
ITAL 4110 Dante: <i>Inferno</i> and <i>Purgatorio</i> . . . . .	3
ITAL 4130 Medieval Lyric Literature . . . . .	3
ITAL 4700 Dante: <i>Paradiso</i> , <i>la Vita Nuova</i> , and Minor Works . . . . .	3
MUSC 5822 Ancient and Medieval Music . . . . .	3-4
NASC 3410/PHIL 3410 History of Science: Ancients to Copernicus . . . . .	3
SPAN 5140 Seminar: Spanish Literature, Medieval Period . . . . .	2-4
<i>Medieval Languages</i>	
ENGL 5674 Anglo-Saxon . . . . .	3
ENGL 5684 Beowulf . . . . .	3
FREN 7030 History of the French Language to 1300: Grammar, Phonology, History . . . . .	3
FREN 7040 History of the French Language From 1300 to the Present Day: Morphology and History . . . . .	2

FREN 7050 Old Provençal . . . . .	2
RUSS 4720/5720 History of Russian Language . . . . .	3
SPAN 5420 Seminar: History of Spanish Language . . . . .	2-4

## MUSEUM

Although no undergraduate major is offered in museum studies, courses listed in the Course Description section may be taken with the approval of the student's major department.

In addition to the above courses, graduate training in anthropology, botany, zoology, and paleontology is provided under the direction of Museum faculty in cooperation with its cognate departments and Master of Basic Science Program. Areas of study include archaeological theory and interpretation, southwestern archaeology and ethnology, textile history and analysis, and early humans in North America; plant taxonomy and phytogeography with specialties in lichenology and bryology; vertebrate paleontology and Cenozoic stratigraphy; lower vertebrate paleontology, African Tertiary faunas and paleoenvironments; biology of mollusks, biology of aquatic invertebrates; taxonomy of insects of the Rocky Mountain Region; and marine micropaleontology.

Museum assistantships, research support from the Walker Van Riper Fund, and other financial assistance are available to selected students. Students interested in working toward advanced degrees in the above areas under the direction of Museum faculty should write the University of Colorado Museum, Campus Box 218, University of Colorado at Boulder, Boulder, Colorado 80309-0218.

Applicants accepted for graduate work by Museum faculty must be admitted to the Graduate School and to the graduate program of the cognate department.

Courses offered by Museum faculty through cooperating departments are listed below.

<i>Museum Courses</i>	<i>Semester Hours</i>
ANTH 4840 Independent Study . . . . .	1-3
ANTH 5840 Guided Study . . . . .	1-3
ANTH 6950 Master's Thesis . . . . .	4-6
ANTH 7840 Independent Research . . . . .	1-3
EPOB 4670/5670 Advanced Invertebrate Biology . . . . .	2-4
EPOB 4840/4870 Independent Study in Biology . . . . .	1
EPOB 6950 Master's Thesis . . . . .	4-6
GEOL 3070 Oceanography . . . . .	3
GEOL 4470/5470 Paleontology of the Lower Vertebrates . . . . .	4
GEOL 4480-5480 Paleontology of the Higher Vertebrates . . . . .	4
GEOL 5610 Mammalian Micropaleontology . . . . .	2
GEOL 5620 Field Problems of Vertebrate Paleontology . . . . .	5
GEOL 5700 through 5790 Geological Topics Seminar . . . . .	3
GEOL 4840 through 4849 Independent Study in Geology . . . . .	variable credit
GEOL 5840 through 5851 Independent Study . . . . .	variable credit

GEOL 5851 Research . . . . . variable credit  
 GEOL 6950 Master's Thesis . . . . . 0-6

## NATURAL SCIENCE

The Natural Science Program offers courses that go beyond the limits of single University departments. Some courses in Natural Science are designed to meet the needs of liberal arts students who are nonscience majors. Others seek to bring the perspectives of several scientific disciplines to bear on common problems or concepts. Courses in the history of science allow insight into the development of science in the broader context of the development of human thought. Overall, the Natural Science Program strives to make the sciences an integral part of the undergraduate, liberal arts curriculum.

## ORIENTAL LANGUAGES AND LITERATURES

*Degree* . . . . . B.A.

### COMPLETION OF MAPS

Beginning Fall Semester 1988, a Level-III high school foreign language course is required as one of the Minimum Academic Preparation Standards for admission to the University. This requirement may also be satisfied by demonstrating equivalent proficiency through placement testing or by satisfactorily completing CHIN 2110 or JPNS 2110. For details on completion of MAPS, see page 38.

### COMPLETION OF ARTS AND SCIENCES LANGUAGE REQUIREMENT

Until Fall Semester 1990, completion of a Level-III high school language course will fulfill the College graduation requirement in foreign language. Students who have studied Chinese or Japanese in high school or at another university and who wish to continue with the same language must consult the Department for placement. Successful completion of 2110 in either language satisfies the College graduation requirement in foreign language.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
Chinese	
CHIN 1010-1020 First Year (Beginning)	
Chinese . . . . .	10
CHIN 2110-2120 Second Year (Intermediate)	
Chinese . . . . .	10
CHIN 3110-3120 Third Year (Advanced) Chinese . 6	

CHIN 3210-3220 Introduction to Classical Chinese, Readings in Classical Chinese . . . . .	6
CHIN 4811 Chinese Poetry in Translation . . . . .	3
CHIN 4821 Chinese Fiction in Translation . . . . .	3
CHIN 4831 Chinese Drama in Translation . . . . .	3
<i>Japanese</i>	
JPNS 1010-1020 First Year (Beginning)	
Japanese . . . . .	10
JPNS 2110-2120 Second Year (Intermediate)	
Japanese . . . . .	10
JPNS 2211 Language and Patterns of Thinking and Behavior in Japanese Culture . . . . .	3
JPNS 3110-3120 Third Year (Advanced)	
Japanese . . . . .	6
JPNS 4110-4120 Readings in Classical and Modern Japanese . . . . .	6
JPNS 4811 Classical Japanese Literature . . . . .	3
JPNS 4821 Modern Japanese Literature . . . . .	3

Students may choose to major in either Chinese or Japanese. In either case they will receive a thorough grounding in the modern language, an introduction to the classical language and literature, and a broad familiarity with the literary and cultural history of the selected area. Upon completing this course of study, students should be able to converse freely and to read both utilitarian and literary materials with relative ease. Advanced work in Classical Chinese, with special emphasis on medieval literature, is also offered.

Before registering for specific courses, students should consult with a Department advisor concerning appropriate placement in language classes. Also, students interested in Chinese or Japanese are encouraged to broaden their career options through a double major, combining either language with another field of interest. Recent graduates have found positions in government service, international business, and secondary-school teaching; others have gone on to graduate study in their chosen area.

All students planning a major in Chinese or Japanese are encouraged to consider study abroad in order to improve their language ability. The University of Colorado is affiliated with a study abroad program based at National Taiwan University, Taipei, Taiwan, and another program at Konan University, Kōbe, Japan. For further information, contact the Office of International Education. Note, however, that not more than 20 semester hours of transfer credit, from universities in this country or abroad, may count toward the major in Chinese or Japanese.

### COURSES IN TRANSLATION

The Department offers several courses in translation. These courses require no previous study of the language, history, or culture of the area involved and are open to all interested students, whether majors in this Department or not. They provide excellent introductions to Chinese or Japanese

literary and cultural history. CHIN 4811, 4821, and 4831 focus on Chinese poetry, fiction, and drama, respectively, with primary emphasis on works from ancient and medieval times. JPNS 4811 and 4821 focus, respectively, on classical and modern Japanese literature, while JPNS 2211 provides an introductory overview of Japanese culture.

## PHILOSOPHY

*Degrees* . . . . . B.A., M.A., Ph.D.

Students are advised to consult the current *Schedule of Courses* for the most accurate information on prerequisites since these sometimes vary with instructors.

Courses at the 1000 level are open to all; courses at the 2000 level are open to all who meet the prerequisites; courses at the 3000 and 4000 levels are recommended only for juniors and seniors; courses at the 5000 and 6000 level are recommended primarily for graduate students.

Courses may be taken in any order providing prerequisites, if any, are met.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
PHIL 3000 and 3010 History of Philosophy . . . . .	6
PHIL 3350 Metaphysics and Epistemology . . . . .	3
PHIL 3100 Ethical Theory . . . . .	3
PHIL 2440 Symbolic Logic or 4440 Mathematical Logic . . . . .	3
PHIL 4040 Twentieth-Century Philosophy . . . . .	3
One course concerned with a single philosopher or a philosophical movement (or a substitute as approved by the student's advisor) . . . . .	3
Electives . . . . .	9

*Note:* The Department offers a number of topically oriented majors that are interdisciplinary in nature, including Law and Society, Dimensions of the Self, Philosophy and the Arts, and Values and Social Policy. Each of these majors requires two semesters in the history of philosophy, as well as a series of core courses that vary according to the topical emphasis. A student intending to complete a topical major in Philosophy should see either the appropriate advisor in the area or the Department undergraduate advisor as soon as possible.

### GRADUATE DEGREE PROGRAMS

Applicants for admission to the Graduate School for work toward a master's or doctoral degree with a major in Philosophy are expected to have had 18 or more semester hours in undergraduate courses in the subject.

Students wishing to pursue graduate work in Philosophy should note Requirements for Advanced Degrees in the Graduate School section of this *Catalog* and should obtain from the Department a copy of the *Graduate Program in Philosophy*.

In addition to its regular M.A. and Ph.D. programs, the Department offers special M.A. programs in the History and Philosophy of Science, and in Major Philosophies (Traditional and Modern). In connection with the Center for Values and Social Policy, the Department also offers an M.A. and Ph.D. in Values and Social Policy.

Beyond the required course work and examinations for the Ph.D., a diversified faculty provides opportunity for a wide range of specializations in the dissertation project. The Department makes available a limited number of teaching assistantships and assists with job placement. Descriptions of all degree programs are available from the Department of Philosophy.

## PHYSICS

*Degrees . . . . . B.A., M.S., Ph.D.*

Three different options are available to students in Physics. A distributed studies program called Computer Applications in Physics is also available. In addition, the content of courses and certain details of the requirements for the degree are changed from time to time. Because there is some flexibility within each option, the Department encourages students to pursue their own interests in setting up their curriculum. The final responsibility for fulfilling the requirements for the degree rests with the student.

For these reasons, students who plan to major in Physics should consult with their departmental advisor at least once per semester. Even if first-year students are only considering Physics as a major, they are strongly encouraged to visit a departmental advisor and discuss the situation. Because most of the advanced physics courses have various prerequisites, failure to settle on an appropriate plan of study early in the college career can result in delay and complications later.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

Major Requirements	Semester Hours
<i>Plan I (45 hours of Physics courses)</i> (Primarily for those planning graduate work in physics)	
PHYS 1110 and 1120 General Physics . . . . .	8
PHYS 1140 Experimental Physics . . . . .	1
PHYS 2130 General Physics . . . . .	3

PHYS 2140 Methods of Theoretical Physics . . . . .	3
PHYS 2150 Experimental Physics . . . . .	1
PHYS 3210 Analytical Mechanics . . . . .	3
PHYS 3220 Quantum Mechanics . . . . .	3
PHYS 3310 and 3320 Principles of Electricity and Magnetism . . . . .	6
PHYS 3330 and 3340 Junior and Senior Laboratory . . . . .	4
PHYS 4230 Thermodynamics and Statistical Mechanics . . . . .	3
PHYS 4410 and 4420 Atomic and Nuclear Physics . . . . .	6
PHYS 4430 Senior Laboratory . . . . .	2
MATH 1300 Analytic Geometry and Calculus 1 . . . . .	5
MATH 2300 Analytic Geometry and Calculus 2 . . . . .	5
MATH 2400 Analytic Geometry and Calculus 3 . . . . .	4
APPM 2360 Introduction to Linear Algebra and Differential Equations, or both MATH 3130 Introduction to Linear Algebra and MATH 4430 Ordinary Differential Equations . . . . .	3-6
CHEM 1111 and 1131 General Chemistry . . . . .	10
or CHEM 1151 and 1171 Honors General Chemistry . . . . .	10

In addition, students must take either PHYS 4440 or PHYS 3450 and a choice of 2 or 3 hours from a departmental list of elective courses.

### Recommendations for Plan I students:

Complete upper-division math courses in linear algebra, advanced calculus, complex variables, and partial differential equations, and one or more semesters of a biological science. Fourth semester of a foreign language will fulfill CU-Boulder Graduate School requirement.

### Plan II (minimum of 36 hours)

(For students who desire an undergraduate concentration in astrophysics, atmospheric physics, or geophysics, or who want to combine a Physics major with work in other areas such as applied mathematics, biophysics, chemical physics, environmental sciences, philosophy and history of science, premedicine, etc.)

PHYS 1110 and 1120 General Physics . . . . .	8
PHYS 1140 Experimental Physics . . . . .	1
PHYS 2130 General Physics . . . . .	3
PHYS 2140 Methods of Theoretical Physics . . . . .	3
PHYS 2150 Experimental Physics . . . . .	1
PHYS 3210 Analytical Mechanics . . . . .	3
PHYS 3220 Quantum Mechanics . . . . .	3
PHYS 3310 and 3320 Principles of Electricity and Magnetism . . . . .	6
PHYS 3330 Junior Laboratory . . . . .	2
PHYS 4230 Thermodynamics and Statistical Mechanics . . . . .	3

A minimum of 3 hours of electives must be taken from the following courses: 3340, 3810, 3820, 3830, 4340, 4510, 4610, 4620, 4410, 4430, 5010, 5030, 5040, 5770 . . . . .

CHEM 1111 and 1131 General Chemistry . . . . .	10
CHEM 1151 and 1171 Honors General Chemistry . . . . .	10
MATH 1300 Analytic Geometry and Calculus 1 . . . . .	5
MATH 2300 Analytic Geometry and Calculus 2 . . . . .	5
MATH 2400 Analytic Geometry and Calculus 3 . . . . .	4
APPM 2360 Introduction to Linear Algebra and Differential Equations, or both MATH 3130 Introduction to Linear Algebra and MATH 4430 Ordinary Differential Equations . . . . .	3-6

Interdisciplinary courses should be selected with the concurrence of the student's advisor, usually before the junior year. Interdisciplinary courses must be approved by the Arts and Sciences Advising Committee; it is therefore imperative that students in Plan II be in close contact with their advisors. For example, Astrophysical, Planetary, and Atmospheric Science courses numbered 3000 or above are acceptable to meet the Plan II astrophysics or atmospheric physics interdisciplinary requirement.

*Plan III (minimum of 26 hours of Physics and minimum of 20 hours in education courses)*  
(For students intending to be secondary teachers)

PHYS 1110 and 1120 General Physics . . . . .	8
PHYS 1150 Experimental Physics . . . . .	2
PHYS 2130 General Physics . . . . .	3
PHYS 2140 Methods of Theoretical Physics . . . . .	3
PHYS 2160 Experimental Physics . . . . .	2
PHYS 3210 Analytical Mechanics . . . . .	3
PHYS 3310 Principles of Electricity and Magnetism . . . . .	3
PHYS 3330 Junior Laboratory . . . . .	2
Teacher education courses . . . . .	20
CHEM 1111 and 1131 General Chemistry . . . . .	10
or CHEM 1151 and 1171 Honors General Chemistry . . . . .	10
MATH 1300 Analytic Geometry and Calculus 1 . . . . .	5
MATH 2300 Analytic Geometry and Calculus 2 . . . . .	5
MATH 2400 Analytic Geometry and Calculus 3 . . . . .	4
APPM 2360 Introduction to Linear Algebra and Differential Equations, or both MATH 3130 Introduction to Linear Algebra and MATH 4430 Ordinary Differential Equations . . . . .	3-6

Special Requirements:  
EDUC 3303: Students are required to take this course or pass a speech adequacy test before they can register for student teaching. Biology and Earth Science (Geology or Physical Geography): Two semesters each.  
The following education courses are taken in the student's senior year, which is known as the "Professional Year."  
EDUC 4102 Foundations of American Education . . . . . 3  
EDUC 4112 Educational Psychology and Adolescent Development . . . . . 3  
EDUC 4122 Principles and Methods of Secondary Education . . . . . 3  
EDUC 4232 Teaching Reading in the Content Areas . . . . . 3  
EDUC 4463 Teaching Exceptional Children . . . . . 2  
EDUC 4382 Methods and Materials in Science . . . . . 3  
EDUC 4712 Student Teaching—Secondary School 1 . . . . . 8  
EDUC 4722 Student Teaching—Secondary School 2 . . . . . 6

*Note:* Recommended elective mathematics courses for students in this plan include MATH 2720 Introduction to Abstract Mathematics, MATH 3110 Introduction to Theory of Numbers, and MATH 3210 Euclidean and Non-Euclidean Geometries.

It is possible at any stage of their college careers for students to transfer among plans, although junior or senior students transferring into Plan I or the distributed studies program, Computer Applications in Physics, may require an additional semester or two of studies beyond the normal four years.

With the approval of the advisor, a student may start with PHYS 2010 and then, deciding upon a Physics major, go directly into PHYS 1120. Similarly, it is not essential for students who have completed PHYS 2020 to take PHYS 1120 and 1140 before continuing with the major requirements.

## GRADUATE DEGREE PROGRAMS

Graduate study and opportunities for basic research are offered in the areas of nuclear physics, theoretical physics, condensed matter physics, elementary particle physics, plasma physics, atomic and molecular physics, laser physics, and fundamental measurements.

Doctoral programs in Chemical Physics and Mathematical Physics are

offered jointly with the Departments of Chemistry and Mathematics respectively and in Geophysics with the other departments that participate in the interdepartmental Geophysics program. For information on these programs, see Interdepartmental Programs in the Graduate School section of this *Catalog*.

In addition, a program leading to a Ph.D. in Physics with a specialization in medical physics is offered jointly with the Department of Radiology at the Health Sciences Center.

### Departmental Requirements

Students wishing to pursue graduate work in physics leading to candidacy for an advanced degree should read carefully Requirements for Advanced Degrees in the Graduate School section of this *Catalog*. Following are special departmental requirements.

### Master's Degree (M.S.)

*Prerequisites.* Entering graduate students must have a thorough undergraduate preparation in physics, equivalent to an undergraduate Physics major at a recognized college or university. This preparation includes courses in general physics, analytical mechanics, electricity and magnetism, thermodynamics, quantum mechanics, and atomic and nuclear physics, as well as two semesters of general chemistry, and mathematics through differential equations and complex variables.

*Language.* The department has no foreign language requirement.

*Course Requirements.* There are two separate plans for obtaining the master's degree. Plan I includes a thesis (4 hours), PHYS 5210 (Theoretical Mechanics), 5250 (Introduction to Quantum Mechanics), and 7310 and 7320 (Electromagnetic Theory) along with electives (5 hours) and mathematics (3 hours). Plan II (without thesis) includes PHYS 5210, 5250, 7310, 7320, and 5260 (Introduction to Quantum Mechanics) or 7550 (Atomic and Molecular Spectra) along with mathematics (6 hours) and electives (9 hours). All courses must be graduate courses numbered 5000 or above.

*Qualifying Examination.* The Graduate Record Examination aptitude tests and advanced test in physics are normally used in place of a qualifying examination, and this examination is normally taken before the time of entry into Graduate School.

*Preliminary Examination.* Each candidate for the master's degree, whether by Plan I or Plan II, must pass the preliminary examination. This examination is given each fall and spring semester.

For details, see discussion under Doctor's Degree.

### *Comprehensive-Final Examination.*

After the other requirements for the master's degree are completed, each master's degree candidate must take a comprehensive-final examination. If the student is following Plan I, in which a thesis is included, the final examination will cover the thesis. The comprehensive-final examination will be oral.

### Doctor's Degree (Ph.D.)

*Prerequisites.* Same as for master's degree, above.

*Languages.* The Department of Physics strongly recommends that the Graduate School communication requirement be met by a fourth semester course in a modern language taken while the student is an undergraduate. The Department has no requirement in foreign languages.

*Qualifying Examination.* Same as for master's degree, above.

*Preliminary Examination.* The preliminary examination consists of two three-hour parts. It will be given on one or two days of the registration period at the beginning of the fall semester. This examination will be a written examination on the material covered in the undergraduate courses leading to a B.A. or B.S. in Physics at CU-Boulder, or comparable courses at other institutions. All incoming regular or provisional degree students in the department are required to take this examination in their first semester.

The preliminary examination is also given at the end of the spring semester and it must be taken and passed at this time by all students who failed it in the fall and who wish to continue in a graduate degree program in the Department of Physics.

*Comprehensive Examination.* On the weekend preceding the start of spring semester and the first weekend of the semester, the written part of the comprehensive examination will be given. The examination will cover the material in the courses normally taken by all Ph.D. candidates in the first and second years of graduate study. The oral part will be given shortly after the written part. Both the written and oral parts will be considered in the passing or failing of the general comprehensive examination. Students who fail the general part of the comprehensive examination on their first attempt may take the examination once more a year later.

The final (research) part of the comprehensive examination is taken during the September following the passing of

the general section. It consists of a presentation of a thesis prospectus to the student's thesis committee.

*Course Requirements.* A set of specific course requirements for the Ph.D. has been eliminated in order to increase the flexibility of the Ph.D. program. The total number of hours required for the Ph.D. in Physics, however, is 36 (passed with a grade of A or B), of which at least 27 must be 5000 level or above physics courses and the remainder must also be from that group or be substitutes approved by the Graduate Committee. Elimination of specific course requirements allows students who have a particularly strong background in one or more of the traditional core areas of physics to skip the appropriate courses in favor of additional physics electives. It is expected, however, that the student with typical undergraduate preparation will take Quantum Mechanics (5250-5260), Electricity and Magnetism (7310-7320), Statistical Mechanics (7230), and Theoretical Mechanics (5210). Most students will also find it necessary to take one or more mathematical physics courses. In addition, Quantum Mechanics 3 (7270) is considered essential material for Ph.D. level physicists.

For a Ph.D. in Physics with a specialization in medical physics, the following physics and mathematics courses (24 semester hours) are required: PHYS 5210, 7310, 7320, 5250, 5260, 7230, and 6 semester hours of 5000- or 6000-level mathematics courses. In addition, 18 semester hours of courses in Medical Physics are required as follows:

Clinical Experience (Rad. 600-4)  
Clinical Radiology (Rad. 610-2)  
Basic Radiological Physics (Rad. 613-4)  
Physics of Radiation Therapy (Rad. 622-2)  
Physics of Medical Imaging I and II  
(Rad. 616-2 and 617-2)  
Radiopharmacy, Anatomy, and Physiology  
(Rad. 623-2)

*Final Examination.* The final examination is oral and covers the thesis.

## POLITICAL SCIENCE

*Degrees . . . . . B.A., M.A., Ph.D.*

The Department of Political Science offers instruction and research on the art and science of politics. Work within the Department is organized around seven basic fields: American government and politics, comparative politics, public administration, law and politics, political philosophy, empirical theory and methodology, and international relations. Three major, current research interests cut across these areas and concentrate teaching and research efforts on the areas of American government, comparative politics, and international relations. The Department

houses four centers of research activities: the American Politics Research Center, the Center for Comparative Politics, the Center for International Relations, and the Center for Public Policy Research, as well as an undergraduate program in International Affairs. A public service option is also available for undergraduates wishing to prepare for and participate in government or private public-policy-oriented organizations. Additionally, a five-year B.A./M.A. program is available for undergraduates interested in studying public policy. The Department also participates in the Distributed Studies program, offering courses leading to a major combining computer science and data analysis skills with knowledge of the political system. Programs leading to the M.A. and Ph.D. degree are offered.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
Students in the regular Political Science major must complete 36 semester hours in the Department of which 21 hours must be in upper-division courses. Nine hours from the following lower-division courses:	
PSCI 1101 The American Political System . . . . .	3
PSCI 2012 Introduction to Comparative Politics: Developed Political Systems or PSCI 2022 Introduction to Comparative Politics; Developing Political Systems; or both PSCI 2112 Governments of Great Britain and France and PSCI 2122 Governments of Germany and Russia . . . . .	3-6
PSCI 2222 Introduction to International Relations . . . . .	3
PSCI 2404 Introduction to Political Theory . . . . .	3
Eighteen hours from the following upper- division courses: PSCI 4004 History of Political Philosophy . . . . .	3
plus one other upper-division theory course . . . . .	3
Completion of at least 6 hours of upper-division courses in each of the two remaining primary fields: American and international/ comparative . . . . .	12
Required courses in addition to Political Science courses:	
ECON 2010 Principles of Microeconomics . . . . .	4
ECON 2020 Principles of Macroeconomics . . . . .	4

## Public Service Option

For students interested in a career in public service (government or private public-policy-oriented organizations), the Department of Political Science offers a special program designed to prepare students for such careers. This program is oriented toward the American political system; however, with special counseling students may organize their studies to emphasize another country or international organizations.

Public Service option majors may also apply for early admission to the M.A. program in Public Policy Analysis. With

proper planning, students may complete the two-year M.A. program in one year by substituting graduate-level courses for Public Service option requirements during their senior year.

*Public Service Option (At least 30 hours of Political Science course work)*

<i>Major Requirements</i>	<i>Semester Hours</i>
PSCI 1101 The American Political System . . . . .	3
PSCI 2101 Introduction to Public Policy Analysis . . . . .	3
PSCI 4181 Public Administration . . . . .	3
PSCI 4074 Quantitative Research Methods . . . . .	3
One upper-division course is required in each of the following two fields: international/ comparative; political theory . . . . .	6
At least 15 hours are required from the following list, including at least one course in state/ urban government, and at least one in federal government: state/urban government courses (PSCI 4021, 4061, 4071, 4081, 4091, 4111); federal government courses (PSCI 4001, 4011, 4031, 4041, 4051, 4141, 4191, 4201, 4211); law courses (PSCI 2481, 4231, 4241, 4251, 4261, 4271); other departmental courses (ECON 4211, 4252) . . . . .	15
ECON 2010 Principles of Microeconomics . . . . .	4
ECON 2020 Principles of Macroeconomics . . . . .	4
At least 15 hours of course work are required from the following list: computer science: (CSCI 1200, 1210, 3245); math/statistics: (MATH 1070, 1080; ECON 3818); accounting: (ACCT 2000, 3220, 3320, 4800) . . . . .	15

All undergraduate transfer students majoring in Political Science must accumulate a minimum of 45 grade points in upper-division political science courses at the University of Colorado in order to qualify for the B.A. degree.

## GRADUATE DEGREE PROGRAMS

The faculty encourages applications for the M.A. and Ph.D. degrees from qualified and motivated students wishing to probe deeply into the analysis of political life. Professional courses in the graduate curriculum range from the analysis of Colorado water policy to the study of the political economy of the global system. The curriculum is structured to lead to the Ph.D. degree as well as offer several programs culminating in the M.A. degree. In addition to the M.A. degree in Political Science, special focus is placed on two professionally oriented M.A. degrees, one that is oriented toward entry into the public sector as a policy analyst and one concentrating on preparing students for careers in global affairs.

Students wishing to pursue graduate work toward one of these degrees should read carefully the Graduate School requirements for admission and degrees in this *Catalog*. In addition they should write to the departmental office for additional information on graduate programs.

*The Department does not offer the Plan II option for the Master of Arts degree.*

## Departmental Admission Requirements

Applicants to the graduate program in Political Science should normally present evidence of at least 18 semester hours of course work in political science, 9 of which should be at the upper-division level. In addition the Department requires applicants to the program to present quantitative and verbal GRE scores that total at least 1000, and that show at least a score of 400 on the verbal. Three letters of recommendation, an undergraduate grade point average of at least 2.75, official transcripts, and a short essay detailing interests and plans are also required to complete the application packet. Students with especially strong records (e.g., total GRE scores greater than 1200; undergraduate GPA  $\leq$  3.20) may apply for direct admission to the Ph.D. program. Applications should be filed with the Department by February 28, although late applications are considered until May 15, and may be considered after that at the Department's discretion. Decisions regarding admission and financial aid are typically completed during the first half of March each year.

## Graduate Minor in Political Science

Graduate students who choose to minor in political science should consult the College of Arts and Sciences section for the descriptions of 4000-level courses, since minors but not majors are eligible to receive credit for 4000-level courses.

## Master of Arts in Political Science

Students desiring a graduate major in Political Science should present 18 semester hours of undergraduate work in the subject, 9 hours of which must be in upper-division courses. Any deficiencies must be made up before the student will be admitted as a regular degree student and the work involved will be in addition to the minimum hourly requirements for the degree.

Students shall concentrate in any one of seven political science fields and offer 3 semester hours of work in regularly scheduled political science seminars in each of three areas defined as follows: American, including American government and politics, public administration, and law and politics; international, including comparative politics and international relations; and theory, including political philosophy and empirical theory and research methods.

Students are responsible for familiarizing themselves with all degree



requirements, some of which are outlined in the Graduate School section of this *Catalog*. In brief, the degree requirements include a minimum of 25 semester hours of graduate credit, encompassing at least 21 semester hours at the 5000 level or above, to include at least 12 semester hours of work in regularly scheduled political science seminars; and 4 semester hours for the M.A. thesis. Students may offer up to 6 hours in Political Science Graduate Research Topics, and up to 6 hours in a cognate discipline (graduate seminar, senior undergraduate course, or independent study), but not more than a total of 9 hours combined. The 9 semester hours may not be substituted for required seminars. The student must take work from at least four members of the graduate faculty.

Students shall select a faculty advisor from among the regular members of the Department's graduate faculty at the earliest possible date, but no later than the end of the second week of the second semester of residence. The faculty advisor must have general competence in the student's primary field of emphasis and will serve as the first reader of the M.A. thesis. The second reader, who shall likewise have general competence in the topic of the M.A. thesis, must be associated intimately with the thesis from its inception and in no case after the student begins writing. The completed draft of the thesis must be in the hands of the second and third readers at least four weeks prior to the comprehensive-final examination.

A thesis based on original investigation and showing mature scholarship and critical judgment, as well as familiarity with tools and methods of research, is required.

Each candidate for a master's degree is required to take a comprehensive-final examination *after* the other requirements for the degree have been completed. This examination may be given near the end of the last semester of residence while the candidate is still taking required courses for the degree, provided satisfactory progress is being made in those courses. The examination will be oral and last approximately two hours. It will concentrate on the student's field of emphasis as well as the M.A. thesis. The Comprehensive-Final Examination Committee will have three members, including the faculty advisor (the Chair) and the second reader of the thesis. At least two committee members must be chosen from among regular members of the graduate faculty of this Department, in consultation with the faculty advisor; the third committee member may be a graduate faculty representative from a cognate

discipline. Satisfaction of the examination requires the affirmative vote of each of three committee members.

M.A. comprehensive-final examinations are normally not given during the summer months. In exceptional circumstances, a student may petition the Graduate Curriculum Committee of the Department, showing cause why this rule should be waived. Such a petition shall be received no later than April 15.

### **Master of Arts in Political Science (International Affairs)**

The increased participation of the United States in world politics has opened a variety of new careers in international affairs. The master's program in international affairs of the Department of Political Science is designed to provide a well-rounded education in international affairs for students who are seeking careers of international service with the national government, with international organizations, with private business, with non-governmental organizations, or in the fields of teaching and research. This M.A. program is also a logical step toward obtaining a Ph.D. in Political Science at the University of Colorado or elsewhere.

Students desiring an M.A. in Political Science (International Affairs) shall normally offer 12 hours of work in the international area, 9 of which must be in the field of international relations, and 3 hours in either American political science or theory. It is advisable for the student to include the international relations proseminar in the 9 hours in the field of international relations. If a student's plan of studies so indicates, and permission is granted by the student's faculty advisor and the Department Chair, the student may substitute up to 6 hours of credit from another department for the 3 hours in each of the other two areas of study.

Each student in this program must pass a GSFLT proficiency test in a foreign language approved by the student's advisors and/or present evidence of an advanced proficiency in social statistics or computer science. The latter proficiency may be achieved by obtaining a *B* or better in a sequence of courses to be identified by the student's committee. A list of the course sequences that have been approved to meet this requirement will be available in the departmental office. In exceptional cases, the Graduate Curriculum Committee may accept other evidence that the student has acquired a good working knowledge of a foreign language or the advanced proficiency in social statistics or computer science.

For the remaining requirements for this degree, see the section on the Master of Arts in Political Science.

### **Master of Arts in Political Science (Public Policy)**

The goal of this program is to train professional policy analysts for non-academic careers. The curriculum is designed to provide skills in normative and empirical analysis necessary to participate responsibly and effectively in policy design and evaluation at any level of government.

This is a Master of Arts program with thesis, requiring 36 hours of credit including 30 hours of course work divided among a core curriculum, quantitative methods, policy research seminars, and electives. The remaining 6 hours include 2 hours of internship credit and 4 hours of thesis credit. Completion of these requirements will normally require two years and at least one summer. University of Colorado students in the Public Service option program may receive up to 15 hours credit toward these requirements for courses taken as part of their B.A. degree requirements. Students interested in the 5-year B.A./M.A. option should contact a faculty advisor to plan their junior and senior year schedule.

The core curriculum consists of 18 hours of required seminars: Public Policy Analysis 1: The Decision Process, Public Policy Analysis 2: The Problem Orientation, Research Methods, and Legal Foundations of Policy Analysis, plus Intermediate Statistics, and Applied Microeconomics. If these courses require prerequisites that the student does not have, those hours must be added to the 36 required to complete the program. Each student is required to take two research seminars in public policy analysis, which may or may not be on the same topic. Six hours of electives allow for additional substantive or methodological specialization. These may include any graduate seminar in political science or selected courses in other departments. Substitutions of alternative courses for outside electives, statistics, microeconomics, and research seminar requirements may be made with the approval of the designated faculty advisor. Course work may include a maximum of 6 hours of Political Science Graduate Research Topics.

The thesis for this M.A. program is a research report on a policy problem and provides a concrete demonstration of the analytical skills, intellectual perspective, and substantive knowledge acquired in course work. When possible, the practical experience gained in the internship will be utilized in the

thesis. As a general rule the research report will be somewhat shorter (but not less analytical) than the standard M.A. thesis. The thesis must be supervised by the thesis advisor and the second reader. The thesis advisor and the second reader must be associated intimately with the thesis from its inception and in no case after the student begins writing. The completed draft of the thesis must be in the hands of all readers at least four weeks prior to the comprehensive-final examination.

Each candidate is required to take a comprehensive-final examination after the other requirements for the degree have been completed. This examination may be given near the end of the last semester of residence while the student is still taking required courses for the degree, provided satisfactory progress is being made in those courses. When possible, comprehensive-final examinations taken during the summer should be scheduled during the week prior to the beginning of the fall semester. At no time will the oral examination be scheduled until the thesis is found substantially acceptable to the first two readers. The oral examination covers the entire program and will last approximately two hours. Satisfaction of the examination requires the affirmative vote of each of the three committee members.

### Doctor of Philosophy

An applicant must have a master's degree in political science or in a related field from this University or from another accredited institution before entering the Ph.D. program.

The Department of Political Science requires at least 40 hours of course work (with a grade of *A* or *B*) beyond the bachelor's degree for the Ph.D. Except for 3 semester hours which may be taken at the senior undergraduate level in a cognate field at this University, all 40 hours must be at the 5000 level or above. Not to be included in the 40 hours are dissertation and research hours, master's thesis hours, or those hours used to fulfill the language and statistics requirements. The 40 minimum hours must include at least two seminars in each of the three fields which the candidate presents for the written comprehensive examination. Furthermore, each student's program shall include at least one seminar in each of the following three categories: American (American government, public administration, law and politics); international relations/comparative politics (comparative politics, international relations); and theory (political

philosophy, empirical theory, and methodology).

Thirty-three hours must be taken in political science. Of this 33, 31 must be in regularly scheduled seminars, not more than 6 hours of which may be transferred from another accredited institution. Not more than 6 hours of Political Science Graduate Research Topics combined will be allowed toward the degree. The maximum amount of work which may be transferred to this University for the Ph.D. is 30 semester hours, but the Department of Political Science may accept an additional 5 hours as in-house credit toward fulfilling departmental requirements beyond those set by the Graduate School.

*The First-Year Requirements.* All beginning graduate students for the Ph.D. program are required to take a core seminar in the fields of American politics, comparative politics, and international relations during their first year in residence. In addition, each incoming student will take a course focusing on a broad-ranging introduction to the methods of research and inquiry in political science. Further, during the first year of residence each student will take an additional core seminar which will be chosen by the student from the fields of political philosophy, law and politics, public administration, and empirical theory and methods.

Students will be required to select a topic in collaboration with their major advisor which will lead to the formulation, execution, and written presentation of a piece of original research. This research paper will demonstrate original research of potentially publishable quality and will be due the first day of finals in the second semester of residence. This work will be evaluated by five readers. Following this, an oral examination focused on the content of the core seminars will be conducted by the student's major advisor and two other members of the Department.

*Advisory Committee.* The role of the Advisory Committee is crucial. Its function is to guide students in their progress through their degree programs. Students shall select a Chair for their Advisory Committee before the end of the semester during which the requirements for the Ph.D. preliminary examination are fulfilled. Normally this will be by the end of the second semester in residence. Exceptions will occur if a part or all of the preliminary examination must be retaken. If a student does not select a Chair during the time specified, the departmental Chair shall designate such a Chair for the purpose of administration and advising.

The Advisory Committee shall consist of three regular faculty members in residence who are members of the political science graduate faculty and who each represent one of the student's fields of concentration. The second and third members of the Advisory Committee shall be selected by the student with the approval of the Chair of the committee within two weeks after the selection of the advisory Chair. The Advisory Committee shall meet with the student at least once during each academic year to review the student's progress and to assist in planning the student's future course of study.

Changes in the composition of the Advisory Committee may be made by the Graduate Curriculum Committee, upon petition from the student or one or more members of the student's Advisory Committee.

*Language Requirement.* The Department requires fulfillment of the Graduate School language requirement.

*Statistics Requirement.* Each student shall be required to take at least two courses from among those designated by the Graduate Curriculum Committee. The Graduate Curriculum Committee will distribute a list of these courses on an annual basis.

*Comprehensive Examinations.* Comprehensive examinations shall consist of a written and an oral part. The written examination shall cover the three fields of concentration selected by the student; the oral examination will be a rigorous comprehensive test of the student's knowledge of the major field of emphasis, including the location of the field in a broad comparative, philosophical, and methodological context.

For the purpose of the comprehensive examination, the discipline of political science is divided into the seven fields listed at the beginning of this departmental section. In the preparation of the student's comprehensive examination, each member of the Advisory Committee, in conjunction with not less than two other members of the Department who are rostered in the same field of concentration, shall design a written examination which shall seek to measure the candidate's range of knowledge over the field involved, as well as the capacity to engage in sophisticated analysis of specific problems identified with that field. The student shall demonstrate close familiarity with the literature of the three fields chosen for the written examination and shall consult frequently in this regard with the members of the Department who are rostered in those fields. Students must receive a *pass* or *high pass* from at least two members of the three-member

committee in each field to pass that examination.

A student who fails to pass the written comprehensive examination in any field shall be allowed to take that written comprehensive examination again during the following semester. If the student fails this second examination, the student shall automatically be dismissed from the Department's graduate program.

No student may be permitted to take the oral part of the comprehensive examinations until he or she has passed the written part.

The oral part of the comprehensive examination shall be scheduled within two weeks after the student has passed the written examination. Normally, this examination shall be administered by the three persons who prepared the student's written examination in the major field of emphasis, plus two additional members selected by the Graduate Curriculum Committee from the faculty roster for this field of emphasis. To insure comprehensiveness where appropriate, one member of the oral examining committee, representing the student's major field of concentration, may be drawn from outside of the Department. If a student fails the written examinations, the oral examination will be canceled in accordance with departmental rules. At least four of the five members of the examining committee must concur for a student to pass this examination. A student may retake the oral part of the comprehensive examination once, after a lapse of not less than eight months. To the extent possible, this reexamination will be conducted by the same examiner(s). If the student fails this second examination, he or she shall automatically be dismissed from the Department's graduate program.

**Dissertation Requirements and Final Examination.** A dissertation based on original investigation and showing mature scholarship and critical judgment, as well as familiarity with tools and methods of research, is required. A candidate for the Ph.D. shall select a dissertation topic in consultation with a dissertation advisor who is rostered in the student's primary field of emphasis, a second reader who has general competence in the dissertation topic, and at least one additional faculty member rostered in the student's primary field of interest. The dissertation advisor shall submit the topic, along with the names of the second reader and other faculty consulted in its selection, to the departmental Chair for approval. These steps must be completed at least eight months prior to the dissertation defense.

Once the dissertation has been accepted tentatively by the first two readers, a final oral examination will be conducted by the dissertation committee. Approved by the Dean of the Graduate School, the committee shall consist of not fewer than five representatives from those departments in which a student has worked, including at least one professor outside the Political Science Department but who is a member of the University of Colorado graduate faculty.

The examination is open to the public. More than one dissenting vote from the committee will disqualify the candidate in the final examination.

## PSYCHOLOGY

*Degrees . . . . . B.A., M.A., Ph.D.*

Psychology is a biosocial science that studies behavior from both biological and social perspectives. The major and elective requirements are designed to achieve a broad understanding of the contents, concepts, and research methods of contemporary psychology in the context of a quality liberal arts education.

Students contemplating postgraduate education, either in professional or in graduate school, are encouraged to participate in the departmental honors program, which provides special opportunities for individualized attention.

According to evaluations by the National Academy of Sciences and the Gourman Report, CU-Boulder's Psychology Department is ranked as one of the best in the country with respect to the quality of the faculty and their scholarly productivity. All of these faculty members are involved in undergraduate instruction. Moreover, the Department offers undergraduates a wide range of opportunities for involvement in research. Students can also participate in preprofessional activities such as serving as a volunteer mental health aide or counselor, a special tutor or teaching assistant, or a substance abuse counselor.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
PSYC 1001 General Psychology . . . . .	4
PSYC 2101 Statistics and Research Methods in Psychology . . . . .	4
One of the following:	
PSYC 4145 Cognitive Psychology, PSYC 4165 Psychology of Perception, or PSYC 4205 Psychology of Learning . . . . .	4
One of the following:	
PSYC 4303 Abnormal Psychology, PSYC 4313 Psychopathology, PSYC 4406 Social Psychology, PSYC 4456 Psychology of Personality, PSYC	

4684 Developmental Psychology, or PSYC 4733 Principles of Psychological Testing . . .	3-4
At least two courses from the following:	
PSYC 4052 Physiological Psychology, and/or PSYC 4102 Behavioral Genetics; if only one of the previously mentioned courses is taken, one of the following courses must also be taken: PSYC 4092 Hormones and Behavior, PSYC 4132 Drugs and the Nervous System, PSYC 4385 Ethology and Comparative Psychology, PSYC 4672 Developmental Psychobiology . . . . .	6-7
PSYC 4001 Honors Seminar, or PSYC 4511 History of Psychology . . . . .	3
Electives . . . . .	4-6

In addition to the requirements listed above, a student majoring in Psychology will be required to pass one of the following science sequences with a grade of C- or better:

ANTH 2010 and 2020 Introduction to Physical Anthropology 1 and 2	
CHEM 1051 and 1071 Introduction to Chemistry and Introduction to Organic and Biochemistry	
CHEM 1111 and 1071 General Chemistry and Introduction to Organic and Biochemistry	
CHEM 1111 and 1131 General Chemistry	
CHEM 1151 and 1171 Honors General Chemistry	
CSCI 2204 and 2250 Discrete Structures 1 and Data Structures and Algorithms	
EPOB 1210 and 1220 General Biology 1 and 2	
MATH 1300 and 2300 Analytic Geometry and Calculus 1 and 2	
MADB 1050 and 1060 Introduction to MCD Biology 1 and 2	
PHYS 1110 and 1120 General Physics	
PHYS 2010 and 2020 General Physics	

*Note:* A major in Psychology requires a minimum of 30 semester hours, 18 of which must be upper division.

## GRADUATE DEGREE PROGRAMS

Students are admitted for graduate studies leading to the Ph.D. in one of seven fields: behavioral genetics, behavioral neuroscience, learning and motivation, clinical, cognitive, social, and sociocultural psychology. The Behavioral Genetics Program focuses on the study of genetic contributions to individual differences in behavior. The fundamental tenet of the Behavioral Neuroscience Program is that a complete understanding of behavior entails unraveling mechanism and principles at any and all levels of organization (i.e., behavior, neuroanatomy, neurophysiology, neurochemistry). The major training goals of the Clinical Psychology Program follow the Boulder Model in that the preparation of scholar-clinicians is stressed. The Cognitive Psychology Program includes course work and research in the following areas of cognition: problem solving, thinking, human learning and memory, judgment and decision making, language, artificial intelligence, reading, attention and performance, perception, and information processing. The Program in Social Psychology trains students to conduct research, either applied or basic, in the fields of social cognition, judgment and decision making, and social behavior, including social development. The Sociocultural Psychology Program offers

graduate training in the knowledge, theory, and research methodology relating to cultural influences on behavior.

### Requirements for the Ph.D. Degree

All students are admitted with the expectation that they will work toward the Ph.D. degree. Many students fulfill the requirements for and receive a Master of Arts degree in the course of working toward the Ph.D. To state the requirements for the Ph.D. in terms of credit hours would be misleading, since the degree is not conferred merely upon the satisfactory completion of a course of study, however faithfully pursued. Students who receive this degree must demonstrate that they are proficient in some broad subject of learning and that they can critically evaluate work in this field; furthermore, they must have shown the ability to work independently in their chosen field and must have made an original contribution of significance to the advancement of knowledge.

In the first year of graduate study, all psychology graduate students enroll in a two-semester graduate statistical sequence. In addition, there is a first-year research requirement that can be fulfilled in several ways, but that requires the student to begin an active program of research. Typically, the student must also enroll in a sequence of proseminars designed to give the student a somewhat broad exposure to various research topics and methods. In addition to a major field of study, the student must demonstrate competence in a minor field of study within the Department.

Before admission to candidacy for the Ph.D. degree, the student must pass a comprehensive examination in the field of concentration and related fields. This examination is written (with additional oral parts, at the option of the faculty) and tests the student's mastery of a broad field of knowledge, not merely the formal course work completed.

A variety of advanced research seminars are taught on a regular basis. Students are required to be enrolled in at least one substantive course in the Department each semester until the comprehensive examinations have been successfully completed. Upon completing the comprehensives, students engage in the dissertation research, culminating in an oral defense.

### RELIGIOUS STUDIES

*Degrees . . . . . B.A., M.A.*

The academic study of religion began at the University of Colorado at Boulder

as a program in 1970. Since then it has grown to full departmental status, with B.A. and M.A. degrees and a diverse and productive faculty with leadership roles in a number of fields. The curriculum includes the study of Mesoamerican and Native American religions, Buddhism, Hinduism, Taoism, Confucianism, Judaism, Islam, Christianity, women and religion, and religion and literature. A variety of theoretical and methodological perspectives and approaches are utilized throughout the curriculum and are critically and extensively considered in special courses. The program offers special resources for the study of indigenous American religions including the Mesoamerican Archive, which maintains a record of the excavation of the great Aztec temple in Mexico City. Colorado is an excellent place for such work because of its geographic location and easy access to sites and contexts in the American West, Southwest, and Mesoamerica.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
Students must complete at least 36 hours in courses on religion. The following courses must be included:	
RLST 1620 Religious Dimension in Human Experience . . . . .	3
RLST 2600 World Religions: Western . . . . .	3
RLST 2620 World Religions: Eastern . . . . .	3
RLST 2700 American Indian Religions . . . . .	3
RLST 4830 Senior Majors Seminar . . . . .	3
At least 18 hours of upper-division work in Religious Studies (including RLST 4830 Senior Majors Seminar) must be taken on the Boulder Campus	

### MASTER OF ARTS IN RELIGIOUS STUDIES

#### Degree Requirements

The Master of Arts in Religious Studies requires the satisfactory accomplishment of the following:

1. At least 24 hours of graduate-level course work plus a thesis of 4-6 hours must be completed. The course work must include RLST 6830 Theory and Method in the Study of Religion. Up to 9 hours of course work may be taken outside the Department consistent with the student's special needs and interests. The student's program of study must receive departmental approval.
2. A satisfactory reading knowledge of a foreign language appropriate to the chosen field of specialization must be demonstrated.
3. A written comprehensive examination must be passed.

4. An acceptable thesis must be written and, after approval of the final draft of the thesis, an oral examination dealing with the subject matter of the thesis must be passed.

### SLAVIC LANGUAGES AND LITERATURES

*Degree . . . . . B.A.*

The Department offers a major in Russian, emphasizing language, literature, and linguistics. The aim of the curriculum is to equip students to read, write, speak, and understand Russian on a level allowing communication with natives and other users of the language. Before registering for a course, students should consult with a departmental advisor concerning appropriate placement. Students interested in Russian should consider a double major in order to increase their career opportunities. Prospective teachers might combine Russian with a major in another foreign language, while those preparing for a career in government service should benefit from a combination of Russian and a social sciences major. Faculty members in other departments who have expertise in areas where important Soviet research is being done can advise students on the way Russian study relates to their specialty.

### COURSES IN TRANSLATION

The Department of Slavic Languages and Literatures offers a number of courses in translation. These courses generally require no previous study in the language, history, or culture of the area involved, and are open to all interested students, regardless of major.

### COMPLETION OF MAPS

Beginning Fall Semester 1988, a Level-III high school foreign language course is required as one of the Minimum Academic Preparation Standards for admission to the University. This requirement may also be satisfied by demonstrating equivalent proficiency through placement testing or by satisfactorily completing RUSS 2010 or 2110. For details on completion of MAPS, see page 38.

### COMPLETION OF ARTS AND SCIENCES LANGUAGE REQUIREMENT

Until Fall Semester 1990, completion of a Level-III high school language course will fulfill the College graduation requirement in foreign language.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
Required beginning-level courses:	
RUSS 1010 and 1020 Beginning Russian . . . . .	10
<i>Required middle-level courses:</i>	
RUSS 2010 and 2020 Second-Year Russian Grammar and Composition . . . . .	6
RUSS 2030 and 2040 Second-Year Russian Oral Practice . . . . .	4
RUSS 3010 and 3020 Third-Year Russian . . . . .	6
RUSS 3200 Russian Phonetics . . . . .	3
<i>Recommended electives:</i>	
RUSS 2110 Reading Russian . . . . .	3
RUSS 2211 Introduction to Russian Culture . . . . .	3
RUSS 2221 Introduction to Soviet Culture . . . . .	3
RUSS 3030 and 3040 Russian Conversation . . . . .	4
RUSS 4821 Twentieth-Century Russian Literature (in English) . . . . .	3

*Note:* Required beginning or middle-level language courses may be met totally or in part by courses taken elsewhere, transfer credit, or other work accomplished.

Students must complete 35 hours beyond the first year or 30 hours beyond the second year (even if they enter the program at an advanced level) to include the following courses:

RUSS 4010 and 4020 Advanced Grammar Topics and Composition . . . . .	6
RUSS 4811 Nineteenth-Century Russian Literature (in English) . . . . .	3
RUSS 4720 History of the Russian Language . . . . .	3
One 4000-level author, period, or genre course listed below:	
RUSS 4310 Pushkin and His Time . . . . .	3
RUSS 4420 Gogol . . . . .	3
RUSS 4430 Dostoevsky . . . . .	3
RUSS 4440 Tolstoy . . . . .	3
RUSS 4450 Chekhov . . . . .	3
RUSS 4460 Solzhenitsyn . . . . .	3
RUSS 4510 Twentieth-Century Russian Poetry . . . . .	3
RUSS 4610 Twentieth-Century Russian Literature: Prose in the Soviet Union . . . . .	3

All of the above courses must be taken on the Boulder Campus.

**Language Placement.** One year of high school Russian is usually considered equivalent to one semester of college Russian. Thus a student with two years of high school Russian should enroll in RUSS 2010 or 2110. Students who think that they should be placed at a level different from the normal one should consult the Department for advice. Placement level will be determined on consultation with the Department and should be done before registering for classes.

Students studying Russian may earn credit for courses taken in the summer or during the academic year in the U.S.S.R. after consultation with the Department. Information on such programs may be obtained through the Office of International Education.

## GRADUATE DEGREE PROGRAM

The master's degree program in Russian has been discontinued.

## SOCIOLOGY

*Degrees . . . . . B.A., M.A., Ph.D.*

### CONCENTRATIONS AND SPECIALIZATIONS

The Sociology Department offers undergraduate concentrations in four fields: criminology, demography, sex and gender, and social conflict. In addition to these major areas of concentration, students may specialize in a number of subfields of sociology including social psychology, sociology of language, medical sociology, and sociology of knowledge.

A current list of the specializations available to graduate students may be obtained from the graduate secretary of the Sociology Department.

### BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
SOCY 1001 and 1011 Introduction to Sociology . . . . .	6
SOCY 4001 Research Methods in Sociology or SOCY 4011 Field Experience in Sociology . . . . .	6
Electives . . . . .	18

### GRADUATE DEGREE PROGRAMS

#### Departmental Requirements

Students wishing to pursue graduate work in sociology leading to candidacy for an advanced degree should read carefully Requirements for Advanced Degrees in the Graduate School section of this *Catalog*.

The following are additional requirements for admission to the graduate degree programs of the Department:

1. A combined grade point average of at least 3.00 (*B*) for all courses in sociology undertaken as an undergraduate or graduate student prior to admission.

2. Satisfactory scores (as determined by the department) on the Graduate Record Examination, including both the verbal and quantitative sections and at least one advanced test. This examination may be taken at any location in the United States certified by the Educational Testing Service and the results may be sent to the Department by the Educational Testing Service or the institution administering the examination.

#### Master's Degree

The requirements for an M.A. degree are 24 semester hours of course work at or above the 5000 level plus a thesis. At

least 18 of these hours must be taken in the Sociology Department at Boulder. The M.A. thesis must be defended at an oral examination.

### The Doctorate

The main requirements for the doctorate degree are:

1. A minimum of 45 semester hours at or above the 5000 level. At least 24 of these 45 hours must be taken in the Sociology Department at CU-Boulder.

2. The following required courses must be included in the 45 hours minimum: (a) 6 hours of sociological theory (SOCY 5001 and SOCY 5011); (b) 6 hours of research methods and statistics (SOCY 5021 and SOCY 5031); and (c) one 3-hour research-oriented seminar.

3. A student must pass a preliminary examination to be taken no later than the first semester after having completed 2a and 2b above.

4. A student must pass the comprehensive examination, having become eligible to take this examination only after having satisfied requirements 1, 2, and 3 above.

5. A student must demonstrate at least second year college proficiency in a foreign language.

6. A student must write a Ph.D. dissertation and defend this dissertation in an oral examination.

A detailed description of the M.A. and Ph.D. programs are given in the Graduate Handbook available from the graduate secretary of the Sociology Department. All inquiries about graduate programs should be addressed to the Chair, Committee on the Graduate Program, Department of Sociology, University of Colorado at Boulder, Boulder, Colorado 80309-0327.

## SPANISH AND PORTUGUESE

*Degrees . . . . . B.A., M.A., Ph.D.*

### COMPLETION OF MAPS

Beginning Fall Semester 1988, a Level-III high school foreign language course is required as one of the Minimum Academic Preparation Standards for admission to the University. This requirement may also be satisfied by demonstrating equivalent proficiency through placement testing or by satisfactorily completing SPAN 2110 or PORT 2110. For details on completion of MAPS, see page 38.

## COMPLETION OF ARTS AND SCIENCES LANGUAGE REQUIREMENT

Until Fall Semester 1990, completion of a Level-III high school language course will fulfill the College graduation requirement in foreign language. Students who have studied Spanish in high school and wish to continue with the language will be placed by examination. Students may not receive credit for a course at a lower level than that into which they are placed.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below:

<i>Major Requirements</i>	<i>Semester Hours</i>
<i>Language and Literature Option</i>	
SPAN 3000 Advanced Spanish Language Skills	
SPAN 3100 Literary Analysis in Spanish, and	
SPAN 3120 Advanced Spanish Grammar . . . . .	12
At least 6 hours in upper-division literature, culture, and/or language courses . . . . .	6
At least 12 hours in courses at the 4000 level or above (with at least 3 hours devoted to Spanish Peninsular literature and 3 hours to Spanish-American literature) . . . . .	12
In addition to the 30 hours in the Department of Spanish and Portuguese, 6 hours in courses from outside the Spanish Department in one of the following areas are required: courses listed in the Latin American Studies Program (e.g., history, art, political science); courses listed in the Chicano Studies Program; linguistics; upper-division courses in another foreign language or comparative literatures; or Portuguese 2110 and 2120 or 2150 . . . . .	6

*Note:* To fulfill the requirements for a Spanish major, students must complete 30 credit hours in 3000-level or above courses. Students seeking teaching certification in Spanish must take SPAN 3050 and 3120, and students who want certification for teaching at the secondary level should note that the School of Education requires SPAN 4650 and 4660 (Practicum). Students who major in Spanish are expected to meet with the departmental chief undergraduate advisor before registration. Failure to do so may delay graduation. Students considering entering graduate school for an advanced degree in Spanish, either at Boulder or any other institution, should see a departmental advisor as early as possible.

## International Spanish for the Professions Option

In cooperation with the College of Business and Administration, the Department offers an interdisciplinary major in International Spanish for the Professions. It offers students numerous career possibilities, both in government and private industry, at home and

abroad. Those choosing this major will not be able to enter Boulder's graduate program in Spanish without fulfilling the requirements in the language and literature major. Only a limited number of students may enroll in the International Spanish for the Professions major. Courses within the major normally are completed in the student's junior and senior years. Applications for admission may be obtained from the Department and should be submitted as early as possible in the student's academic career, but no later than the second semester of the sophomore year.

<i>Professional Spanish Courses (15 credit hours)</i>	
SPAN 3030 Professional Spanish for Business 1 . . .	3
SPAN 3040 Professional Spanish for Business 2 . . .	3
SPAN 3200 Spanish Culture or SPAN 3210 The Cultural Heritage of Latin America . . . . .	3
SPAN 4060 Problems of Business Translation in Spanish 1 . . . . .	3
SPAN 4070 Problems of Business Translation in Spanish 2 . . . . .	3

<i>Spanish Language Courses (15 credit hours)</i>	
SPAN 3000 Advanced Spanish Language Skills . . .	6
SPAN 3100 Literary Analysis in Spanish . . . . .	3
SPAN 3120 Advanced Spanish Grammar . . . . .	3
Elective . . . . .	3
Recommended electives: SPAN 3310, 3340, 4010, and 4930	

<i>Courses in the College of Business and Administration (15 credit hours)</i>	
<i>Fall, Junior Year</i>	
ACCT 2000 Introduction to Financial Accounting . . .	3
<i>Spring, Junior Year</i>	
MKTG 3000 Principles of Marketing . . . . .	3
<i>Fall-Spring, Senior Year</i>	
BSLW 3000 Business Law . . . . .	3
FNCE 3050 Basic Finance . . . . .	3
ORMG 3300 Introduction to Management and Organization . . . . .	3
(These courses must be taken in sequence during the junior and senior years as indicated, unless taken in summer school)	

<i>Area Courses (15 credit hours)</i>	
These are related courses in Arts and Sciences to be taken from the following distribution: 15 credit hours total from Area I and II or from Area I and III. <i>Note:</i> Some courses are not offered every semester.	
<i>Area I (6 credit hours)</i>	
ANTH 3110 Ethnography of Mexico and Central America . . . . .	3
ANTH 3120 Peoples of Latin America . . . . .	3
ANTH 4220 Archaeology of Mexico and Central America . . . . .	3
CSCI 1000 Computer Concepts and Applications . . .	3
CSCI 1200 Introduction to Programming 1 . . . . .	3
CSCI 1210 Introduction to Programming 2 . . . . .	3
FINE 4419 Pre-Columbian Art . . . . .	3
FINE 4429 Latin American Art Since 1492 . . . . .	3
GEOG 2002 World Geographic Problems . . . . .	3
GEOG 3812 Latin America . . . . .	3
HIST 1038 Introduction to Latin American History . . . . .	3
HIST 2517 Chicano History to 1848 . . . . .	3
HIST 2527 Chicano History: 1848 to Present . . . . .	3
HIST 3018 Selected Readings in Latin American History . . . . .	3
HIST 4118 History of Mexico to 1821 . . . . .	3
HIST 4128 The Emergence of Modern Mexico . . . . .	3
LING 2200 Language in Its Social Context . . . . .	3
LING 3500 Language and the Public Interest . . . . .	3
MATH 1070 Mathematics for Social Science and Business . . . . .	3
MATH 1080 Calculus for Social Science and Business . . . . .	3
<i>Area II (9 credit hours)</i>	
ECON 4111 Money and Banking . . . . .	3

ECON 4211 Public Finance . . . . .	3
ECON 4252 Urban Economics . . . . .	3
ECON 4413 International Trade . . . . .	3
ECON 4423 International Finance . . . . .	3
ECON 4794 Economic Development of Latin America . . . . .	3
PSCI 4001 Government Regulation of Business . . .	3
PSCI 4061 State Government and Administration . . .	3
PSCI 4112 Problems in Latin American Politics . . .	3
PSCI 4122 The Military in Politics . . . . .	3
PSCI 4181 Public Administration . . . . .	3
PSCI 4182 International Law . . . . .	3
PSCI 4261 The Judicial System . . . . .	3

*Area III (9 credit hours)*  
Complete 9 more hours from the courses listed above or other upper-division courses in Spanish. The required 9 hours may also be completed in upper-division courses in any other foreign language (Portuguese is strongly recommended). Summer session courses from the College of Business and Administration, study abroad, and other related courses will be accepted for credit upon approval of the major advisor.

*Note:* Prerequisites before admission to the program include sufficient Spanish to be admitted to 3000-level courses and ECON 2010 and 2020.

The Department strongly recommends that all majors include some study in a Spanish-speaking country in their major program. The University cooperates with full-year and semester programs in San José, Costa Rica; Dominican Republic; Guadalajara, Mexico; and Seville, Spain. Credit earned will normally count toward satisfaction of the major requirements, but the student should see an advisor before enrolling in a foreign program to discuss transfer of credit. Credit for work done in special programs offered by foreign universities will be evaluated on an individual basis. It should be noted that courses taken abroad and designated as Spanish will also be subject to the 45-hour maximum rule of the College of Arts and Sciences.

Students interested in study abroad will find further information under the International Education section of this *Catalog*.

Students who present transfer work or credit earned in CU study abroad programs to satisfy major requirements will be expected to complete at least 12 upper-division credits, including at least 6 at the 4000 level or above, on the Boulder Campus.

For Chicano Studies, Latin American Studies, and Linguistics courses, see those sections of this *Catalog*.

## GRADUATE DEGREE PROGRAMS

### Departmental Requirements

Students wishing to pursue graduate work in Spanish leading to candidacy for advanced degree should read carefully Requirements for Advanced Degrees in the Graduate School section of this *Catalog*.



## Master's Degree

**Language Requirement.** Students must demonstrate, as early as possible and before taking the comprehensive examination, a communication knowledge (as defined by the Graduate School) of a foreign language other than Spanish. They must also be able to speak, read, and write English well.

**Areas of Concentration.** The Master of Arts in Spanish is offered in two areas of concentration: one with an emphasis on literature, and one with an emphasis on linguistics (for further information on these options, please contact the Department).

## Doctor's Degree

**Residence Requirement.** Ph.D. students must complete a minimum of one academic year in residence on the Boulder Campus (excluding summer) within the four years immediately preceding the date on which they present themselves for the Ph.D. comprehensive examination.

**Language Requirement.** The student will demonstrate as early as possible, but at least one full semester before taking the comprehensive examination, a communication knowledge (as defined by the Graduate School) of one foreign language and a reading knowledge of a second language in addition to Spanish. The languages will be chosen by the student in consultation with the advisory committee.

**Areas of Concentration.** The Ph.D. in Spanish is offered in six literary periods of concentration: medieval, golden age, eighteenth- and/or nineteenth-century peninsular, twentieth-century peninsular, colonial and nineteenth-century Spanish-American, and twentieth-century Spanish American. For further information on these options, please contact the Department.

## Portuguese

Although no major in Portuguese is offered, language courses at the elementary and intermediate levels are available, as well as senior and graduate courses in Luso-Brazilian civilization and literature.

## THEATRE AND DANCE

*Degrees . . . . . B.A., B.F.A., M.A., M.F.A., Ph.D.*

The Department of Theatre and Dance offers undergraduate and graduate degrees in both Theatre and Dance. These programs combine traditional studies with practical training. Ambitious seasons of theatre productions

and dance concerts feature student performers and student designers, directors, and choreographers. Guest artists of national and international stature often participate in curricular and extracurricular activities. Recent guests have included Clay Taliaferro, Nada Diachenko, Nina Weiner, and Murray Louis in dance; Celeste Holm, Jean-Claude van Itallie, Billie Whitelaw, and Michael Meyer in theatre.

Students seriously interested in theatre and dance are urged to consult with an advisor in the appropriate field to obtain both advice and the most current information concerning program opportunities and expectations.

## BACHELOR'S DEGREE REQUIREMENTS

### *B.A. Degree, Theatre Major*

The B.A. degree program in Theatre requires 41 semester hours in theatre, 3 in dance, and 6 in dramatic literature. It is a broadly based program of theatre practice and study for the student who may wish to pursue in-depth studies in another area as well. It also serves as the core of studies for a student who wishes to pursue further theatre training in one of the B.F.A. areas of concentration.

In addition to the general College of Arts and Sciences' requirements for the B.A. degree, the major in Theatre requires the following:

<i>Major Requirements</i>	<i>Semester Hours</i>
THTR 1011 Development of Theatre and Drama 1 . . . . .	3
THTR 1021 Development of Theatre and Drama 2 . . . . .	3
THTR 2005 Stagecraft . . . . .	3
THTR 2015 Stagecraft Lab . . . . .	1
THTR 2035 Design Fundamentals . . . . .	3
THTR 2003 Acting Fundamentals . . . . .	3
THTR 2013 Performance of Literature . . . . .	3
(The courses above should be taken during the first two years of study.)	
THTR 2085 History of Fashion 1 or THTR 3033 Vocal and Physical Preparation . . . . .	3
THTR 3035 Practicum (2 semesters) . . . . .	4
THTR 3071 Directing . . . . .	3
Elective THTR hours, 6 of which must be in theatre history/literature . . . . .	12
Elective(s) in dance . . . . .	3
Electives in dramatic literature, outside the Theatre and Dance Department, including at least one course in Shakespeare!	
ENGL 3562, 3572 . . . . .	6

A student wishing to qualify for teaching certification should check in the Department office for the requirements of this option.

### *B.F.A. Degree, Theatre Major*

The B.F.A. degree program in Theatre offers preprofessional training to a limited number of highly motivated and talented students aiming at professional careers. The B.F.A. student will pursue

one of three possible areas of concentration: acting, design and technical theatre, or performance studies. Total semester hours required in the B.F.A. concentrations:

Acting: B.A. requirements (41 semester hours in THTR), plus 35-38 additional hours (26 in THTR)  
 Design/technical: B.A. requirements (41 semester hours in THTR), plus 33 additional hours (24 in THTR)  
 Performance studies: B.A. requirements (41 semester hours in THTR), plus 36 additional hours (24 in THTR)

Admission will be limited not only in terms of student capacity, but also to ensure the type of individual attention necessary for effective training. Interested students should identify themselves as early as possible, and formal application should be made at the beginning of the third semester. A student may apply for one, two, or all three areas of concentration, but can be admitted to only one. Counseling in advance is recommended. Admission will be based on talent, academic record, motivation, and audition-interviews. Auditions will be held each fall semester. A grade of C (2.00) or better is needed in each required course to fulfill the requirements for the B.F.A. degree. The College will count only 67 semester hours of THTR credits toward the total hours required for graduation.

In addition to the general College of Arts and Sciences requirements for the B.A. degree and the B.A. major requirements in Theatre, the additional requirements for the B.F.A. in Theatre are as follows. (Courses taken as part of a student's B.F.A. concentration cannot also be counted towards fulfillment of the B.A. electives.)

I. Concentration in *Acting*  
 35-38 semester hours: 26 in THTR courses, 9-12 in other disciplines.  
 Students accepted into the acting concentration each year will constitute an ensemble and as a group will follow the required sequence of courses. Specific details about this sequence are available from the Department. Students in this concentration are required to audition for major season productions each semester.

<i>Major Requirements</i>	<i>Semester Hours</i>
THTR 3013 Studio 1: Internal Acting Process . . . . .	5
THTR 3023 Studio 2: External Acting Process . . . . .	5
THTR 4013 Studio 3: Master Class in Specialized Style . . . . .	4
THTR 4023 Studio 4: Performance of Elizabethan Roles . . . . .	4
THTR 4043 Studio 5: Performance of Classical Roles . . . . .	4
THTR 4053 Studio 6: Senior Repertory . . . . .	4
Plus:	
DNCE 1000 Beginning Modern Dance . . . . .	1
DNCE 1100 Beginning Ballet . . . . .	1
DNCE 1200 Beginning Jazz Dance . . . . .	1
DNCE 2400 Theatre Dance Forms . . . . .	2
Two additional Dance/Movement courses . . . . .	2-5
PMUS 1200 Voice Class . . . . .	2

II. Concentration in *Design and Technical Theatre*  
 33 semester hours: 24 in THTR courses, 9 in other disciplines.  
 Students in the design and technical theatre concentration should use the electives in the B.A.

<sup>1</sup>B.F.A.—Acting concentration students must elect to take all six credits in Shakespeare (ENGL 3562, 3572)

requirements to fulfill prerequisites for the following:

<i>Major Requirements</i>	<i>Semester Hours</i>
THTR 3025 Developments in Theatre Architecture and Design	3
THTR 4005 or 4015 Costume Design 2 or Scene Design 2	3
THTR 4035 Design Ornamentation	3
THTR 4045 Stage Lighting Design	3
THTR 4065 Advanced Design Projects (6 credits max.)	1-3
THTR 4075 Advanced Technical Projects (6 credits max.)	1-3
Electives in design and technical theatre sufficient to total 24 THTR hours beyond the 41 required for the B.A. degree, plus: as advised, courses in other departments in drawing, painting, drafting, sculpture, and/or environmental design	9

### III. Concentration in *Performance Studies*

36 semester hours: 24 in theatre courses, 12 in other disciplines.

Students in the performance studies concentration should take THTR 3071 Directing as one of their B.A. electives.

<i>Major Requirements</i>	<i>Semester Hours</i>
THTR 4003 Ensemble Performance	3
THTR 4011 Seminar in Theory and Criticism	3
THTR 4051 Playwriting	3
THTR 4071 Advanced Directing	3
Electives in theatre history/literature (in addition to the B.A. selections)	9
Elective in design and technical theatre (in addition to the B.A. selections)	3
Plus: as advised, courses in film studies, literature, art and/or music	12

### *B.A. Degree, Dance Major*

The B.A. degree program in Dance consists of 45 semester hours in Dance plus 6 in Theatre. Courses fulfilling College requirements as well as general electives are to be chosen in consultation with and approved by a departmental advisor. All normal College requirements must be met. Students are advised that more than 120 hours may be needed for graduation. The following courses are required for the Dance major. A grade of *C* (2.00) or better is needed in each course required to fulfill the requirements of the B.A. degree.

<i>Major Requirements</i>	<i>Semester Hours</i>
DNCE 2240 or 2250 Intermediate Jazz	1
DNCE 1101-4171 Dance Techniques: Ballet	2
DNCE 1001-4071 Dance Techniques: Modern Dance <sup>1</sup>	12
DNCE 1160 Dance Techniques: Recreational Dance Forms	1
DNCE 2013 Dance Improvisation	2
DNCE 2033 Beginning Composition	3
DNCE 2012 Dance Production	2
DNCE 3015 Movement Analysis (Prereq., PHED 2790)	3
DNCE 2014 Rhythmic Analysis and Accompaniment	2
DNCE 3024 Musical Resources for Dance	2
DNCE 4016 Creative Dance for Children	3
DNCE 4036 Methods of Teaching Dance	3
DNCE 3043 Intermediate Dance Composition (Prereq., DNCE 2033) or DNCE 4053 Advanced Dance Composition (Prereq., DNCE 3043)	3
DNCE 4017 History and Philosophy of Dance	3
DNCE 4027 Dance in the Twentieth Century	3
Electives in Theatre	6
Dance courses listed as nonmajor technique courses do not normally count toward the major.	

<sup>1</sup>Students will be placed in the appropriate course in this series.

### *B.F.A. Degree, Dance Major*

The B.F.A. in Dance is designed to meet the needs of highly talented students interested in a performing career. The degree requires 65 semester hours in dance, 6 in theatre, and 6 in kinesiology. The college will count a maximum of 67 hours in dance toward the total required for graduation. Admission will be limited to ensure the type of individual attention necessary for effective training. Interested students should identify themselves as early as possible and formal application should be made at the beginning of the third semester. Selection will be based on an audition-interview, demonstrated competency, motivation, and grade point average. All normal College requirements must be met. A grade of *C* (2.00) or better is needed in each required course to fulfill the requirements for the B.F.A. degree.

<i>Major Requirements</i>	<i>Semester Hours</i>
DNCE 1101-4171 Dance Techniques: Ballet <sup>1</sup>	8
DNCE 1001-4071 Dance Techniques: Modern <sup>1</sup>	16
DNCE 2240 or 2250 Intermediate Jazz	1
DNCE 2013 Improvisation	2
DNCE 2033 Beginning Composition	3
DNCE 3015 Movement Analysis (Prereq., PHED 2790)	3
DNCE 2014 Rhythmic Analysis and Accompaniment	2
DNCE 3024 Musical Resources for Dance	2
DNCE 3043 Intermediate Dance Composition (Prereq., DNCE 2033)	3
DNCE 4016 Creative Dance for Children	3
DNCE 4036 Methods of Teaching Dance (Prereq., DNCE 2013, 2014, 2033, 3015)	3
DNCE 4053 Advanced Dance Composition (Prereq., DNCE 3043)	3
DNCE 4017 History and Philosophy of Dance	3
DNCE 4027 Dance in the Twentieth Century	3
DNCE 4038 Dance Repertory	3
DNCE 5052 Studio Concert	3
Elective Courses in Dance.	
Students must elect a minimum of 4 credits from the following:	
DNCE 1101-4171 Dance Techniques: Ballet <sup>1</sup>	2-4
DNCE 2240 or 2250 Intermediate Jazz	1
DNCE 1160 Dance Techniques: Recreational Dance Forms	1
DNCE 4919 Dance Practicum (credit for performance or special project)	1-3
A minimum of 6 elective Theatre credits	6
Recommended: THTR 2035, 4029, 4039	
PHED 2790 Kinesiological Anatomy	3
KINE 4540 Analysis of Human Movement (Kinesiology)	3

### GRADUATE DEGREE PROGRAMS

The M.F.A. degree is offered in Dance. The M.A. and Ph.D. degrees are offered in Theatre.

#### Departmental Requirements

Students wishing to pursue graduate work in Theatre and in Dance should read carefully both Requirements for Advanced Degrees in the Graduate School section of this *Catalog* and the following departmental requirements. Students should note that departmental requirements are sometimes more comprehensive than those minimums established by the Graduate School.

*Prerequisites.* Applicants are admitted to the graduate program in Theatre and in Dance on the basis of their academic records and recommendations. Students admitted who are unable to offer a substantial number of semester hours of work in the area of their intended specialization or allied fields must expect that a significant number of additional courses and semester hours will be required of them in order to make up deficiencies. Applicants for the M.F.A. program in Dance must audition in person or by submission of a video tape.

*Diagnostic Examination.* Every student must take a diagnostic examination upon entrance. This examination and all other information available are employed to design the best possible course of study for the student.

*Advisor and Graduate Committee.* For every student who declares an intention to work toward an advanced degree, an advisor and committee will be designated so that a degree plan may be designed before the end of the first semester of residence.

All candidates for a degree have the responsibility of making certain that the appropriate persons or committees have been appointed to supervise the various steps in their graduate programs. Detailed instructions are available from the Department.

#### M.A. Degree in Theatre

*Course Requirements.* All master's degree students in Theatre are required to complete THTR 6009 and two of the following: THTR 6011, 6021, 6031, or 6041.

*Plan I With Thesis.* After any undergraduate deficiencies have been removed, students under Plan I must earn 30 semester hours, at least 16 of which must be in THTR courses at the 5000 level or above. Four to 6 thesis credit hours may be counted toward the 30-hour requirement.

*Plan II With Project (Creative and/or Analytical).* After any undergraduate deficiencies have been removed, students under Plan II must earn 30 semester hours, at least 16 of which must be in THTR courses at the 5000 level or above.

#### M.F.A. Degree in Dance

*Course Requirements.* A minimum of 48 semester hours are required, at least 38 of which must be taken in Dance at the 5000 level or above. At least 6 semester hours must be taken outside of Dance in an approved allied field at the 4000 level or above.

The M.F.A. in Dance is based on a required core of courses including Teaching Methods, Dance Technique,

Ballet, Advanced Composition, Readings in Dance, Research Strategies and Techniques, Dance Seminar, and a Creative Project or Thesis.

**Project/Thesis.** Before the end of a student's first year of graduate work, a written proposal for a creative project or thesis must be presented and approved. Upon its completion, a defense of the project/thesis is required in an oral examination, which also requires a demonstration of the student's knowledge of dance.

**Technical Proficiency.** For completion of the degree, technical proficiency must be demonstrated at the advanced level in modern dance and at the intermediate level in ballet.

**Examination.** A written comprehensive examination covering the student's graduate studies must be taken and passed near the end of the final semester of studies.

### Ph.D. Degree in Theatre

Doctoral students in Theatre will normally be expected to earn 40 semester hours of course work beyond the master's degree, at least 30 of which must be at the 5000 level or above. When approved by the student's advisory committee, credits from other departments on campus may count.

Doctoral study in Theatre is based on the following core of required advanced courses.

THTR 6009	Research Strategies and Techniques
THTR 6019	Professional Orientation
THTR 6011	On-Stage Studies: Classical and Neoclassical Drama
THTR 6021	On-Stage Studies: Elizabethan and Jacobean Drama
THTR 6031	On-Stage Studies: American Theatre and Drama
THTR 6041	On-Stage Studies: Modern European Drama

Beyond the core courses, studies will be determined by students and their advisory committees, consistent with Graduate School and departmental requirements. Doctoral students should also consult the Graduate School description of dissertation hour requirements.

## UNIVERSITY WRITING PROGRAM

The University Writing Program (UWRP) trains students from all disciplines, schools, and colleges in the techniques of writing exposition and argument. Most classes are conducted as workshops: that is, student papers are discussed at every class meeting.

The program promotes the principle that ideas do not exist apart from language, and thus content cannot be isolated from style. For ideas to flourish,

they must be expressed clearly and gracefully, so that readers take pleasure while taking instruction.

Introductory Composition is open to all students. Intermediate Composition is open to students who have mastered the introductory-level skills. Advanced Composition is open only to students who have demonstrated exceptional competence in writing. Graduate courses offer professional training to students writing theses, articles, and grant proposals.

For information about specific classes and their instructors, students should consult the *Schedule of Courses*. UWRP courses do *not* fulfill the humanities requirement under the pre-1988 curriculum for students in the College of Arts and Sciences.

## WOMEN STUDIES

*Degree* . . . . . B.A.

Students may concentrate in Women Studies through a special track within the American Studies major or may earn a Women Studies Certificate to supplement study in their major field. In its fourteenth year at the University, the Women Studies Program offers an interdisciplinary curriculum encompassing social sciences and humanities. Courses reflect the new scholarship on women: they focus on the interface of the public and private spheres of women's lives and on feminist issues such as gender identity, theories of inequality, women's language and literature, Third World women, and violence against women. The program houses a library and sponsors colloquia, workshops, and other cultural and educational events. *Frontiers: A Journal of Women Studies* is published in association with the program.

Students may earn a Ph.D. in women's history through the History Department.

## BACHELOR'S DEGREE REQUIREMENTS

Completion of general requirements and the major requirements listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
Students must complete a minimum of 36 credit hours with grades of C- or better in Women Studies courses, a minimum of 18 credits of which must be upper division. These 36 credit hours should be distributed as follows:	
WMST 1260 Introduction to Women's Literature . . . . .	3
WMST 2000 Introduction to Women Studies . . . . .	3
WMST 2010 Contemporary Issues . . . . .	3
WMST 4090 Feminist Theory . . . . .	3
One cross-cultural or minority Women Studies course . . . . .	3
One lower-division Women Studies course in sociology or history (e.g., HIST 2616, SOCY 1016) . . . . .	3

Women Studies electives (6 hours in social sciences, 6 hours in humanities) . . . . .	12
Choose two courses from the following:	
WMST 2910 Crisis Intervention: Women's Line . . . . .	3
WMST 3000 Women in Organizations . . . . .	3
WMST 4000 Senior Seminar: Special Topics (may be repeated) . . . . .	3
WMST 4020 Senior Research Seminar . . . . .	3
<i>Women Studies Certificate Requirements</i> (24 credit hours)	
WMST 2000 Introduction to Women Studies . . . . .	3
WMST 2010 Contemporary Issues . . . . .	3
Women Studies electives (6 hours in social science, 6 hours in humanities) . . . . .	12
Choose two courses from the following:	
WMST 2910 Crisis Intervention: Women's Line . . . . .	3
WMST 3000 Women in Organizations . . . . .	3
WMST 4000 Senior Seminar: Special Topics (may be repeated) . . . . .	3
WMST 4020 Senior Research Seminar . . . . .	3
WMST 4090 Feminist Theory . . . . .	3

## PREHEALTH SCIENCES

Students with vocational interest in a health field usually apply to that professional program after completing one to three years of college work, which must include specific preprofessional courses. Most University of Colorado professional health programs are offered at the Health Sciences Center in Denver. Preprofessional work can be completed on the Boulder Campus, where preprofessional advising is available from faculty members and from the Preprofessional Advising Office in the Dean's office.

Students must recognize that admission to a preprofessional program on the Boulder Campus does not guarantee later admission to a professional program. At the time of actual application to a professional program, the student will be judged on several factors, including performance in undergraduate courses. For this reason, *no required course* may be taken on a pass/fail basis. Some fields require specific preprofessional examinations before application. For most fields, interviews are an essential part of the application process. In all cases, admissions committees will be concerned with the student's personal qualities including compassion, coping and decision-making abilities, intellectual capabilities, realistic self-appraisal, sensitivity in interpersonal relations, and staying power (physical and motivational). In addition to formal course work, students should have experience in people-related activities (especially those related to their field of choice), so that they can be more certain of their motivations for health careers.

Some of the professional programs at the University of Colorado give preference to Colorado residents and WICHE (Western Interstate Commission on Higher Education) state residents; interested students should check with individual programs for specific policies.

Students from other states usually can obtain at Boulder the preprofessional courses required by their state schools, but should check with those schools in advance. Students are encouraged to apply both to their state schools and to private professional schools to increase their chances of gaining acceptance to the professional program of their choice.

During the preprofessional years, personal intellectual development will lead many students to change professional goals. Since traditionally there are more applicants for these programs than there are spaces available, many students need to pursue alternative goals. Under these circumstances, students should plan college programs to give themselves the greatest flexibility in considering other vocations.

Most students in certain fields (dentistry, health administration, medicine) will complete an undergraduate degree before entering the professional program. Other fields (e.g., child health associate, dental hygiene, medical technology, nursing, pharmacy, physical therapy) do not require an undergraduate degree. Students actually entering these latter programs are not required to satisfy degree requirements on the Boulder Campus. However, it is prudent for students, while working to satisfy preprofessional requirements, to also protect themselves by satisfying requirements for an undergraduate degree at Boulder. Care in selection of courses will permit the same courses to be used to satisfy several sets of requirements. For example, CHEM 1051 and 1071 will satisfy minimal requirements for such fields as child health associate, dental hygiene, nursing, and physical therapy, but will not be accepted for the other health fields. On the other hand, CHEM 1111, 1131, 3311, 3321, 3331, and 3341 will permit the student to apply to any health program and will also satisfy degree requirements for any major requiring chemistry.

Students who plan to apply to medical or dental school or to the health administration graduate program may do so from any major. For example, premedical and pre-dental students may be found majoring in both science and nonscience departments in the College of Arts and Sciences, as well as in such colleges as engineering, business, and music. Such students are therefore urged to examine carefully their academic strengths and weaknesses, as well as vocational alternatives, in planning a program of study. Generally, there is no advantage of one college or academic department over another in

gaining admission to a professional program. Students who plan to apply to other health sciences programs are not required to be preprofessional majors in those fields in order to be eligible to apply to any of them. However, to be assured of receiving pertinent information and advising, such students should declare majors in the field of their primary interest. All students are urged to consult with advisors in their major department, as well as with advisors in the prehealth fields.

A summary of current preprofessional requirements for the University of Colorado programs follows, together with the number of openings in the program and information on the time the student normally applies. This information may change without notice. Students are therefore advised to check with the Preprofessional Advisor at Boulder or with the program office at the Health Sciences Center for current admissions requirements and policies. For information about other health fields not specifically available at the University of Colorado, check with the Preprofessional Advising or Career Services offices. Transfer students who have completed the necessary preprofessional work should apply for admission directly to the desired program at the University of Colorado Health Sciences Center, Office of Admissions, 4200 East Ninth Avenue, Campus Box A054, Denver, Colorado 80262, or call (303) 394-7676.

### Child Health Associate

Minimum 90 semester hours

Requirements	Semesters
Chemistry, general (CHEM 1051 and 1071) . . . . .	2
Biology (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1050 and 1060) . . . . .	2
Psychology . . . . .	2
Humanities . . . . .	12 semester hours

*Suggested:* behavioral and child psychology, cultural anthropology, English, sociology, Spanish. The professional program requires 3 years, and a B.S. degree may be obtained at the end of the first year. At that time students may apply for acceptance into the M.S. degree program, which can be completed by the end of the third year. Application deadline December 15; 15-20 positions. Many applicants will have more than minimal college requirements.

### Dental Hygiene

Minimum 60 semester hours

Requirements	Semesters
English composition (UWRP 1150 and 1250) . . . . .	2
Mathematics (MATH 1010, 1070, or 1100) . . . . .	1
Psychology . . . . .	1
Speech (COMM 1020 or CDSS 2500) . . . . .	1
Sociology . . . . .	1
Chemistry, general, with laboratory (CHEM 1051, 1071) . . . . .	2
Biology, general, with laboratory (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1050 and 1060) . . . . .	2

Application normally at beginning of sophomore year, deadline April 15; 20 positions open (ACT

required). Program leads to a Bachelor of Science in Dental Hygiene.

### Dentistry

Minimum 90 semester hours; undergraduate degree normally obtained before entrance.<sup>1</sup>

Requirements	Semesters
Chemistry, general (CHEM 1111 and 1131 <sup>2</sup> ) . . . . .	2
Chemistry, organic (CHEM 3311 and 3321, 3331, and 3341 <sup>3</sup> ) . . . . .	2
Biology, general (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1050 and 1060) . . . . .	2
Physics, general (with laboratory) . . . . .	2
Mathematics (minimum college algebra and trigonometry) . . . . .	2
Literature . . . . .	2
English composition (UWRP 1150 or 1250) . . . . .	1

Application normally between junior and senior years with deadline March 1; 32 positions open. Out-of-state residents (particularly from WICHE states) may be accepted. Dental Admission Test required.

### Health Administration

Requires baccalaureate or advanced degree, and applicants should have GPA of 3.00 or better. Other requirements for admission include: satisfactory score on the Graduate Management Admission Test (GMAT) or Graduate Record Exam (GRE); four letters of recommendation from professors or employers; an essay on the student's career plan; and a personal interview may be required. The program is housed within the Graduate School of Business Administration, University of Colorado at Denver.

Application deadlines: fall admission, April 1; spring admission, October 1. Program leads to a Master of Science in Health Administration.

### Medicine

Most applicants will enter medical school with a baccalaureate degree or at least 120 hours.

Requirements	Semesters
Chemistry, general (CHEM 1111 and 1131 <sup>2</sup> ) . . . . .	2
Chemistry, organic (CHEM 3311 and 3321, CHEM 3331 and 3341 <sup>3</sup> ) . . . . .	2
Biology, general (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1050 and 1060) . . . . .	2
Physics, general, with laboratory . . . . .	2
Mathematics (minimum college algebra and trigonometry) . . . . .	2
Literature . . . . .	2
English composition (UWRP 1150 or 1250) . . . . .	1

Application normally between junior and senior years with deadline November 1. Students normally take the Medical College Admissions Test in spring of the junior year and should be completing science requirements at that time. Approximately 125 positions are open. Admission preference is given to Colorado, Alaska, Wyoming, and Montana residents and to Native Americans from states adjacent to Colorado. Nonresident minorities may be considered.

### Medical Technology

Minimum 80 semester hours

Requirements	Semester Hours
(CU-Boulder hours may exceed minimum requirements shown)	

<sup>1</sup>A double degree program permits students to obtain a bachelor's degree and dental degree in 7 years. To obtain both degrees, a student satisfies all course requirements for a bachelor's degree by counting hours from the dental curriculum.

<sup>2</sup>For especially qualified students, CHEM 1151 and 1171 may be substituted.

<sup>3</sup>For Chemistry majors, CHEM 3351 and 3361, 3371 and 3381 will be substituted.

Chemistry, with laboratory, usually general chemistry (CHEM 1111, 1131) and organic (CHEM 3311-3331) or biochemistry (CHEM 4611) . . . . . 16

Biology, with laboratory. Must include microbiology and immunology (EPOB 3400). Remaining credits from general biology (EPOB 1210 and 1230, 1220 and 1240 or MCDB 1050 and 1060), physiology or anatomy . . . . . 16

Mathematics (MATH 1010-1020 or 1100) . . . . . 5-10

Courses in statistics, computer science and physics are *recommended*. Suggested general curriculum electives: English, speech or communication, social sciences, physical education, and modern language (German, Russian, French, or Spanish).

Application normally in fall of junior year with application deadline January 1. Colorado residents have priority for admission. 22 positions open. Program leads to degree of Bachelor of Science in Medical Technology, program certification, and eligibility to sit for national certification exams.

## Nursing

Minimum 60 semester hours

<i>Requirements</i>	<i>Semester Hours</i>
Biology, general, as prereq. for microbiology and physiology (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1050 and 1060) . . . . .	8
Microbiology (EPOB 3400) . . . . .	4
Human anatomy (EPOB 3420) . . . . .	5
Chemistry (CHEM 1051 and 1071, CHEM 1031 and 1071, or CHEM 1111 and 1131, 3311 and 3321) . . . . .	8
Physiology (EPOB 3430) . . . . .	5
Sociology, general (SOCY 1001) . . . . .	3
General psychology (PSYC 1001) . . . . .	4
Developmental psychology (PSYC 2643, plus KINE 4480 or PSYC 2303 or 4456) . . . . .	6
Anthropology (ANTH 1040) . . . . .	3
English composition (UWRP 1150 or 1250) . . . . .	3
Statistics . . . . .	3
Humanities (two semesters in literature, philosophy, art, music, foreign language, dance, fine arts, humanities, political science, history, or theatre) . . . . .	6
Nutrition (KINE 3420 or PSYC 2062) and Abnormal Psychology (PSYC 4303) are strongly recommended. Other courses, if needed to complete the 60 semester-hour minimum, may be selected from any academic discipline with the exception of commercial and vocational courses and doctrinal courses in religion. Because of the number of science prerequisite courses, the beginning prenursing student has two choices: take both chemistry and biology during the freshman year, or take one of these courses, preferably biology, during the summer session either preceding or following the freshman year. General application for fall admission by December with required supporting material by February 1 (approximately 60-80 positions open). General application for spring admission by September 1 with all required supporting material by October 1. Minimum GPA is 2.50. Students should check periodically for possible changes in requirements. Program leads to a Bachelor of Science in Nursing.	

## Pharmacy

Although the School of Pharmacy is located on the Boulder Campus, two academic years of preprofessional study are required before admission to the professional program.

<i>Requirements</i>	<i>Semester Hours</i>
Chemistry, general (CHEM 1111 and 1131) . . . . .	10
Chemistry, organic (CHEM 3311 and 3321, CHEM 3331 and 3341) . . . . .	8
Biology, general, with laboratory (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1050 and 1060) . . . . .	8
Mathematics (college algebra and trigonometry or calculus) . . . . .	5
Physics, general, with laboratory (PHYS 2010) . . . . .	5

Microeconomics (ECON 2010) . . . . .	4
English composition (UWRP 1150 and 1250) . . . . .	6
Communication, interpersonal (COMM 1020) . . . . .	3
General education . . . . .	9
Psychology, sociology, or cultural anthropology . . . . .	6

Application during sophomore year, deadline March 1 or until quota is filled; 75 positions open. For prepharmacy advising, consult the School of Pharmacy, Ekeley Building, West 181.

## Physical Therapy

Minimum 90 semester hours required. The professional program at the Health Sciences Center constitutes the senior year.

<i>Requirements</i>	<i>Semester Hours</i>
(CU-Boulder hours may exceed minimum requirements shown)	
Biological sciences . . . . .	14
General biology (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1050 and 1060)	
Anatomy (human preferred—EPOB 3420; prereq. 1 year of biology)	
Physiology (human preferred—EPOB 3430; prereq. 1 year of chemistry)	
Humanities . . . . .	6
English composition (UWRP 1150 or 1250) . . . . .	3-6
Psychology (PSYC 1001 and PSYC 2303, 2456 or 2643) . . . . .	6
Social science . . . . .	6
Kinesiology (KINE 4540) . . . . .	3
Physics, general (recommended content to include mechanics, heat, electricity, magnetism, sound, heat and labs, usually PHYS 2010 and 2020) . . . . .	8
Chemistry, general, with laboratory (CHEM 1051 and 1071) . . . . .	8

Colorado and WICHE students are given preference for the program. Application will be accepted in the junior year after completion of at least 75 hours and the majority of the prerequisite courses. The deadline for application is January 2 for entrance in June of the same year; 40 positions available. Minimum GPA 2.75. The Graduate Record Examination is required. For advising consult the Department of Kinesiology. Program leads to a Bachelor of Science in Physical Therapy.

## Preoptometry Course Requirements

General biology or zoology (MCDB 1050 and 1060 or EPOB 1210 and 1230 and 1220 and 1240) . . . . .	1/2-1 year
General chemistry (CHEM 1111 and 1131 or CHEM 1151 and 1171) . . . . .	1 year
General physics (PHYS 2010 and 2020 or PHYS 1110, 1120, and 1140) . . . . .	1 year
English composition or creative writing and/or literature . . . . .	1 year
College mathematics (MATH 1010 and 1020 or 1100) . . . . .	1/2-1 year

There are additional course requirements, however, which vary with each school or college. You will need to check catalogs for specific schools to be certain of individual requirements. All schools require applicants to take the OATP, which is given each spring and fall.

## Prepodiatry Course Requirements

General biology (MCDB 1050 and 1060 or EPOB 1210 and 1230 and 1220 and 1240, plus upper-division courses as desired) . . . . .	1-2 years
General chemistry (CHEM 1111 and 1131 or CHEM 1151 and 1171) . . . . .	1 year
Organic chemistry (CHEM 3311 and 3321, CHEM 3331 and 3341 or CHEM 3351 and 3361, CHEM 3371 and 3381 for Chemistry majors) . . . . .	1 year
General physics (PHYS 2010 and 2020 or 1110, 1120 and 1140) . . . . .	1 year

English composition or creative writing and/or literature . . . . .	1 year
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Students should check catalogs for schools for the specific requirements. Application is made to all schools through AACPMAS, an application service. Applicants are required to take the MCAT, which is given each spring and fall.

## Preveterinary Medicine Course Requirements

General biology (MCDB 1050 and 1060 or EPOB 1210 and 1230 and 1220 and 1240) . . . . .	1 year
Developmental biology (MCDB 4650 and 4660 or EPOB 3650 and EPOB 3660) . . . . .	1/2 year
Genetics (EPOB 3200) or Cell biology (CU-Boulder 3120) . . . . .	1/2 year
General chemistry (CHEM 1111 and 1131 or CHEM 1151 and 1171) . . . . .	1 year
Organic chemistry (CHEM 3311 and 3321, CHEM 3331 and 3341 or CHEM 3351 and 3361, CHEM 3371 and 3381) . . . . .	1 year
Biochemistry (CHEM 4611 or 4711) . . . . .	1/2 year
College Math (any 3-hour course) . . . . .	1/2 year
Statistics (MATH 2510 or 4570 or PSYC 2101) . . . . .	1/2 year
Physics (PHYS 1110, 1120, and 1140 or 2010 and 2020) . . . . .	1 year
English composition (UWRP 1150 or 1250) . . . . .	1/2 year
Humanities (six hours) . . . . .	1 year
Social science (six hours) . . . . .	1 year

The above requirements are specific to Colorado State University. Students should check with other schools for their requirements. CSU also requires students to take the Graduate Record Examination morning tests in October of the year in which application is made.

## PRELAW

Students who plan to apply for law school admission upon completion of their baccalaureate degree have no specific requirements to complete for this purpose. Instead they should major in the discipline that best suits their intellectual concerns, one that could serve as the basis for an alternative career should they elect not to apply to law school or should they not be accepted. Prelaw students should seek a rigorous and broad-based education that will insure them a fundamental understanding of American society and its institutions as well as an appreciation for other cultures. They need to become familiar with mathematical analysis and scientific reasoning and to develop excellent oral and written communication skills.

Advising and support services for prelaw students are available in the Preprofessional Advising Office in the College of Arts and Sciences. In addition, the Assistant Dean serves as Chair of a panel of faculty advisors who have a special interest and expertise in the theoretical and practical aspects of the law and judicial systems. These faculty advisors are available for consultation with all undergraduates on the Boulder Campus. Contact the Preprofessional Advising Office for more information.

# College of Arts and Sciences Faculty

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## ASIAN STUDIES

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**PETER S. CONTI**, Professor. B.S., Rensselaer Polytechnic Institute; Ph.D., University of California, Berkeley.

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**GREGORY CAREY**, Assistant Professor. B.A., Duquesne University; M.A., Graduate Faculty, New School for Social Research; Ph.D., University of Minnesota.

**DESMOND S. CARTWRIGHT**, Professor. B.A., London University; Ph.D., University of Chicago.

**DAVID A. CHISZAR**, Professor. B.A., M.S., Ph.D., Rutgers University.

**CAROL M. CICERONE**, Associate Professor. B.S., M.S., University of Illinois; Ph.D., University of Michigan.

**STUART W. COOK**, Distinguished Professor Emeritus.

**EDWARD J. CROTHERS**, Associate Professor. A.B., Ph.D., Indiana University.

**JOHN C. DeFRIES**, Professor. B.S., M.S., Ph.D., University of Illinois.

**BRUCE R. EKSTRAND**, Vice Chancellor for Academic Affairs and Dean of Faculties, Professor. B.A., M.S., Ph.D., Northwestern University.

**K. ANDERS ERICSSON**, Associate Professor. B.A., Ph.D., University of Stockholm (Sweden).

**EVA FIFKOVA**, Professor. M.D., School of Medicine, Charles University (Czechoslovakia); Ph.D., Czechoslovak Academy of Sciences.

**JOHN R. FORWARD**, Associate Professor. B.A., University of Melbourne (Australia); Ph.D., University of Michigan.

**DAVID W. FULKER**, Professor. B.Sc., University of London; M.Sc., Ph.D., University of Birmingham.

**EUGENE S. GOLLIN**, Professor. B.S.S., M.A., City College of New York; Ph.D., Clark University.

**KENNETH R. HAMMOND**, Professor Emeritus.

**LEWIS O. HARVEY, JR.**, Associate Professor. B.A., Williams College; M.S., Ph.D., Pennsylvania State University.

**O. J. HARVEY**, Professor. B.A., M.A., Ph.D., University of Oklahoma.

**ALICE F. HEALY**, Professor. A.B., Vassar College; Ph.D., Rockefeller University.

**WILLIAM F. HODGES**, Professor. B.A., Ph.D., Vanderbilt University.

**RICHARD JESSOR**, Professor. B.A., Yale University; M.A., Columbia University; Ph.D., Ohio State University.

**CHARLES M. JUDD**, Professor. B.A., Yale University; M.A., Ph.D., Columbia University.

**WALTER KINTSCH**, Professor. B.A., Teachers College, Feldkirch (Austria); M.A., Ph.D., University of Kansas.

**MILTON E. LIPETZ**, Professor. B.A., New York University; M.A., Brooklyn College; Ph.D., Ohio State University.

**STEVEN F. MAIER**, Professor. A.B., New York University; M.A., Ph.D., University of Pennsylvania.

**DOROTHY R. MARTIN**, Professor Emerita.

**DONALD J. MASON**, Associate Professor Emeritus.

**GARY H. McCLELLAND**, Associate Professor. B.A., University of Kansas; M.A., Ph.D., University of Michigan.

**CAROLYN L. McLEAN-BARTOS**, University Counselor, Assistant Professor (Attendant Rank). B.A., Ph.D., University of Colorado.

**RAYMOND C. MILES**, Professor. B.S., M.S., University of Idaho; Ph.D., Ohio State University.

**LEIGH MINTURN**, Professor. B.A., Mt. Holyoke College; M.A., Ph.D., Radcliffe College.

**RICHARD K. OLSON**, Professor. B.A., Macalester College; M.A., Ph.D., University of Oregon.

**PETER G. OSSORIO**, Professor. B.A., Ph.D., University of California, Los Angeles.

**BERNADETTE M. PARK**, Assistant Professor. B.S., University of Oregon; M.A., Ph.D., Northwestern University.

**PETER G. POLSON**, Professor. B.S., A.B., Stanford University; Ph.D., Indiana University.

**VICTOR C. RAIMY**, Professor Emeritus.

**ALBERT RAMIREZ**, Assistant Vice Chancellor for Academic Affairs, Associate Professor. B.A., M.A., Ph.D., University of Houston.

**JERRY W. RUDY**, Professor. B.A., George Washington University; M.A., University of Richmond; Ph.D., University of Virginia.

**VICTOR L. RYAN**, Assistant Professor. B.A., Northwestern University; Ph.D., University of Michigan.

**KURT SCHLESINGER**, Professor. B.A., M.A., San Francisco State College; Ph.D., University of California, Berkeley.

**JOHN B. SCHOOLLAND**, Professor Emeritus.

**SETH K. SHARPLESS**, Professor. M.A., University of Chicago; Ph.D., McGill University (Canada).

**LOUISE ELLEN SILVERN**, Associate Professor. B.A., University of California, Berkeley; M.A., Ph.D., University of California, Los Angeles.

**TIMOTHY SMOCK**, Assistant Professor. B.A., Reed College; Ph.D., University of California.

**RONALD G. TAYLOR**, Professor. B.S., Western Michigan University; M.A., Ph.D., Michigan State University.

**DAVID R. THOMAS**, Professor. B.A., M.A., Brooklyn College; Ph.D., Duke University.

**STEVEN G. VANDENBERG**, Professor Emeritus.

**THEO. VOLSKY, JR.**, Vice President for Administration, Professor. B.S., M.S., Kansas State University; Ph.D., University of Minnesota.

**DONALD ARTHUR WEATHERLEY**, Associate Professor. B.S., M.A., Northwestern University; Ph.D., Stanford University.

**JOHN S. WERNER**, Associate Professor. B.A., M.A., University of Kansas; Ph.D., Brown University.

**MICHAEL WERTHEIMER**, Professor. B.A., Swarthmore College; M.A., Johns Hopkins University; Ph.D., Harvard University.

**JAMES R. WILSON**, Professor. B.A., Ph.D., University of California, Berkeley.

## RELIGIOUS STUDIES

**RODNEY L. TAYLOR**, Department Chair, Professor. B.A., University of Southern California; M.A., University of Washington; Ph.D., Columbia University.

**DAVID CARRASCO**, Associate Professor. B.A., Western Maryland College; M.A., M.Th., Ph.D., University of Chicago.

**IRA CHERNUS**, Associate Professor. B.A., Rutgers College; M.A., Ph.D., Temple University.

**FREDERICK M. DENNY**, Associate Professor. A.B., College of William and Mary; B.D., Andover Newton Theological School; M.A., Ph.D., University of Chicago.

**SAM D. GILL**, Professor. B.S., M.S., Wichita State University; M.A., Ph.D., University of Chicago.

**DORIS WEBSTER HAVICE**, Professor Emerita.

**ROBERT C. LESTER**, Professor. B.A., University of Montana; B.D., Yale Divinity School; M.A., Ph.D., Yale University.

**REGINALD A. RAY**, Professor Adjunct. B.A., Williams College; Ph.D., University of Chicago.

**LYNN ROSS-BRYANT**, Associate Professor. B.A., Occidental College; M.A., Ph.D., University of Chicago.

## SLAVIC LANGUAGES AND LITERATURES

**EARL D. SAMPSON**, Department Chair, Associate Professor of Russian. B.A., University of Colorado; M.A., Ph.D., Harvard University.

**REGINA AVRASHOV**, Instructor of Russian. M.A., Leningrad State Herzen Pedagogical Institute; M.A., Georgetown University.

**HOWARD A. DAUGHERTY**, Assistant Professor of Russian. B.A., Ph.D., University of Washington.

**C. NICHOLAS LEE**, Professor of Russian. B.A., M.A., University of Maryland; Ph.D., Harvard University.

**D. L. PLANK**, Professor Emeritus.

## SOCIOLOGY

**PAUL E. WEHR**, Department Chair, Associate Professor. B.A., University of Connecticut; M.A., University of North Carolina; Ph.D., University of Pennsylvania.

**E. MERLE ADAMS**, Professor. A.B., Doane College; M.A., Ph.D., Harvard University.

**PATRICIA A. ADLER**, Assistant Professor. A.B., Washington University; M.A., Ph.D., University of California, San Diego.

**OTOMAR J. BARTOS**, Professor. B.A., M.A., University of Colorado; Ph.D., Yale University.

**HERBERT BYNDER**, Associate Professor. A.B., Wilkes College; M.P.H., Ph.D., Columbia University.

**RAY P. CUZZORT**, Professor. B.A., M.A., University of Cincinnati; Ph.D., University of Minnesota.

**JAMES V. DOWNTON**, Associate Professor. B.A., M.A., Sacramento State College; Ph.D., University of California.

**DELBERT S. ELLIOTT**, Professor. B.A., Pomona College; M.A., Ph.D., University of Washington.

**ESTEVAN T. FLORES**, Assistant Professor. B.A., St. Mary's University; M.A., University of Notre Dame; Ph.D., University of Texas.

**MARTHA E. GIMENEZ**, Associate Professor. B.A., Montaña State University; M.A., National University of Cordoba (Argentina); Ph.D., University of California, Los Angeles.

**ROBERT C. HANSON**, Professor. B.A., M.A., Ph.D., University of California, Berkeley.

**HOWARD HIGMAN**, Professor Emeritus.

**ROBERT M. HUNTER**, Associate Professor. B.A., Ph.D., University of Colorado.

**J. ROLF KJOLSETH**, Associate Professor. B.A., Ph.D., University of Colorado.

**THOMAS F. MAYER**, Associate Professor. B.A., Oberlin College; Ph.D., Stanford University.

**BLAINE E. MERCER**, Professor Emeritus.

**ELIZABETH W. MOEN**, Associate Professor. B.S., Lenoir Rhyne College; Ph.D., Johns Hopkins University.

**JOYCE M. NIELSEN**, Associate Professor. B.A., University of Colorado; M.A., Ph.D., University of Washington.

**LEONARD J. PINTO**, Associate Professor. B.S., M.A., Fordham University; Ph.D., University of Chicago.

**ROBERT M. REGOLI**, Associate Professor. B.S., M.A., Ph.D., Washington State University.

**GEORGE F. RIVERA, JR.**, Associate Professor. B.A., M.A., University of Houston; Ph.D., State University of New York at Buffalo.

**RICHARD G. ROGERS**, Assistant Professor. B.A., University of New Mexico; M.A., Ph.D., University of Texas.

**EDWARD ROSE**, Professor Emeritus.

**JULES J. WANDERER**, Professor. B.A., Ph.D., University of Colorado.

## SPANISH AND PORTUGUESE

**LUIS T. GONZALEZ-DEL-VALLE**, Department Chair, Professor. B.A., University of North Carolina;

M.A., University of Massachusetts; Ph.D., Five College Cooperation Program; Amherst College, Hampshire College, Mount Holyoke College, Smith College, and University of Massachusetts.

**YVONNE GUILLON BARRETT**, Associate Professor. B.A., University of Colorado; M.A., Ph.D., Florida State University.

**KENNETH BROWN**, Assistant Professor. B.A., M.A., Ph.D., Pennsylvania State University; Teaching Degree, University of Barcelona (Spain).

**JOHN G. COPELAND**, Associate Professor. B.S., A.M., Indiana University.

**SALVADOR RODRIGUEZ del PINO**, Associate Professor. B.A., California State University, Long Beach; M.A., University of California, Irvine; Ph.D., University of California, Santa Barbara.

**JOSE DE ONIS**, Professor Emeritus.

**JOHN S. GEARY**, Associate Professor. B.A., M.A., Ph.D., University of California, Berkeley.

**ANTOLIN GONZALEZ-DEL-VALLE**, Visiting Professor. Ph.D., University of Havana.

**TOMAS L. GRAMAN**, Assistant Professor. B.A., University of Illinois; M.A., University of Utah; Ph.D., University of New Mexico.

**WILLIAM J. GRUPP**, Professor Emeritus.

**CHARLES L. KING**, Professor Emeritus.

**RALPH B. KITE**, Associate Professor. B.A., University of Arizona; Ph.D., University of New Mexico.

**RICARDO LANDEIRA**, Visiting Professor. B.A., M.A., Arizona State University; Ph.D., Indiana University.

**ANTHONY GIRARD LOZANO**, Professor. B.A., Ph.D., University of Texas.

**ISIDORO MONTIEL**, Professor Emeritus.

**TERESINHA ALVES PEREIRA**, Associate Professor. B.A., Universidade de Minas Gerais, Brazil; M.A., Ph.D., University of New Mexico.

**LILLIAN FERNANDEZ de ROBINSON**, Senior Instructor. B.S., Rider College; M.A., Ph.D., University of Colorado.

**BERNICE UDICK**, Professor Emerita.

**RAYMOND L. WILLIAMS**, Professor. B.A., Washington State University; M.A., Ph.D., University of Kansas.

## THEATRE AND DANCE

**JAMES M. SYMONS**, Department Chair, Professor. B.A., Illinois College; M.A., Southern Illinois University; Ph.D., Cornell University.

**MARGARET LYNN BECKER**, Professor Emerita.

**ROBERT J. BOVARD**, Instructor. B.S., Lehigh University; M.F.A., Dallas Theatre Center/Trinity University.

**WILLIAM L. BOYETTE**, Lecturer. B.A., University of North Carolina.

**DAVID A. BUSSE**, Associate Professor. B.S., M.F.A., University of Wisconsin.

**MARTIN T. COBIN**, Professor Emeritus.

**MARILYN C. COHEN**, Senior Instructor. B.S., University of Illinois.

**WILLIAM G. ELLIOTT**, Instructor. M.Mus., M.A., University of Colorado; B.A., Rice University.

**JOEL G. FINK**, Associate Professor. B.F.A., Goodman School of Drama, The Art Institute of Chicago; M.F.A., New York University; D.A., New York University.

**TOBY R. HANKIN**, Assistant Professor. B.A., Barnard College; M.A., Mills College.

**CHARLOTTE YORK IREY**, Professor. B.S., University of Wisconsin; M.A., University of Colorado.



**DONNA PELLE JACOBY**, Assistant Professor. B.A., University of Minnesota; M.F.A., University of Hawaii.

**RICHARD K. KNAUB**, Professor. M.F.A., State University of Iowa; A.B., Ph.D., Indiana University.

**RANDALL J. MCMULLEN**, Assistant Professor. B.S., Colorado State University; B.A., University of Missouri; M.F.A., University of North Carolina.

**MARGARET LEE POTTS**, Associate Professor. B.A., Occidental College; M.A., Ph.D., University of Southern California.

**AARON D. SMITH**, Assistant Professor. B.S., University of Oregon; M.A., University of Illinois.

**NANCY L. SPANIER**, Professor. B.A., Middlebury College; M.A., Mills College.

**DANIEL S. P. YANG**, Professor. B.A., National Taiwan University; M.F.A., University of Hawaii; Ph.D., University of Wisconsin.

## UNIVERSITY WRITING PROGRAM

**ELISSA SCHAGRIN GURALNICK**, Program Director, Professor. A.B., A.M., University of Pennsylvania; M. Phil., Ph.D., Yale University.

**PAUL M. LEVITT**, Program Director, Professor. B.A., M.A., University of Colorado; M.A., Ph.D., University of California, Los Angeles.

## WOMEN STUDIES

**JANET L. JACOBS**, Program Director, Women Studies, Assistant Professor Adjunct. B.S., M.A., Ph.D., University of Colorado.

**DEBORAH L. FLICK**, Assistant Professor Adjunct. B.B.A., Ohio University; M.A., Sonoma State University; Ph.D., University of Colorado.

**MARCIA WESKOTT**, Professor. B.A., Ursinus College; M.A., Ph.D., University of Pennsylvania.



# College of Business and Administration and Graduate School of Business Administration

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## INFORMATION ABOUT THE COLLEGE

*Edward A. Johnson, Dean*

### History and Purpose

The College of Business and Administration and Graduate School of Business Administration serve the need for educating competent and responsible administrative personnel, for continued education of those already in such positions, and for research. The College was admitted to membership in the American Assembly of Collegiate Schools of Business in 1938.

Four degrees are awarded by the College in Boulder: the Bachelor of Science in Business (B.S.), the Master of Science in Business (M.S.), the Master of Business Administration (M.B.A.), and the Doctor of Philosophy in Business Administration (Ph.D.). The College also offers undergraduate and M.B.A. programs on the Colorado Springs Campus.

The College participates on a continuing basis in the Executive Program for the Gas Industry, the Institute for Organization Management, the Colorado School of Banking, the National Installation Banking School, the School of Bank Marketing, the School for International Banking, and many other activities. The College also assists in the presentation throughout Colorado of the Certificate Program in Real Estate. Faculty members participate in many continuing education, government, and corporate educational programs.

The Executive-in-Residence program provides students with an opportunity to work with and to learn from business leaders who reside at the University during the academic year.

The Business Alumni Advisory Council serves as a direct link with the business community to promote understanding, cooperation, and mutual gain in a variety of education-industry activities.

### Career Opportunities

Graduates occupy positions and perform widely varied functions in:

Accounting—financial	Marketing management
Accounting—management	Marketing research
Accounting—public	Minerals land management
Advertising	Operations research
Banking	Personnel management
Consumer credit and mortgage financing	Production management
Credit administration	Real estate
Financial management	Recreation
Industrial selling and purchasing	Retailing
Information systems	Selling and sales management
Insurance	Tourism
International business	Traffic and distribution
Investments	Transportation
Management consulting	Wholesaling

Others hold positions of responsibility in fields as diverse as business journalism, public relations, city planning, chamber of commerce and trade association management, college administration, and government.

### Facilities and Research Activities

The Business Building is a total educational environment designed for the specific needs of business students. The facilities include personal computers, computer terminals, the William White Business Library, organizational laboratories, lounges, varied classrooms, all faculty and administrative offices, the Business Research Division, the Center for Applied Artificial Intelligence, and the Center for Rural Recreation Research and Development; in addition, the Small Business Assistance Center, though not housed within the College, is under the College's auspices.

The Business Research Division provides facilities and trained personnel for research on business and economic problems. Established in 1915, the unit serves as the research arm of the College. The Division serves Colorado and the surrounding region by working to improve the general economic welfare of the area and by gathering and disseminating business and economic information; encourages research by

faculty members and graduate students; and develops closer relationships among students, faculty, and members of the business community.

Through its annual outlook, *Forum*, and quarterly retail sales tax reports, the Division provides basic business information concerning Colorado. Other publications include compilations of business and economic data, industry surveys, studies of special problems in business management, and regional community studies.

The William White Business Library, located in the Business Building, contains over 60,000 monographs and bound journals, over 86,000 microforms, and 200 audiotapes. The library subscribes to over 530 current periodicals, with additional titles on cassette format. One of the most comprehensive business reference libraries in the area, the library enables students to locate books and periodicals through an on-line catalog and circulation system.

The Center for Applied Artificial Intelligence focuses on state-of-the-art computer methods and tools for solving complex information processing problems of economic and practical importance. Artificial intelligence is the science of building detailed models of intelligent human behavior that can be run in a computer, thereby integrating expertise from computer scientists, psychologists, and educators.

The Center for Rural Recreation Development aims to establish a comprehensive planning process that integrates recreation services with other dimensions of community life throughout seven states in the Rocky Mountain Region. Due to an increased awareness of the contribution that recreation makes to the individual, family, and community, and the important role that recreation plays in improving a community's economic base, residents of rural and small towns are seeking to develop and maintain year-round recreation service systems through the Center.

The Small Business Assistance Center is funded jointly by Colorado's Department of Local Affairs and the U.S. Department of Commerce's Economic



Development Administration. The Center provides access for small businesses to financial and resource information, professional management consulting services, and the technical resources of the University of Colorado and the state higher education system, with access to over 200 national data bases.

## Student Organizations

Organizations that stimulate professional interests and that provide recognition of scholastic attainment are listed below.

- AAS, Association of Accounting Students
- AIIESEC, international business association
- Beta Alpha Psi, national honorary and professional accounting fraternity
- Beta Gamma Sigma, national honorary scholastic fraternity in business
- CUAMA, student chapter of the American Marketing Association
- CU Entrepreneurship Club
- CUFMA, CU Financial Management Association
- Delta Nu Alpha, honorary transportation fraternity
- Delta Sigma Pi, professional business fraternity
- Doctoral Business Student Association
- HBSA, Hispanic Business Student Association
- ISO, Information Systems Organization
- Leadership Council
- MBA Association, for Master's students in Business
- Phi Chi Theta, professional business and economics fraternity
- SAM, Student Association of Management
- SAML, Student Association of Minerals Landmen
- Sigma Iota Epsilon, professional and honorary management fraternity
- Student Business Board
- Student Real Estate Association
- UCSPA, University of Colorado Society for Personnel Administration (Student Chapter), for students interested in personnel or industrial relations
- Women in Business

## Student Board

This is the student governing body of the College of Business, and functions as a liaison between the students and the administration. The Board helps formulate policies and represents students' interests in many different areas. Thirteen representatives are elected from the student body and serve for

two semesters. Three Board members, normally officers, are required to serve on the College of Business Academic Ethics Committee.

## Graduation Recognition Ceremony

Each December and May the Dean's Office and the Student Board sponsor a Recognition Ceremony honoring the graduating class, in addition to the Universitywide commencement. Graduates and their families are invited to attend.

## Scholarships

Each year the College awards a number of divisional and general scholarships. Generally, Business scholarships are for students who have completed Business course work at the University. The amount and number of the awards vary each year. For additional information students may contact the Office of Undergraduate Studies.

## ACADEMIC POLICIES— UNDERGRADUATE

The academic policies, rules, and regulations of the College given below are in effect at the time this *Catalog* is printed. All students are responsible for knowing and following the provisions set forth in this *Catalog*. Any questions concerning these provisions are to be directed to the College office. The College cannot assume responsibility for problems resulting from a student's failure to follow the policies stated in the *Catalog* or from misadvice given by those outside the Office of Undergraduate Studies. Similarly, students are responsible for all deadlines, rules, and regulations stated in the *Schedule of Courses*. All rules and regulations are subject to change. Any questions should be directed to the Office of Undergraduate Studies.

### Academic Ethics (Dishonesty, Cheating)

Students are expected to conduct themselves in accordance with the highest standards of honesty and integrity. Cheating, plagiarism, illegitimate possession and disposition of examinations, alteration, forgery, or falsification of official records, and similar acts or the attempt to engage in such acts are grounds for suspension or expulsion from the University. Any reported act of academic dishonesty may be referred to the College of Business Academic Ethics Committee at the discretion of the

Associate Dean, a member of the instructional staff, or other appropriate University representative.

In particular, students are advised that plagiarism consists of any act involving the offering of the work of someone else as the student's own. It is recommended that students consult with their instructors as to the proper preparation of reports, papers, etc., in order to avoid this and similar offenses. Official College procedures concerning academic ethics are maintained in the Office of Undergraduate Studies.

## Adding and Dropping Courses

Business classes may be added only through the second Friday that classes are in session.

See the General Information section for University-wide Drop/Add policy.

*Administrative Drop.* Instructors may recommend to the Office of Undergraduate Studies that students who fail to meet expected course attendance or prerequisites be dropped from the courses.

## Advising and Records

All Business students receive their academic counseling from a staff of advisors in the Office of Undergraduate Studies. During the semester, advisors are available Monday through Friday from 9:00 to 11:30 a.m. and 1:00 to 4:00 p.m. During registration periods, the advisors are available at the registration area. Individual advising and scheduling are not possible during registration periods; they should be obtained instead throughout the semester.

Students may look at their progress sheets any time during advising hours, and a copy will be provided upon request. Students are expected to assume responsibility for planning their programs in accordance with College rules and policies.

Students are encouraged to discuss with the faculty of the College the various emphases available as well as career opportunities.

## Attendance Regulations

Classroom attendance is left to the discretion of the instructor. Students are responsible for understanding each instructor's policy on attendance.

## Credit

To receive credit, all courses must be listed on the student's unofficial transcript by the Office of Academic Records. Credit is then evaluated by the

College of Business to determine degree acceptability.

Courses completed at any University of Colorado campus are credited toward degree requirements, if appropriate to the degree program.

### TRANSFER CREDIT

The College reserves the right to disallow any credit that is not appropriate degree credit as determined by the College.

Credits in business subjects transferred from other institutions will be limited to the number of credit hours given for equivalent work in the regular offerings of the University. Only work from regionally accredited institutions will transfer to the College. The College will limit transfer credit for business courses taken at a lower-division level to such courses as the College offers at that level. A maximum of 60 semester hours of credit may be accepted from a two-year school.

Actual equivalent courses may be substituted for required courses. Students must submit a catalog description and course syllabus for course equivalency to be determined. Careful checking is required. A course given at another institution may have the same name and same textbook as a required Business course and still be taught with a nonbusiness emphasis or other variations that give it little value for business.

Business students desiring to take work at another institution or another campus of the University of Colorado and apply the work toward the B.S. degree in Business must have prior approval of the College of Business. Generally, only elective credit is acceptable in transfer from other institutions once the student has enrolled in the College.

All courses in the area of emphasis must be taken at the University of Colorado (Boulder or Colorado Springs) unless written approval is given by the appropriate division head and the Associate Dean of Undergraduate Studies. Transfer students must take a minimum of 30 hours of Business courses in residency after admission to the College. For a detailed explanation of transfer credit, see the Undergraduate Admission section.

### CORRESPONDENCE CREDIT

Required Business courses and area of emphasis courses cannot be taken by correspondence. All correspondence courses must be evaluated and have prior approval to determine their acceptability.

### CREDIT BY EXAMINATION

*Advanced Placement (CEEB).* For students who make scores of 3, 4, or 5, college credit will be given where appropriate.

*College Level Subject Examination Credits (CLEP).* College credit for approved CLEP may be considered, providing the scores are at the 67th percentile or above. Specific information is available in the Office of the Dean.

Generally, CLEP credit is only appropriate for (a) prebusiness requirements and (b) nonbusiness electives. A maximum of 6 hours of credit in any one course area is allowed. CLEP may not be used in course areas where credit has already been allowed. General examinations are not acceptable.

Credit for CLEP must have prior approval in writing by the Office of Undergraduate Studies.

### ROTC CREDIT

Students who are enrolled in and complete the ROTC program may apply a maximum of 12 semester hours of advanced ROTC credit toward nonbusiness elective requirements and toward the 120-semester-hour total degree requirement for the B.S. degree in Business. Students must be enrolled as official ROTC students in order to receive degree credit for ROTC courses. No credit toward degree requirements is granted for basic (freshman and sophomore) ROTC courses. The ROTC advisor can provide more detailed information.

### SPECIAL SOURCES OF CREDIT

The College reserves the right to accept or reject all special sources of credit which do not have prior approval of the Dean. A maximum of 6 hours of theory courses in physical education or dance can be accepted toward graduation.

Up to 6 hours of independent study and other nontraditional types of credit will be accepted as degree credit. Prior approval is required if the work is to be applied as degree credit. A maximum of 3 hours of this type of credit may be taken in any one semester. Normally, such classes as ROTC, certain teacher education classes, teaching methods, orientations, practica, and workshops are not acceptable. Classes such as music, band, choir, art, and Arts and Sciences (ARSC) courses might be counted as part of the 6 hours, providing prior approval is given. Failure to have all such courses approved prior to enrolling may result in loss of credit.

For detailed information see Model Degree Program, Curriculum Note 5.

*Independent Study Credit.* Junior or senior Business students desiring to work beyond regular business course coverage may seek permission to take variable credit courses (1-3 semester hours) under the direction of an instructor who approves the project, but the student must have prior approval of the Office of Undergraduate Studies.

To receive credit for independent study and experimental studies courses, students must obtain the Dean's approval prior to registering for the courses. Further information and forms are available in the Office of Undergraduate Studies.

*Cooperative Education.* No credit is given for work experience, internships, or cooperative education programs. See Model Degree Program Curriculum Notes for additional information concerning elective credit.

### STUDY ABROAD CREDIT

Study abroad programs are available for students who are interested in international business or in cultural experiences abroad. One such program is the London Seminar in International Finance, a month-long, 6-credit-hour program held each summer in the financial district of London, England. The seminar is open to juniors and seniors in the College of Business and Administration who have completed at least one course in international finance or international trade.

Transfer credit from study abroad programs is applied as nonbusiness elective credit. Students planning to attend study abroad programs must meet with an undergraduate advisor and have their course selections approved before leaving campus.

More specific information about these opportunities is available from the College of Business and Administration Office of Undergraduate Studies or from the Office of International Education.

### NO CREDIT

Because of space limitations, Business classes may not be taken on a No Credit basis.

### Grading Policies

See the University Policies, Programs, and Services section for the grading system and Pass/Fail policy.

*Pass/Fail.* Students in the College may not use courses taken on a Pass/Fail basis to satisfy required business or required nonbusiness courses, or business elective courses. Only nonbusiness

electives may be taken on a Pass/Fail basis. A maximum of 16 hours of Pass/Fail credit may be applied toward the B.S. degree in Business; transfer students may take 1 hour of Pass/Fail for every 8 hours successfully completed at this institution. Pass/Fail determination must be made within the first two weeks of the semester and is irreversible. A maximum of 6 hours Pass/Fail may be taken in any one semester.

**Failed Courses.** Failed courses may be repeated, but the *F* will be included in the grade point average.

**Incomplete Grades.** The only incomplete grade given in the College is *IF*. An *IF* grade is given only when documented circumstances clearly beyond the student's control prevent the student from completing the course. Generally, students should make up the missing work and not retake the entire course. Students should not register for the class a second time, and the work should be made up with the instructor giving the *IF*. All *IF* grades must be made up within one year, or the *IF* will be changed to a grade of *F*.

## GRADE CHANGES

Final grades as reported by instructors are to be considered permanent and final. Grade changes will be considered only in cases of documented clerical errors, and must be approved by the Associate Dean.

## Honors Program

Upon recommendation of the faculty, students who demonstrate superior scholarship are given special recognition at graduation.

Students must achieve an overall grade point average of 3.30 and a grade point average of 3.50 in all Business courses taken at the University of Colorado to be considered for *cum laude*.

Those who achieve an overall grade point average of 3.50 and a grade point average of 3.70 in all Business courses taken at the University of Colorado will be considered for *magna cum laude*.

## BETA GAMMA SIGMA

Membership in Beta Gamma Sigma is an honor which must be earned through outstanding scholastic achievement. Such membership is the highest scholastic honor that a student in a school of business or management can attain.

To be eligible for Beta Gamma Sigma membership, students must rank in the top 5 percent of their junior class, the top 10 percent of their senior class, or rank in the top 20 percent of those students receiving master's degrees. Also,

students completing all requirements for the doctoral degree conferred by a business school are eligible for Beta Gamma Sigma. It should be noted that Beta Gamma Sigma chapters may be chartered only in those schools of business and management accredited by the American Assembly of Collegiate Schools of Business.

## Registration for Business Courses

Students may register only for those courses for which they have the stated prerequisites. Junior standing is required for all Business courses numbered 3000-4999. Priority is given to students officially in the Business program.

Students enrolled in a section of a Business course, but attending a different section, will receive a final grade of *F* for nonattendance. Students attending classes for which they are not enrolled will not be added after the Add period is over.

## Scholastic Load

The normal scholastic load of an undergraduate in the College is 15 semester hours, with a maximum of 17 hours during the fall and spring semesters. A maximum of 6 hours may be taken during a five-week summer session with not more than 12 hours total during the 10-week summer session.

## Standards of Performance

Students are held to basic standards of performance established for their classes with respect to attendance, active participation in course work, promptness in completion of assignments, correct English usage both in writing and in speech, accuracy in calculations, and general quality of scholastic workmanship.

In general, examinations are required in all courses and for all students, including seniors.

To be in good standing, students must have an overall grade point average of *C* (2.00) or better for all course work taken, and a 2.00 or better for all business courses taken. This requirement applies to work taken at all University campuses. Physical education activity courses and remedial course work are not included in the overall grade point average.

When semester grades become available, students below the acceptable standard will be placed on probation or suspension. Students are responsible for being aware of their academic status at all times, and late grades and/or late

notification does not waive this responsibility. College rules governing probation and suspension are as follows:

1. Any student whose cumulative grade point average, or cumulative business grade point average, is less than 2.00 will be placed on probation immediately. A student may be removed from probation when the cumulative grade point average and the cumulative business grade point average have been raised to 2.00.

2. A student may remain on probation for up to four semesters as long as the student maintains normal degree progress each semester as determined by the College and obtains no grade below a *C*. Such probationary status may continue a maximum of four terms, providing these provisions have been met. Please note that students may be on probation a maximum of four semesters during their entire academic career at the College of Business, regardless of whether or not the probationary terms are consecutive. Summer is considered a term. Failure to meet probationary provisions will result in suspension.

3. Indefinitely suspended students may attend the University of Colorado summer school (at any campus) and/or take correspondence courses in order to improve their grade point average in the area of deficiency, but may not attend any division of the University during the regular (fall and spring) semesters, or take Continuing Education Boulder Evening credit classes.

4. A student who has been under indefinite suspension for one calendar year may apply for readmission to the College of Business and Administration. Generally, a suspended student must attend CU summer school (at any campus) and remove all grade deficiencies before being considered for readmission for the regular academic year. If readmitted, that readmission will be on probationary status. After being readmitted under such probationary status, students who fail to comply with the requirements of their probation will be subject to permanent suspension.

5. Students who have been suspended once and then readmitted by the College of Business will be permanently suspended if their overall grade point average, or business grade point average, again falls below a 2.00.

6. Any student who is placed on suspension more than once will be permanently suspended from the College of Business and may not attend any campus of the University of Colorado while a Business student.

7. Any student earning all failing grades or no academic credit for the semester will not be permitted to register without the Dean's approval.

8. Official combined degree students are required to maintain the same standard of performance as College of Business students in order to continue in the combined program.

## Withdrawal

Students may withdraw at any time *before* the start of the final examination period.

Students who withdraw during the semester are not assured admission the following semester but will be considered on an individual basis, if space is available.

## UNDERGRADUATE DEGREE PROGRAMS

### Planning the Business Program

#### FRESHMAN STUDENTS

Prospective students are encouraged to complete strong academic programs in high school. A minimum of four academic units should be completed *each year* with special emphasis given to writing, mathematics, and science skills. For a detailed explanation of the high school preparation desired, see the Undergraduate Admission section.

#### TRANSFER STUDENTS

Transfer students are expected to demonstrate proficiency in writing and mathematics. Prospective transfer students should complete courses equivalent to those taken by University of Colorado Business freshmen and sophomores. See the Model Degree Program.

### Intrauniversity Transfer

A large number of students admitted to the College of Business each year are Intrauniversity Transfers. An undergraduate student who is enrolled on the Boulder Campus and who wishes to transfer to the College of Business may submit a completed Intrauniversity Transfer Application to the College upon completion of at least 12 semester hours of graded course work at the University of Colorado. October 1 is the deadline for spring admission and March 1 for fall admission. No Intrauniversity Transfers are admitted during the summer term. The College will consider each application based upon the number of spaces available, the quality of the student's academic work, and the courses completed.

## Diversity

In addition to grade point average requirements, hours taken, and non-business course requirements completed, the College will also look at other factors that contribute to diversity in the student body. Factors that will be considered as contributing to a more diverse student body are race and ethnic background; age; business experience; economic, cultural, and physical handicaps; and unique situations.

## Concurrent Registration

Concurrent registration is for graduating seniors who need to be enrolled on two campuses of the University of Colorado at the same time in order to fulfill graduation requirements.

Students enrolled in the College of Business and Administration or the Graduate School of Business and Administration may only exercise the concurrent registration option if they are in their graduating semester; students who are two semesters from graduating and cannot obtain a course necessary to complete the prerequisite sequence may also be allowed to use this option. The course must be required for graduation and not offered on the Boulder Campus, or the course must conflict with another required course in which the student is enrolled. Students from other colleges and schools who wish to take Business courses must have the approval of the Boulder Campus College of Business and Administration in addition to the approval of their own college or school before submitting the concurrent registration form.

## Requirements for the B.S. (Business) Degree

The student alone is responsible for fulfilling these requirements. Questions concerning graduation should be directed to the Office of Undergraduate Studies.

## GRADUATION

Prospective graduates must file an Application to Graduate with the Office of Undergraduate Studies and request a senior audit two semesters before they plan to graduate. Students planning to graduate in May or August must request a senior audit by the previous October 15. Students planning to graduate in December must request a senior audit by the previous March 15. Failure to do so will delay graduation. Also, students

desiring to change their area of emphasis after the senior audit has been completed must have the change approved by the graduation supervisor no later than the first week of class of their final semester. Changes after that time will delay graduation.

## GENERAL REQUIREMENTS

The Bachelor of Science (Business) degree requires:

1. *Total Credits.* A minimum of 120 acceptable semester hours of credit as follows:

	<i>Semester Hours</i>
Required business core classes . . . . .	30
Required nonbusiness classes . . . . .	39
Required area courses (minimum) . . . . .	12
Business electives . . . . .	9
Upper-division nonbusiness electives . . . . .	9
Nonbusiness electives . . . . .	6
Either business or nonbusiness electives . . . . .	15

The College reserves the right to disallow any credit that is not appropriate academic credit as determined by the College.

2. *Residence.* Completion of at least 30 semester hours of business, usually in the senior year, after admission to the College of Business, and to include the 12 hours in the area of emphasis.

3. *Grade Point Average.* A minimum scholastic cumulative grade point average of 2.00 (C) for all courses attempted at the University acceptable toward the B.S. (Business) degree, 2.00 cumulative for all Business courses, and 2.00 in the required areas of emphasis courses.

## DEGREE PROGRAM

The following four-year plan lists all the specific course requirements. Due to course availability the order of courses taken may vary. Students should fulfill all course prerequisites.

<i>Freshman Year</i>	<i>Semester Hours</i>
UWRP 1150 or 1250 Composition (Note 1) . . . . .	3
Oral Communication (Note 2) . . . . .	3
MATH 1070 and College Calculus (Note 3) . . . . .	6
PSCI 1101 American Government . . . . .	3
Additional political science, 1000-4000 level . . . . .	3
SOCY 1001 Introductory Sociology, SOCY 1004, 2011, 2031, or ANTH 1040 . . . . .	3
Natural science (Note 4) . . . . .	6
Nonbusiness electives (Note 5) . . . . .	3
	<u>30</u>

<i>Sophomore Year</i>	<i>Semester Hours</i>
ECON 2020, 2010 Macro/Microeconomics (Note 6) . . . . .	8
PSYC 1001 General Psychology (Note 6) . . . . .	4
Socio-humanistic elective (Note 7) . . . . .	3
INFS 2000 Business Information Systems and the Computer . . . . .	3
OPMG 2010 Business Statistics . . . . .	3
ACCT 2000 Introductory Financial Accounting . . . . .	3
Nonbusiness electives (Note 5) . . . . .	6
	<u>30</u>

<i>Junior Year</i>	<i>Semester Hours</i>
BSLW 3000 Business Law . . . . .	3
MKTG 3000 Principles of Marketing . . . . .	3
FNCE 3050 Basic Finance . . . . .	3
ORMG 3300 Introduction to Management and Organization . . . . .	3

OPMG 3000 Operations Management	3
Nonbusiness electives (Note 5)	3
Business electives	6
Either business or nonbusiness electives (Note 5)	6
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	30
<i>Senior Year</i>	
BPOL 4500 or 4520 Business Policy	3
BPOL 4550 Business and Society or FNCE 4100 Business and Government	3
Area of emphasis (minimum)	12
Business electives	3
Either business or nonbusiness electives (Note 5)	9
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Minimum to graduate (Note 8) 120	

**Curriculum Notes**

1. Recommended for freshmen, but due to space limitation may have to be taken during the sophomore year.
2. The following courses will fulfill this requirement: COMM 1020, 2030, 2150, 2200, 3200, 4200.
3. MATH 1070 and 3 hours of college calculus are required. There are no course substitutions for MATH 1070. MATH 1080, 1300, APPM 1350, and 1360 will fulfill the calculus requirement. No credit is given for college algebra.
4. Natural sciences include general college-level chemistry (not CHEM 1101), physics, biology, astronomy, geology, and earth science. Introduction to Physical Anthropology, ANTH 2010-2020, and Environmental Systems, GEOG 1001-1011, are also acceptable.
5. *Elective Credits.* Elective credits should be selected carefully, as not all classes are acceptable. Generally, to be acceptable, electives must be taught by regular University of Colorado faculty, must have a form of assessment such as a term paper and/or examinations, and must be regular classroom-type courses. Course coverage must be college-level, not repetitious of other work applied toward the degree, must be academic as opposed to vocational or technical, and must be part of the regular University offerings. Specifically, the college will accept:
  - a. A maximum of 6 hours of physical education theory and dance theory, and
  - b. A maximum of 12 hours of advanced ROTC, providing the student is enrolled in the program and completes the total program, and
  - c. A maximum of 6 hours of approved independent study, choir, band, music lessons, and art lessons.
 The College will *not* accept physical education activity, workshops, orientations, dance classes, teaching methods, practica, certain teacher education classes, and certain classes offered by the College of Arts and Sciences. The above examples are not exclusive, but are intended to provide guidelines. The College of Business reserves the right to disallow any credit that is not appropriate academic credit as determined by the College. For further information, contact the Office of Undergraduate Studies.
6. A minimum of 3 semester hours each of macro/micro economics and introductory psychology is required. The additional hour earned in each of these courses will apply as nonbusiness elective credit.
7. Three hours selected from the following courses:
  - a. History course, 1000-4000 level
  - b. PSYC 2303 Psychology of Adjustment; PSYC 2456 Social Psychology of Social Problems; PSYC 2643 Child and Adolescent Psychology; PSYC 2700 Psychology of Contemporary American Women; PSYC 4406 Social Psychology; PSYC 4456 Psychology of Personality
  - c. PHIL 1000 Introduction to Philosophy; PHIL 1200 Philosophy and Society; PHIL 2200 Major Social Theories
  - d. SOCY 1001 Introduction to Sociology 1; SOCY 1004 Deviance; SOCY 2011 Contemporary Social Issues; SOCY 2031 Social Problems and

- Social Change; ANTH 1040 Principles of Anthropology 2
- Group d courses are acceptable only if not used to fulfill the sociology requirement.
8. Because of the internship requirement, Tourism and Recreation students are required to take a minimum of 130 hours to graduate.

**Combined Programs**

Numerous career opportunities exist for persons trained in both a specialized field and management. For this reason students may be interested in combined programs of study leading to completion of degree requirements concurrently in two fields. Such combined programs have been arranged for engineering, environmental design, journalism, music, and may be arranged for other professional combinations as well.

The two programs of study proceed concurrently, terminating together with the awarding of two degrees. Normally, at least five years will be needed for such combined programs. No substitutions are allowed in this program. A minimum of 150 semester hours is required for all combined programs.

Students desiring to transfer from combined programs to the College of Business must submit an application to the Office of Undergraduate Studies.

For students in combined programs, the requirements for the degree in Business are as follows:

1. An application for admission to the combined program, which must be filed with the College of Business and approved by the deans of both colleges.
2. Completion of at least 48 semester credits in business and economics, to include ECON 2020 and 2010 (6 semester hours), required courses in business (30 semester hours), and a business area of emphasis (12 semester hours).
3. Completion of at least 30 of these semester hours at the University of Colorado while concurrently enrolled in the College of Business.
4. Completion of nonbusiness requirements in mathematics, communications, and the social and behavioral sciences in a degree program approved in advance by the College of Business. In addition, for some courses and areas of emphasis, there are prerequisite requirements which must be met.
5. At least a 2.00 grade point average must be earned in all courses undertaken in the College of Business, the area of emphasis, and the University of Colorado.
6. Any combined degree student who does not make reasonable progress toward the completion of the Business degree requirements, as determined by the College of Business, may be dropped from the program.

7. The number of students accepted in any combined degree program may be numerically limited and is dependent upon existing demand each semester.

Shown below is the combined engineering-business program. For other combinations, students must consult with the Business Dean's office.

The requirements for all combined business and engineering programs are as follows:

<i>Required Nonbusiness Courses</i>	<i>Semester Hours</i>
PHYS 1110, 1120 General Physics	6
MATH 1300, APPM 2360 Calculus and Linear Algebra	10
ECON 2010 Principles of Microeconomics	3
ECON 2020 Principles of Macroeconomics	3
ENGL 1200, 1300, 1400 Introduction to Fiction/ Drama/Poetry	6
Political science elective (1000-2000 level)	3
PSCI 1101 The American Political System	3
PSYC 1001 General Psychology	3
Socio-humanistic elective selected from business list	3
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<i>Required Business Courses</i>	<i>Semester Hours</i>
ACCT 2000 Introduction to Financial Accounting	3
INFS 2000 Business Information and the Computer	3
OPMG 2010 Business Statistics	3
MKTG 3000 Principles of Marketing	3
FNCE 3050 Basic Finance	3
OPMG 3000 Operations Management	3
ORMG 3300 Introduction to Management and Organization	3
BSLW 3000 Business Law	3
FNCE 4100 Business and Government; or BPOL 4550 Business and Society	3
BPOL 4500 Cases and Concepts in Business Policy; or BPOL 4520 Small Business Strategy, Policy and Entrepreneurship	3
Specified courses in an area of emphasis in one of the following fields: accounting, entrepreneurship and small business management, finance, information systems, international business, marketing, minerals land management, operations management, organizational management, personnel-human resource management, public agency administration, real estate, tourism and recreation, or transportation and distribution management. All work in the area of emphasis must be taken at the University of Colorado College of Business. Areas of emphasis (minimum)	12
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**AREAS OF EMPHASIS**

Each candidate for the B.S. (Business) degree must complete the prescribed courses in an area of emphasis comprising a minimum of 12 semester hours taken at the University of Colorado. A 2.00 average is required for the required area courses.

Students so desiring may accomplish the effect of a dual area of emphasis by careful selection of courses and use of elective hours for the second area.

**Accounting**

The principal areas of accounting study are financial accounting, managerial accounting, systems, taxation, and auditing. The emphasis is designed to prepare students for careers in public

accounting and in business, nonprofit, and governmental organizations.

Course work in accounting conveys a comprehensive understanding of the theory and concepts that underlie accounting practice. Emphasis is placed on logical reasoning, enabling students to solve problems in accounting and to make sound accounting policy decisions.

In addition to training in accounting, a thorough knowledge of the social, legal, and political environment is essential. Good communications skills are indispensable to the professional accountant. Thus, course work in English composition, report writing, and speech are highly recommended.

The undergraduate area of emphasis in Accounting consists of 27 hours beyond ACCT 2000:

<i>Required Courses</i>	<i>Semester Hours</i>
ACCT 2310 Managerial Cost Accounting 1	3
ACCT 3220 Intermediate Financial Accounting 1	3
ACCT 3230 Intermediate Financial Accounting 2	3
ACCT 3320 Managerial Cost Accounting 2	3
ACCT 4410 Income Tax Accounting	3
ACCT 4620 Auditing	3
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<i>Elective Courses (9 hours chosen from among the following courses):</i>	<i>Semester Hours</i>
ACCT 4240 Advanced Financial Accounting	3
ACCT 4250 Financial Accounting Issues and Cases	3
ACCT 4330 Managerial Accounting Issues and Cases	3
ACCT 4420 Advanced Income Tax Accounting	3
ACCT 4540 Accounting Systems and Data Processing	3
ACCT 4800 Accounting for Government and Nonprofit Organizations	3
BSLW 4120 Advanced Business Law	3

Students usually take as many as two courses in accounting each semester in their junior and senior years to complete area of emphasis requirements. Students planning to take the CPA examination should take Advanced Business Law (BSLW 4120) as an Accounting elective.

Students should consider continuing their education at the graduate level. An M.S. with a major or minor in Accounting is available. Also, the M.S. in Accounting with a concentration in taxation is available. In conjunction with the Division of Management Science and Information Systems, the Accounting Division offers an M.S. program in Accounting and Information Systems. An area of emphasis in Accounting is also offered as part of the M.B.A. program.

### Entrepreneurship and Small Business Management

This course of study provides understanding, knowledge, and skills in creating, organizing, and managing a new venture or small business. The emphasis is on the managerial aspects of the

wide range of activities required of the entrepreneur.

A second area of emphasis in Business is highly recommended. The course requirements for the second area can be included as part of business or free electives.

Students must take BPOL 4520 (Small Business Strategy, Policy and Entrepreneurship) in satisfying their business policy requirement. Additional courses in management, finance, accounting, and marketing should be planned in consultation with the advisor in order to serve individual career needs.

<i>Required Courses</i>	<i>Semester Hours</i>
ESBM 4700 Entrepreneurship and Small Business Management	3
(Two or three of the following four courses)	
FNCE 4010 Business Finance 1	3
ACCT 3320 Managerial Cost Accounting 2	3
PHRM 4400 Management of Human Resources	3
MKTG 4800 Marketing Strategies and Policies	3
The fourth course may be selected from the following:	
PHRM 4410 Labor and Employee Relations	3
OPMG 4400 Production and Inventory Planning and Control	3
<i>Recommended Electives</i>	
FNCE 4570 New Venture Funding	3
OPMG 4470 Policy Analysis in Production and Operations Management	3
TRMG 4500 Transportation Operation and Management	3
OPMG 4600 Purchasing and Materials Management	3
MKTG 4650 Physical Distribution Management	3
FNCE 4020 Business Finance 2	3

This area of emphasis is administered by the Division of Strategy and Organizational Management of the College of Business.

### Finance

The Finance area of emphasis is designed to provide students with in-depth exposure to the theoretical concepts and applied tools and techniques that are necessary for entry-level positions in various areas of financial management. The principal areas of study include financial management, money and capital markets, investments and security analysis, financial institutions, and accounting.

Finance is an applied discipline with an analytical orientation. Every effort is made to develop the student's ability to think logically about financial problems and to formulate sound financial decisions and policies. Although the emphasis is on financial management of profit-oriented organizations, the principles and concepts developed in this area of emphasis are applicable to nonprofit and governmental organizations.

<i>Required Courses</i>	<i>Semester Hours</i>
FNCE 4010 Business Finance 1	3
FNCE 4330 Investment and Portfolio Management	3
FNCE 4550 Financial Markets and Institutions	3
One of the following Finance electives:	
FNCE 4020 Business Finance 2	3
FNCE 4340 Security Analysis	3

FNCE 4400 International Financial Management	3
FNCE 4530 Bank Management	3
FNCE 4570 New Venture Funding	3
Three of the following four Accounting courses:	
ACCT 2310 Managerial Cost Accounting 1	3
ACCT 3320 Managerial Cost Accounting 2	3
ACCT 3220 Intermediate Financial Accounting 1	3
ACCT 3230 Intermediate Financial Accounting 2	3

### Information Systems

The Information Systems emphasis is designed for those who wish to prepare themselves for professional careers in data processing/information systems in business and government. Students develop the technical skills and administrative insights required to analyze information systems and to manage data processing operations. The emphasis is on management information systems—systems for the collection, organization, accessing, and analysis of information for the planning and control of operations.

<i>Required Prerequisite Courses</i>	<i>Semester Hours</i>
INFS 2000 Business Information Systems and the Computer	3
OPMG 2010 Business Statistics	3
INFS 2200 Business Programming 1: Structured COBOL	3
INFS 2210 Business Programming 2: Structured COBOL and Data Organization Techniques	3

<i>Required Courses</i>	<i>Semester Hours</i>
INFS 4650 System Analysis and Design 1	3
INFS 4660 System Analysis and Design 2	3
INFS 3500 Logical Data Structures and Database Management Systems	3
Plus one of the following courses:	
OPMG 3200 Intermediate Statistics	3
INFS 3300 Operations Research for Decision Support	3
INFS 4200 Introduction to Expert Systems	3
INFS 4700 Computer and Information Technology	3
OPMG 4400 Production and Inventory Planning and Control	3

### International Business

In recent years, companies have completely reoriented their thinking, planning, and operations to capitalize on the opportunities offered in the world marketplace. Every phase of business operation is affected by this reorientation, and individuals who offer the appropriate skills, training, and orientation are in great demand.

The program reflects the basic principle that effectiveness in international business is based on a thorough training in business administration. The International Business emphasis provides the opportunity to build on these skills.

Other courses emphasizing international affairs may be elected from the following departments: anthropology, economics, geography, history, political science, psychology, and sociology.

Students should note that MKTG 4400 is offered only in the spring semester and the prerequisite is 6 hours of the required courses.



<i>Required Courses</i>	<i>Semester Hours</i>
ECON 3403 International Economics and Policy . . . 3 plus three of the following courses:	
MKTG 4400 International Business Seminar . . . . . 3	
FNCE 4400 International Financial Management . . . 3	
TRMG 4580 International Transportation . . . . . 3	
MKTG 4100 International Marketing . . . . . 3	

A second area of emphasis in Business is highly recommended. The course requirements for the second area can be included as part of the business and free elective hours. Foreign language study is also recommended.

It is important for students who expect to be involved in international business to have an understanding of international relations, which may be gained in study abroad programs. Information on study abroad programs may be obtained from the Office of International Education. The College of Business will evaluate credit earned in such programs and determine degree acceptability. This area of emphasis is administered by the Division of Marketing of the College of Business.

## Marketing

Marketing is concerned with analyzing the market for a product or service, planning and developing that product, determining the most appropriate distribution channels, pricing the product, and promoting it. The administrative policies and practices of any well-managed firm should be marketing-oriented toward the consumer.

The career opportunities in marketing reflect the business world's awareness of the importance of this field. Today many individuals are rising to top executive positions by the marketing route. There are more executive and other job opportunities for women in the marketing field than in any other single area outside teaching or secretarial work. One out of every four people gainfully employed in this country is in a marketing position.

Career opportunities abound in such fields as personal selling, advertising, sales management, marketing research, retailing, wholesaling, marketing by manufacturers, international marketing, marketing of services, and non-profit marketing.

<i>Required Courses</i>	<i>Semester Hours</i>
MKTG 3300 Marketing Research . . . . . 3	
Marketing electives (beyond MKTG 3000) . . . . . 9	

Students should note that the required course, MKTG 3300, is not offered during summer session.

## Minerals Land Management

A student who plans to complete an area of emphasis in Minerals Land Management should comply with the following outline in regard to courses, hours, restrictions, and options. These

requirements are in addition to the required core courses and nonbusiness courses. No required courses (business or nonbusiness) may be taken Pass/Fail. It is suggested that those who plan to pursue Minerals Land Management as an area of emphasis select a second area of emphasis as well.

<i>Specific Required Courses</i>	<i>Semester Hours</i>
GEOL 1010 Introduction to Geology 1 . . . . . 4	
CHEM 1051 or 1111 General Chemistry . . . . . 4	
GEOL 1020 Introduction to Geology 2 or	
GEOL 1530 Geological Development of Colorado and the West . . . . . 4	
REAL 3000 Principles of Real Estate . . . . . 3	
ACCT 2310 Managerial Cost Accounting 1 . . . . . 3	
ACCT 4410 Income Tax Accounting . . . . . 3	
A minimum of 6 hours of the following upper-division geology or geography courses taken in conjunction with the courses listed above, of which a minimum of 3 hours must be geology. Other relevant geology and geography courses may be approved, if appropriate, by petition to the department.	
GEOL 1861 Petroleum Technology (offered only at the Denver Campus) . . . . . 4	
GEOL 4360 Glacial Geology . . . . . 3	
GEOL 4950 Natural Catastrophes and Geologic Hazards . . . . . 3	
GEOL 4960 Mineral Resources in World Affairs . . 3	
GEOG 3063 Maps and Mapping . . . . . 3	
GEOG 4063 Geographic Interpretation of Aerial Photos . . . . . 3	

<i>Required Courses</i>	<i>Semester Hours</i>
The following courses comprise the area of emphasis:	
FNCE 4010 Business Finance 1 . . . . . 3	
REAL 4730 Legal Aspects of Real Estate Transactions . . . . . 3	
MLMG 4600 Oil-Gas and Mineral Law . . . . . 3	
MLMG 4610 Minerals Landman Administration . . 3	
Minerals Landman Administration and Oil-Gas and Mineral Law are to be taken after all lower-division requirements have been completed and the completion of 90 semester hours of work toward the M.L.M. emphasis. These courses are open only to students who are regularly enrolled in the College of Business and Administration.	

<i>Suggested Electives</i>	<i>Semester Hours</i>
REAL 4300 Residential and Income Property Appraising . . . . . 3	
ECON 4767, 4784 Economics . . . . . 6	
BSLW 4120 Advanced Business Law . . . . . 3	
CVEN 2012 Plane Surveying . . . . . 3	
CVEN 3032 Photogrammetry and Control Surveys . . . . . 3	
INFS 3300 Operations Research for Decision Support . . . . . 3	
OPMG 3200 Intermediate Statistics . . . . . 3	

This area of emphasis is administered by the Division of Strategy and Organization Management of the College of Business.

## Operations Management

The area of emphasis in Operations Management is designed to prepare students for professional careers in operations planning and control, inventory management, and purchasing, in both manufacturing and service organizations.

Emphasis in the program is placed upon current practices in these professional fields and upon the knowledge and skills required for entry-level jobs.

Students whose major areas of emphasis are Information Systems, Transportation Management, or Engineering will find the Operations Management 4000-level courses to be particularly well related to their course of study.

<i>Required Courses</i>	<i>Semester Hours</i>
INFS 3300 Operations Research for Decision Support . . . . . 3	
OPMG 4400 Production and Inventory Planning and Control . . . . . 3	
OPMG 4470 Policy Analysis in Production and Operations Management . . . . . 3	
Plus one of the following courses:	
OPMG 4440 Work Design, Measurement, and Productivity Management . . . . . 3	
OPMG 4600 Purchasing and Materials Management . . . . . 3	

<i>Recommended Electives</i>	<i>Semester Hours</i>
ORMG 3350 Managing Individuals and Work Groups . . . . . 3	
ORMG 4320 Managing Complex Organizations . . . 3	
PHRM 4400 Management of Human Resources . . 3	
PHRM 4410 Labor and Employee Relations . . . 3	
TRMG 4500 Transportation Operation and Management . . . . . 3	
MKTG 4650 Physical Distribution Management . . 3	
ACCT 3320 Managerial Cost Accounting 2 . . . . . 3	
OPMG 3200 Intermediate Statistics . . . . . 3	

This area of emphasis is administered by the Division of Management Science and Information Systems of the College of Business.

## Organization Management

Every organizational unit has a manager who is responsible for establishing goals and for planning, organizing, staffing, leading, and controlling the activities of that unit. Management and leadership opportunities exist in all organizations, large or small, and the challenge of getting things done through people excites the professional manager. Entry-level supervisory jobs emphasize technical competence while middle management requires greater interpersonal skills. Top-level management positions require greater conceptual abilities. The Organization Management curriculum provides a foundation for careers in supervision and general management. Related areas of study are entrepreneurship and small business management, minerals land management, personnel-human resource management, and public agency administration.

<i>Required Courses</i>	<i>Semester Hours</i>
ORMG 3350 Managing Individuals and Work Groups . . . . . 3	
ORMG 4320 Managing Complex Organizations . . . 3	
and at least two of the following:	
PHRM 4400 Management of Human Resources . . 3	
PHRM 4410 Labor and Employee Relations . . . 3	
PHRM 4420 Employment Staffing and Development . . . . . 3	
PHRM 4430 Compensation and Benefits . . . . . 3	

<i>Recommended Electives in Addition to the Above</i>	<i>Semester Hours</i>
OPMG 4400 Production and Inventory Planning and Control . . . . . 3	
OPMG 4440 Work Design, Measurement, and Productivity Management . . . . . 3	

OPMG 4470 Policy Analysis in Production and Operations Management . . . . .	3
OPMG 4600 Purchasing and Materials Management . . . . .	3
ESBM 4700 Entrepreneurship and Small Business Management . . . . .	3
ACCT 3320 Managerial Cost Accounting 2 . . . . .	3
SOCY 4015 Theories of Conflict . . . . .	3
SOCY 4025 Conflict Management in Social Systems . . . . .	3
SOCY 4031 Social Psychology . . . . .	3
PSYC 4406 Social Psychology . . . . .	3

This area of emphasis is administered by the Division of Strategy and Organization Management of the College of Business.

**Personnel-Human Resource Management**

Personnel-Human Resource Management offers opportunities for students to develop professional competence in the areas of personnel administration and labor relations. Students gain understanding and skill in developing and implementing personnel systems including recruitment, selection, evaluation, training and motivation of employees, and union-management relations.

<i>Required Courses</i>	<i>Semester Hours</i>
PHRM 4400 Management of Human Resources . . .	3
PHRM 4410 Labor and Employee Relations . . .	3
PHRM 4420 Employment Staffing and Development . . . . .	3
PHRM 4430 Compensation and Benefits . . . . .	3

<i>Recommended Electives</i>	
ORMG 3350 Managing Individuals and Work Groups . . . . .	3
ORMG 4320 Managing Complex Organizations . . .	3
OPMG 4440 Work Design, Measurement, and Productivity Management . . . . .	3
ACCT 3320 Managerial Cost Accounting 2 . . . . .	3
OPMG 3200 Intermediate Statistics . . . . .	3
ECON 4616 Labor Economics . . . . .	3
PSYC 4733 Principles of Psychological Testing . . .	3
SOCY 4015 Theories of Conflict . . . . .	3
SOCY 4025 Conflict Management in Social Systems . . . . .	3
SOCY 4031 Social Psychology . . . . .	3
PSYC 4406 Social Psychology . . . . .	3

This area of emphasis is administered by the Division of Strategy and Organization Management of the College of Business.

**Public Agency Administration**

The Public Agency Administration program prepares students for careers in management of governmental or other nonprofit service organizations. The curriculum in Public Agency Administration provides a foundation of core courses upon which students can construct an area of emphasis which will focus on the type of service organization they desire to enter upon graduation.

<i>Required Courses</i>	<i>Semester Hours</i>
ACCT 4800 Accounting for Government and Nonprofit Organizations . . . . .	3
PHRM 4400 Management of Human Resources . . .	3
INFS 3300 Operations Research for Decision Support . . . . .	3
Business elective approved by area director . . . . .	3

This area of emphasis is administered by the Division of Strategy and Organization Management of the College of Business.

**Real Estate**

Real Estate requires knowledge of real estate investments, urban land economics, real estate law, appraising, finance, taxes, management, sales, and accounting. Real estate is one segment of the economy where it is still possible for persons to be their own bosses whether they are brokers, appraisers, developers, syndicators, or property managers.

<i>Required Courses</i>	<i>Semester Hours</i>
REAL 3000 Principles of Real Estate Practice . . .	3
REAL 4300 Residential and Income Property Appraising . . . . .	3
REAL 4540 Real Estate Finance . . . . .	3
REAL 4730 Legal Aspects of Real Estate Transactions . . . . .	3
REAL 4010 Real Estate Development or REAL 4330 Real Estate Investments . . . . .	3

Any student planning to sit for the Colorado broker's examination should consult with the College's Real Estate Advisor. Additional preparatory courses for a real estate career are:

AREN 2406 Building Construction . . . . .	3
MLMG 4610 Minerals Landman Administration . . .	3
FNCE 4550 Financial Markets and Institutions . . .	3
ACCT 4410 Income Tax Accounting . . . . .	3
FNCE 4330 Investment and Portfolio Management . . . . .	3
MKTG 3100 Personal Selling . . . . .	3
MKTG 3200 Consumer Behavior . . . . .	3
MKTG 4700 Sales Management . . . . .	3
ESBM 4700 Entrepreneurship and Small Business Management . . . . .	3
COMM 3200 Argumentation . . . . .	3
COMM 4200 Persuasion . . . . .	3

This area of emphasis is administered by the Division of Finance of the College of Business.

**Tourism and Recreation**

The Tourism and Recreation area of emphasis is designed to prepare students for careers in the travel, hospitality, and recreation portions of the service sector.

The extensive development of tourism and related commercial recreation enterprises provides the focus for courses in principles, marketing analysis, planning, implementation and control, financial analysis and planning, as well as organizational design and development. Particular attention is focused on the major trends in each of the major parts of Tourism and Recreation as they impact on positioning and competitive strategies.

The Tourism and Recreation area of emphasis combines both academic and practical experiences to prepare students for placement in industry. Students are expected to complete an internship with an organization in the

tourism and recreation industry. The 10 hours of internship credit are in addition to the 120 hours required by the College, bringing the total required for graduation to 130.

In addition to general College of Business requirements, students must complete the following courses:

<i>Required Courses</i>	<i>Semester Hours</i>
TREC 3400 Principles of Commercial Recreation . . .	3
TREC 4010 Program Planning . . . . .	3
TREC 4030 Marketing Parks and Recreation Areas and Facilities . . . . .	3
TREC 4070 Financial Management of Leisure Services . . . . .	3
TREC 4931 Internship—Commercial Recreation . . .	10

Students must complete the internship requirement supervised by the faculty in the Tourism and Recreation area.

The Tourism and Recreation emphasis is administered by the Division of Marketing of the College of Business.

**Transportation and Distribution Management**

The curriculum in Transportation Management includes the role of transportation in society and the problems of traffic management within specific industries as well as the management of firms in the transportation industry, such as airlines, urban transit firms, trucking firms, and railroads. International transportation management problems and policies are analyzed.

One of the recommended elective courses may be substituted with permission of the advisor for one of the required courses if there is a schedule conflict, if the course is not available, or if a student demonstrates a career need for such a course.

<i>Required Courses</i>	<i>Semester Hours</i>
TRMG 4500 Transportation Operation and Management . . . . .	3
Plus any three of the following five courses:	
TRMG 4520 Problems in Surface Transportation Management . . . . .	3
TRMG 4560 Air Transportation . . . . .	3
TRMG 4570 Urban Transportation . . . . .	3
TRMG 4580 International Transportation . . . . .	3
MKTG 4650 Physical Distribution Management . . .	3
<i>Recommended Electives</i>	
PHRM 4410 Labor and Employee Relations . . . . .	3
TRMG 4510 Survey of Transportation Law and Freight Claims Procedures . . . . .	3
OPMG 4600 Purchasing and Materials Management . . . . .	3
MKTG 4100 International Marketing . . . . .	3

This area of emphasis is administered by the Division of Marketing of the College of Business.

**GRADUATE DEGREE PROGRAMS**

The graduate program leading to the Master of Business Administration degree is offered through the Graduate School of Business Administration.

Graduate programs leading to the Doctor of Philosophy in Business Administration and Master of Science are offered through the University's Graduate School. Master's degree programs in Business are accredited by the American Assembly of Collegiate Schools of Business.

## Requirements for Admission—Master's Programs

Admission to the master's programs will be determined by the following criteria:

1. The applicant's total academic record. (The bachelor's degree must be from a regionally accredited college or university.)

2. The applicant's scores on the Graduate Management Admission Test (GMAT). This test is given four times each year at numerous centers throughout the world. For information and to make application for the test, write to the Educational Testing Service, CN 6101, Princeton, NJ 08541-6101.

In general, students failing to meet minimum standards are not admitted on provisional status. Seniors in this University who have satisfied the undergraduate residence requirements and who need not more than 6 semester hours of advanced subjects and 12 credit points to meet their requirements for bachelor's degrees may be admitted to the Graduate School of Business Administration. They must meet regular admission criteria and submit complete applications by deadlines listed below.

The application, GMAT scores, two official transcripts (not student copies) from *each* college attended, and a nonrefundable application fee (\$40 for M.B.A., \$30 for M.S.) must be submitted by April 1 for summer admission, by May 1 for fall admission, and by November 1 for spring admission or until the available spaces are filled each term. Personal interviews are not required.

## Diversity

In addition to grade point average requirements, hours taken, and non-business course requirements completed, the College will also look at other factors that contribute to diversity in the student body. Factors that will be considered as contributing to a more diverse student body are race and ethnic background; age; business experience; economic, cultural, and physical handicaps; and unique situations.

The mailing address for all graduate applications is:

Graduate School of Business  
Administration  
Campus Box 419  
University of Colorado at Boulder  
Boulder, Colorado 80309-0419

## BACKGROUND REQUIREMENTS

Students applying for graduate programs in Business need not have taken their undergraduate degrees in business. For those students without a business degree, the M.B.A. or M.S. programs provide a series of 3-semester-hour background courses. These include INFS 5000 (Fundamentals of Computing); ACCT 5010 (Fundamentals of Accounting); OPMG 5020 (Fundamentals of Business Statistics); MKTG 5030 (Fundamentals of Marketing); ORMG 5040 (Fundamentals of Management and Organization); FNCE 5050 (Fundamentals of Finance); BSLW 5060 (Legal Environment of Business); and FNCE 5080 (Economic Theory and Application for Managers). Only admitted graduate Business students are allowed in these courses. In addition, all graduate students are required to attend a non-credit seminar on Sources of Information and Research Methods during their first semester.

In order to waive the relevant graduate fundamental courses, students must have completed equivalent courses at a regionally accredited university with grades of C or better. The appropriate undergraduate courses are:

	<i>Semester Hours</i>
Introduction to Accounting (Financial/Managerial) . . . . .	6
Statistics . . . . .	3
Principles of Marketing . . . . .	3
Introduction to Management and Organization . . . . .	3
Finance . . . . .	3
Business Law . . . . .	3
Introduction to Computing . . . . .	3
Principles of Economics (Macro/Micro) . . . . .	6

Remedial work is required of all applicants accepted for the M.B.A. and M.S. programs who do not have mathematical and programming skills.

## Master of Business Administration

The Master of Business Administration program is devoted to the concepts, analytical tools, and communication skills required for competent and responsible administration. The administration of an enterprise is viewed in its entirety and within its social, political, and economic environment.

In addition to the background requirements for a master's degree listed above, the candidate for the

M.B.A. degree must complete the specific requirements of the M.B.A. curriculum (30 semester hours) as follows:

Core Requirements	<i>Semester Hours</i>
a. <i>Functional Courses</i>	
Two of the following four functional courses are required: FNCE 6010, MKTG 6000, INFS 6450, and OPMG 6400. Candidates with either marketing or finance undergraduate or graduate majors shall not take the corresponding functional course to fulfill this requirement. Please check with the Office of Graduate Studies for other limitations . . . . .	6
b. <i>Business and Its Environment</i>	
FNCE 6100 Business, Government, and Society . . . . .	3
c. <i>Analysis and Control</i>	
FNCE 6150 Managerial Economics . . . . .	3
ACCT 6200 Administrative Controls . . . . .	3
d. <i>Human Factors</i>	
ORMG 6300 Organizational Behavior . . . . .	3
e. <i>Planning and Policy</i>	
BPOL 6500 Business Policy . . . . .	3
Areas of Emphasis (three courses) . . . . .	9
	<u>30</u>

Areas of emphasis include accounting, finance, management science/information systems, marketing, organization management, personnel-human resource management, operations management, and transportation management. (Students who have undergraduate degrees in business with majors in finance or marketing normally are not allowed to select the same fields for areas of emphasis.)

For students taking an area of emphasis in accounting, ACCT 3220, 3230, 3320 or their equivalents are prerequisites for all graduate-level accounting courses. ACCT 6250 and two other graduate-level accounting courses are required.

Requirements for an area of emphasis in finance are FNCE 6010 and two of the following three courses: FNCE 6020, 6330, or 6550.

Requirements for an area of emphasis in marketing are MKTG 6000, 6050 and one additional graduate marketing course.

Candidates pursuing their area of emphasis in management science normally elect either an operations management option or an information systems option. Those electing the operations management option should consult the Operations Management Advisor. Those electing the information systems option will normally take INFS 6500, 6650, and 6660. Typically, INFS 2200 and 2210 or their equivalents will be required prerequisite courses.

Students taking other areas of emphasis should consult the division chair concerning the requirements.

No thesis is required in the M.B.A. program. In the total program there must be a minimum of 30 semester hours of graduate course work and a minimum of 24 semester hours of course work at the 6000 level. Independent study is normally not acceptable

for credit in the final 30 semester hours of the M.B.A. program.

## JOINT J.D./M.B.A. DEGREE PROGRAM

### Objective

The purpose of the joint degree program is to allow students admitted to both the School of Law and the Graduate School of Business Administration to obtain both the Juris Doctor (J.D.) and the Master of Business Administration (M.B.A.) degrees in not more than four years of full-time study.

The program is designed to train students for careers in which business administration and law overlap. Only those students who are convinced that the combined studies are important to their career plans and who have the background to handle the rigorous and concentrated course of study should attempt the joint program.

### Admission

To be eligible for the joint J.D./M.B.A. degree program of the Law School and the Business School, a student must apply separately to and be admitted by each of the two schools under their respective admission procedures and standards.

Students may elect the joint degree program at the time of initial application to both schools, or students enrolled in the applicable degree program of either school may, during their year of study under the degree program of that school, apply for admission to the other school and elect to be enrolled under the joint program.

### Course of Study

A student enrolled in the joint degree program may commence studies under the program in either the Law School or the Business School. However, a student must take the first year of the Juris Doctor curriculum as a unit exclusively in the Law School. Otherwise the student may take courses in the Business School or in the Law School, or both, as the student desires and as is necessary to meet the requirements of the degree programs of the two schools.

No student in the joint degree program shall be allowed to take fewer than 9 semester hours or more than 16 semester hours during any term (excluding summer terms) without receiving the consent of the program advisor in each school in which courses are being taken.

### Credit for Courses Taken

The Law School will grant credit toward the Juris Doctor degree for up to 9 semester hours of acceptable performance in graduate-level courses taken by a joint degree program student at the Business School, and up to 12 semester hours of credit for such performance if 3 of such semester hours are in ACCT 5010, Fundamentals of Accounting. A student must earn a grade of B- or better in the Business School course in order for the performance to be acceptable for Law School credit.

The Business School will grant credit toward the Master of Business Administration degree for up to 9 semester hours of acceptable performance in Law School courses taken by a joint degree program student, will waive any business law course requirement, and will waive or otherwise modify other requirements so that a joint degree program student will be able to obtain the M.B.A. degree with not more than 46 semester hours of Business School course credit exclusive of credit given for Law School courses under the program. A student must have earned a grade of C- or equivalent in the Law School course in order for the performance to be acceptable for Business School credit.

### Termination of Joint Degree Enrollment or of Good Standing

Students in the joint degree program who do not maintain the academic or ethical standards of either school may be terminated from the joint degree program. Students in good standing in one school, but not the other, may be allowed to continue in the school in which they are in good standing. However, students who do not complete the joint degree program will be required to meet the regular degree requirements (J.D. or M.B.A.) which were in effect when they entered the program for that degree.

For additional information concerning the joint degree program see the program advisors in the School of Law and the Graduate School of Business Administration.

### Master of Science

Standard programs leading to the Master of Science degree afford the opportunity for in-depth training in a major field, together with study in a minor field.

In addition to the standard programs, two specialized programs are available. One, consisting largely of courses in

taxation offered by the Accounting Division and the School of Law, leads to the Master of Science in Accounting with a concentration in taxation. The other, a joint offering of the Accounting Division and Information Systems Division, leads to the Master of Science in Accounting.

## REGULAR PROGRAMS

### Major Fields

For detailed information concerning requirements and recommended programs for each of the major fields, students should consult the following professors:

Accounting	Professor Tracy
Finance	Professor Rush
Management Science and Information Systems	Professor Taylor
Marketing	Professor Buchanan
Management and Organization	Professor Morrison
Taxation	Professor Jackson
Accounting-Information Systems	Professors Tracy and Taylor

### Minor Fields

With the approval of the student's advisor and the Director of Graduate Studies, minor fields may be chosen from Business subjects, or from other graduate departments.

Fields available in the College of Business for selection as a minor are:

Accounting
Finance
Information Systems
Marketing
Operations Management
Organization Management
Personnel-Human Resource Management
Transportation and Distribution Management

### Minimum Requirements

The minimum requirements for the M.S. degree, after all undergraduate background deficiencies have been removed, may be met by Plan I or Plan II.

The student's degree program should have approval in advance by the advisory committee and the Director of Graduate Studies.

*Plan I.* The requirement is 30 semester hours of graduate credit including a thesis (6 hours credit) based upon original research by the candidate. A minimum of 21 semester hours credit is required of all candidates and, including the thesis, must be earned in a major field. Not fewer than three courses, normally 9 semester hours, must be completed in a minor field. A minimum of 16 hours must be at the 6000 level. All students with a major in Information Systems will be required to write a thesis.

*Plan II.* (Not an option for Information Systems majors.) A minimum of 30 semester hours of graduate-level course work must be completed. Requirements must be met in both a major and a minor field. No thesis is required. Of the 30 semester hours of graduate-level course work, a minimum of 16 hours must be at the 6000 level.

All M.S. students must pass written comprehensive examinations covering major and minor fields during the last semester they are enrolled. The candidate's committee may require an oral final comprehensive examination subsequent to the written examination. Information Systems majors will have an oral examination covering the thesis and course work for the degree.

## SPECIAL PROGRAMS

### Program in Taxation

The program leading to the M.S. in Accounting with a concentration in taxation requires a minimum of 30 semester hours of graduate credit. A thesis is not required. The program is designed to build on an undergraduate emphasis in accounting or other undergraduate business emphasis that includes course work in intermediate and cost accounting, as well as introductory federal taxation of individuals. Students lacking the prerequisite background course work may remove those deficiencies by enrolling in appropriate courses offered by the College.

All courses constituting the program are offered in the College of Business; some courses are taught by the School of Law faculty. The program is as follows:

#### *Required Courses (13 hours):*

ACCT 6250 Seminar: Accounting Theory  
ACCT 6420 Research Problems in Income Tax Accounting  
ACCT 6440 Tax Policy  
ACCT 6700 Income Taxation  
Plus one of the following:  
ACCT 6260 Seminar: Managerial Accounting  
ACCT 6350 Current Issues in Professional Accounting  
ACCT 6620 Advanced Auditing Theory

#### *Elective Courses (at least 14 hours):*

Select from among the following:  
ACCT 6430 Taxation of Partnerships and S Corporations  
ACCT 6450 Taxation of Corporations  
ACCT 6460 Civil and Criminal Tax Procedure  
ACCT 6470 Foreign Source Income Taxation  
ACCT 6490 Taxation of Natural Resources  
ACCT 6500 Special Topics in Taxation  
ACCT 6710 Federal Estate and Gift Tax  
ACCT 6720 Advanced Estate Planning  
ACCT 6730 Real Estate Planning  
ACCT 6740 Business Planning  
ACCT 6750 Taxation of Natural Resources  
Students taking courses that are cross-listed with the School of Law (ACCT 6700, 6710, 6720, 6730, 6740, and 6750) must obtain a copy of the Law School Honor Code from the Law School Registrar (Law 141) and sign a pledge each term that they are enrolled in any of the above courses.

### Program in Accounting and Information Systems

The joint program in Accounting and Information Systems requires 30 semester hours of graduate credit. A thesis is not required. The program is designed to build on an undergraduate emphasis in accounting, information systems, or other undergraduate business degree that includes course work in intermediate and cost accounting and in business programming. Students lacking the prerequisite background course work may remove those deficiencies by enrolling in appropriate courses offered by the College.

The program consists of 21 semester hours of required courses and 9 semester hours of elective courses. Courses constituting the program are offered by the Accounting Division and the Management Science and Information Systems Division. The program is as follows:

#### *Required Courses (21 hours):*

ACCT 6250 Seminar: Accounting Theory  
ACCT 6260 Seminar: Managerial Accounting  
ACCT 5540 Accounting Systems and Data Processing  
INFS 6650 Systems Analysis and Design 1  
INFS 6660 Systems Analysis and Design 2  
INFS 6450 Information Systems and Management  
INFS 6500 Database Management Systems

#### *Elective Courses (9 hours):*

Select from among the following:  
ACCT 5330 Managerial Accounting Issues and Cases  
ACCT 5620 Auditing  
ACCT 5800 Accounting for Government and Nonprofit Organizations  
MKTG 7300 Multivariable Methods in Marketing  
INFS 5700 Computer and Information Technology  
OPMG 6010 Deterministic Models  
OPMG 6020 Stochastic Models

## General Information— Master's Programs

*Advising.* All graduate students should report first to the graduate student advisor in the Office of Graduate Studies to ascertain deficiencies and a principal field of interest. The division chairs of each area serve as faculty advisors.

During the first term of residence, each student must prepare a degree plan. This plan, with appropriate signatures, is to be filed in the Office of Graduate Studies.

*Course Load.* The normal course load for graduate students is 12-15 semester hours.

*Minimum Hours Required.* A candidate for a master's degree in Business must complete a minimum of 30 semester hours of graduate work plus any deficiencies. A maximum of 6 semester hours of graduate work can be transferred from another AACSB accredited master's program.

*Comprehensive Examination.* A comprehensive examination is not required for students pursuing the Master of Business Administration degree program. Each candidate for a Master of Science degree is required to take a comprehensive final examination during the final semester of enrollment. Students must be registered when they take this examination. Written comprehensive examinations are given in November, April, and July.

*Minimum Grade Point Average.* A minimum cumulative grade point average of 3.00 must be achieved in courses taken after the student's admission to the graduate program. Effective Fall Semester 1974 for M.B.A. students, courses taken as a nondegree student at the University of Colorado that are later applied to a graduate program in Business will count towards the overall grade point average. If the cumulative grade point average falls below 3.00, a student will be placed on academic probation and given one regular semester (summer terms excluded) in which to achieve the required 3.00 cumulative average. Failure to achieve the required average within the allotted time period may result in suspension.

Any grade below C- is not a passing grade for graduate students. Students may repeat courses once for which they have received grades of below C-. Both the original grade and the grade for the repeated course count in the computation of the grade point average.

To earn a grade of W (withdrawal) in a course, a student must be earning a passing grade in that course. Students normally will not be permitted to withdraw from courses after the sixth week of the semester.

An IF grade shall be a valid grade only until the middle of the second semester (summer terms excluded) following that in which the grade of IF is given. By the end of that interval, the instructor concerned shall have turned in a final grade of A, B, C, D, or F. If no reports are received from the instructor within the allotted time the IF shall be converted to an F.

*Time Limit.* All graduate courses, including the comprehensive final examination, should be completed within four years. Deficiency courses are not included in this time limit. Courses completed earlier will not be accepted for the degree unless validated by a special examination. Candidates for the master's degree are expected to complete their work with reasonable continuity.

## Doctor of Philosophy in Business Administration

The highest level of formal study available in business administration is afforded by the Ph.D. in Business Administration program. It is intended to develop both the breadth and depth of comprehension, the understanding of related disciplines, and the command of research methodology required for graduate and undergraduate university teaching, for high-level staff positions, and for research careers in these fields. The positions for which a Ph.D. program helps prepare the student demand the highest level of excellence in intellectual attainment. The requirements of the program are therefore demanding and the standards high.

Field requirements for the Ph.D. degree at the University of Colorado are broadly conceived and are designed to encourage study in the cognate disciplines. Candidates' degree programs are prepared in detail after a careful review of their career objectives and a thorough appraisal of their preparation.

### REQUIREMENTS FOR ADMISSION—PH.D. PROGRAM

To preserve the individualized character of the Ph.D. program and its quality goals, the number of candidates is closely limited, and candidates are admitted only after careful screening. Applicants must submit a \$30 nonrefundable fee with their applications.

The graduate committee of the School, in reviewing applications, will consider:

1. The applicant's undergraduate and graduate academic records.
2. The applicant's scores on the Graduate Management Admission Test. For information and to make application for the test, write to the Educational Testing Service, CN 6101, Princeton, NJ 08541-6101.
3. Recommendations from not fewer than three persons qualified to advise the committee concerning the applicant's capacity for doctoral study and research.
4. Information obtained from the applicant concerning his or her career objectives. *Students are admitted for study in a specific major field for doctoral work.*
5. The mailing address for all applications is:  
Graduate School of Business  
Administration  
Campus Box 419  
University of Colorado at Boulder  
Boulder, Colorado 80309-0419

### REQUIREMENTS FOR DEGREE—PH.D. PROGRAM

Students in the doctoral degree program must fulfill the following requirements:

*Prerequisites.* Completion of the graduate fundamentals courses for the M.B.A. program as outlined in this *Catalog*.

*Advising.* The newly accepted Ph.D. student should counsel with the divisional doctoral advisor to determine courses for major and minor fields. Assignments of faculty members working with doctoral students on their programs should be decided upon by the end of the first semester. Each student's advisory committee shall include two members from the student's dissertation field and at least one member from each other field of specialization, with one faculty member, normally from the dissertation field, to act as chair.

At the end of the first term of residency, each student should prepare a degree plan with the approval of the advisory committee. The signatures of the division (department) chairs of the dissertation field and other field(s) will be required on all degree plans and applications for candidacy for Ph.D. students. The signature of the division chair of the dissertation field signifies the approval of the entire degree plan. The plan with appropriate signatures should be filed in the Office of Graduate Studies.

*Qualifying Examinations.* These exams are normally given prior to enrollment in the program, or during the first two months. These examinations are given in the student's major area for the purpose of ensuring the candidate's qualifications and needs in the program. The results of the examination will be used to advise and qualify the candidate for further work at the doctoral level.

*Fields of Study.* Preparation in two or more fields of study, including:

1. One of the following fields in Business, which must be the dissertation area:

Accounting	Information systems
Administrative policy	Marketing
Finance	Organization management

2. One or more other fields, which may be in the above Business fields or an approved and related field outside the College of Business and Administration.

*Analytical and Conceptual Tools.* Demonstration of the required level of competence in:

1. Quantitative analysis for business decisions: students must demonstrate competence in mathematical and statistical processes as applied to business

decision making. Minimum competence in quantitative analysis will normally be gained by completing OPMG 5020, INFS 5000, and MKTG 7300. With approval, this requirement may be met by taking EDUC 5716 and EDUC 7316 or PSYC 5741 and PSYC 5751 in lieu of OPMG 5020 and INFS 5000.

2. Microeconomic and macroeconomic theory: at least one course each in intermediate microeconomic and macroeconomic theory (ECON 3070 and 3080) and one graduate-level course in economics to be approved by the student's advisory committee.

3. Dissertation research methodology: a doctoral seminar in dissertation research and the research internship are expected to provide this competence.

*Language.* Before admission to candidacy for the Ph.D. degree, students must satisfy the language requirement established by the Graduate School.

*Research Internship.* Doctoral students are required to participate in a research internship under the direction of a faculty member. The research internship is decided on with the student's advisory committee. At the end of the internship, a research paper is presented to the faculty member and to all faculty members in the major field of the doctoral candidate.

*Credit by Transfer.* Resident graduate work of high quality earned in another institution of approved standing will not be accepted for application to the doctorate until after the student has established a satisfactory record of residence in the Graduate School. However, such credit must be transferred before the student applies to candidacy for the degree. Such transfer will not reduce the minimum residence requirement at this University, but it may reduce the amount of work to be done in formal courses.

Requests for transfer of credit to be applied toward an advanced degree must be made on the form specified for this purpose and submitted to the Graduate School.

The maximum amount of work which may be transferred to this University for the Ph.D. degree is 10 semester hours.

*Residence.* The minimum residence requirement is six semesters of scholarly work beyond the attainment of an acceptable bachelor's degree. As the word is used here, residence is not limited to or defined as mere attendance in campus classes. Residence may be earned for course work completed with distinction, for participation in seminars, and for scholarly research performed on campus or elsewhere under



the auspices of the University of Colorado. Full-time employment outside the University is prohibited during this residency period.

Not more than two semesters of residence credit toward a Ph.D. degree may be allowed for an acceptable master's degree.

All students in the doctoral program are expected to be full-time students on the Boulder Campus (at least during residency and prior to completing comprehensive examinations). Courses at the 6000 level or above are expected to be taken on the Boulder Campus. Doctoral students are expected to be available to participate in colloquia and other informal academic discussions. One year of residency must include two consecutive academic (not summer) semesters on the Boulder Campus, the timing to be determined by the student's advisory committee.

*Course Load.* During each semester in an academic year, a student must carry a minimum course load of 8 semester hours. Each semester's work must include at least three courses on the Boulder Campus. (This academic year normally will satisfy two full semesters of residence credit.) During this academic year the student's total nonstudy work load of any kind, on campus or off campus, must not exceed half-time.

*Minimum Grade Point Average.* It is expected that high standards of academic excellence (a minimum grade point average of 3.30) will be maintained in all work undertaken; grades less than B- are not considered passing grades in the dissertation field or supporting fields.

To drop a course without discredit a graduate student must be earning a grade of C or better in that course.

It is recommended that all students who intend to become college or university teachers seek employment in a teaching or research capacity in the College of Business and Administration or the Graduate School of Business Administration.

*Admission to Degree Candidacy.* A student must make formal application for admission to candidacy for the Ph.D. degree on forms supplied by the Office of Graduate Studies in the first month of the semester in which the comprehensive examination is to be attempted.

*Comprehensive Examination.* Before admission to candidacy for the Ph.D. degree, the student must pass a comprehensive examination in the dissertation field and the other field(s) of specialization. This examination may be oral, written, or both, and will test the student's mastery of a broad field of knowledge, not merely the formal course work completed.

The oral part of the examination is open to any member of the faculty. The written part of the examination will be evaluated by those faculty members designated by the division in which the field is undertaken.

The oral part of the examination shall be conducted by an examining board consisting of at least five members, and shall follow the written exam as soon as practicable. A successful candidate must receive affirmative votes from the majority of the members of the examining board. In case of failure, the examination may be attempted once more with the approval of and after a period of time determined by the examining board.

Comprehensive examinations for the Ph.D. degree will be given twice each year: in November and April. A student may attempt the examination during the last semester of residency while still taking required courses for the degree, provided satisfactory progress is being made in those courses. It is strongly recommended that adequate time for review be allowed. Therefore, a student might be well advised to consider taking the comprehensives during the semester following completion of all course work.

All field examinations must be attempted during one examination period and the student must be registered at the time of the examination.

*Dissertation.* A dissertation based upon original investigation and showing mature scholarship and critical judgment as well as competence in the use of methods and tools of research, must be written on a subject approved by the candidate's dissertation committee. The dissertation committee shall consist of at least three members, normally two from the dissertation field and one from the other field(s) of specialization. One member, normally from the dissertation field, will act as chair of the dissertation committee. Membership of the dissertation committee may be the same as, or different from, the membership of the student's advisory committee.

A student must register for a total of 30 semester hours of doctoral dissertation credit with up to 10 credits in any one semester. The specific number must be approved by the student's advisor. Not more than 10 of these credits may be obtained before the semester the student takes the comprehensive examination.

Dissertation credit does not apply toward the 30 semester hours of required credit specified in Article VII, Section 2, of the Rules of the Graduate School, and will not be included in calculating the student's grade point average.

One formally approved, printed or typewritten copy of the dissertation and two original abstracts must be filed in the Graduate School Office at least two weeks before the date on which the degree is to be conferred. A second formally approved, printed or typewritten copy of the dissertation must be filed in the Office of Graduate Studies, Graduate School of Business Administration.

*Final Examination.* After the dissertation has been accepted by the dissertation committee, a final examination on the dissertation and related topics will be conducted. This examination will be wholly or partly oral. The oral portion will be open to anyone. The examination will be conducted by a committee of at least five members and will consist of the candidate's dissertation committee.

## BUSINESS-EDUCATION PROGRAM

A doctoral program is offered in conjunction with the School of Education. Consult the Director of Graduate Studies in the School of Education for information concerning the program.

## College of Business and Administration Faculty

EDWARD A. JOHNSON, Dean of the College of Business and Administration. B.A., Antioch College; M.I.L.R., Cornell University; Ph.D., Michigan State University.

NILS-ERIK AABY, Associate Professor of Marketing and International Business. B.S., M.B.A., University of Wyoming; Ph.D., University of Nebraska.

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WILLIAM S. APPENZELLER, Assistant Professor of Recreation. B.S., M.Ed., University of Minnesota.

JOSEPH W. BACHMAN, Professor of Accounting Emeritus.

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WILMAR F. BERNTHAL, Professor of Management and Organization Emeritus.

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- THOMAS A. BUCHMAN**, Associate Professor of Accounting. B.S., M.S., Ph.D., University of Illinois; C.P.A., Illinois.
- ALEXANDER L. BUFFER**, Lecturer in Management Science and Information Systems. B.S., University of Kansas; M.B.A., University of Missouri.
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- RICHARD DISCENZA**, Associate Professor of Production Management, Management Science and Information Systems. B.S.F., Northern Arizona University; M.B.A., Syracuse University; Ph.D., University of Oklahoma.
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- C. WILLIAM FISCHER**, Vice President for Budget and Finance, Professor Attendant Rank. B.A., Muskingum College; M.P.A., Harvard University.
- JERRY R. FOSTER**, Associate Professor of Transportation and Management. B.A., University of Wyoming; M.P.A., University of Colorado; Ph.D., Syracuse University.
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**THOMAS J. ZWIRLEIN**, Assistant Professor of Finance. B.S., M.B.A., University of Wisconsin-La Crosse; Ph.D., University of Oregon.



# School of Education

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## INFORMATION ABOUT THE SCHOOL

Philip P. DiStefano, Resident Dean

### Accreditation

The certification programs, both undergraduate and graduate, are fully accredited by the North Central Association of Colleges and Secondary Schools, by the National Council for the Accreditation of Teacher Education, and by the Colorado Department of Education.

### Purpose

The School of Education provides study and research opportunities for persons involved in teaching and the study of education. Through its graduate and undergraduate certification programs, it prepares teachers and researchers for all levels of education. Its faculty and students participate in research efforts which develop new knowledge and understanding of the educational process.

### Scholarships and Awards

The School of Education administers a number of scholarships and awards for its students. Graduate students in Education are eligible to compete for Graduate School fellowships, and both graduate and undergraduate students are eligible to apply for Universitywide financial assistance. The following are available exclusively to students in Education:

*The Elizabeth Anne Wilson Memorial Assistantship.* Awarded each year to an outstanding graduate student whose study emphasis is in elementary education.

*Clifford G. Houston Graduate Scholarship Fund.* Limited to graduate students in counseling and student personnel work. Application for the Houston Award must be made to the Chair of Educational Psychological Studies.

*The Emery and Evelyn Fitzsimmons Stoops Scholarship.* Awarded yearly to an outstanding student in Education.

Competition for the award is automatically open to students having a 3.50 or better grade point average.

*The Harry M. Barrett Memorial Scholarship.* Granted by Kappa Delta Pi and limited to seniors preparing to teach, the scholarship varies in amount from \$25 to \$50 per year.

Applications for these awards should be made on forms available from the Office of the Dean, Education 124, prior to March 1 of each year for the summer or academic year following that date.

### Student Organizations

The Student Advisory Board in Education is an organization that represents the undergraduate certificate-seeking student body. Officers elected each fall serve as liaisons between the students in certification programs and the University of Colorado Student Union. The organization also performs vital advising and student assistance functions.

The Association of Graduate Students in Education is a similar organization for graduate students. Its officers are selected in the fall.

Honorary societies in education include Kappa Delta Pi and Phi Delta Kappa.

### Advising

Students interested in elementary and secondary teacher certification may obtain information in Education 247 (Teacher Certification Office).

Graduate students are assigned individual advisors and are required to submit a formal program of studies, approved by those advisors, before the end of the first full term of study. Graduate students may obtain program information from the Graduate Office, Education 130, or from their advisors.

### Certification

Each state, including Colorado, requires public school teachers to be certified as qualified teachers by its state Department of Education. Certification requirements vary from state to state and from teaching area to area.

Students who are interested in teaching in other states should familiarize themselves with the requirements of those states so that they may plan an appropriate degree program.

The University of Colorado at Boulder, through the School of Education, offers course work leading to initial certification (Type P-provisional) in:

Elementary education	Mathematics
Secondary education	Sciences
Drama	Social studies
English	Elementary/Secondary
Foreign language	(K-12)
(French,	Art
Spanish, German,	Music
Russian, Latin,	Health and physical
Italian)	education

Teacher certification at the University of Colorado, while administered by the School of Education, is an all-University function. Many academic departments provide course work which supports the varied options available to the teacher in training. The certification program involves a combination of courses at the University and off-campus educational experiences in cooperation with the public schools.

Underlying the University's program of teacher certification are the assumptions that all teachers should:

1. Be professionally competent.
2. Possess personal qualities essential to effective teaching.
3. Have a liberal education.
4. Know well the subjects they teach.

The objectives of the University relative to teacher certification are the following:

1. To provide programs of undergraduate and graduate studies designed to develop outstanding teachers, supervisors, college teachers and administrators, and researchers.

2. To conduct and direct educational research and to engage in writing and related creative endeavors.

3. To identify and attract into the teacher certification program students who possess the intellectual abilities, leadership potential, and personal qualities essential for effective teaching.

4. To cooperate with other state, regional, and federal agencies to improve educational programs.

## GENERAL INFORMATION FOR STUDENTS SEEKING TEACHER CERTIFICATION

### Admission Procedures

This section applies to all students (with or without baccalaureate degrees) pursuing a teacher certification program. Students who transfer to the University of Colorado from other institutions must meet the requirements for admission as outlined in the Undergraduate Admission section of this *Catalog*.

Students should be aware that enrollment limits have been established for each area of endorsement in teacher certification; therefore, there may be times when not all students who meet minimum requirements will be admitted to the certification program. Both elementary and secondary students seeking certification will be required to pass screening examinations in prescribed areas.

### STUDENTS ENTERING OR CURRENTLY ENROLLED AT THE UNIVERSITY OF COLORADO

Students seeking certification in the School of Education must be enrolled in an undergraduate degree program in one of the colleges or schools of the University. Freshmen interested in teaching should seek certification advising at the time of entrance or shortly thereafter. Other students should seek certification advising as soon as they become interested in the Teacher Certification Program. Students should pick up the Advising Manual in Education 247 and make an appointment with one of the faculty advisors listed in the manual.

### TRANSFER STUDENTS

Students who seek to transfer to the University of Colorado from another accredited institution must apply for admission through normal University channels. They must enroll in a degree program in one of the colleges or schools of the University and also apply for teacher certification in the School of Education. The last 30 hours of course work for certification *must* be taken while the student is officially enrolled as a student in the University. Credit in student teaching will not transfer to the University of Colorado at Boulder.

### FORMER STUDENTS

Former students may reenter the University according to general University policies; however, they must apply for entry into the Teacher Certification Program. Students previously admitted in education programs must also reapply for acceptance in the present certification program. Students are required to complete the program that is in effect at the time of their most recent application.

### POSTBACCALAUREATE STUDENTS SEEKING CERTIFICATION

Students who already hold a bachelor's degree and wish to qualify for certification in elementary or secondary teaching must apply directly to the School of Education. Students desiring institutional recommendation for certification must complete at least 30 semester hours of work at the University of Colorado and must also fulfill the same certification requirements as undergraduate students. The actual number of required hours will depend on the courses already completed.

### TEACHER CERTIFICATION

The student is responsible for obtaining an Advising Manual in Education 247 and becoming familiar with its contents. (Off-campus students may obtain a manual by writing to the Teacher Certification Office, Campus Box 249, University of Colorado at Boulder, Boulder, Colorado 80309-0249.) Specific information for all certification areas are included in the Advising Manual.

The School of Education awards a Diploma in Education to the student who simultaneously completes a bachelor's degree and a certification program at the University of Colorado. A Certificate in Education is awarded to the student who completes a certification program.

### Requirements for Initial Application to the Elementary and Secondary Certification Programs

At the time of publication, new requirements for teacher certification were being established. The official requirements and application forms may be obtained in Education 247.

Students may apply to one of the programs if the following requirements have been fulfilled:

1. A minimum of 56 semester hours have been completed or are in progress with a grade point average of 2.50 at the institution granting the degree.
2. Students have designated a major or earned a bachelor's degree from an accredited institution.
3. Approximately two-thirds of the general education requirements have been completed as specified by the student's school or college.
4. Students enrolled in schools or colleges other than Arts and Sciences and those holding degrees are required to have 40 semester hours in the humanities, the natural sciences, and the social sciences, with no less than 12 hours in each.
5. Students who hold degrees should make application by March 1 for fall or summer admission and October 15 for spring admission.

Acceptance to a certification program is official when all parts of the basic skills test have been passed and the speech requirement has been met, verification of experience with youth has been provided, and all transcripts and application forms are received. Students are notified in writing of formal admission once this process is completed.

### General Education Requirements

At the University of Colorado, general education requirements for graduation may vary in the separate schools and colleges. Students seeking degrees at the University of Colorado should consult, as soon as possible, with an advisor in the college or school from which they expect to graduate.

All certification students, as well as students with degrees, however, must have a minimum of 40 semester hours in general education distributed in the broad areas of learning represented by the humanities, the natural sciences, and the social sciences, with no less than 12 hours in each area.

For advising in the certification program, students should bring transcripts and consult with an elementary education advisor or the appropriate subject area advisor in the School of Education. Students seeking certification in drama, French, German, Italian, Latin, Russian, Spanish, art, music, and health and physical education must see the designated advisor in their major department. A listing of advisors is in the Advising Manual which can be obtained in Education 247.

## Majors in Academic Areas

The School of Education does not offer degree programs at the undergraduate level.

Students enrolled at the University of Colorado at Boulder seeking both a bachelor's degree and certification in elementary or secondary teaching must complete a major in an academic department in the school or college in which they are enrolled. For Arts and Sciences majors, 90 of the 120 semester hours required for graduation must be liberal arts course work.

To meet both degree and certification requirements, students, especially those seeking elementary certification, will be required to take more than 124 semester hours.

The major selected is determined by the student's interest in teaching a certain subject or instructional level. Before selecting a particular major, students should see one of the certification advisors. *Secondary students need to be aware that in many subject areas the teaching program requires additional courses or more hours than the academic major.* Course requirements for students majoring in English, mathematics, science, and social studies are explained in the Advising Manual available in Education 247. The requirements for students majoring in other secondary fields are available in the offices of the certification advisors in other colleges and schools.

## Basic Skills Test

1. *Communication.* During the sophomore or junior year, students must enroll in and complete the course Oral Communication for Teachers (EDUC 3303) with a grade of B- or better. If students do not receive a grade of B- or better in EDUC 3303 or a similar speech course, they are required to pass an oral speech test before they begin student teaching.

2. All students must pass the California Achievement Tests (CAT) in spelling, English, and mathematics as mandated by the Colorado Department of Education (effective January 1, 1983). A fee is charged for taking the test and for any retakes. These tests are given four or five times each year. Times and places are announced each January by the School of Education.

- Students must pass the tests before they are permitted to go to any public school to complete requirements for the Teacher Education courses.
- Students must pass the tests before they are formally admitted to the Teacher Certification Program.

- Students who do not receive passing scores on the tests may take the tests three additional times.
- All persons taking the tests must register in the School of Education (Room 247) no later than two weeks prior to the testing date.

## Degree Alternatives

Certification in some secondary fields is not offered at the University of Colorado. For example, there are no programs in business education, home economics, or industrial arts. Students interested in a particular major should consult an advisor in the School of Education.

## College of Arts and Sciences

The College of Arts and Sciences is a four-year college that admits students as freshmen. Many undergraduate degrees are offered and may be pursued by students wishing to complete the typical major plan to teach on the elementary and secondary school level.

Requirements for the bachelor's degree in the College of Arts and Sciences vary somewhat, depending on the degree sought; therefore students are urged to study carefully the College of Arts and Sciences section of this *Catalog* to determine the requirements applicable to the particular degree they seek.

## Academic Policies

Any student registered in the Teacher Certification Program who fails to maintain a 2.50 grade point average may be placed on probation or may be suspended for a period of one academic year. Readmission is then subject to conditions determined by the Dean. The same conditions apply to students in other colleges and schools who have been admitted to the Teacher Certification Program.

## GRADUATE STUDY IN EDUCATION

Graduate study in education at the University of Colorado is administered through the Office of the Director of Graduate Study, School of Education, and all inquiries regarding programs should be directed to the following address:

Director of Graduate Study  
School of Education  
Campus Box 249  
University of Colorado at Boulder  
Boulder, Colorado 80309-0249

A wide range of professional and academic interests is served by these areas. Detailed program materials and *The Graduate Student Handbook* are available from the School of Education Graduate Office. The degrees available in the various areas of graduate study are listed below:

### *Instruction and Curriculum in the Content Areas*

Master of Arts  
Doctor of Philosophy  
Mathematics education, science education, English education, social studies education, language arts, reading, and general curriculum in elementary and secondary education.

### *Educational-Psychological Studies*

Master of Arts  
Doctor of Philosophy  
Educational psychology, and school psychology  
*Research and Evaluation Methodology*

### *Doctor of Philosophy*

Methods of educational research and evaluation, including statistics, measurement, and qualitative methods.

### *Social and Multicultural Bilingual Foundations*

Master of Arts  
Doctor of Philosophy  
Social foundations of education, experiential education, ESL, bilingual and multicultural education, and bilingual/special education.

## Certification at the Graduate Level

The University of Colorado at Boulder through the School of Education offers course work leading to certification in the following areas:

Reading teacher	Secondary education
Type B Certification	Art, bilingual/ESL, drama, English,
Elementary education	foreign languages,
Special education <sup>1</sup>	mathematics, music,
Educable mentally	physical education,
handicapped	science, social
Educationally	studies, and speech
handicapped	
School psychology	
Speech correctionist/ language specialist	

These graduate certification programs are approved by all of our accrediting groups.

## Graduate Programs at Two Levels

Graduate study in education is offered at two levels: Master of Arts (M.A.) degree and Doctor of Philosophy (Ph.D.) degree. Each level is discussed in the following pages.

## Application for Admission

Prospective students who believe that they may qualify for admission to a graduate degree program should request application forms from the Education Graduate Office, Campus Box 249. The completed form should be returned to that office. Prospective graduate students should also read the

<sup>1</sup>Through the bilingual/special education program.



Graduate School portion of this *Catalog* for additional admission information. *Application papers and all supporting documents, including GRE test scores (see Admission Requirements below), must be in the Graduate Office at least six months before the opening of the term for which the student is applying.*

Applicants should request that the Educational Testing Service send their scores on the verbal and quantitative sections of the Graduate Record Examination (GRE) to the Education Graduate Office. A doctoral applicant who has not taken the GRE should arrange to do so.

## Maximum Load and Part-Time Study

A maximum of 15 semester hours in any one semester may be applied toward degree requirements. During the summer, 9 semester hours may be taken in a full summer session, 6 hours in a five-week summer term, and 3 hours in a three-week term. During the academic year, students will be regarded as having a full load if they are registered for not less than 5 semester hours in courses numbered 5000 or above or are registered for 7 or 10 thesis hours.

## Quality of Work

A grade average of *B* or better is required for all work taken for any graduate degree. Transferred credits are not included in calculating grade averages.

A mark of *C* may not be used in a Ph.D. program. Any graduate course in which a mark of *D* or *F* is reported is failed and must be repeated and passed if it is required in a student's degree program.

Students who do not maintain at least a *B* average or better may be suspended by the Dean of the Graduate School upon the recommendation of the Director of Graduate Study of the School of Education. Students may also be suspended from the Graduate School for continued failure to maintain satisfactory progress toward the degree sought.

## Master of Arts in Education

The Master of Arts degree is available, comprising one academic year or more of graduate work beyond the bachelor's degree. The minimum residence requirement for the master's degree of one academic year or the equivalent may be satisfied by two semesters in residence, or three full

summer sessions, or any combination equal to two semesters. (For part-time credit toward meeting the residence requirement, see the Graduate School section of this *Catalog*). The master's degree must be completed within four years (or six summers) of initial enrollment. The M.A. Plan II (nonthesis) degree requires a minimum of 30 semester hours. See the Graduate School section of this *Catalog* for discussion of Plan I and Plan II. Students may transfer no more than 9 semester hours of work taken as a nondegree student and/or work taken at other institutions.

Most program areas have outlined a recommended or required program of studies, and students pursuing a degree are expected to follow that program unless they have appropriate substitutions arranged in advance with their advisors. Pamphlets outlining the programs of studies in education are available from faculty or the Graduate Office in the School of Education.

In the final term of study (at least 10 weeks prior to graduation) each student must submit an Application for Admission to Candidacy for an Advanced Degree form. These forms are available in the Education Graduate Office. If a minor is included, the forms must first be signed by a representative of the student's minor department or program area. The forms must be signed by the student's advisor and submitted to the Education Graduate Office for School of Education approval and then to the Graduate School for final approval. (For time limits and other information, see the Graduate School section under Master's Degree.)

## EDUCATION AS A MINOR FIELD

In M.A. programs providing for majors outside the School of Education, students may include education as a minor if both their major department and the Director of Graduate Studies in the School of Education approve. For master's degrees, a minor in education consists of at least 6 hours of study in related courses. Not more than 2 semester hours may be transferred from another institution.

Students who propose to minor in education must have had sufficient undergraduate work in education to prepare them for graduate study in the field. Appraisal of undergraduate preparation will be made by the Director of Graduate Studies.

## Doctoral Study in Education

In addition to the information included here, the student is referred to the Graduate School section of this *Catalog*.

The School of Education offers the Doctor of Philosophy (Ph.D.) in Education. The doctoral program requires a period of study and research of two academic years (four semesters) or more beyond a master's degree or three years beyond a bachelor's degree.

At least two semesters of full-time study in residence during one academic year are required; the remainder of the residence requirement may be satisfied by any combination of study in academic years or summer terms, subject to the definition of full load stated earlier.

## ADMISSION REQUIREMENTS

Applicants for admission to doctoral study are expected to have a strong liberal arts background, approximately 18 semester hours of undergraduate credit in education (same as for master's applicants except as noted earlier), or a master's degree in education, and an undergraduate average of 2.75 or better on a 4.00 scale. An average of 3.00 or better is expected on all graduate work completed. Ph.D. applicants are not in all cases required to have a master's degree, although it is generally deemed preferable. The decision rests with the program area faculty. At least two years of professional experience relevant to the applicant's proposed area of study is required for most programs.

Graduate Record Examination scores of 1,000 or above (total on verbal and quantitative) are required for admission. To adjust for the different cultural experiences of some applicants, this standard may in certain instances be reduced on the basis of faculty judgment. An interview with a faculty admissions committee may be required.

## DEGREE REQUIREMENTS

Doctoral students in some programs are expected to have had a course in statistical methods, a basic course in educational research, a graduate course in psychological foundations of education, and a graduate course in social foundations of education. If they have not had such courses, advisors may require one or more of them *in addition to the courses approved for the degree sought*. All doctoral programs must include an intermediate statistics course (EDUC 7316) and must also include at least one advanced course in research

methods (EDUC 7326, 7336, 7346). EDUC 5716 may not be used in the doctoral degree plan. EDUC 5716 is, however, a prerequisite to EDUC 7316; both EDUC 5726 and 7316 are prerequisite to all three of the Ph.D. course options. Students who have completed course work equivalent to EDUC 5716 or 5726 as part of a prior degree may seek approval of the substitute courses from the Research, Evaluation, and Methodology (REM) Chair. Students may also satisfy the prerequisite by receiving a passing grade on competency tests administered by the REM Chair. With approval of a candidate's committee and depending on the type of doctoral research planned for the dissertation, a substitution of a two-course doctoral level *research* sequence in history, philosophy, or one of the social sciences may be substituted for the 7300 series above. Graduate courses in other departments may be included in any degree program if they are approved by the student's advisor and committee.

Most program areas have outlined a program appropriate for individuals pursuing study in their areas, and students are expected to follow that program unless they have arranged appropriate substitutions in advance with their advisors. Pamphlets outlining the recommended programs of studies in education are available from faculty or the Education Graduate Office.

Approximately 40 semester hours of course work beyond the master's degree is the normal requirement for the Ph.D. Applicants who are admitted without a master's degree can expect to have about 70 semester hours of course work in their programs.

Ph.D. students are required to complete the Graduate School's language requirement. Please refer to that section of this *Catalog* for specific information.

Before taking the comprehensive examination, each student must submit an Application for Admission to Candidacy for an Advanced Degree. Application forms are available in the School of Education Graduate Office.

Near the end of the term when students complete their course work and if their advisors approve, they write a 12-hour comprehensive examination. The examination is focused chiefly on the student's area of specialization, conceived rather broadly. Students who fail the comprehensive examination may repeat it once, at a time to be determined by the examining committee.

In addition to the course work, a doctoral thesis for 30 semester hours of credit is required of each student. A student registers for EDUC 8994 (Thesis) for the Ph.D. for three or more terms, but not more than 10 semester

hours in any term; not more than 10 semester hours may be taken prior to the successful completion of the comprehensive examination. After the satisfactory completion of the comprehensive examinations, the student must register for 3 (requires permission of Associate Dean of the Graduate School at least two months in advance), 7, or 10 hours' continuous registration during fall and spring semester until the final defense. The student must be registered for 7 or 10 hours the semester the defense is completed. During the research for and the writing of a thesis, grades of *IP* (in progress) are reported; if the thesis is completed and accepted as satisfactory, a grade is reported for the student's record. When a student and the chair of the advisory committee agree on a subject for the thesis, the student prepares a detailed prospectus and arranges for a meeting with the committee. (As a rule the advisory committee constitutes the thesis committee, but additional faculty in Education and other departments may be asked to serve also.) When the committee approves the prospectus, the student may proceed with the research. Research involving human subjects must also have the approval of the University Committee on Human Research.

No continuing education work is permitted for the Ph.D.

### TIME LIMITS

Time limits for the Ph.D. in Education are the same as time limits for all Ph.D. programs. Students in Education should read the Graduate School section for Ph.D. time limits.

When students have passed the comprehensive examination they are required to register each semester until the degree they seek is attained, and pay the standard fee as announced by the Graduate School.

### CHECKING ON PROGRESS TOWARD A DEGREE

Doctoral study entails a long period of scholarly endeavor, which requires a time schedule. Students are responsible for meeting the deadlines involved.

### OPPORTUNITIES FOR ASSISTANTSHIPS

The School of Education has a limited number of assistantships which are administered by the Dean of the School of Education on the recommendations of chairs of the divisions and Director of Teacher Certification or Director of Graduate Study. Some assistantships involve the supervision of student

teachers; others involve helping professors in their teaching or research. Taxable stipends in amounts set by the University are paid for all assistantships. Appointments are usually made in terms of one-fourth time (10 hours a week) or one-half time (20 hours a week). Inquiries should be directed to the Dean, School of Education.

## School of Education Faculty

**PHILIP DISTEFANO**, Resident Dean and Director of Graduate Study, Professor. M.A., West Virginia University; B.S., Ph.D., Ohio State University.

**HAROLD MILTON ANDERSON**, Professor Emeritus.

**RONALD DELAINE ANDERSON**, Professor. B.S., Ph.D., University of Wisconsin.

**LEONARD M. BACA**, Professor. S.T.B., Catholic University of America; M.A., University of New Mexico; Ed.D., University of Northern Colorado.

**RUTH K. CLINE**, Professor. B.A., St. Olaf College; M.A., Ph.D., University of Iowa.

**JACK EUGENE COUSINS**, Professor. B.A., Anderson College; M.A., Ball State University; Ed.D., Indiana University.

**ROBERT DE KIEFFER**, Associate Dean Emeritus, Continuing Education.

**MARGARET A. EISENHART**, Associate Professor. B.A., Emory University; M.A., Ph.D., University of North Carolina.

**ROBERTA FLEXER**, Associate Professor. B.S., Tufts University; M.Ed., Harvard University; Ph.D., University of Colorado.

**CALVIN GRIEDER**, Professor Emeritus.

**JOHN D. HAAS**, Professor. B.A., Hope College; M.A., Ph.D., University of Michigan.

**RICHARD HARPEL**, Associate Professor. B.A., Wheaton College (Illinois); M.P.S., Ph.D., University of Colorado.

**MYRLE EMERY HEMENWAY**, Associate Professor Emeritus.

**ELFRIEDA H. HIEBERT**, Associate Professor. B.A., Fresno Pacific College; M.Ed., University of Illinois; Ph.D., University of Wisconsin.

**STEPHEN E. HODGE**, Associate Professor. A.B., Sacramento State College; M.Ed., Ph.D., University of Missouri.

**KENNETH D. HOPKINS**, Professor. A.B., Pasadena College; M.S., Ph.D., University of Southern California.

**ERNEST R. HOUSE**, Professor. A.B., Washington University; M.S., Southern Illinois University; Ed.D., University of Illinois.

**CLIFFORD G. HOUSTON**, Professor Emeritus.

**KENNETH R. HOWE**, Assistant Professor. B.A., M.A., Ph.D., Michigan State University.

**KENNETH LAWRENCE HUSBANDS**, Professor Emeritus.

**MICHAEL KALK**, Professor Emeritus.

**VERNE CHARLES KEENAN**, Associate Professor. B.S.E.E., University of Washington; M.A., San Jose State College; Ph.D., University of California, Berkeley.

**RICHARD JOHN KRAFT**, Professor. B.A., Wheaton College; M.S.Ed., Northern Illinois University; Ph.D., Michigan State University.

**PHILIP LANGER**, Professor. A.B., University of Michigan; M.A., New York University; Ph.D., University of Connecticut.

**ROBERT L. LINN**, Professor. A.B., University of California, Los Angeles; M.A., Ph.D., University of Illinois.

**JOHN R. LITTLE**, Professor Emeritus.

**ROY P. LUDTKE**, Professor Emeritus.

**PAMELA A. McCOLLUM**, Assistant Professor. B.A., M.A., Ph.D., University of Illinois.

**ROBERT C. MCKEAN**, Professor Emeritus.

**MARIE ANNA MEHL**, Assistant Professor Emerita.

**MICHAEL S. MELOTH**, Assistant Professor. B.S., Boise State University; M.A., San Francisco State University; Ph.D., Michigan State University.

**HUBERT H. MILLS**, Professor Emeritus.

**OFELIA MIRAMONTES**, Assistant Professor. M.A., United States International University; B.A., Ph.D., San Diego State University.

**MILES C. OLSON**, Professor. B.S., M.Ed., South Dakota State University; Ed.D., University of Nebraska.

**KARL OPENSHAW**, Professor. B.A., M.S., University of Utah; Ed.D., Columbia University.

**ROBERT D. PRICE**, Professor. B.S., State University of New York; M.A., University of Wyoming; Ph.D., University of Texas.

**LOREN STANLEY RATLIFF**, Associate Professor. B.S., M.S., Ed.D., University of Denver.

**MARIA de la LUZ REYES**, Assistant Professor. B.A., Webster University (St. Louis); M.Ed., Texas Woman's University; Ph.D., University of California, Santa Barbara.

**ALBERT EDWARD ROARK**, Professor. B.A., M.A., Arizona State University; Ph.D., University of Arizona.

**STEPHEN ROMINE**, Professor Emeritus.

**JAMES S. ROSE**, Professor Emeritus.

**DARYL L. SANDER**, Professor. B.Mus., Coe College; M.A., Syracuse University; Ph.D., State University of Iowa.

**LORETTA A. SHEPARD**, Professor. B.A., Pomona College; M.A., Ph.D., University of Colorado.

**MARC SWADENER**, Associate Professor. B.S. (Ed.), M.S. (Ed.), M.A.T., Ed.D., Indiana University.

**RICHARD L. TURNER**, Professor. B.S., M.A., Northwestern University; Ph.D., Indiana University.

**JAMES R. WAILES**, Professor. B.A., M.A., Colorado State College; Ph.D., State University of Iowa.

**VIRGINIA M. WESTERBERG**, Professor Emeritus.

**EUGENE HOLT WILSON**, President Emeritus, Professor Emeritus.



# College of Engineering and Applied Science

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## INFORMATION ABOUT THE COLLEGE

*Richard Seebass, Dean*

The College of Engineering and Applied Science was established by the Board of Regents in 1893.

Through engineering, the resources of nature are used for the benefit of humanity and the environment. Engineers are expected to be and to remain in the forefront of high technology. They must also be aware of the impact of this technology on their environment in both the social and humanistic sense. Engineering professional societies are committed to the principle that as we gain the ability to build more powerful and useful devices, we must also protect our natural resources and the environment.

An engineering career demands work and discipline; so does an engineering education. The engineer is generally well compensated and enjoys a variety of employment opportunities. Although employment in the various engineering disciplines fluctuates, there are usually attractive opportunities for well-educated engineers in related areas.

The following programs in the College offer Bachelor of Science degrees and are accredited by the Accreditation Board for Engineering and Technology (ABET): aerospace engineering sciences, architectural engineering, chemical engineering, civil engineering, electrical engineering, electrical engineering and computer science, and mechanical engineering. A Bachelor of Science degree in Computer Science is also offered by the College. Bachelor of Science degrees in Applied Mathematics and Engineering Physics are offered by the College of Engineering and Applied Science in cooperation with the Mathematics and Physics departments of the College of Arts and Sciences.

## Educational Opportunities

Students have an opportunity to study engineering with faculty members of national and international reputation and work within the superior facilities of the University of Colorado Engineering Sciences Center. Recent years have

seen the development of new instrumentation, integrated circuits, and solid state laboratories in electrical engineering, of bioengineering and biotechnology laboratories, and the computerization of all laboratories. All entering freshmen receive instruction in and undertake academic projects involving computers. Each engineering department has laboratories suitable for undergraduate instruction and experimental research through the doctoral or postdoctoral level. Specific information on these facilities may be obtained from the departments concerned.

Within most departments several degree options are offered. Most departments offer options emphasizing bioengineering, premedicine, or computing aspects of their disciplines. Some options are oriented toward graduate study, others toward engineering practice.

Engineers work in a wide variety of fields, and the 10 degree programs of the College reflect this diversity. The following descriptions summarize these fields.

*Aerospace engineering sciences* prepares engineers for an industry that encompasses the design and construction of commercial and military aircraft and space vehicles. Recent advances in this technology have permitted the aerospace industry to enter the fields of urban mass transit, undersea exploration, bioengineering, nuclear engineering, laser technology, and other emerging high technology fields. The aerospace engineer often works at the forefront of engineering with scientists in the fields of mathematics, physics, chemistry and biology.

*Applied mathematics* meets the needs of modern research, which is dependent upon advanced mathematical concepts. Almost all industries engaged in industrial and scientific research need applied mathematicians, as do federal agencies such as NASA.

*Architectural engineering* prepares students for careers in the building industry and for research at the graduate level on building-related topics. This course of study fulfills the academic requirements for registration as a professional architectural engineer.

The architectural engineering curriculum is recommended for those wishing to specialize within the building industry in engineering design, construction and contracting, or sales engineering. The architectural engineering student may select any one of several areas of specialization offered: construction, environmental, structural, or building energy engineering and illumination.

*Chemical engineers* convert natural resources into industrial and consumer products in facilities that include refineries and gasification plants. Among their products are many that often are not identified with chemical engineering—oils, metals, glass, plastics, rubber, paints, soaps and detergents, foods, beverages, electronics, synthetic and natural fibers, nuclear and exotic fuels, and medicines.

The department has a strong bioengineering/premedical engineering program and is interested in research directed toward the ecologically sound development of chemical processes. It is moving into the newest area of high technology, the use of microorganisms to produce complex molecules. It is also working effectively on energy problems, and is stressing in its instructional program problems of energy conversion, such as coal gasification.

*Civil and environmental engineering* offers an interesting and challenging career to the student interested in the design and construction of buildings, bridges, dams, aqueducts, and other structures; in transportation systems including highways, canals, pipelines, airports, rapid transit lines, railroads, and harbor facilities; in the transmission of water and the control of rivers; in the development of water resources for urban use, industry, and land reclamation; in the control of water quality through water purification and proper waste treatment; in the construction and contracting industry; and in the problems concerned with the physical environment and the growth of cities.

*Computer science* offers study in such fields as programming languages, operating systems, numerical analysis, information systems, and the theories of computation. Graduates typically take positions as systems programmers for computer manufacturers or software

firms, advanced applications programmers in scientific research firms, or technically oriented systems designers in a commercial or government environment. Ph.D. graduates typically take positions in industrial research laboratories or in university teaching.

*Electrical engineering* offers professional possibilities that include teaching and research in a university; research in development of new electrical or electronic devices, instruments, or products; the design of equipment or systems; production and quality control of electrical products for private industry or government; and sales or management for a private firm or branch of government. Specialties within electrical engineering include the design of computer interfaces and computer software; electromagnetic fields, which are basic to radio, television, and related systems; communication theory and signal processing; electrical machinery; solid-state, integrated-circuit, and electron devices; energy and power; control systems; and others.

*Electrical and computer engineering* offers a program designed to provide entry-level competence in computer engineering. The program includes design and construction of efficient software systems as well as an introduction to hardware design. One major present interest is in the area of microprocessors.

*Engineering physics* offers a program in which general knowledge of the diverse fields of physics provides the ability to deal with industrial problems that cannot be solved by a standardized procedure in a specialized field. The student is then prepared for a career in physics where there are many and varied opportunities in development work and industrial research. It is also basic for graduate work in physics, for specialized training in research, and especially appropriate to space technology and research.

*Mechanical engineering* is broad in scope, not identified with nor restricted to a particular technology, vehicle, device, or system, but concerned with all such subjects, both individually and collectively. The objective of the undergraduate program is to prepare students to meet and anticipate change, and to work with technologies as yet unknown. Typical starting assignments for the graduating senior include positions with nearly all industries. New emphases include computer-aided design/computer-aided manufacturing (CAD/CAM). The industrial engineering option in mechanical engineering deals with the complex problems of fields that demand an integrated systems approach, such as manufacturing,

health systems, and transportation. Because they are concerned with people as well as things, industrial engineers frequently are placed in management positions.

## Computing

The application of microcomputers and CAD/CAM (computer-aided design and computer-aided manufacturing) is progressing rapidly in engineering. The College of Engineering and Applied Science continues to develop instructional and research laboratories for these and other computer-related fields as it prepares future engineers to lead in these new areas.

Classes in all departments place strong emphasis on the use of computers in engineering. Students are encouraged to bring their personal computers. Nearly 200 personal computers are owned by the College and many are available to students without restrictions.

Further information on computing can be found in departmental descriptions and in the description of research facilities found in the Graduate School section of this *Catalog*.

## Registered Engineers

The need for professional registration depends on the field of engineering and the nature of practice in that field. Engineers in private professional practice generally need to be registered; for those in the employ of others, registration is not usually required. Currently, registration is required in all states for the legal right to practice professional engineering. Although there are variations in the state laws, graduation from an accredited curriculum in engineering, subscription to a code of ethics, and four years of qualifying experience are minimum requirements for registration. Two days of examinations covering the engineering sciences and the applicant's practical experience are also required in states and territories.

## Ethics

As members of the academic community, students have a responsibility to conduct themselves with the highest standards of honesty and integrity. These qualities are also vital to the profession of engineering.

*Academic penalties including suspension or expulsion will be imposed for the following acts, or intent to engage in such acts: plagiarism; the illegal possession and distribution of examinations or answers to specific questions; presenting work of another student as one's*

*own work; performing work or taking an examination for another student; or the alteration, forgery, or falsification of official records. This listing is not complete; it includes only some types of academic dishonesty recently brought before the Academic Discipline Committee. Additional information on honesty, ethics, and student discipline is found in the *Student Survival Guide*. (See also Academic Integrity and Student Conduct in the University Policies, Programs, and Services section.)*

## Minority Engineering Program

The College of Engineering and Applied Science is committed to increasing minority enrollment and assisting minority students in meeting graduation requirements. This commitment is reflected in the establishment of the Minority Engineering Program (MEP) and support of its activities. MEP recruits underrepresented minority students into the College and offers them specialized advising, counseling, and tutoring. This effort is steadily increasing minority representation in the College of Engineering. The primary source of funds for MEP is industrial donations, but MEP also receives some funding from the College and other associations.

## Scholarships

Money contributed to the University Foundation for assistance to Engineering students is deposited in appropriate accounts and used according to the restrictions imposed by the donors. Numerous industries match employee contributions or offer scholarships. More than 300 undergraduate scholarships are conferred annually. Awards are based on demonstrated academic ability, academic progress, financial need, or all three criteria (see Financial Aid section of this *Catalog*). For details students may contact the Office of the Dean at (303) 492-5071.

Those interested in contributing may contact the Director of Engineering Development at the College of Engineering and Applied Science, (303) 492-7335, Campus Box 422.

## Study Abroad

Since engineers frequently work in foreign nations or with foreign engineers, it is desirable that Engineering students familiarize themselves with foreign cultures by the selection of appropriate courses or by study abroad. Cooperative programs in engineering



education are maintained by the University of Colorado and the Ecole National des Ponts et Chaussées in Paris; the University of Stuttgart in Germany; the Instituto Tecnológico y de Estudios Superiores de Monterrey in Mexico; the University of Lancaster in England; and the University of Oviedo in Spain. With the proper preparation, students may complete one or two semesters of engineering education abroad (see International Education in this *Catalog*).

## Honors at Graduation

For students admitted to the College before Fall Semester 1987:

In recognition of high scholarship and professional attainments, Honors, Special Honors, or With Distinction may be awarded at graduation (at the discretion of the Engineering Honors and Recognition Committee). These honors are recorded on the diploma of the graduate and indicated on the commencement program. Grades earned during the semester immediately preceding graduation will not be considered in designating Honors.

For Honors, a student must have a cumulative grade point average between 3.60 and 3.79, and for Special Honors, at least a 3.80. With Distinction is awarded at the discretion of the Committee.

For students admitted to the College Fall Semester 1987 and thereafter:

In recognition of high scholastic achievement, the designation "With Distinction" will be awarded at graduation and will be recorded on the diploma and in the commencement program. To qualify for this designation, the student's overall GPA must be at least 3.75 and at least 50 semester hours must have been earned at the Boulder Campus. Grades earned during the semester of graduation will not be considered.

Qualified students are encouraged to participate in the Honors Program in the College of Arts and Sciences. The awards of honors within this program are *cum laude*, *magna cum laude*, and *summa cum laude* and are recorded on the student's diploma and in the commencement program. Criteria for these designations are set by the Honors Council. Interested students should consult with the Director of the Honors Program for detailed information.

Transfer students must complete a minimum of one-half of their academic work at the University of Colorado at Boulder to be considered for the Honors designation. Grades earned at other institutions are not considered. Transfer students must have completed at least 50 hours before their last semester.

## Student Organizations

The following honorary engineering societies have active student chapters in the College of Engineering and Applied Science:

*Chi Epsilon*, civil and architectural society

*Eta Kappa Nu*, electrical engineering society

*Omega Chi Epsilon*, chemical engineering society

*Pi Tau Sigma*, mechanical engineering society

*Sigma Gamma Tau*, aerospace society

*Tau Beta Pi*, engineering society

Student chapters of the following professional societies are also in the College:

American Institute of Aeronautics and Astronautics

American Institute of Architectural Engineers

American Institute of Chemical Engineers

American Society of Civil Engineers

American Society of Heating, Refrigerating and Air-Conditioning Engineers

American Society of Mechanical Engineers

American Solar Energy Society

Associated General Contractors

Biomedical Engineering Society

Illumination Engineering Society

Institute of Electrical and Electronics Engineers

National Society of Architectural Engineers

Society of Manufacturing Engineers

Society of Women Engineers

These societies meet frequently to present papers, speakers, films, and other programs of technical interest. A representative student organization, the Associated Engineering Students (AES), is composed of all students in the College of Engineering and Applied Science. AES supervises matters of interest to all undergraduate students through the Control Board, its legislative body. With the advice of the Engineering faculty, AES also publishes *The Colorado Engineer*.

Student activities and organizations, such as athletics, oratorical and debating societies, student publications, and musical, literary, and religious organizations, are open to students in all colleges and schools of the University.

## UNDERGRADUATE ADMISSION

### Requisite Qualifications

The prospective engineering student must have mathematical aptitude and a

keen interest in science and its methods. Curiosity about the natural principles governing the behavior of forces and materials and the ability to visualize structures and concepts are prerequisites. Written and oral communication skills are also essential.

The College seeks to identify applicants having a high probability of completing their academic program. Admission is based on the evaluation of many criteria; among the most important are the general level of academic performance prior to admission, performance on standardized tests, and other evidence of motivation, potential, scholarly ability, and accomplishment. These factors are indicated by trends in the student's records, test scores, letters of recommendation from teachers and others qualified to evaluate the student, and accomplishments outside academic work.

Engineering students are expected to begin their study of mathematics with analytic geometry and calculus. Mathematics courses required to prepare a student for calculus carry no credit toward fulfilling graduation requirements but are recommended for all students not ready to begin the calculus sequence. For the type of mathematics courses that will be taught, the student must be competent in the basic ideas and skills of ordinary algebra, geometry, and plane trigonometry.

Please see the Undergraduate Admission section of this *Catalog* for a full discussion of admission standards and requirements.

## Transfer Students From Other Institutions

Students desiring to transfer from other accredited collegiate institutions will be considered for admission on an individual basis if they meet the requirements outlined in the Undergraduate Admission section of this *Catalog* and the freshman requirements for entering the College of Engineering and Applied Science.

### TRANSFER CREDIT POLICY

After a prospective transfer student has made application and submitted transcripts to the University of Colorado, the Office of Admissions issues a Statement of Advanced Standing listing those courses that are acceptable for transfer by University of Colorado at Boulder standards. A copy of this statement is received by the Dean's Office after the student is admitted, and is made a part of the Dean's Office permanent record. The appropriate Engineering Transfer Credit Evaluator (TCE) will



use this copy of the form to indicate which of those credits listed are tentatively acceptable in meeting the appropriate degree requirements. The Faculty Transfer Credit Evaluator will note the tentative acceptance of these credits by initialing and dating each acceptable course listed on the Statement of Advanced Standing. The student will be notified that the acceptance of these courses is tentative and is contingent upon the satisfactory completion of a minimum of 30 semester hours at the University of Colorado Boulder Campus before the credits may officially apply toward degree requirements. All transfer credit must be validated by satisfactory achievement in subsequent courses. *It is the responsibility of the transfer student, after having completed the 30 semester credit hours at the University of Colorado Boulder Campus, to request final validation of the credits by the department and to have this validation noted on the Statement of Advanced Standing in the student's college file.*

If at any time a student wishes to have a course not previously accepted considered again for transfer, the student should consult with the departmental Transfer Credit Evaluator and petition the Dean through the department Chair for approval of the transfer.

### NONTRANSFERABLE CREDITS

Students desiring to transfer credits from engineering technology programs should note that such credits are accepted only upon submission of evidence that the work involved was fully equivalent to that offered in this College.

Some technology courses are given with titles and textbooks identical to those of some engineering courses. These courses may still not be equivalent to engineering courses because the areas of academic emphasis were nonmathematical or otherwise divergent.

In order to assist engineering technology students with transfer problems, the following guidelines are established:

1. Courses on basic subjects such as mathematics, physics, foreign languages, literature, or history may be acceptable for transfer of credit if they were taught as part of an accredited program for all students and were not specifically designated for technology students.
2. Students who have taken courses with technology designations that may be valid equivalents for engineering courses have these options:
  - a. The student may petition for permission to waive the course. The requirement for a course can be

waived if students demonstrate that, by previous course work, individual study, or work experience they have acquired the background and training normally provided by the course. No credit is given for a waived course, but students may benefit from the waiver by being able to include more advanced work in their curriculum. Other students may profit by repeating the course at this College and thus establishing a fully sound basis for what follows.

- b. The appropriate University of Colorado academic department may recommend to the Dean's Office that credit be transferred to count toward the requirements for a related course in its curriculum. Credit cannot be given for vocational/technical or remedial courses under rules of the University. (See the Undergraduate Admission section of this *Catalog* under Transfer of College-Level Credit.)
- c. The student may seek credit for the course by examination. See Advanced Placement and College-Level Examination Program (CLEP) Credit.

### Intrauniversity Transfer Students

Intrauniversity Transfers within the same campus of the University to the College of Engineering and Applied Science are considered on an individual basis if the following conditions are fulfilled:

1. The applicant is expected to apply during the second semester of calculus and the second semester in which the appropriate science courses will be completed.
2. Enrollment limitations permit.
3. The applicant's prior academic record fulfills the admissions requirements of the College of Engineering and Applied Science.
4. The applicant demonstrates by prior academic achievements the ability to successfully complete the degree requirements of the College.

Intrauniversity Transfers are admitted at the end of the fall and spring semesters. Specific application details and deadline dates are available in the Dean's Office.

### Intercampus Transfer Students

Intercampus transfers of students from one campus of the University to another are considered on an individual

basis if the following conditions are fulfilled:

1. Enrollment levels permit.
2. The applicant has completed a minimum of 30 hours in an engineering curriculum on a separate University of Colorado campus.
3. If an Engineering student, the applicant must be in good academic standing and demonstrate the ability to complete successfully the degree requirements of this College on the Boulder Campus. If not in the College of Engineering and Applied Science, the applicant's academic record must meet transfer admission requirements of the College.

It is recommended that students anticipating an intercampus transfer meet with the Transfer Credit Evaluator in the appropriate Boulder academic department to coordinate the possible transfer of credit and remaining degree requirements.

### Former Students

Former students must meet the requirements outlined in the Admissions section of this *Catalog*. Courses taken at collegiate institutions while the student was a member of the armed forces will not necessarily be a determining factor in a student's readmission to the University of Colorado, but transcripts on all such work must be submitted. *Students who have withdrawn will have a Dean's Stop placed in their records and must obtain permission of the Dean to reenroll in the College of Engineering and Applied Science.* The former student must then submit a new application for admission as a returning former student.

Students who interrupt their courses of study may be required to take any preparatory courses which have been added during their absence or to repeat courses in which their preparation is evaluated as weak.

### Advanced Placement

Advanced placement and college credit may be granted on the basis of the College Entrance Examination Board's Advanced Placement Tests. For students who have taken an advanced placement course in high school and who make scores of 4 or 5 in the CEEB's Advanced Placement Examination, advanced placement as well as college credit will be granted. Students who make scores of 3 may be advised not to attempt advanced placement depending on the student's academic performance. All advanced placement credit must be validated by satisfactory achievement in subsequent courses, in

accordance with standard transfer policies of the College.

Advanced placement credit for the freshman mathematics courses in calculus and differential equations will be limited to not more than 4 hours each.

## College-Level Examination Program (CLEP) Credit

Prospective students may earn college-level credit through the College-Level Examination Program (CLEP) examinations, provided that they score at the 67th percentile or above. Departments will advise students of the credits accepted for such courses. The number of credits so earned must be within the limits of the number of elective hours of the individual department. A list of subjects in which CLEP examinations will be accepted may be obtained in the Dean's Office of the College of Engineering and Applied Science.

## Work Experience

It is the policy of the College of Engineering and Applied Science that any credits accrued in the official records of the student that were awarded for work experience (or for co-op experience) will not apply toward degree requirements.

## UNDERGRADUATE DEGREE PROGRAMS

The College of Engineering and Applied Science offers four-year courses leading to the Bachelor of Science degree in:

Aerospace Engineering Sciences	Computer Science
Applied Mathematics	Electrical Engineering
Architectural Engineering	Electrical Engineering and Computer Science
Chemical Engineering	Engineering Physics
Civil Engineering	Mechanical Engineering

A variety of programs and options are offered in each of the degree options.

## Combined Degrees

*Combined Bachelor's Degrees in Engineering and in Other College Academic Programs at the Boulder Campus.* Arrangements to obtain joint bachelor's degrees in engineering and in the academic program of another college may be made through consultation with and written approval of the appropriate deans and completion of a minimum of 30 additional semester hours beyond the largest minimum required by either college or school.

*Bachelor of Science Degrees in Two Academic Departments of the College of*

*Engineering and Applied Science at the Boulder Campus.* Two bachelor of science degrees in engineering may be earned by obtaining the written approval of both departments concerned and completing a minimum of 30 additional semester hours beyond the largest minimum required by either department (currently this would require a minimum of at least 158 semester credit hours). Transfer students desiring two bachelor's degrees must present a minimum of 60 semester credit hours taken as a student in this College, and must satisfy all other stipulations regarding total hours required and approval of all course work by both departments concerned. Of the 30 additional hours for the second degree, a minimum of 24 shall be in courses in the secondary academic department concerned or in courses approved in writing in advance by the department as substitutes.

Students desiring to pursue a double-degree program must formally designate themselves double-degree candidates by filing in the Dean's Office a petition signed by the chair of both departments concerned prior to enrolling for the last 30 hours of work to be completed for the double degree.

A decision to earn a joint degree should be carefully weighed, since qualified students may be able to obtain a master's degree for a similar number of credits (see Graduate Study in Engineering).

*Combined Degrees.* A student in the College of Engineering and Applied Science may be able to obtain a combined bachelor's degree in engineering and another field, such as business, music, or one of the arts and sciences. Interested students should come to the Dean's Office for additional information and application materials for these combined degree programs.

## Combined Business and Engineering Curricula

Undergraduates with career interests in administration may be able to complete all of the requirements for bachelor's degrees in both engineering and business by extending their study program to five years, including one or two summer terms. It may be possible to start earning the 48 semester credits required in the College of Business and Administration in the second, third, or fourth year, depending upon the curricular plan for the particular field of engineering in which the student is enrolled.

It is also possible for qualified graduates (with cumulative grade point averages of 3.00 or better) to complete the requirements for a Master's degree in Business within one year after receiving the baccalaureate degree in Engineering. Before deciding upon the business option, a student should carefully consider, in consultation with departmental advisors, the relative advantages of the combined Business-Engineering curricula, the M.B.A. degree program of the Graduate School of Business Administration, and the M.S. degree program in the student's own discipline.

Combined business and engineering programs for which students may be able to qualify are available in all Engineering departments.

An Engineering student wishing to obtain a combined degree must submit the appropriate form to both the College of Business and the College of Engineering and be approved by both Colleges as a combined degree student. Failure to do so will preclude the student from taking any Business courses. Students should complete at least one semester of study before applying for the combined program.

## Premedicine Option

Most Engineering departments have an option by which a student may meet fully all requirements for entry into medical school while also earning a degree in Engineering. Engineering departments with this option will approve inclusion of appropriate biological and bioengineering courses in the student's program of technical electives. The courses listed below are prescribed by medical schools and must be completed with superior grades.

	<i>Semester Hours</i>
Expository or creative writing	3
General chemistry	8-10
Organic chemistry	8-10
General biology or zoology	8
Literature (in English)	6
English composition	3
Physics	9
Calculus	4
Genetics (required for predentistry only)	3

Students can meet these requirements by careful substitutions of electives in the Engineering curriculum. In some cases where additional hours may be required, interested students should consult with the departmental chair and the appropriate Prehealth Sciences advisor on the Boulder Campus.

The Admissions Committee of the School of Medicine at the University of Colorado Health Sciences Center welcomes inquiries and visits from prospective students, particularly at the time of their first interest in medicine as their chosen profession.

## PLANNING THE ENGINEERING PROGRAM

### The Preceptor Program

To establish support relationships between Engineering students and the faculty of the College, the Dean has established the Preceptor Program. Groups of approximately 15 students are assigned to faculty preceptors who, in the course of the two-semester program, help introduce the students to the many-faceted intellectual rewards of engineering. This program offers one hour of Pass/Fail credit each semester to those students participating in the Engineering Residence Hall Program. Those students register for GEEN 1700 in the Fall and for GEEN 1720 in the Spring.

### Freshman Year and Curriculum Choices

Fundamentals taught in the freshman year are of prime importance in the more advanced classes, and every effort is made to register the students in appropriate courses.

All freshmen are urged to consult their instructors whenever they need help in their assignments and should feel free to consult with the deans and/or members of their staffs about their problems. During the freshman year, students not doing satisfactory work may be required to consult with the Dean or College staff.

It is strongly recommended that students avoid the likelihood of later scheduling problems by carefully following the prescribed curriculum.

*Courses Required in the Freshman Year.* Course requirements for freshmen are detailed within the curriculum of each academic department. The freshman is exposed to a broad university background, doing much course work outside the College of Engineering and Applied Science in science, mathematics, and humanities. *Every student should read and follow the assigned curriculum carefully.*

### Advising

All students are advised by faculty members from the respective major academic departments and are counseled by the College's professional staff.

Advising for students is available at the Administrative Offices of the College of Engineering, EC AD 1-1, telephone (303) 492-5071, or through the major departments. The department offices are:

Aerospace Engineering Sciences, EC OT 6-16, 492-6416  
 Applied Mathematics, EC CR 2-38, 492-7664  
 Chemical Engineering, EC OT 2-6, 492-7471  
 Civil, Environmental, and Architectural Engineering, EC OT 4-34, 492-7315  
 Computer Science, EC OT 7-7, 492-6361  
 Electrical Engineering, EC EE 0-2, 492-7327  
 Engineering Physics, Gamow F-715, 492-7772  
 Mechanical Engineering, EC OT 6-29, 492-7151

These sources of help are readily available to assist students with academic, vocational, or personal concerns. *Students are assigned specific departmental advisors for academic planning and should consult with the departmental chair or designated representative for assignment.* Additional advising information is contained in the College of Engineering *Student Survival Guide* for the current year. A copy of this publication may be obtained in the Dean's Office.

## UNDERGRADUATE DEGREE REQUIREMENTS

1. The B.S. degree requires that not less than 128 semester hours in an acceptable curriculum be completed to the satisfaction of the department concerned.

The last 30 hours must be earned after admission and matriculation as an undergraduate Engineering degree student at the University of Colorado Boulder Campus. Some students will need to present more than the minimum because of departmental requirements or because they may have enrolled in courses that do not carry full credit toward a degree—for example, some ROTC courses (see Credit for ROTC), physical education, and performance courses.

A student is awarded a degree by a vote of the faculty of the College of Engineering and Applied Science after the student's major academic department determines that all requirements for the degree have been successfully completed.

The diploma indicates whether the student graduated from the University of Colorado at Boulder, Colorado Springs, or Denver. The campus named is the one where the department recommending the student for the degree is located. Consideration will generally be given to designating the campus

where the last 30 hours of course work were completed. However, the final decision on the campus designation is made by the designated faculty representative of the student's major academic department.

2. The cumulative grade point average of an Engineering student will include all academic courses attempted at the University of Colorado. The student must remember that a cumulative grade point average (GPA) of 2.00 is required in all courses used to fulfill degree requirements. In addition, a GPA of 2.00, separately computed, must be attained in all courses taken from the student's major department. The grades of *P* or *H* in honors courses and of *P* in Pass/Fail courses count toward graduation but are excluded from these computations. The grade of *F* is included.

3. Each degree program requires a minimum of 18 credit hours in social-humanistic subjects. Courses may be selected from the Humanities and Social Science divisions of the old Arts and Sciences *College List*. Humanities or social science electives must not be limited to a selection of unrelated introductory courses. At least two courses must be at an advanced level and should be selected with the approval of a faculty advisor. Humanities or social science courses are to be selected from the following categories:

a. *Humanities.* Courses listed in the Humanities division of the old Arts and Sciences *College List*, except those under Communication Disorders and Speech Science. Advanced courses should be selected with the approval of a faculty advisor.

b. *Social Science.* Courses listed in the Social Science division of the old Arts and Sciences *College List*, except those on the history of science listed under Philosophy in the Natural Science division of the *College List* and those under Linguistics. Advanced courses should be selected with the approval of a faculty advisor.

c. *Language.* Lower-division reading or conversation courses in a language other than the student's native tongue. Since departmental policies regarding foreign language electives vary, students should obtain approval from their faculty advisors for all such courses.

Qualified students may take appropriate honors courses for social-humanistic credit.

Courses such as accounting, contracts, management, public speaking, and technical writing should be considered technical electives where applicable. *Students should consult their faculty advisors.*

4. The College strongly believes that its students should be competent writers. To this end, the College has established a writing requirement. All Engineering students entering the College in Fall 1987 or later must complete a writing course through the University Writing Program at the 2000 or 3000 level before the end of their junior year. Such writing courses focus on argumentative writing and critical thinking and should be considered as humanities-social science electives.

Students should see also Requirements for Graduation and the general rules and policies of the University listed in this *Catalog*.

Consideration can be given to substitution of equivalent courses for required courses. Students desiring such substitution must obtain verification in writing from their faculty advisors that courses actually are equivalent. Careful checking is required.

It is possible to become a candidate for two baccalaureate degrees of the College of Engineering and Applied Science by gaining the approval of both designated departments. A minimum of an additional 30 semester credit hours must be earned for the second baccalaureate degree.

Students should read carefully the College of Engineering *Student Survival Guide* for the current academic year. It may be obtained in the Dean's Office, Room EC AD 1.

## Credit for ROTC

Some departments may allow their students limited amounts of technical elective or humanities and social science credit for ROTC courses deemed to have suitable educational value.

## Graduation Requirements

To be eligible for one of the bachelor's degrees of the College of Engineering and Applied Science, a student must meet the following minimum requirements:

1. The satisfactory completion of the prescribed and elective work in any curriculum as determined by the appropriate academic department. A student must complete a minimum number of semester hours, not less than 128, of which the last 30 must be earned after admission to the University and the College as a degree student.

2. A grade point average of 2.00 for all courses attempted and for all courses that count toward graduation requirements. The grades *H*, given in Honors courses, and *P*, given in Pass/Fail courses, are not counted in the cumulative grade point average.

These courses may, however, count toward graduation.

A cumulative grade point average of 2.00 in courses taken from the student's major department is also required. For students in the Applied Mathematics program, the major department is the Mathematics Department; for students in the Engineering Physics program, the major department is the Physics Department.

3. The recommendation of the faculty of the academic department offering the degree. The campus designation on the diploma and transcript corresponds to the campus designation of the academic department initiating the degree recommendation.

4. The recommendation of the faculty of the College.

5. It is possible to become a candidate for two bachelor's degrees of the College of Engineering and Applied Science by gaining the approval of both designated departments. A minimum of an additional 30 semester credit hours must be earned for the second degree.

*Incompletes and Correspondence Courses.* All incompletes must be completed and all correspondence course grades must be officially received no later than three weeks prior to the graduation ceremony. It is the student's responsibility to contact the instructor concerning the removal of incomplete grades.

It is the student's responsibility to be certain that all degree requirements are fulfilled, to file the intended date of graduation in the departmental office upon the completion of 96 semester hours applicable to the B.S. degree sought, to fill out a diploma card at the beginning of the next-to-last semester before graduation, and to keep the departmental advisor in the Dean's Office informed of any change in graduation plans.

*Commencement Exercises.* Commencement exercises are held in December, May, and August.

*Campus Designation on Diploma.* See Undergraduate Degree Requirements, section 1.

## ACADEMIC RULES AND POLICIES

### Credits

Students may receive credit for only those courses for which they officially registered, passed special examinations, or transferred credits from other institutions. (See Advanced Placement, CLEP Credit, and Transfer Credit.) Students who have had extensive experience equivalent to required courses

should consult with the appropriate department.

## Normal Course Schedule

*All students must register for a normal course schedule (at least 12 credit hours) as outlined in the departmental curricula in this Catalog.* Variations from the normal loads specified should be carefully planned and set forth in a petition approved by the appropriate faculty advisor, department, and Dean's Office. Students who are employed should consult with their advisors before each registration regarding course loads to be attempted.

## Sequence of Courses

Students should follow the curriculum recommended by their major department. The completion of any course in which there is a grade below *C-*, grade of *F*, or grade of *IF* should take precedence over other courses. Students must register so that departmental requirements will be completed with the least possible delay.

A student who receives a grade of *D+* or lower in a course that is prerequisite to another may not register for the succeeding course without the permission of the department, the instructor of the succeeding course, and the College.

Students may enroll for as much as 50 percent of their courses in work that is not a part of the prescribed curricula. To exceed this limit, the advance approval of the major department and the College must be obtained by petition.

*All courses are not necessarily offered each semester.* According to College policies, undergraduate courses having an enrollment of fewer than 20 students may be cancelled. Students can minimize scheduling problems by following closely the curricular sequence recommended by their major departments. If a course is unavailable, a junior or senior may petition to enroll for equivalent studies in Independent Study courses.

## Grading System, Pass/Fail, and Drop/Add Procedures

See the University Policies, Programs, and Services section of this *Catalog* for the University of Colorado uniform grading system and for additional Pass/Fail information and Drop/Add procedures. Also see the current *Schedule of Courses* and current *Student Survival Guide*.

## NO CREDIT RESTRICTIONS

It is particularly important to note that in the College of Engineering and Applied Science, courses to be counted toward fulfilling the graduation requirement *cannot be taken no credit (NC)*. Once a course has been taken for no credit, the course cannot be repeated for credit. An Engineering student must petition for approval before enrolling for any course *NC*.

## PASS/FAIL

The primary purpose for offering courses on a Pass/Fail grade basis is to encourage students, especially juniors and seniors, to broaden their educational experience by electing challenging courses without serious risk to their academic records. In general, Pass/Fail should be limited to 3000- or 4000-level courses. Below are specific Pass/Fail regulations for the College of Engineering and Applied Science. Individual departments may have more stringent rules which should be checked before registering for Pass/Fail courses.

1. A maximum of 16 Pass/Fail hours may be included in a student's total program. A maximum of 6 hours may be taken in one semester, but it is recommended that not more than one course at a time be taken Pass/Fail.

2. Courses that a student may elect to take Pass/Fail shall be designated and *approved in advance* by the student's major department and the Dean's Office. If courses not so designated are taken, the earned grade will be recorded in place of the *P* or *F* grade.

All students who wish to register for a course Pass/Fail must register for this course on a P/F basis during the first two weeks of the semester, as noted in the *Schedule of Courses*. After two weeks, it will not be possible for students to change their P/F registration unless approved by the Dean.

3. A transfer student may count toward graduation 1 credit hour of Pass/Fail for each 9 credit hours completed in this College.

4. Students on academic probation may not enroll in a course Pass/Fail.

## INCOMPLETES

The grade of *IW* (incomplete, withdrawn) is not given by the faculty of the College.

The grade of *IF* (incomplete, failing) may be given by an Engineering faculty member for circumstances beyond the student's control, such as a documented medical or personal emergency.

When the *IF* grade is to be given, the student, the Dean's Office, and the departmental office are informed, in

writing, by the instructor of what the student is to do in order to remove the incomplete and the deadline by which the tasks are to be completed. The student is expected to complete all course requirements, e.g., the final examination or term paper, within the established deadline and not to retake the entire course. The grade of *IF* will be converted automatically to a grade of *F* after one year unless the specified work is completed. If, because of exceptional circumstances, the course must be repeated, approval by petition is necessary. Under no circumstances will a student be permitted to repeat a course at a campus of the University other than the one on which an *IF* was received.

The grade of *IP* (in progress) is given only to graduate students in thesis courses (see University grading policy).

## DROP/ADD

Only under circumstances clearly beyond the student's control will petitions for dropping courses be approved after the drop deadline. Students should consult the most recent *Student Survival Guide* for additional Drop/Add information.

## Withdrawal

Students may withdraw with College approval only during the first six weeks of the semester. After this time, withdrawals are permitted only upon the presentation of documented evidence to verify that the withdrawal is necessary because of conditions (such as medical circumstances) beyond the student's control.

If a student suspends work by withdrawing, *permission must be secured from the Dean to reenroll in the College of Engineering and Applied Science*. Students who interrupt their course of study may be required to take any preparatory courses that have been changed during their absence or to repeat any courses showing weak preparation. A student wishing to return after a withdrawal must reapply for admission and is therefore subject to enrollment limits and academic criteria.

## Class Standing

To be classified as a sophomore in the College, a student must have completed 30 semester credit hours; to be classified as a junior, 60 hours; and to be classified as a senior, 90 hours. A student with more than 120 hours is classified as a fifth-year senior. All transfer students will be classified on this basis according to their hours of

credit accepted at the University of Colorado. This class standing does not necessarily reflect the academic standing of the student in a degree program.

## Attendance

Successful work in the College of Engineering and Applied Science is dependent upon regular attendance in all classes. Students who are unavoidably absent should make arrangements with instructors to make up the work missed. Students who, for illness or other valid emergency, miss a final examination must notify the instructor and the Office of the Dean no later than the end of the day on which the examination is given. Failure to do so will result in an *F* in the course.

## Policy on Academic Progress

The following is a statement of the Policy on Academic Progress in the College of Engineering and Applied Science.

To remain in good standing in the College of Engineering and Applied Science, a student must maintain satisfactory academic performance, as measured by two grade-point-average-based criteria and satisfactory academic progress toward completion of a Bachelor of Science degree in the College. Failure to meet these requirements will result in the student being placed first on academic probation and subsequently on academic suspension.

## ACADEMIC PROBATION

Academic probation is the first step taken by the College to express concern that a student is not maintaining satisfactory academic performance. It represents an official warning that academic performance on the part of a student must improve or the student will be subject to suspension from the College.

A student is placed on academic probation based upon either the student's *cumulative* University of Colorado grade point average (GPA) dropping to less than 2.00, or the student having two consecutive semesters at the University of Colorado where the *semester* grade point average is less than 2.00.

Once placed on academic probation, the student remains in that status for the duration of his or her enrollment as an undergraduate student in the College.

After being placed on probation, the student must correct academic deficiencies or be subsequently suspended from the College of Engineering and Applied Science.

If probation is by cumulative grade point average, the student must raise the cumulative GPA to at least 2.00 during the next semester of enrollment and maintain that level in all subsequent semesters. Additionally, the student is subject to probation by consecutive semester grade point average.

If probation is by consecutive semester grade point average, the student must maintain a semester GPA of at least 2.00 during all subsequent semesters.

If probation is due to both cumulative and semester GPA's, the student is required to maintain both cumulative and semester GPA's above 2.00 during all subsequent semesters.

While on academic probation, the student must enroll for and complete at least 12 credit hours per semester of courses which meet engineering degree requirements. Course work taken above minimum degree requirements in humanities, social science, and ROTC subjects do not count toward this minimum course load requirement.

## ACADEMIC SUSPENSION

Academic suspension is the involuntary withdrawal of the student from the College. It reflects a College position that the student is unable to meet minimal academic requirements for a Bachelor of Science degree.

A student is placed on academic suspension from the College of Engineering and Applied Science if, after a period of academic probation, the student does not maintain satisfactory academic performance as described under the section entitled Academic Probation.

The conditions of academic suspension are as follows:

1. The period of the suspension is indefinite, but must be at least one academic year.
2. The suspension applies to the College of Engineering and Applied Science on all campuses of the University of Colorado.
3. The student may not enroll in courses of the College, except those offered during the summer term and correspondence courses through the Division of Continuing Education.

Academic suspension is for an indefinite period; however, the student may not be readmitted to an engineering degree program for at least one academic year.

If a student, while on academic probation or suspension, elects to transfer to another college or school of the University of Colorado, the College of Engineering and Applied Science considers that this student has changed his or her choice of academic major to one offered

by that college or school. Therefore, the student is not permitted to enroll in any courses taught by this College during any semester which may apply toward engineering degree requirements. If such a student attempts to transfer back into the College via an Intrauniversity Transfer (IUT), the College policy governing IUT applicants will apply, and the student must petition the Committee on Academic Progress for removal of the Scholastic Stop.

A suspended student may elect to attend another accredited institution, complete a minimum of two semesters of full-time course work applicable toward engineering degree requirements, and petition the committee for removal of the Scholastic Stop that was imposed upon suspension. The student returns to the prior CU grade point average, and grades earned at other institutions do not transfer.

Readmission of a suspended student must be approved by the College's Committee on Academic Progress and the University's Office of Admissions, and such readmission is not assured. A student seeking readmission must have a cumulative CU grade point average of at least 2.00. In addition, the student must present convincing evidence of an ability to continue successfully in the engineering degree program. The student must recognize that the College of Engineering and Applied Science has taken the action of academic suspension on the premise that the student is unable to meet minimal academic requirements for a Bachelor of Science degree.

## Repetition of Courses

Students may not register for credit in courses in which they already have received a grade of C or better. When a student takes a course for credit more than once, *all grades are used in determining the grade point average*. An F grade in the repetition of a required course necessitates a subsequent satisfactory completion of the course. *Students may not register for credit in any course which they have previously completed for no credit.*

A student who has taken a course twice and earned grades no higher than D+ or IF must complete the course successfully on the third attempt or face the possibility of academic suspension.

## Petition Policy

A student desiring a waiver of college or departmental policies must secure

approval for this waiver. Approval is given only through a petition procedure. Petition forms and information on the petition procedure are available in the Dean's Office or in the academic department office. Also refer to the current *Student Survival Guide* for additional information on petitions.

## Changing Majors

The form necessary for transferring from one Engineering degree major to another is available in the Dean's Office.

## Other University Campuses

A student who needs to work at a part-time or full-time job while obtaining a college education, or who lives in the metropolitan areas of Denver or Colorado Springs, may prefer or find it necessary to attend the University of Colorado at Colorado Springs or the University of Colorado at Denver. The campus designation on the student's diploma and transcript correspond to the campus designation of the faculty recommending the student for a degree.

## UNIVERSITY OF COLORADO AT DENVER

Bachelor's and master's degree programs are offered by the Department of Civil Engineering, the Department of Electrical Engineering and Computer Science, and the Department of Mechanical Engineering on the campus of the University of Colorado at Denver. The Bachelor's degree is also offered in Computer Science, Mechanical Engineering, and Applied Mathematics. A Master's degree program is offered in Applied Mathematics, as are many of the courses leading to the Bachelor's degree in Engineering Physics and other engineering fields.

## UNIVERSITY OF COLORADO AT COLORADO SPRINGS

Bachelor's degree programs are offered in Electrical Engineering and Computer Science, and Applied Mathematics. The Master of Science degree is awarded in Computer Science, Applied Mathematics, Electrical Engineering, and Systems Engineering. Students may also complete work for the Master of Engineering and the Ph.D. degrees through the systemwide Graduate School.



## Summer Courses

A limited selection of summer session courses are planned for regular degree students and for those who must remove academic deficiencies. For information about courses, students should write to the chair of the department in which the courses are taught and to the registration office on the campus on which they plan to enroll for its schedule of summer courses.

## GRADUATE STUDY IN ENGINEERING

The College of Engineering and Applied Science offers degree programs for the Master of Engineering (M.E.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) degrees. There are degree programs in each of the following departments or fields:

Aerospace Engineering Sciences	Computer Science
Chemical Engineering	Electrical Engineering
Civil, Environmental, and Architectural Engineering	Mechanical Engineering

The Master of Science in Applied Mathematics is offered in conjunction with the Department of Mathematics in the College of Arts and Sciences. Please see page 70 for more information.

The Master of Science in Telecommunications is offered cooperatively by various departments. A description of the Telecommunications program is found on page 173.

Graduate programs within each Engineering department offer a variety of options, providing a number of alternative careers.

The Aerospace program has a strong emphasis on experimental and computational fluid dynamics, astrodynamics, orbit determination, remote sensing, control systems engineering and design, space structures and control, space-station design, and neurobio-systems engineering.

Key activities in Chemical Engineering include membrane and thin-film science, biochemical engineering and biotechnology, surface science, process control, enhanced oil recovery, coal gasification and combustion, and cryogenics.

Fields emphasized in Civil Engineering include geotechnical engineering, structural mechanics and engineering, building systems engineering, construction management, and environmental and water-resource engineering.

Strengths in Computer Science include artificial intelligence, automata, theoretical computer science, numerical optimization, parallel processing,

systems, database design, and software engineering.

Areas of focus in Electrical Engineering include optoelectronics and optical computing, computer design and simulation, VLSI design, electromagnetic theory, solid-state devices and materials, microwave and optical guided wave structures, antennas and propagation, and robotic control systems.

In Mechanical Engineering areas of concentration include combustion science, convective heat transfer, polymer science/engineering, nondestructive structural evaluation, wave propagation and scattering, and fluid mechanics.

## Graduate Study for Practicing Engineers

The Master of Engineering degree permits graduate students flexibility in defining specialized interdisciplinary fields that meet their professional needs as well as make them more productive for their employers. This degree has standards fully equivalent to those of the Master of Science degree (See Master of Engineering in the Graduate School section of this *Catalog*), but there is no residency requirement for this degree.

The Center for Advanced Training in Engineering and Computer Science (CATECS) provides state-of-the-art graduate education and professional development for practicing engineers, computer scientists, and managers of technology. Delivered from the Boulder Campus via live instructional television with two-way audio to business, government, and industry along the Front Range, CATECS courses help students update their technical knowledge. Course sequences can lead to a master's degree with a concentration in computer science, engineering management, and most engineering disciplines. Students receiving the televised courses may participate in the classroom discussion and question the instructor over open phone lines connected into the classroom. Classroom sessions are also recorded on video cassettes which are express-mailed to those outside the signal range.

CATECS also offers courses at the new University of Colorado site at Greenwood Plaza, 5660 Greenwood Plaza Blvd., Englewood. This site is intended to serve neighboring industry in Greenwood Village, Denver Tech Center, Inverness, and surrounding areas. Professionals can meet at Greenwood Plaza to receive courses from the Boulder Campus delivered on live television with two-way audio. (See also

Master of Engineering in the Graduate School section of the *Catalog*.)

CATECS can also assist working professionals in setting up study programs to meet individual goals under sponsorship of their employers. By providing liaison among the student, the employer, and the participating departments, CATECS makes it possible to set up acceptable programs of graduate study leading to a Master of Engineering degree. Students in industry may enroll in a CATECS course prior to acceptance in the Graduate School, but should be accepted to the Graduate School prior to completing their third course through CATECS.

The center also offers technical refresher courses, programming languages, management of technical enterprises, and workshops for non-technical managers.

For more information, prospective students should contact the office responsible for professional development at their work places or the Director of CATECS, Campus Box 435, University of Colorado at Boulder, Boulder, Colorado, 80309, or call (303) 492-6331.

## Graduate Work in Business

Undergraduates in Engineering who intend to pursue graduate study in business may be able to complete some of the business background requirements as electives in their undergraduate programs. Seniors in Engineering who have such intentions and appear likely to qualify for admission to graduate study in business may be permitted to register for graduate fundamentals courses designed to provide qualified students with needed background preparation in business. (See concurrent B.S. and M.S. degree programs.)

## Concurrent B.S. and M.S. Degree Program in Engineering

Students who plan to continue in the Graduate School after completing the requirements for the B.S. degree will usually find it advantageous to apply for admission to the concurrent degree program. This program allows students who qualify for graduate study and expect to continue for an advanced degree to plan a graduate program from the beginning of the senior year rather than from the first year of graduate study. Students can then plan their courses better, make fuller use of courses offered in alternate years,

and reach their degree of proficiency sooner.

Application is made to the Graduate School through the department early in the second semester of the junior year (after completion of at least 80 semester hours). Admission to the Graduate School may be granted on completion of 110 semester hours. (See Seniors at the University of Colorado in the Graduate School section of this *Catalog*.) Requirements are the same as for two degrees taken separately: 128 credit hours for the B.S. degree and 24 hours plus thesis (Plan I) or 30 credit hours (Plan II) for the M.S. or for the Master of Engineering degree. Humanities and social science requirements must be completed within the first 128 credit hours. A grade point average of 3.00 or better for all work attempted through the first six semesters (at least 96 credit hours) and written recommendations from at least two departmental faculty members are required.

All students will choose or be assigned faculty advisors to help them develop programs best suited to their present interests. Those in each program will be encouraged to pursue independent study on research problems or in areas of specialization where no formal courses are offered. A controlled substitution policy will be followed for courses normally required in the last year of the undergraduate curriculum. The program selected must be planned so that the student may qualify for the B.S. degree after completing the credit-hour requirements for the degree if the student so elects, or if the student's grade point average falls below the 3.00 required to remain in the program. In this case, all hours completed with a passing grade while in the program will count toward fulfilling the normal requirements for the B.S. degree. There will be no credit given toward a graduate degree for courses applied to the B.S. degree requirements; however, students who elect to exit at the B.S. level are still eligible to apply for admission to the Graduate School under the rules set forth in the Graduate School section of this *Catalog*. Normally, however, these students will apply for admission to the Graduate School when all but 6 of the credit hours required for the B.S. degree have been completed and will be awarded the B.S. and M.S. degrees simultaneously upon meeting the requirements set forth for the concurrent degree program.

## Graduate Degree for Science Majors

Science graduates who have good academic records and strong backgrounds in mathematics and science may be eligible for admission as graduate students in Engineering or may be able to qualify with some extra course work. Preliminary information may be obtained from the Office of the Dean of Engineering. In many cases, some financial support may be available for such students.

## Master of Engineering, Master of Science, and Doctor of Philosophy Degrees

Students wishing to pursue graduate work in Engineering leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section of this *Catalog*. Some departments also have available explanatory material on their advanced degree programs.

*Prerequisites.* To enroll for an advanced degree in any department of the College of Engineering and Applied Science, candidates either must have previously earned a bachelor's degree in a curriculum that includes the necessary prerequisites for that branch of engineering or qualify for the concurrent B.S. and M.S. program open to juniors. If the candidate's preliminary education was taken at some other institution, the degree of qualification for advanced work shall be determined by the department concerned and by the Dean of the Graduate School.

Graduates of engineering technology programs should note that the equivalent of a B.S. degree in an appropriate engineering field is required for entry into the Graduate School. Because the goals and orientation of engineering programs differ from those of technology programs, technology graduates should expect to make up deficiencies before being admitted to graduate study in engineering. Students may not be admitted to the Graduate School while making up deficiencies, but can enroll as nondegree students.

For admission as a regular degree student, an undergraduate grade point average of at least 3.00 is normally required.

*Language Requirement.* Ph.D. candidates should note the communication requirement of the Graduate School, under which a foreign language is required.

Graduate work in each department of the College of Engineering and Applied Science falls into two classes:

1. Courses that are offered for candidates who have chosen to major in the particular department or as a base for the Master of Engineering combined degree.

2. Courses that are offered as minors for candidates who have chosen their major in some other department.

Graduate students who plan to become candidates for the M.E., M.S., or Ph.D. degree are required to take a qualifying examination in the appropriate field of specialization during the first semester in which they are registered as candidates for a graduate degree. Individual departments should be consulted for the timing of this examination. The purpose of this examination is to enable the advisor and student to plan a suitable program of study.

*Course Requirements.* Graduate students majoring in any department receive no credit in the Graduate School for courses listed as required and undergraduate work in the same department. They may, however, receive graduate credit for advanced undergraduate courses in an Engineering department other than that in which they receive the bachelor's degree, with the approval of the department granting the degree and the Dean of the Graduate School.

*Availability of Courses.* All courses are not necessarily offered every year. They are available only if there is sufficient demand.

## AEROSPACE ENGINEERING SCIENCES

### BACHELOR'S DEGREE REQUIREMENTS

The primary objective of the Aerospace Engineering Sciences curriculum is to provide general education in subjects that are fundamental to the practice of and research in this branch of engineering. The major part of the first two years is devoted to the study of mathematics, physics, mechanics, chemistry, computer science, and the humanities and social sciences. The last two years are devoted to engineering courses in fluid dynamics, flight dynamics, systems and control, materials and structures, energy conversion and propulsion, space science, and aircraft and spacecraft design. Advanced technical elective courses are available for further specialization in those subfields of aerospace engineering. Students are also encouraged to pursue special

research topics for credit during their junior and senior years under the direction of a faculty member of their choice.

For students having sufficient ability and interest, planning of graduate study should begin by the start of the junior year. Such a plan should consider the foreign language requirements of appropriate graduate schools and an advanced mathematics program. Students who wish to combine the Business and Aerospace Engineering Sciences curricula are advised to consider obtaining the B.S. degree in Aerospace and a master's degree in Business rather than a combined B.S. degree.

### Bioengineering/Premedical Option in Aerospace Engineering Sciences

The Department of Aerospace Engineering Sciences offers a bioengineering/premedical option which has been specifically designed for students who wish either to attend medical school or to enter graduate work in bioengineering after receiving the B.S. degree. Students taking the bioengineering/premedical option program are allowed to substitute appropriate bioengineering courses for some of their normal course work during the senior year. Students electing this option should consult their advisor regularly to assure the adequacy of their curricula. ASEN 3018, Bioengineering 1, and chemistry through biochemistry provide good introductory background for Engineering students who are considering neuroscience, premedicine, or other bioengineering studies.

The Department offers bioengineering courses in neurophysiology, neural control systems, neural modeling, neuroscience laboratory, and brains, minds, and computers. Other courses in neuroscience are available within the campus-wide neuroscience program. Seniors and beginning graduate students are encouraged to enter the neuroscience program through the basic courses, ASEN 5018 Bioengineering 2 and ASEN 5028 Neural Control Systems.

Senior and graduate students can also work with faculty in other bioengineering areas. These opportunities can be coordinated through the department with the college-wide bioengineering program.

Students must be sure that their curriculum includes 9 hours of capstone design courses.

### Curriculum for B.S., Aerospace Engineering Sciences

The B.S. curriculum in Aerospace Engineering Sciences is revised annually to keep up with new advances in technology, to make use of new educational methodologies, and to satisfy updated program accreditation criteria. The curriculum requirements described below are those in effect at the time when this *Catalog* was printed. They are given here only for general information and are subject to change. Students enrolled in the program should meet the requirements in effect during their actual period of enrollment. It is their responsibility to obtain a copy of the current curriculum from the Department office or from their faculty advisor at the beginning of each academic year.

#### Freshman Year

Fall Semester	Semester Hours
ASEN 1016 Introduction to Science of Flight	3
ASEN 1036 Freshman Laboratory	1
APPM 1350 Calculus for Engineers 1	4
PHYS 1110 General Physics	4
Humanities or social science elective	3
	15

#### Spring Semester

Spring Semester	Semester Hours
ASEN 1026 Introduction to Space Science	2
APPM 1360 Calculus for Engineers 2	4
PHYS 1120 General Physics	4
PHYS 1140 Experimental Physics	1
CSCI 1700 Introduction to Scientific Programming	3
Humanities or social science elective	3
	17

#### Sophomore Year

Fall Semester	Semester Hours
APPM 2350 Calculus for Engineers 3	4
PHYS 2130 General Physics	3
PHYS 2150 Experimental Physics	1
ASEN 2010 Mechanics 1	3
CHEM 1111 General Chemistry	5
	16

#### Spring Semester

Spring Semester	Semester Hours
APPM 2360 Introduction to Linear Algebra and Differential Equations	3
ASEN 2013 Thermodynamics and Heat Transfer	4
ASEN 2020 Mechanics 2	3
ASEN 2022 Materials Science and Engineering	3
Humanities or social science elective	3
	16

#### Junior Year

Fall Semester	Semester Hours
ASEN 3010 Aerospace Dynamics	3
ASEN 3011 Fluid Dynamics 1	3
ASEN 3012 Structures 1	3
ASEN 3014 Systems Analysis 1	3
ECEN 3030 Electronics and Electric Circuits	3
ECEN 3430 Electronics and Electric Circuits Lab	1
	16

#### Spring Semester

Spring Semester	Semester Hours
ASEN 3015 Flight Mechanics	3
ASEN 3021 Fluid Dynamics 2	3
ASEN 3022 Structures 2	3
ASEN 3024 Systems Analysis 2	3
Humanities or social science elective	3
	15

#### Senior Year

Fall Semester	Semester Hours
ASEN 4013 Foundations of Propulsion	3
ASEN 4015 Senior Design Laboratory 1	3
ASEN 4019 Computational Fluid Mechanics	3
Design course No. 1	3
Technical elective	3
Design course No. 2	3
	18

#### Spring Semester

Spring Semester	Semester Hours
ASEN 4025 Senior Design Laboratory 2	3
Design course No. 3	3
Technical elective	3
Humanities or social science electives	6
	15

### Notes on Elective Courses

#### Humanities and Social Science Requirements

1. A minimum of 18 semester credit hours in humanities and social science is required.
2. A plan for humanities and social science elective courses should be developed by the students in consultation with their faculty advisor.
3. Humanities and social science electives must not be limited to a selection of unrelated introductory courses. At least 6 semester credit hours must be at the upper division (3000-4000) or graduate (5000 and above) level.
4. Each ROTC course sequence (AIRR 4010-4020 and MILR 4072-4082) is acceptable for 3 semester credit hours of humanities and social science elective. The AIRR course sequence is equivalent to the course PSCI 4191 and the MILR course sequence is equivalent to the course COMM 4240.
5. Students may be permitted to take some honors courses for humanities and social science credits with the approval of the AES Faculty Advising Coordinator.
6. Courses in Business are not acceptable as humanities and social science electives.

#### Technical Elective Requirement

1. A minimum of 6 credit hours of technical electives is required, of which a minimum of 3 credit hours must be in Aerospace Engineering Sciences.
2. All technical elective credits must be approved in advance by the student's faculty advisor.
3. A technical elective is generally a course in engineering or science (such as mathematics, physics, chemistry, biology, or computer science) at the 3000 level or above.
4. Up to 3 credit hours of independent study and/or undergraduate research may count as technical elective.
5. Up to 3 semester hours of ROTC course work may be acceptable for technical elective credits.

#### Engineering Design Requirement

In addition to the ASEN 4015/4025 Senior Design Lab courses and the design work included in other AES required courses, a minimum of 9 credit hours of engineering design must be taken from the following list of capstone design courses:

- ASEN 4055 Space Habitation
- ASEN 4035 Aircraft Design
- ASEN 4045 Spacecraft Design
- ASEN 5065 Experimental Space Science
- CVEN 3515 Structural Design I

Other capstone design courses will be added to this list as they become available. See faculty advisor for current list. Courses that are not specifically on this list cannot be used for the total or partial fulfillment of the engineering capstone design requirement.

## GRADUATE DEGREE PROGRAMS

The Department of Aerospace Engineering Sciences offers graduate programs in its areas of emphasis and active research. They include: fluid dynamics (theoretical fluid dynamics, computational fluid dynamics, aerodynamics and design, atmospheric dynamics and modeling, low-gravity fluid mechanics and heat transfer, experimental fluid dynamics and flow visualization, and transonic flow); astrodynamics and remote sensing (orbit determination, space debris, space mission analysis, remote sensing, satellite geodesy, satellite oceanography, ocean modeling, and NAVSTAR global positioning system); control, systems engineering, and aerospace design (classical control theory and optimization, software engineering and control of large space structures, attitude control and fine-pointing, design and control of space vehicles and experiments); and life support/neuro-bioengineering (life support systems, neuro-modeling, bio-manufacturing in space, flight support/G-loc, synthetic intelligence, and autonomous control system interfaces).

Aerospace-related research centers recently established in the College include the Colorado Center for Astrodynamics Research, the Center for Space Structures and Controls, the Center for Low-Gravity Fluid Mechanics and Transport Phenomena, and Bioserve Space Technologies (a NASA Center for the Commercial Development of Space). Other research centers within the University that are involved in space-related research activities are the Center for the Study of Earth from Space, the Laboratory for Atmospheric and Space Physics, the Joint Institute for Laboratory Physics, and the Cooperative Institute for Research in Environmental Sciences.

### Requirements for Advanced Degrees

Graduate students applying for admission to Aerospace Engineering Sciences are required to submit the results of the analytical, quantitative, and verbal sections of their Graduate Record Examination. They are also encouraged to present the results of one specialized section in any area of engineering, mathematics, physics, chemistry, or biology.

The Department offers graduate programs leading to the Master of Engineering and the M.S. and Ph.D. degrees in Aerospace Engineering Sciences. Degree plans often are formulated on the basis of the student's interest and needs. Portions of the program are

designed to promote the student's engineering and professional development.

At the time of this *Catalog's* printing, a core of courses is required of all M.S. students as follows: ASEN 5051, Macroscopic Physics of Fluids; ASEN 5019, Computational Fluid Mechanics; and MCEN 5120 and 5130, Methods of Engineering Analysis 1 and 2 (or their equivalents). Students may satisfy these requirements by transfer credit. Both the M.S. candidacy examination and the Ph.D. preliminary examination contain a written part based on the content of this core curriculum of four courses. This test is given once a semester or once a year, depending on the demand. The form of the remainder of the examinations, covering specific areas, is decided by the student's committee and can be written, oral, or both.

Since the graduate degree requirements are being revised, prospective graduate students are urged to obtain more current information by writing to the Chair of the Graduate Committee, Department of Aerospace Engineering Sciences, Campus Box 429, University of Colorado at Boulder, Boulder, Colorado 80309-0429.

## APPLIED MATHEMATICS

The Department of Mathematics in the College of Arts and Sciences offers all courses in mathematics for the College of Engineering and Applied Science. The Department also offers three options leading to the degree B.S. (APPM) in the College of Engineering and Applied Science. In Option I, the student takes a specified amount of course work in a specific Engineering department. In Option II, the student takes course work in distributed Engineering departments including a solid grounding in mechanics, electronics, and materials. Option III is a joint mathematics-computer science program.

*Pregraduate Courses.* Students considering doing graduate work in mathematics are strongly urged to take MATH 3140 and MATH 4310-4320. Without these courses students may have difficulty gaining admission to some graduate schools and, if admitted to graduate school, may expect a delay of an additional year in earning an advanced degree.

The undergraduate curriculum is designed to give training in mathematics, engineering, and science. The use of numerical methods and electronic computers is included. Technical electives indicated in the curriculum must be selected from the following fields: mathematics, engineering, physics, chemistry, computer science, biology, astrophysics, or geology.

In general, nontechnical electives should be broadening and have cultural value. Students interested in research are encouraged to take a foreign language as early as possible. German, French, and Russian are strongly recommended. (Only 6 hours of language courses below the 3000 level or 6 hours of English composition may be counted toward the humanities and social science requirement.)

Students with high academic standing and Calculus 1 and 2 or their equivalents may be invited to enroll in the Honors sequence APPM 2370-3150. Admission is by controlled enrollment card. For further information, consult the Office of the Dean, College of Engineering and Applied Science.

## BACHELOR'S DEGREE REQUIREMENTS

The B.S. degree in Applied Mathematics requires the completion of a minimum of 128 credit hours of course work with an average grade of *C* (2.00) or better. Students majoring in Applied Mathematics must complete the following minimum requirements:

1. Three semesters of calculus, all with a grade of *C* or better.
2. At least 24 hours of mathematics beyond calculus, including MATH 3130 (Linear Algebra), with 18 hours in courses numbered above 3000 and 6 hours numbered above 4000, all with a grade of *C* or better. (APPM 2510 may not be used.)
3. A minimum of 24 hours of approved Engineering courses (in addition to required courses CSCI 1200, GEEN 1017, and Thermodynamics). A list of approved courses is available in the Mathematics Department.
4. At least 18 hours of humanities and social science courses. Of these, 6 hours must be in literature, and 6 hours must be courses at the 3000 level.
5. One of the three options listed below.
6. Other electives to reach a total of 128 hours. These hours must include at least 6 hours in courses at the 3000 level or above.
7. The courses listed in the following curriculum:

### Curriculum for B.S. (Applied Mathematics)

Freshman Year	
<i>Fall Semester</i>	<i>Semester Hours</i>
MATH 1300 Analytic Geometry and Calculus 1	5
PHYS 1110 General Physics	4
Elective in Literature (Note 1)	3
CSCI 1200 Introduction to Programming 1	3
	15
<i>Spring Semester</i>	<i>Semester Hours</i>
MATH 2300 Analytic Geometry and Calculus 2	5
GEEN 1017 Engineering Drawing 1	2

Elective in Literature (Note 1) . . . . .	3
PHYS 1120 General Physics . . . . .	4
PHYS 1140 Experimental Physics . . . . .	1
	<hr/> 15
<b>Sophomore Year</b>	
<i>Fall Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
MATH 2400 Analytic Geometry and Calculus 3 . . . . .	4
PHYS 2130 General Physics . . . . .	3
PHYS 2150 Experimental Physics . . . . .	1
Electives (Note 2) . . . . .	9
	<hr/> 17
<i>Spring Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
CHEM 1111 General Chemistry I . . . . .	5
Electives (Note 2) . . . . .	12
	<hr/> 17
<b>Junior Year</b>	
<i>Fall Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
MATH 3130 Introduction to Linear Algebra . . . . .	3
Electives (Note 2) . . . . .	13
	<hr/> 16
<i>Spring Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
MCEN 2120 Thermodynamics (or ASEN 2013 or ECEN 3020) . . . . .	3
Electives (Note 2) . . . . .	13
	<hr/> 16
<b>Senior Year</b>	
<i>Fall Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
Electives (Note 2) . . . . .	16
<i>Spring Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
Electives (Note 2) . . . . .	16
Minimum total hours for degree . . . . .	128

Requirements under each option are as follows:

<b>Option I—Engineering Minor</b>	
	<i>Semester Hours</i>
Specialty in a specific engineering department . . . . .	24
Technical electives . . . . .	12
Required humanities and social science electives . . . . .	12
<b>Option II—Distributed Engineering Minor</b>	
Distributed engineering subjects in the College of Engineering . . . . .	24

Some recommended courses are:  
 ASEN 3010, 3011, CVEN 2121, 3111, ECEN 3030, MCEN 3024.

Technical electives . . . . .	12
Required humanities and social science electives . . . . .	12

<b>Option III—Computer Science</b>	
Specific courses required, all with grades of C or better:	
CSCI 1210 Introduction to Programming 2 . . . . .	4
ECEN 2570 Logic Circuits . . . . .	3
ECEN 2220 Microcomputer Architecture and Programming . . . . .	3
CSCI 2250 Data Structures and Algorithms . . . . .	3
CSCI 3245 Survey of Programming Languages . . . . .	3
Additional hours of upper-division CSCI courses or upper-division computer science-related ECEN courses . . . . .	6
Technical electives . . . . .	6
Noncomputer-oriented engineering courses . . . . .	12
Required humanities or social science electives . . . . .	12

*Note:* It is strongly recommended that students in Option III take the following mathematics courses: MATH 3170, 4430, 4650, 4660, and 4510.

**A. Math. Curriculum Notes**

1. A list of approved English courses is available in the Mathematics Department.
2. Electives include technical, social-humanistic, and electives in the chosen option.

**ARCHITECTURAL ENGINEERING**

**BACHELOR'S DEGREE REQUIREMENTS**

Architectural engineering has many elements in common with civil engineering, but is specifically directed toward the building industry. Its focus is on building systems, which include structural systems, design of the building envelope, design of systems to control the environment within the building, illumination design, and construction methods applied to buildings. The program is administered by the Department of Civil, Environmental, and Architectural Engineering. Students also take courses in architectural history and architectural design from the College of Environmental Design.

There is a broad core of requirements for all students. Students are also expected to choose, in consultation with faculty advisors, elective courses to add depth in one or more specialty areas. Such specialty areas include structural analysis and design, construction engineering, building energy analysis, mechanical systems, and illumination. A list of recommended electives is available to students to help them select a coherent academic program which enhances one of these areas.

**COMBINED DEGREE**

Students interested in pursuing a B.S. degree in Business in addition to the B.S. degree in Architectural Engineering should be prepared to spend at least three additional semesters. A faculty advisor should be consulted in the student's freshman year so that social sciences and humanities courses required of Business students can be taken.

Academically qualified students may want to consider working toward the Master of Business Administration degree upon completion of the baccalaureate in Engineering as an alternative to a B.S. in Business.

**Curriculum for B.S. (Arch.E.)**

<b>Freshman Year</b>	
<i>Fall Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
AREN 1306 Introduction to Architectural Engineering . . . . .	3
APPM 1350 Calculus for Engineers I . . . . .	4
GEEN 1300 Introduction to Engineering Computing . . . . .	3
PHYS 1110 General Physics . . . . .	4
GEEN 1017 Engineering Drawing . . . . .	2
	<hr/> 16

<i>Spring Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
APPM 1360 Calculus for Engineers 2 . . . . .	4
AREN 1027 Descriptive Geometry . . . . .	2
PHYS 1120 General Physics . . . . .	4
PHYS 1140 Experimental Physics . . . . .	1
CHEM 1111 General Chemistry I . . . . .	5
	<hr/> 16

<b>Sophomore Year</b>	
<i>Fall Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
CVEN 2121 Analytical Mechanics I . . . . .	3
CVEN 2012 Plane Surveying . . . . .	3
AREN 2010 Introduction to Solar Utilization . . . . .	3
APPM 2350 Calculus for Engineers 3 . . . . .	4
Humanities or social science elective . . . . .	3
	<hr/> 16

<i>Spring Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
AREN 2020 Energy Fundamentals . . . . .	3
CVEN 3121 Mechanics of Materials . . . . .	3
APPM 2360 Introduction to Linear Algebra and Differential Equations . . . . .	3
Basic science elective . . . . .	4
Humanities or social science elective . . . . .	3
	<hr/> 16

<b>Junior Year</b>	
<i>Fall Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
CVEN 3505 Structural Analysis . . . . .	3
AREN 3010 Mechanical Systems for Buildings . . . . .	3
AREN 3540 Illumination I . . . . .	3
ARCH 4114 Architectural History . . . . .	3
CVEN 3141 Engineering Materials Laboratory . . . . .	2
or	
Engineering science elective . . . . .	3
	<hr/> 14/15

<i>Spring Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
CVEN 3515 Structural Design I . . . . .	3
AREN 3030 Energy Laboratory . . . . .	2
or	
Engineering science elective . . . . .	3
ARCH 4214 Architectural History . . . . .	3
ECEN 3030 Electric Circuits . . . . .	3
Technical electives . . . . .	5
	<hr/> 16/17

<b>Senior Year</b>	
<i>Fall Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
CVEN 3111 Analytical Mechanics 2 . . . . .	3
AREN 4416 Construction Costs, Estimating, and Prices . . . . .	3
ARCH 4010 Architectural Appreciation and Design . . . . .	3
or	
Technical electives . . . . .	6
Technical elective . . . . .	2
Humanities or social science elective . . . . .	3
	<hr/> 17

<i>Spring Semester</i> <span style="float:right"><i>Semester Hours</i></span>	
CVEN 4919 Senior Seminar . . . . .	1
AREN 4570 Building Electrical Systems . . . . .	3
Technical electives . . . . .	3
or	
ARCH 4010 Architectural Appreciation and Design . . . . .	6
Technical elective . . . . .	3
Humanities or social science elective . . . . .	3
	<hr/> 16
Minimum hours for degree . . . . .	128

**Courses Available for Specialization**

Upon consultation with their advisors, students are expected to select courses applicable to their areas of interest and specialization. The areas of specialization are construction engineering and management, building systems engineering, illumination, and structural engineering. In addition to the courses listed below, other courses,

not listed, may be proposed by a student and approved by the advisor if they are found to be applicable.

AREN 3020 Energy Conservation Analysis  
 AREN 4010 Solar Design  
 AREN 4315 Design of Masonry Structures  
 AREN 4466 Construction Planning and Scheduling  
 AREN 4550 Illumination 2  
 AREN 4560 Luminous Radiative Transfer 2  
 CVEN 3313 Theoretical Fluid Mechanics  
 CVEN 3323 Applied Fluid Mechanics  
 CVEN 3708 Geotechnical Engineering 1  
 CVEN 3718 Geotechnical Engineering 2  
 CVEN 4525 Matrix Structural Analysis  
 CVEN 4545 Steel Design  
 CVEN 4555 Reinforced Concrete Design  
 CVEN 4565 Design of Timber Structures  
 CVEN 4087 Engineering Contracts  
 CVEN 4147 Engineering Economy  
 CVEN 5111 Introduction to Structural Dynamics<sup>1</sup>  
 CVEN 5121 Mechanics of Materials 2<sup>1</sup>  
 CVEN 4511/5511 Introduction to Finite Element Analysis<sup>1</sup>  
 CVEN 6525 Finite Element Analysis of Structures<sup>1</sup>  
 ACCT 2000 Introduction to Financial Accounting  
 ACCT 2020 Introduction to Managerial Accounting  
 ECEN 5767 Power Distribution Systems  
 MCEN 3042 Heat Transfer  
 MCEN 4122 Air-Conditioning  
 MCEN 4142 Refrigeration

## GRADUATE STUDY

Graduate credit is offered in the following courses:

CVEN 5010 HVAC System Controls  
 CVEN 5020 Building Energy Measurements and Audits  
 CVEN 5050 Advanced Solar Design  
 CVEN 5060 Advanced Passive Solar Design  
 CVEN 5070 Thermal Analysis of Buildings  
 CVEN 5080 Computer Simulation of Building Energy Systems  
 CVEN 5236 Construction Planning and Scheduling  
 CVEN 5246 Engineering Contracts  
 CVEN 5256 Construction Management  
 CVEN 5266 Industrialized Building Techniques and Systems  
 CVEN 5286 Construction Engineering 1  
 CVEN 5296 Construction Engineering 2

## CHEMICAL ENGINEERING

### BACHELOR'S DEGREE REQUIREMENTS

Chemical engineers are responsible for producing the world's supply of chemicals. They carry out basic research; design, build, operate, and manage chemical processes and plants; and supply us with petroleum products, plastics, detergents, agricultural chemicals, pharmaceuticals, biological compounds, photographic materials, electronic memory devices, and many other products. Today's processes must be energy efficient, nonpolluting, and profitable. Thus, to prepare to enter this field, students must master inorganic, organic, and often biochemistry; mathematics, statistics, and computers; physical chemistry and biology; and physics. Students must learn to use these fundamentals as they are applied in the process industries.

There is a natural affinity between chemical engineering and medicine, and the department emphasizes its special premedical and bioengineering program. Paralleling the technical courses are studies in literature, social sciences, and humanities.

As students learn more about the field and test interests and aptitudes, they will be able to make better and better decisions concerning how much education to get and what specialties are best. Most engineers in industry have B.S. degrees; a larger proportion each year are earning M.S. degrees, because certain activities, especially process development and design, require more in-depth study. Some are more interested in the business aspects of manufacturing, and so earn B.A. or M.B.A. degrees in business. Others, interested in teaching and/or basic research, will want to earn a Ph.D. At the B.S., M.S., and Ph.D. levels, there are opportunities to specialize, via electives, independent study, and research; several are mentioned in the material which follows. If a student has an interest that is not included here, special arrangements can usually be made. Thus, students should work closely with their advisors, revising anticipated schedules as circumstances and interests change. The department believes that, since no two students are alike, no two programs should be alike either.

Students may carry out a part of their studies in another country (see International Education), and are encouraged to consider this opportunity very seriously, given the international nature of most large engineering corporations, and international cooperation in scientific and engineering research. Many of the faculty have significant international experience.

### Options in the Chemical Engineering Curriculum

Curricular options have been established in fields of major importance and of particular interest. To follow one of these requires careful planning and course selection by student and advisor.

#### *Bioengineering-Premedical Option.*

Since all biological and medical systems involve complex chemical and physical processes, chemical engineering is a natural professional basis for either medical school or bioengineering research. The Department has a strong undergraduate program that is tailored toward students who are preparing for medical school or for careers in biomedical engineering, biochemical engineering, or biotechnology. Modern

biotechnology has been defined as "applied genetic engineering" and is of considerable importance due to recent advances that molecular biologists and geneticists have made in genetic engineering. The successful industrial application of these advances will, in large part, depend on new chemical engineering initiatives in the development of high-rate bioreactors, efficient separation and purification techniques for bioproducts, and computer-interfaced instrumentation for optimal bioprocess control.

The courses which comprise the central core of the bioengineering program are: CHEN 3700, Bioenergetics: Structure and Function; CHEN 4710/5710, Molecular Basis of Behavior; CHEN 4800/5800, Recent Advances in Biotechnology; and CHEN 4810/5810, Biotechnology Laboratory. In addition, bioengineering students are required to complete two semesters of general biology.

The Department also offers graduate bioengineering research programs at both the M.S. and Ph.D. levels. These programs are oriented toward specialization in various aspects of biochemical engineering, biotechnology, and sensory physiology.

#### *Environmental Engineering Option.*

Chemical engineers can make major contributions in the fields of pollution control, resource utilization, and environmental control. The environmental option is designed to emphasize biological and environmental sciences, the sociopolitical effects of engineering on the environment, and chemical engineering applications in environmental problems. The Department has a strong interest in this field.

*Computer Option.* Modern machine computation continues to have a great impact on the practice of chemical engineering. The computer option allows the student to emphasize computer work, including the theory of computer operation, programming, and mathematical techniques for computer utilization. The Department, the College, and the University have extensive, modern computing facilities.

### Curriculum for B.S. (Ch.E.)

Freshman Year	
Fall Semester	Semester Hours
APPM 1350 Calculus for Engineers 1	4
CHEM 1111 General Chemistry 1 (Note 1)	5
GEEN 1300 Introduction to Engineering Computing	3
ENGL 2600 Introduction to World Literature 1 (Note 2)	3
CHEN 1300 Introduction to Chemical Engineering	2

<sup>1</sup> For well-qualified undergraduates.



<i>Spring Semester</i>	<i>Semester Hours</i>
APPM 1360 Calculus for Engineers 2	4
CHEM 1131 General Chemistry 2 (Note 1)	5
CHEM 2010 Introduction to Chemical Engineering Calculations	3
PHYS 1110 General Physics 1	4
	16
<b>Sophomore Year</b>	
<i>Fall Semester</i>	<i>Semester Hours</i>
APPM 2350 Calculus for Engineers 3	4
CHEM 3311 and 3321 Organic Chemistry and Laboratory	4
CHEM 2120 Chemical Engineering Material and Energy Balances	3
PHYS 1120 and 1140 General Physics 2 and Laboratory	5
	16
<i>Spring Semester</i>	<i>Semester Hours</i>
APPM 2360 Introduction to Linear Algebra and Differential Equations	3
CHEM 3331 and 3341 Organic Chemistry 2 and Laboratory	4
CHEM 3200 Chemical Engineering Principles 1	3
ENGL 2610 Introduction to World Literature 2 (Note 2)	3
Free elective	3
	16
<b>Junior Year</b>	
<i>Fall Semester</i>	<i>Semester Hours</i>
CHEM 4511 Physical Chemistry	3
CHEM 3210 Chemical Engineering Principles 2	3
ECEN 3030 Electronics and Electric Circuits 1	3
ECEN 3430 Electronics/Circuits Laboratory 1	1
Humanities or social science elective	3
Free elective	3
	16
<i>Spring Semester</i>	<i>Semester Hours</i>
CHEM 4551 Physical Chemistry	3
CHEM 4541 Physical Chemistry Laboratory	2
CHEM 3220 Chemical Engineering Principles 3	4
CHEM 4320 Chemical Engineering Thermodynamics	3
Humanities or social science elective	3
	15
<b>Senior Year</b>	
<i>Fall Semester</i>	<i>Semester Hours</i>
CHEM 4030 Chemical Engineering Laboratory	4
CHEM 4330 Chemical Engineering Reaction Kinetics	3
CHEM 4440 Chemical Engineering Materials	3
CHEM 4580 Process Modeling and Computer Simulation	3
Humanities or social science elective	3
	16
<i>Spring Semester</i>	<i>Semester Hours</i>
CHEM 4520 Chemical Process Synthesis	4
CHEM 4570 Instrumentation and Process Control (Note 3)	3
Humanities or social science elective	3
Technical elective	3
Technical elective	3
	16
Minimum total hours for degree	128

### Ch.E. Curriculum Notes

- The sequence of CHEM 1151 and CHEM 1171 is an acceptable substitute for CHEM 1111 and CHEM 1131. See advisor concerning the requirement of CHEM 1111 and CHEM 1131.
- Alternate literature courses in English and foreign languages are acceptable. Students should consult advisors.
- Technical elective may be substituted but must meet engineering science and design requirements. See advisor.

### GRADUATE DEGREE PROGRAMS

Major areas of current research interests in the Chemical Engineering Department are biotechnology and

bioengineering, heterogeneous catalysis and kinetics, cryogenics, fluid dynamics, mass transfer, membrane and polymer science, phase equilibria, process control and optimization, surface science and interfacial phenomena, transport in porous media, and thermodynamics.

### Master of Science Degree

**Admission.** General criteria for admission to the master's program include: (a) a baccalaureate degree from a college or university of recognized standing, equivalent to the degree given at this University; or college work equivalent to that required for such a degree, at least 96 semester hours of which must be acceptable toward a baccalaureate degree at this University; (b) promise of ability to pursue advanced study and research, as judged by previous scholastic record or otherwise; (c) adequate preparation to begin graduate study in the chosen field.

A candidate for the Master of Science degree in Chemical Engineering must fulfill the following departmental requirements:

- Twenty-seven semester hours of graduate work including a satisfactory thesis. Maximum credit of 6 semester hours will be allowed for the completion of the master's thesis. Twelve hours at the 5000 level or above (excluding 6 hours of thesis) must be completed. It is recommended that 6 to 9 semester hours be taken in a minor technical field approved by the Department of Chemical Engineering.
- A final examination as required by the Graduate School on the thesis and/or course work must be passed.
- It is expected that a qualified student can complete the master's degree in less than two calendar years. A graduate student with a bachelor's degree in a field related to chemical engineering can obtain the master's degree in Chemical Engineering but may be required to make up deficiencies in background. Programs will be arranged on an individual basis.

Four of the following core courses for the M.S. and Ph.D. degrees must be taken.

CHEM 5210 Transport Phenomena (required)  
 CHEM 5220 Mass Transport  
 CHEM 5370 Intermediate Chemical Engineering Thermodynamics  
 CHEM 5390 Reaction Engineering  
 CHEM 5740 Analytical Methods in Chemical Engineering (required)  
 CHEM 5750 Numerical Methods in Chemical Engineering

A degree plan must be prepared at the beginning of the academic program in consultation with an advisory committee. The student is urged to

maintain close contact with this advisory committee during the entire course of study.

The M.S. thesis committee must consist of three members, including two faculty members from the Department of Chemical Engineering.

### Master of Engineering (M.E.) Degree Requirements

**Admission.** (The standards of admission to the M.S. program also apply to M.E. degree applicants.) A 3.00 overall undergraduate grade point average is required for regular admission; a 2.75 overall undergraduate grade point average is usually required for provisional acceptance.

**M.E. Degree Advisor.** All M.E. candidates should see the Chemical Engineering Master of Science degree advisor for counseling.

**Requirements for Graduation.** Nine hours of Chemical Engineering at the 5000 level or above are required for those M.E. degree students enrolled in the Department of Chemical Engineering. Students will orally defend their written reports as specified in the M.E. degree description. A comprehensive examination will be administered by the student's advisory committee on the report and course work. Television course credit will be given as approved by the committee.

### Doctor of Philosophy Degree

Admission requirements for the Ph.D. include:

- The applicant must have achieved academic competence equivalent to a Master of Science degree from an accredited college or university, with a grade point average substantially above the minimum normally required for the degree.

- The applicant must show the ability to perform independent research.

- The applicant must indicate a field of specialization and be acceptable as a thesis advisee to a member of the Chemical Engineering graduate faculty.

- The applicant must pass the Ph.D. preliminary examination administered by the Department of Chemical Engineering.

Admission to the doctoral program will be based on consideration of the above four criteria and decided by majority vote of the Chemical Engineering faculty.

A candidate for the Doctor of Philosophy degree must meet the requirements as described under Requirements for Advanced Degrees in the Graduate School section. A minimum of 30 semester hours of courses numbered

5000 or above is required for the degree. Twelve hours should be taken outside the Department of Chemical Engineering.

The Ph.D. dissertation committee must consist of five members, including at least three from the Department of Chemical Engineering and at least one from outside the Department. A regular faculty member of the Department must be chosen to act as Chair of the committee.

### RESEARCH FACILITIES

Chemical Engineering research facilities are extensive and modern. Nearly all research equipment is interfaced to microcomputer systems for automated data collection, monitoring, and control. A full description of Chemical Engineering research facilities can be found in the Graduate School section of this *Catalog*.

## CIVIL, ENVIRONMENTAL, AND ARCHITECTURAL ENGINEERING

### BACHELOR'S DEGREE REQUIREMENTS

This curriculum requires the student to obtain a background in the humanities, a broad knowledge of the basic engineering sciences of chemistry, mathematics (including differential equations), physics, mechanics (including fluid mechanics and soil mechanics), electrical engineering, and thermodynamics. Social-humanistic hours may be devoted to the social sciences, the humanities, or to approved communications courses, with not more than half of the hours from any one of the three areas.

Advanced technical courses are elected in the senior year. Random selection is not allowed, the objective being to permit a graduate to enter the engineering profession with a firm groundwork in fundamental engineering science and adequate knowledge in specialized fields. Students should consult with their advisors.

Students interested in pursuing a B.S. degree in Business in addition to the B.S. (C.E.) degree should be prepared to spend at least 3 additional semesters. A faculty advisor should be consulted in the student's freshman year so that social sciences and humanities courses required of Business students can be taken.

Academically qualified students may want to consider working toward the Master of Business Administration

degree upon completion of the baccalaureate in Engineering as an alternative to a B.S. in Business.

A student interested in a premedical option should consult with an advisor and the Department Chair at the earliest possible time in order to make proper plans for an acceptable program (see Premedical Option).

### Curriculum for B.S. (C.E.)

Freshman Year	
<i>Fall Semester</i>	<i>Semester Hours</i>
APPM 1350 Calculus for Engineers 1	4
PHYS 1110 General Physics	4
CVEN 1306 Introduction to Civil Engineering	3
GEEN 1017 Engineering Drawing	2
GEEN 1300 Introduction to Engineering Computing	3
	<hr/> 16
<i>Spring Semester</i>	
APPM 1360 Calculus for Engineers 2	4
PHYS 1120 General Physics	4
PHYS 1140 Experimental Physics	1
CHEM 1111 General Chemistry	5
Humanities or social science elective	3
	<hr/> 17
Sophomore Year	
<i>Fall Semester</i>	
APPM 2350 Calculus for Engineers 3	4
CVEN 2121 Analytical Mechanics 1	3
CVEN 2012 Plane Surveying	3
AREN 2020 Energy Fundamentals	3
Humanities or social science elective	3
	<hr/> 16
<i>Spring Semester</i>	
APPM 2360 Introduction to Linear Algebra and Differential Equations	3
CVEN 3121 Mechanics of Materials	3
CVEN 3313 Theoretical Fluid Mechanics	3
CVEN 3698 Engineering Geology	3
Humanities or social science elective	3
	<hr/> 15
Junior Year	
<i>Fall Semester</i>	
CVEN 3141 Engineering Materials Laboratory (Note 1)	(2)
CVEN 3323 Applied Fluid Mechanics	3
CVEN 3414 Introduction to Environmental Engineering	3
CVEN 3505 Structural Analysis	3
CVEN 3708 Geotechnical Engineering	3
Humanities or social science elective	3
	<hr/> 15 (17)
<i>Spring Semester</i>	
CVEN 3454 Engineering Laboratory—Water Quality Materials (Note 1) or CVEN 3728 Engineering Laboratory—Geotechnical	(2)
CVEN 3246 Introduction to Construction	3
CVEN 3424 Water and Wastewater Treatment	3
CVEN 3515 Structural Design 1	3
CVEN 3718 Geotechnical Engineering 2	3
ECEN 3030 Electronics and Electric Circuits	3
	<hr/> 15 (17)
Senior Year	
<i>Fall Semester</i>	
CVEN 3217 Civil Engineering Systems	3
CVEN 3111 Analytical Mechanics 2	3
CVEN 4XXX Capstone course (Note 2)	3
Technical electives (Note 3)	4
Humanities or social science elective	3
	<hr/> 16
<i>Spring Semester</i>	
CVEN 3602 Transportation Engineering	3
CVEN 4919 Senior Seminar	1
CVEN 4XXX Capstone course (Note 2) or Technical Elective	3
Technical electives (Note 3)	6
Humanities or social science elective	3
	<hr/> 16

Minimum hours for degree . . . . . 128

### C.E. Curricula Notes

1. Either CVEN 3141, 3454, or 3728 will fulfill lab requirement.
2. The capstone course requirement may be satisfied by CVEN 4424, 4545, or 4555 and may be taken in fall or spring, since each of these courses will normally be offered only once per academic year.
3. Not more than 6 hours of technical electives may be taken outside the Department.

### GRADUATE DEGREE PROGRAMS

A pamphlet on the requirements for graduate study in civil, environmental, and architectural engineering is available from the departmental office.

The Graduate Record Examination, consisting of the aptitude tests and advanced test in engineering, is used in the evaluation of candidates and competition for University and other fellowships. Therefore, students who wish to be considered for fellowships are advised to take this examination prior to their arrival on campus. There is no other qualifying examination required by the Department for the Master of Science degree.

The Department offers the degrees Master of Science, Master of Engineering, and Doctor of Philosophy with study emphasis in six major areas: building energy systems, construction engineering and management, environmental engineering, geotechnical engineering, structural engineering and structural mechanics, and water resources engineering. A major in Transportation and Planning is available through the Denver Campus. Students majoring in certain areas of graduate study may be required to take courses at the Denver Campus.

### Master of Science Degree

Requirements for this master's degree can be fulfilled in two ways. Under Plan I the candidate presents 24 semester hours of course work including thesis, and under Plan II, 30 credits of course work are required.

### Master of Engineering Degree

Requirements for this professionally-oriented degree are available from the Office of the Dean of Engineering.

### Doctor of Philosophy Degree

This degree requires a minimum of 30 semester hours of graduate-level (5000 or above) work, the last 20 of which must be taken at this University. The doctoral dissertation likewise requires 30 semester hours. The applicant for this degree will normally have completed a master's degree in civil engineering or closely related field and

must demonstrate the capability for both rigorous academic accomplishments and independent research.

**RESEARCH INTERESTS AND FACILITIES**

The Department has a wide variety of research facilities including a 10g-ton centrifuge for geotechnical and structural model studies and a large 400g-ton geotechnical centrifuge for use in model testing. Also available are numerous computing facilities, extensive structural mechanics and geotechnical capabilities, and hydraulics and water resources research laboratories including excellent facilities in water quality and environmental engineering. New programs in construction management and building energy are well supported.

Current research covers such topics as water and wastewater treatment, alpine hydrology, hydraulic research, land treatment, rapid infiltration, and activated sludge processes. Cost prediction in construction, construction management, energy conservation in buildings, solar applications, lighting systems, and wind engineering are included. Also, offshore structures, centrifugal modeling, excavations, tunnelling, and rock and soil mechanics are being studied. In structures, research includes focus on buckling, finite element techniques, reinforced concrete, earthquake behavior, masonry structures, and prestressed concrete.

**COMPUTER SCIENCE**

The Department of Computer Science, in cooperation with other departments in the University, offers a wide range of opportunities for students interested in computing. The Computer Science Department itself offers a B.S. degree in Computer Science. This program is designed to prepare students for careers as computer specialists and for graduate study in computer science. An interdisciplinary B.A. program in applied computer science is offered for students interested primarily in the uses of computing in another field such as economics or psychology. Students interested in this program should contact the Office of the Dean of the College of Arts and Sciences. Computer options are also offered by several departments, including Electrical and Computing Engineering, Business, and Mathematics; students interested in these programs should contact the appropriate department.

The Computer Science Department also offers M.S. and Ph.D. degrees. See Graduate Requirements.

**BACHELOR'S DEGREE REQUIREMENTS**

Students electing to pursue the B.S. degree are required to master the central areas of computer science, including software design and construction, algorithm design and analysis, computer systems, programming languages and language processors, theoretical foundations, and numerical computation. A firm foundation for the scientific study of computing is laid in the freshman year, with detailed studies of the most important areas occupying the sophomore and junior years. Electrical engineering courses early in the curriculum provide essential knowledge of computer hardware. A two-semester sequence in the senior year involves students in all aspects of a major software development project, from requirements analysis to finished product. Students can round out their computer science backgrounds by selecting from a wide variety of electives in such areas as artificial intelligence, graphics, and data base systems. Students should consult their academic advisors before choosing electives.

It is also vital for the socially responsible computer professional to have a broad background in the liberal arts. Consequently, students are encouraged to pursue interests in nontechnical as well as technical areas outside of computer science. Twenty-four hours of courses in the humanities and social sciences are required, including literature and composition. Competence in a foreign language at the second semester college level is required. The program also includes a broad sampling of mathematics and basic science courses.

A minimum of 128 hours is required for graduation. The requirements of the College of Engineering and Applied Science must be satisfied for graduation.

**Curriculum for B.S. in Computer Science (Note 1)**

<b>Freshman Year</b>	
<i>Fall Semester</i>	<i>Semester Hours</i>
CSCI 1300 Introduction to Computing for Majors (Note 2) . . . . .	4
ECEN 2570 Logic Circuits . . . . .	3
APPM 1350 Calculus for Engineers 1 . . . . .	4
Humanities or social science elective (usually ENGL 2600, Note 3) . . . . .	3
Elective . . . . .	3
	<hr/> 17
<i>Spring Semester</i>	
CSCI 1404 Discrete Methods for Computer Science (Note 2) . . . . .	2
Science 1 (Note 4) . . . . .	4
ECEN 1330 Logic Lab . . . . .	1
APPM 1360 Calculus for Engineers 2 . . . . .	4
Humanities or social science elective (usually ENGL 2610, Note 3) . . . . .	3
Humanities or social science elective . . . . .	3
	<hr/> 17

<b>Sophomore Year</b>	
<i>Fall Semester</i>	<i>Semester Hours</i>
CSCI 2310 Fundamentals of Computer Science 1 . . . . .	4
ECEN 2220 Microcomputer Architecture and Programming . . . . .	3
Science 2 (Note 4) . . . . .	4
APPM 2350 Calculus for Engineers 3 . . . . .	4
	<hr/> 15

<i>Spring Semester</i>	
CSCI 2320 Fundamentals of Computer Science 2 . . . . .	4
CSCI 2555 Programming Languages . . . . .	3
MATH 3130 Introduction to Linear Algebra (Note 2) . . . . .	3
Science elective . . . . .	3
Humanities or social science elective (Note 3) . . . . .	3
	<hr/> 16

<b>Junior Year</b>	
<i>Fall Semester</i>	<i>Semester Hours</i>
CSCI 3753 Systems . . . . .	3
CSCI 3656 Numerical Computation 1 . . . . .	3
MATH 3140 Introduction to Modern Algebra . . . . .	3
Science elective . . . . .	3
English Composition (Note 5) . . . . .	3
	<hr/> 15

<i>Spring Semester</i>	
CSCI/ECEN 4593 Computer Organization . . . . .	3
CSCI 3434 Computer Science Theory 1 . . . . .	3
Science elective . . . . .	3
Humanities or social science elective . . . . .	3
Elective . . . . .	3
	<hr/> 15

<b>Senior Year</b>	
<i>Fall Semester</i>	<i>Semester Hours</i>
CSCI 4555 Introduction to Compiler Construction . . . . .	3
CSCI 4208 Software Development 1 . . . . .	4
MCEN 3140 Engineering Statistics (Note 6) . . . . .	3
Humanities or social science elective . . . . .	3
Elective . . . . .	4
	<hr/> 17

<i>Spring Semester</i>	
CSCI 4218 Software Development 2 . . . . .	4
CSCI Elective (Notes 7 and 8) . . . . .	3
Humanities or social science elective . . . . .	3
Electives . . . . .	6
	<hr/> 16

**C.S. Curriculum Notes**

1. Some of these courses were under development at press time, and descriptions are therefore not printed in this *Catalog*. An updated list of courses which have been approved, along with catalog descriptions, may be obtained from the C.S. Department.
2. A grade of B or better in CSCI 1200 may replace CSCI 1300, but CSCI 1300 is preferable. A grade of B or better in CSCI 2204 may replace CSCI 1404, but CSCI 1404 is preferable. MATH 3150 or APPM 2360 may replace MATH 3130.
3. Specific requirements for humanities and social science electives are available from the C.S. department. These requirements include a two-semester literature sequence, usually ENGL 2600-2610, taken in the freshman year. Students must also demonstrate a proficiency in a foreign language equivalent to two college-level semesters.
4. The courses listed as Science 1 and Science 2 must be a two-semester introductory sequence in a laboratory science.
5. This must be a course emphasizing expository writing by the student.
6. MATH 4570 (Statistical Methods in Research) is an acceptable substitute for MCEN 3140.
7. This course may be any upper-division undergraduate course with the exception of CSCI 3245, 3263, 4208, and 4218. Graduate courses approved by an advisor may also satisfy the elective.
8. Students who intend to pursue graduate degrees are strongly encouraged to take CSCI 3444 (Computer Science Theory 2) and MATH 4710 (Introduction to Mathematical Logic).

## GRADUATE DEGREE PROGRAMS

### General Admission Requirements

Graduate students should consider a major in Computer Science if they are primarily interested in the general aspects of computational processes, both theoretical and practical, e.g., theory of algorithms, methods by which algorithms are implemented on a computer, and information structures. A student who is primarily interested in the results of a computer process and its relation to a particular area of application should major in another field and consider a minor in Computer Science.

Applicants will be favorably considered for graduate study in computer science if they hold at least a bachelor's degree or its equivalent from an institution comparable to the University of Colorado. They should have considerable programming experience and sufficient mathematical maturity to understand pure mathematics courses.

The applicant should satisfy the following requirements for mathematics courses: at least three semesters of university-level calculus and at least two one-semester courses of a mathematical nature beyond calculus, for example, advanced calculus, differential equations, linear algebra, probability, statistics, combinatorial analysis, etc. These courses need not be in a mathematics department; however, they should require mathematical maturity expected of an upper-level mathematics undergraduate.

In computer science, the applicant should offer the equivalent of the following University of Colorado courses (the contents of which are outlined later in this *Catalog*): CSCI 1300, 1404, 2310, 2320, 2555, 3656, and ECEN 2220. Students who lack this computer science background but who have exceptionally strong credentials in another field should contact the Department for individual consideration.

Applicants should have a grade point average of at least 3.00 (on a scale of 4.00). Applicants having the listed qualifications will, if accepted, be classified as regular degree students. Applicants with an average below 3.00 and above 2.75 and/or lacking certain of the prerequisites, as indicated, will be considered on an individual basis. Students accepted in this category will be classified as provisional degree students.

These requirements apply to both the M.S. and Ph.D. programs. Applicants should be aware that admission is competitive, and meeting the requirements does not guarantee admission. Admission to the Ph.D. program is especially competitive, and successful applicants

will in general have records considerably stronger in breadth and quality than these minimum standards suggest.

Ph.D. applicants are encouraged to submit scores for the aptitude portion of the Graduate Record Examination, but these scores are not required unless the applicant wishes to be considered for a fellowship award. Any applicant whose grade point average is marginal, or whose previous work was undertaken at an institution lacking a strong national reputation, is strongly urged to submit scores.

Financial aid is available to Ph.D. students in the form of teaching and research assistantships and fellowships. Unfortunately, aid is only rarely available for M.S. students.

Applications for the M.S. program should be received by April 1 for Fall admission and by October 1 for Spring admission. Ph.D. applications should be received by January 15 for Fall and October 1 for Spring admission. Normally fewer students can be admitted in Spring than Fall.

### Master's Degree

Admission requirements for this program are given above under General Admission Requirements. Plan I or Plan II may be followed. The requirements for Plan I (thesis) are as stated under the general requirements of the Graduate School in this *Catalog*. Students in Plan I and Plan II must pass a written comprehensive examination. Students in Plan I are examined orally on their theses. Under Plan II (no thesis) a student must take a minimum of 6 hours of graduate seminars with a grade of B or better. Under Plan I or Plan II a student may take 6 hours in a minor field. Students are expected to work out an acceptable program of course work with their advisors. Specific courses depend on the student's background and field of specialization.

### Doctor of Philosophy Degree

Admission requirements for this program are given above under General Admission Requirements. Students in this program must pass preliminary examinations in several subareas of computer science to be eligible for admission to Ph.D. candidacy. The language requirement is as stated under the General Requirements of the Graduate School. A minimum of 30 semester hours in courses numbered 5000 or above is required for the degree, but the number of hours in formal courses will ordinarily be greater than that total. Specific courses depend on the student's background and field of specialization. Following the formal course

work, a student must pass a comprehensive examination aimed primarily at determining whether the student is adequately prepared to begin doctoral thesis work. Finally, students who have completed a minimum of 30 semester hours are expected to prepare a doctoral thesis based on original research in the field of computer science. After the thesis has been completed, an oral final examination on the thesis and related topics will be conducted. The examination will be conducted by a committee of at least five graduate faculty members.

Further details on either the M.S. or Ph.D. degree programs are available in the departmental office.

## DEPARTMENT COMPUTING FACILITY

The Computer Science Department has a number of computers on the Engineering Research Network (10 Mbit Ethernet running Berkeley Unix) as detailed in the table below. In addition, departmental instruction is based on a network of 30 AT&T 3B2 computers, approximately 150 PC/ATs, 20 Macintoshes, a Sequent Balance 8000, a UNIX Vax 11/785, and timesharing access to the Computing Center's Vax VMS cluster. These machines, together with associated peripherals, sophisticated output devices including several laser printers and x-y plotters, and terminals provide ready access for graduate students and faculty.

Computers	Use
VAX 11/785	AI research and teaching
VAX 11/780	general timesharing (faculty)
Pyramid P90x	general timesharing (students)
Sun <sup>3</sup> workstations:	
CER subnet (9 nodes)	dedicated experiments user interface design projects parallel algorithm and language design projects
OT subnet (21 nodes)	general usage (faculty and students)
systems subnet (5 nodes)	systems and networking research
compiler subnet (6 nodes, ECE Department)	compiler tools research
numerical subnet (5 nodes, ME Department)	space structures optimization subnet
8 Symbolics workstations	AI research
30 HP Bobcat workstations	AI instruction
20 node Encore Multimax	parallel algorithms research parallel language research
32 node Intel Hypercube	general timesharing parallel algorithms research

## ELECTRICAL AND COMPUTER ENGINEERING

Note: Because of the rapidly changing technology in the field of electrical engineering, the curriculum is constantly being updated. Please contact the Electrical and Computer Engineering Office for a copy of the latest "Help Guide."

### BACHELOR'S DEGREE REQUIREMENTS

The Department of Electrical and Computer Engineering offers students a wide range of elective choices, including the following specialty areas:

Computer architecture including real time and parallel systems, software engineering including portable compiler construction, microprocessor-based instrument design, and VLSI computer-aided design  
Electromagnetic fields associated with microwaves, antennas and radio propagation  
Signal processing, communications and communications systems  
Electrical devices, from rotating machines to lasers  
Power equipment and systems  
Solid-state devices, solid-state materials, integrated circuit fabrication techniques  
Modeling of systems related to electrical engineering  
Bioelectronics research for selected undergraduate students  
Optoelectronics courses are available to undergraduates in optical electronics, optoelectronic system design, and holography

In just four years it is impossible to study all the areas in detail. Qualified students may specialize further by pursuing a graduate program or by taking continuing education courses after completing the B.S. degree requirements. A graduating senior with high scholarship can finish a master's degree in electrical engineering with about one additional full year of work at any of the nation's major universities.

Principles of computing, physics, chemistry, mathematics, logic, electric circuits, and electronics augmented with laboratory experience form the core of the first two years of study. The third year includes additional work in electronic circuits, solid-state devices, electromagnetic and transmission theory, electrical machines and transformers, thermodynamics, and mechanics. During this year, those students desiring to specialize in computer engineering may elect the Computer Engineering degree program. This program requires additional courses in software and hardware and has a special emphasis on computer languages and the mathematics courses necessary for this field. In the summer between the junior and senior years, many students will have an opportunity to put their knowledge to work with jobs in industry or on research projects being conducted at the University. In the senior year students may elect courses from a wide

variety of subject areas to fit their particular interests. Practical experience in well-equipped laboratories augments the theoretical approach throughout the program.

Students are encouraged to develop interests outside their electrical engineering specialties by enrolling in non-technical courses in other colleges of the University. They are urged to participate in College and University activities as well as meetings of their technical societies.

A minimum of 128 hours must be completed for graduation with either the degree B.S. in EE or B.S. in EE and CS.

Qualified transfer students can usually join the program without appreciable loss of time or credit. For example, one who has completed the required mathematics and physics of the freshman and sophomore years and who has a total of about 68 credit hours acceptable to the Department can usually complete the program in about four semesters.

### Standard Curriculum for B.S. (EE)

The regular ECE curriculum provides a broad background enhanced by a wide range of elective subjects in the senior year. Part of the requirement may be fulfilled through courses in other branches of engineering approved by the student's advisor. Although many students avail themselves of this broadly based program, those who have specific interests in computer technology, business, or a career in medicine may wish to elect one of the programs listed below.

### Computer Engineering Degree Program for B.S. (EE and CS)

This program, leading to the degree B.S. in EE and CS, is elected by petition during the junior year and covers both hardware and software aspects of computer system design. It is directed toward students whose major interests are in the computer itself and in a broad range of applications. The program leads to a B.S. (EE and CS) and can be extended for one year to obtain an M.S. in either Computer Science or Electrical Engineering.

The details of the program are listed below. Additional information may be obtained from the departmental office. This curriculum is considerably more specific than the general ECE program and includes courses in scientific application of computers, logic structure of computers, and assembly language programming. Operating experience on

departmental computers is an important adjunct to this program.

For other computer-related programs, see the Computer Science listings.

### Premedical and Bioengineering Programs in Electrical and Computer Engineering

Within a four-year program it is possible for a student majoring in Electrical and Computer Engineering also to fulfill requirements for entry to medical school or to pursue a bioengineering emphasis. In either case, technical elective credit for appropriate courses in biology and chemistry will be granted if at least two ECE courses in the bioengineering category are also elected by the student. The two programs do, however, differ in terms of total credit hours, content and course sequencing.

Students interested in medical careers can complete their premedical requirements in the ECE department by adding three additional chemistry and two biology courses to their programs. All but two of these courses may be used as technical electives in the ECE program, resulting in a probable minimum requirement of 136 credit hours. Premedical ECE students are advised to begin the chemistry sequence with CHEM 1111 (instead of CHEN 2100) in the freshman or sophomore year so that all premedical courses can be completed in time for the MCAT tests in the junior year. To do this, some of the sophomore ECE requirements may have to be deferred to the junior year. Further information concerning course programs that fulfill both ECE and premed requirements can be obtained from the departmental advisor.

The undergraduate ECE course of study in bioengineering also incorporates course work in biology and chemistry, but it is tailored to fit the standard 128-credit-hour ECE curriculum and does not require a rearrangement of the required ECE course sequence. It is primarily a technical elective emphasis area which includes bioengineering courses in ECE and other engineering and biological science departments. The bioengineering emphasis area is provided for students interested in the application of engineering techniques to biomedical problems rather than as an entrance to a medical career. Students who initially pursue the premedical course of study can easily change to bioengineering, but the reverse will be more difficult.

**Combined Business Degree Program**

A five-year combined program in Electrical Engineering and Business leading to the degrees B.S.(EE) or B.S. (EE and CS) and B.S.(Bus.) is available for those interested in these areas. Students electing this program should enroll for ECON 2010 and 2020 as two of their humanities or social science electives and should obtain advice from the College of Business about the necessary Business courses early in their programs.

**Combined Music Degree Program**

A five-year combined program in Electrical Engineering and Music leading to the degrees B.S. (EE) or B.S. (EE and CS) and B.A. in Music is available for those interested in these areas. Students interested in this program should obtain advice from the College of Music regarding the necessary music courses early in their programs.

**Curriculum for B.S. (EE)**

Freshman Year	
<i>Fall Semester</i>	<i>Semester Hours</i>
APPM 1350 Calculus for Engineers 1	4
ECEN 1300 Logic Circuits	3
CSCI 1200 Introduction to Programming 1 (Note 3)	3
Humanities or social science elective (Note 2)	6
	<hr/> 16
<i>Spring Semester</i>	
ECEN 1330 Logic Laboratory	1
APPM 1360 Calculus for Engineers 2	4
PHYS 1110 General Physics	4
CSCI 1210 Introduction to Programming 2	4
Humanities or social science elective (Note 2)	3
ECEN 1340 Technical Writing (Note 1)	1
	<hr/> 17
Sophomore Year	
<i>Fall Semester</i>	
APPM 2350 Calculus for Engineers 3	4
PHYS 1140 Experimental Physics	1
CHEN 2100 Physical and Chemical Properties of Materials	4
ECEN 2150 Circuits/Electronics 1	4
ECEN 2550 Circuits/Electronics Laboratory 1	1
ECEN 2220 Microcomputer Architecture and Programming	3
	<hr/> 17
<i>Spring Semester</i>	
APPM 2360 Introduction to Linear Algebra and Differential Equations (Note 4)	3
ECEN 3130 Electromagnetic Fields and Waves	3
ECEN 2160 Circuits/Electronics 2	4
ECEN 2560 Circuits/Electronics Laboratory 2	1
ECEN 2230 Microprocessor Laboratory	1
ECEN 3810 Introduction to Probability Theory	3
	<hr/> 15
Junior Year	
<i>Fall Semester</i>	
ECEN 3230 Circuits/Electronics 3	3
ECEN 3530 Circuits/Electronics Lab 3	1
PHYS 2130 General Physics	3
Humanities or social science elective (Note 2)	3
ECEN electives (Note 6)	6
	<hr/> 16

<i>Spring Semester</i>	
Engineering Sciences (Note 5)	3
Technical electives (Note 8)	6
ECEN electives (Note 6)	6
	<hr/> 15

Senior Year	
<i>Fall Semester</i>	
Humanities or social science elective (Note 2)	3
Technical electives (Note 8)	13
	<hr/> 16

<i>Spring Semester</i>	
Technical electives (Note 8)	9
Humanities or social science electives (Note 2)	6
	<hr/> 15

**Curriculum for B.S. (EE and CS) Option\***

Junior Year	
<i>Fall Semester</i>	
ECEN 3230 Circuits/Electronics 3	3
ECEN 3530 Circuits/Electronics Lab 3	1
ECEN 4703 Switching and Finite Automata	3
Humanities or social science electives (Note 2)	3
ECEN electives (Note 7)	6/7
	<hr/> 16/17

<i>Spring Semester</i>	
CSCI 2250 Data Structures and Algorithms	3
PHYS 2130 General Physics	3
ECEN/CSCI 4593 Computer Organization	3
ECEN electives (Note 7)	3
Humanities or social science elective (Note 2)	3
	<hr/> 15

Senior Year	
<i>Fall Semester</i>	
ECEN 4603 Computer Laboratory**	1
Technical electives	12
CSCI 3245 Survey of Programming Languages	3
	<hr/> 16

<i>Spring Semester</i>	
Technical electives	8/9
Humanities or social science electives (Note 2)	6
	<hr/> 14/15

Minimum total hours for degree 128  
 \*Election will be made during the first semester of the junior year.  
 \*\*ECEN 4573 is an acceptable substitute for ECEN 4603.

**ECE and ECE/CS Curricula Notes**

1. ECEN 1340 (Technical Writing) is a required course for freshmen in Electrical Engineering.
2. Humanities or social science elective courses are in general *people-related* (social sciences, humanities and languages) as opposed to technical electives which are *thing-related* (natural sciences and business).  
 Of the 21 hours of required humanities or social science courses, at least six must be at the upper-division level (3000 or 4000 level). A maximum of three hours will be accepted for skill courses such as beginning foreign languages, composition, communication skills, or ROTC. One additional foreign language course may be permitted by petition.
3. CSCI 1200 (Introduction to Programming 1) and CSCI 1210 (Introduction to Programming 2) are taught in Pascal and may be repetition of material covered in other courses. If this seems to be the case, the student should request a waiver of the course in question from the student's advisor before or during the first week of the semester in which the student is registered for the course.
4. Students who have been admitted to the Mathematics Honors Program will substitute APPM 2370 and MATH 3150 for APPM 2350 and APPM 2360, respectively.
5. The engineering science course should be selected from ECEN 3020 (Statistical Thermodynamics), PHYS 3210 (Analytical Mechanics), or CVEN 3101 (Applied Mechanics).

6. ECEN electives for the EE degree include a minimum of four of the following five courses: ECEN 3320 (Semiconductor Devices), ECEN 3140 (Electromagnetic Waves and Transmission), ECEN 3170 (Energy Conversion 1), ECEN 3310 (Linear Systems), ECEN 4703 (Switching and Finite Automata).
7. ECEN electives for the EE/CS program include a minimum of three of the following four courses: ECEN 3320 (Semiconductor Devices), ECEN 3140 (Electromagnetic Waves and Transmission), ECEN 3170 (Energy Conversion 1), ECEN 3310 (Linear Systems).
8. The senior year technical electives provide for breadth in the program and usually include courses in electrical engineering at the 3000, 4000 or 5000 levels. Courses in mathematics, physics, and other engineering areas at the same levels may be included with the permission of the student's advisor. A minimum grade point average of 2.85 is required for enrollment in any 5000-level course, and courses above this level are open to qualified graduate students only. The approval of the student's undergraduate advisor is required for all technical electives.

Electrical engineering technical electives are designated in the following 10 subject areas: Bioengineering (B), Communications (C), Computer Systems, and Digital (CP), Optics (O), VLSI Computer Aided Design Methods (V), Electronics (E), Fields (F), Materials (SS), Power (P), and Systems (S). To ensure a minimum breadth of studies, each senior's program must include at least 9 semester hours of electrical engineering theory courses distributed in three different areas and a minimum of three electrical engineering laboratory courses in three different areas at the 4000 level. In addition to the required courses for the CS Option, students must have two theory courses and two laboratories from areas other than CP.

Only one independent study course (ECEN 4840) may be applied toward the laboratory distribution requirement. Courses at the 4000 and 5000 levels without a letter designation may not be used to satisfy the distribution requirement.

**GRADUATE DEGREE PROGRAMS**

Electrical Engineering graduate programs leading to M.S. and Ph.D. degrees include the areas of biomedical engineering, materials and quantum electronics, information systems, energy conversion and systems, control theory, optics and optoelectronics, fields and propagation, VLSI/design automation, digital signal processing, computers, and remote sensing. Close cooperation with the National Bureau of Standards and industrial organizations in the Boulder area enhances the graduate effort and both teaching and research capabilities are strengthened by the addition of adjoint faculty members from these institutions.

**Requirements for Advanced Degrees**

An undergraduate grade point average of 3.00 or above is required for entrance into the graduate program. Information and application forms may be obtained by writing to the Director of Graduate Admissions, Department of Electrical and Computer Engineering, Campus Box 425, University of Colorado at Boulder, Boulder, Colorado, 80309-0425. Qualified students in their senior



year and within 18 hours of graduation may be admitted into the graduate program and apply graduate-level credits above the 128-semester-hour B.S. requirement toward an advanced degree. Students formally accepted into the graduate program will be assigned to program advisors.

Master's students are expected to include two semesters of graduate seminar (without credit) in their programs. Students may choose either an M.S. thesis under Plan I, or a non-thesis option of 30 hours under Plan II.

All students accepted into the Ph.D. program must take the Ph.D. preliminary examination the next time it is offered (usually in January). They are required to pass the examination in the areas of mathematics and their specialty from an approved list.

The Doctor of Philosophy is the highest degree awarded by the Electrical and Computer Engineering Department. The minimum requirements for admission include a 3.40 undergraduate GPA, good GRE scores, and demonstration of research ability. Exceptional students can be directly admitted into the Ph.D. program with a B.S. degree.

The Department is involved in an interdisciplinary study leading to the M.S. degree in Telecommunications, details of which are included under Telecommunications in this *Catalog*.

The Department of Electrical and Computer Engineering participates in the Graduate Program in Geophysics. For more information, see the Graduate School section in this *Catalog*.

## RESEARCH AND INSTRUCTIONAL EQUIPMENT

The Electrical and Computer Engineering Department special equipment and facilities include a class 1000 clean room facility for epitaxial growth and fabrication of microwave and optical devices; high-vacuum and vacuum deposition equipment for thin-films research; an integrated circuits laboratory; ion implantation equipment; crystal growing facilities; a modern systems laboratory; undergraduate laboratories in circuits, electronics, and energy conversion; a holography and optics laboratory; numerous special purpose computers; mini- and microprocessors and a computer laboratory; a roof-mounted antenna range; an anechoic chamber for studying propagation effects at microwave frequencies; a special microscope for laser manipulation of microorganisms, *in vivo*; a bio-microwave laboratory and a growing array of other bioengineering research apparatus.

The Electrical and Computer Engineering Department has several computers on the Engineering Research Computing Facility Network (a 10 Mbit Ethernet), primarily dedicated to faculty and student research projects. ECE machines on the network include an IBM 4381, a Pyramid P90-X, an AT&T 3B15, a Harris H800, two Metheus Graphics workstations, and a software engineering sub-net consisting of several Sun-3 workstations. Through the network, students can access a wide variety of printers, plotters, and graphics terminals. A limited number of undergraduates also use the systems for VLSI courses and independent study projects. The Harris H800 system is used by the radar remote sensing group and the signal processing group. The real-time computer laboratory has five INTEL 310/286 computers. Two Hewlett Packard 9000 minicomputers are used in conjunction with HP development stations and micros to support undergraduate microprocessor laboratories. In addition, students have access to several supercomputers, including high-speeds links to the CYBER 205 at Colorado State University in Ft. Collins to the CYBER 205 at the John von Neumann Center in Princeton, NJ, and to the CRAY computers at the National Center for Atmospheric Research, located in Boulder.

## Career Opportunities

A degree in Electrical Engineering or Electrical and Computer Engineering provides the opportunity to enter the profession of engineering and to engage in a variety of practice areas such as teaching and research in a university; research in development of new electrical or electronic devices, instruments, or products; design of equipment or systems; production and quality control of electrical products for private industry or government and sales or management for a private firm or branch of government. Specialties within electrical engineering include the design of computer interfaces and computer software; electromagnetic fields and optics, which are basic to radio, television, and related systems; communication theory and signal processing; electrical machinery; solid-state, integrated-circuit, and electron devices; energy and power; control systems and others.

## ENGINEERING PHYSICS

### BACHELOR'S DEGREE REQUIREMENTS

The Engineering Physics curriculum gives students a thorough foundation in

the physical principles underlying most of engineering. The large number of engineering electives that may be incorporated in the curriculum make it possible for the student to prepare for professional work or graduate school in a wide variety of fields. Because the program is particularly flexible, students should be aware that proper preparation for their professional field will require careful selection of engineering electives. Students are urged to prepare, in consultation with a departmental advisor, a coherent plan of courses to meet their professional objectives.

During the freshman and sophomore years, the student must attain a thorough training in mathematics and a grounding in fundamental methods and principles of physical sciences.

During the junior and senior years the work in physics is extended to provide a comprehensive knowledge of various branches of physics such as nuclear physics, atomic physics, electronics, thermodynamics, mechanics, electricity, and magnetism. Individual initiative and resourcefulness are stressed.

For purposes of federal civil service requirements this degree is an engineering degree from an accredited college of engineering. Students who plan to become registered professional engineers should check the requirements for registration in their state before choosing their engineering electives.

It is recommended that students preparing for graduate school also prepare for its foreign language requirement as part of their undergraduate curriculum.

In order to earn a bachelor's degree in Engineering Physics from the Department of Physics, a student must, in addition to any other requirements, successfully complete 30 semester hours of courses on the Boulder Campus, including 12 semester hours in upper-division physics courses. A student must also achieve an overall physics course grade point average of at least 2.00.

### Curriculum for B.S. (EPhys) (Note 1)

Freshman Year	Semester Hours
<i>Fall Semester</i>	
APPM 1350 Calculus for Engineers 1	4
GEEN 1017 Engineering Drawing 1	2
Humanities or social science electives (Note 2)	6
PHYS 1110 General Physics	4
	16
<i>Spring Semester</i>	
APPM 1360 Calculus for Engineers 2	4
Humanities or social science elective (Note 2)	3
PHYS 1120 General Physics	4
PHYS 1140 Experimental Physics	1
CSCI 1200 Introduction to Programming 1	3
	15

Sophomore Year	
<i>Fall Semester</i>	
APPM 2350 Calculus for Engineers 3	4
Electives (Note 3)	3
PHYS 2130 General Physics	3
PHYS 2150 Experimental Physics	1
CHEM 1111 General Chemistry (Note 4)	5
	16
<i>Spring Semester</i>	
APPM 2360 Introduction to Linear Algebra and Differential Equations (Note 5)	3
CHEM 1131 General Chemistry (Note 4)	5
Humanities or social science elective (Note 2)	3
PHYS 2140 Methods of Theoretical Physics	3
Electives (Note 3)	3
	17
Junior Year	
<i>Fall Semester</i>	
Upper-division mathematics elective (Note 5)	3
PHYS 3330 Junior Laboratory	2
PHYS 3210 Analytical Mechanics	3
PHYS 3310 Principles of Electricity and Magnetism 1	3
Humanities or social science elective (Note 2)	3
Electives (Note 3)	2
	16
<i>Spring Semester</i>	
PHYS 3340 Junior Laboratory	2
PHYS 3220 Quantum Mechanics	3
PHYS 3320 Principles of Electricity and Magnetism 2	3
PHYS 4230 Thermodynamics and Statistical Mechanics	3
Electives (Note 3)	5
	16
Senior Year	
<i>Fall Semester</i>	
PHYS 4410 Atomic and Nuclear Physics	3
PHYS 4430 Senior Laboratory	2
Electives (Note 3)	8
Humanities or social science elective (Note 2)	3
	16
<i>Spring Semester</i>	
PHYS 4420 Atomic and Nuclear Physics	3
PHYS 4440 Senior Laboratory (Note 6)	2
Electives (Note 3)	11
	16

**EPhys Curriculum Notes**

- The minimum total number of hours for the degree is 128. Approved ROTC courses may be substituted for a maximum of 6 hours of electives.
- A total of 18 semester hours in social-humanistic courses is required from the following three areas. Students should take no more than half of these electives from any one of the three categories listed below.
  - Humanities.* Any course listed in the Humanities section of the old Arts and Sciences *College List*, except those under Communication Disorders and Speech Science or University Writing Program (see category c for writing courses).
  - Social Science.* Any course listed in the Social Science section of the old Arts and Sciences *College List*, except those listed under Linguistics. Courses on the history of science listed under Philosophy in the Natural Science section of the *College List* are included in this category.
  - Language.* Any lower-division reading or conversation course in a language other than the student's native tongue. Any course in expository writing under University Writing Program in the Humanities section of the old *College List*.
- Required and elective engineering courses excluding mathematics, physics, and computer science must total 22 semester hours. They must include at least one upper-division laboratory course.
- CHEM 1151-1171 may replace CHEM 1111-1131. The sequence: MATH 3130 Introduction to Linear Algebra, and MATH 4430 Ordinary Differential Equations, may be substituted for APPM 2360 and the upper-division MATH elective, provided that

they will be completed in time to meet the prerequisite requirement for PHYS 3210.  
6. OR PHYS 4340, 4510, 4530, 4610, 4620, 5010, 5030, 5040, 5150, 5210, 5250, and 5770.

**MECHANICAL ENGINEERING**

**BACHELOR'S DEGREE REQUIREMENTS**

The undergraduate curriculum in Mechanical Engineering incorporates six basic components: mathematics, physical science, engineering science, design and manufacturing, systems engineering, and the humanities. These components are interwoven throughout the curriculum to provide a balanced education in the fundamentals of the profession. Courses required for this education comprise three-fourths of the minimum curriculum of 128 semester hours; they are complemented by five technical electives and six electives in the humanities.

To meet the needs of students with varied professional objectives, the Department offers two technical-elective plans for the degree Bachelor of Science in Mechanical Engineering. Plan A augments the required-course curriculum with electives designed to provide a broad, general undergraduate education in Mechanical Engineering. Plan B is designed for the student with more specific career plans, facilitating in-depth study in a specific technical area. In consultation with a faculty advisor, the student assembles course offerings within the Department and across the University into a *concentration* within the discipline of Mechanical Engineering. Typical concentrations are:

Design and Manufacturing	Premedicine
Fluid Mechanics	Solid Mechanics
Industrial Engineering	Systems Engineering
Materials Science	Thermal Science

**Curriculum for B.S. (ME)**

The Mechanical Engineering faculty is currently reviewing and revising the Department's undergraduate curriculum. The following constitutes a representative course schedule for freshmen entering the program in the fall of 1988.

Freshman Year	
<i>Fall Semester</i>	
Literature elective	3
CHEM 1111 General Chemistry	5
APPM 1350 Calculus for Engineers 1	4
MCEN 1020 Analytical and Computational Tools	3
	15
<i>Spring Semester</i>	
Literature elective	3
Humanities or social science elective	3
PHYS 1110 General Physics	4
APPM 1360 Calculus for Engineers 2	4
MCEN 1045 Computer-Aided Drawing and Fabrication	3
	17

Sophomore Year	
<i>Fall Semester</i>	
Humanities or social science elective	3
PHYS 1120 General Physics	4
PHYS 1140 Experimental Physics	1
APPM 2350 Calculus for Engineers 3	4
MCEN 2023 Mechanics of Particles	3
	15
<i>Spring Semester</i>	
Humanities or social science elective	3
PHYS 2130 General Physics	3
PHYS 2150 Experimental Physics	1
APPM 2360 Introduction to Linear Algebra and Differential Equations	3
MCEN 2022 Engineering Thermodynamics	3
MCEN 2043 Mechanics of Rigid Bodies	3
	16
Junior Year	
<i>Fall Semester</i>	
Humanities or social science elective	3
ECEN 3030 Electronics and Electric Circuits	3
MCEN 3024 Introduction to Materials Science	4
MCEN 3020 Mathematical Methods	4
MCEN 3021 Fluid Mechanics	3
	17
<i>Spring Semester</i>	
MCEN 3027 Measurements Laboratory	3
MCEN 3022 Heat Transfer	3
MCEN 3023 Mechanics of Deformable Bodies	4
MCEN 3040 Computational Methods	3
MCEN 3026 Control Systems	3
	16
Senior Year	
<i>Fall Semester</i>	
MCEN 4026 Manufacturing Processes and Systems	4
MCEN 4025 Component Design	3
MCEN 4027 Mechanical Engineering Laboratory	3
Technical electives	6
	16
<i>Spring Semester</i>	
MCEN 4045 Mechanical Design Project	4
MCEN 4065 Design Estimating	3
Technical electives	9
	16
Minimum total hours for degree	128

**GRADUATE DEGREE PROGRAMS**

**Graduate Study in Mechanical Engineering**

The Department offers Master of Science and Doctor of Philosophy degree programs to students whose career plans include advanced practice, research and development, and/or teaching at the college or university level. The programs focus on the areas of fluid mechanics, thermal science, solid mechanics, materials science, and computer-aided engineering. Within these areas, research topics of particular interest to the faculty include:

Geophysical Fluid Dynamics	Nonlinear Structural Dynamics
Low-Gravity Fluid Mechanics	Robotics/Machine Dynamics
Combustion	Prosthetic Devices
Air Pollution Control	Computational Mechanics
Acoustic Radiation/Scattering	Polymer Science/Engineering
Waves in Structured Media	Composite Materials
Structure-Medium Interaction	Materials Processing
Earthquake Engineering	Computer-Aided Design

The Department participates in the interdepartmental Ph.D. program in Geophysics. Please refer to the discussion of this program in the Graduate School section of this *Catalog*.

Students pursuing the degree of Master of Science in Mechanical Engineering may follow either Plan I, which requires the writing of a thesis, or Plan II, which involves only course work. A student following Plan I aggregates a minimum of 24 semester hours of course work and 6 semester hours of thesis work; at least 15 semester hours of the course work must be in Mechanical Engineering subjects. A student following Plan II aggregates a minimum of 30 semester hours of course work, of which at least 18 semester hours must be in Mechanical Engineering subjects. Up to 9 semester hours of graduate course work may be transferred from another accredited institution as long as those hours were not used to satisfy another degree requirement. All students must pass an oral comprehensive examination covering the course work and, if applicable, the thesis. Students consult with an academic advisor to realize the course of study that best meets their academic objectives.

A student pursuing the degree of Doctor of Philosophy in Mechanical Engineering aggregates a minimum of 30 semester hours of course work in courses numbered 5000 and above, as well as 30 semester hours of thesis work; at least 21 semester hours of the course work must be in Mechanical Engineering subjects. Up to 10 semester hours of graduate course work may be transferred from another accredited institution; there is no credit limit for appropriate courses taken at the University of Colorado, such as those taken for the Master of Science degree.

Every student desiring to pursue the Ph.D. degree must first pass a written, open-book, preliminary examination, which is normally taken during the second year of graduate study. The preliminary examination is taken in three subject areas selected by the student from the following seven:

Computational	Mathematics
Mechanics	Solid Mechanics
Design	Thermal Science
Fluid Mechanics	
Materials Science	

Each subject-area examination is three hours long and is designed to measure the student's mastery of the fundamentals of that subject area. A student who does not pass a subject-area examination may take it a second time. The Ph.D. preliminary examination may be taken in lieu of the comprehensive examination required for the Master of Science degree.

After passing the preliminary examination, students continue their course work, including that required to satisfy the language requirement of the Graduate School, and prepare a written thesis prospectus. When ready, they take an oral comprehensive examination covering the graduate course work and the thesis prospectus. After passing the comprehensive examination, students are admitted into the Ph.D. program and conduct the original research required to satisfy the thesis requirement. This research culminates in the writing of the thesis, which students defend in a final examination.

Ph.D. students are assigned an academic advisor to review their progress toward the degree. Students are expected to meet with the advisor at least once each semester prior to registration. Once students have selected a research topic for the thesis, academic advising is done by their thesis advisor. Additional information on graduate study may be found in the Graduate School section of this *Catalog*.

## College of Engineering and Applied Science Faculty

### AEROSPACE ENGINEERING SCIENCES

**GEORGE W. MORGENTHALER**, Department Chair, Director of the Engineering Research Center, Associate Dean of Engineering for Graduate and Research Programs, Professor. B.S., De Paul University, Concordia; M.S. Math, University of Chicago; M.S. Physics, University of Colorado (Denver); Ph.D., University of Chicago; M.S. Mgm Sci, Massachusetts Institute of Technology.

**MARK J. BALAS**, Professor. B.S.E.E., University of Akron; M.A., University of Maryland; Ph.D., University of Denver.

**CHARLES A. BARTH**, Professor Adjoint. B.S., Lehigh University; M.A., Ph.D., University of California, Los Angeles.

**ALFRED J. BEDARD**, Associate Professor Adjoint. B.S., Boston College; M.S., Ph.D., University of Colorado.

**SEDAT BIRINGEN**, Associate Professor. B.S., M.S., Robert College (Turkey); Diploma, von Karmán Institute for Fluid Dynamics, D.Sc., University of Brussels.

**GEORGE H. BORN**, Professor. B.S., M.S., Ph.D., University of Texas.

**CHARLES D. BROWN**, Lecturer. B.S.M.E., University of Oklahoma; M.S.M.E., Southern Methodist University.

**ROBERT R.P. CHASE**, Associate Professor. B.S., Syracuse University; S.M., University of Chicago; M.E., Millersville State College; Ph.D., University of Chicago.

**CHUEN-YEN CHOW**, Professor. B.S., National Taiwan University; M.S., Purdue University; M.S., Massachusetts Institute of Technology; Ph.D., University of Michigan.

**ROBERT D. CULP**, Professor. B.S., University of Oklahoma; M.S., Ph.D., University of Colorado.

**F. CARROLL DOUGHERTY**, Assistant Professor. B.S., Purdue; M.S., Ph.D., Stanford University.

**WILLIAM EMERY**, Professor. B.S., Brigham Young University; Ph.D., University of Hawaii.

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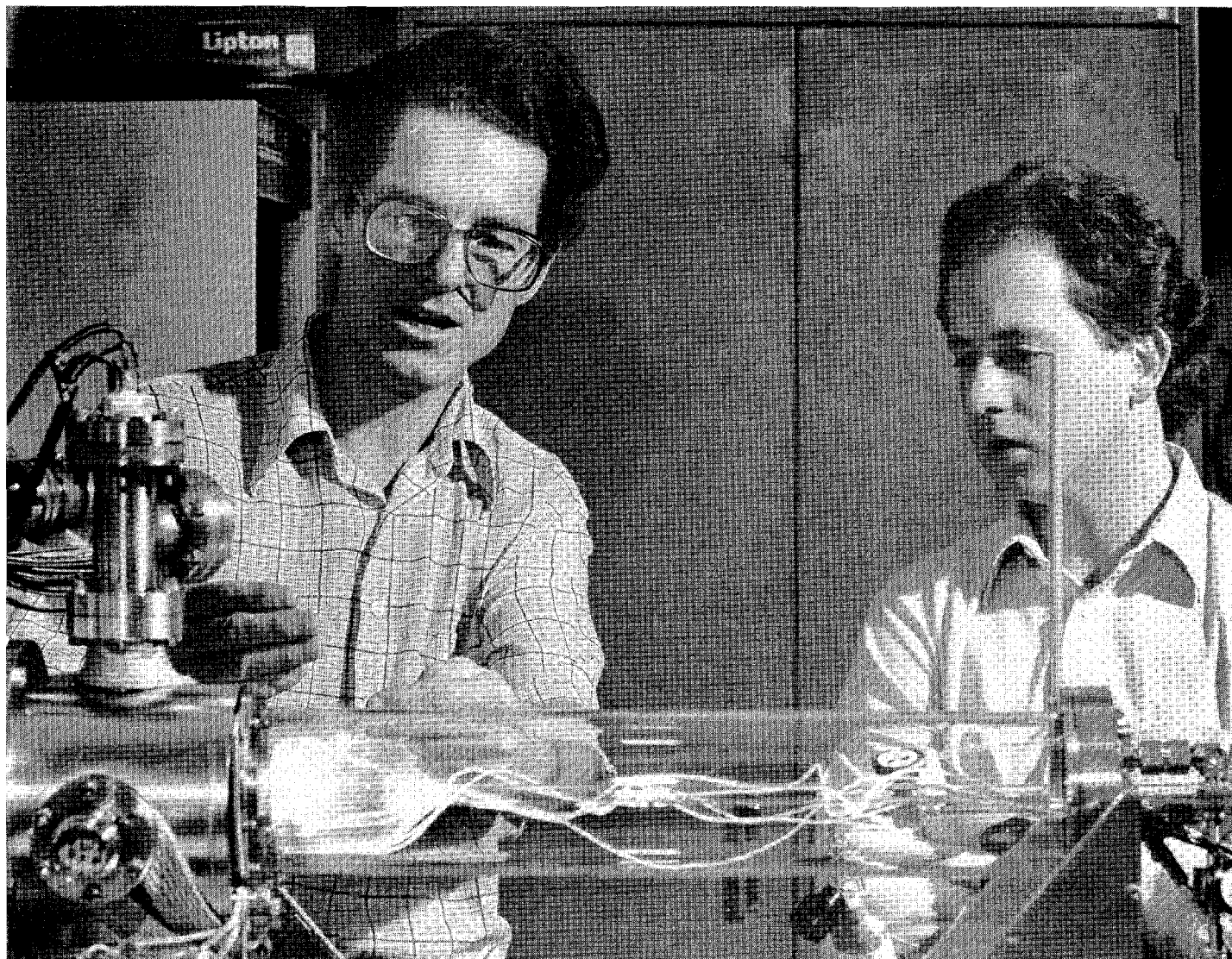
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# College of Environmental Design

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## INFORMATION ABOUT THE COLLEGE

*Raymond G. Studer, Jr., Dean*

### Scope and Purpose

The College of Environmental Design is the only undergraduate program in the state of Colorado offering preprofessional training in architecture and planning and related fields of design. The College of Environmental Design is located on the Boulder Campus. Graduate divisions of Architecture, Urban Design, Interior Design, Landscape Architecture, and Planning and Community Development are located at the Denver Campus in the School of Architecture and Planning.

Designers and planners of the physical environment in recent years have moved into expanded roles and responsibilities. Changes in breadth of concern and scope of service have brought together the architect, the landscape architect, the urban and regional planner, the technologist, and the interior designer, who address the complex problems encountered in today's physical environments. Lines of demarcation among these professions are being minimized and interdependence among them increased.

These requirements necessitate a broader base of educational experience including not only a background for design technique, but also an increased association with and understanding of the physical, natural, and social sciences. The social and economic determinants of contemporary life, the complexities of urbanization and the allied problems of transportation and population, the effect of business and governmental activity, changing availability of resources, human values, and rapid technological advances all require of the environmental designer a broad educational base to meet present needs and anticipate future environmental change.

To fulfill its mission, the College provides the student with an educational experience that is founded in the humanities, the sciences, and the arts. This background provides the technical

and aesthetic perspectives for designing and planning the constructed environment. It brings to the practicing professional an opportunity for continuing education and a means for keeping abreast of cultural and technological change. It encourages a better informed public through academic experiences for students other than those majoring in the environmental design professions.

Preparation for professional service through a career in one of the design and planning fields is partially fulfilled through academic experience. Accordingly, the University of Colorado has expanded its offerings to provide an undergraduate degree in Environmental Design and a series of professional graduate degrees allowing specialization in particular areas of concern, e.g., architecture, landscape architecture, and planning and community development.

Full professional status in most environmental design fields requires additional study at the graduate level. Some fields of practice also require several years of practical experience followed by state registration or licensing through a professional examination. Completion of the four-year curriculum allows those who do not wish to pursue further academic work or full professional status the opportunity to pursue paraprofessional careers in private practice, government, and corporate service in design and planning-related activities.

### Organization

The College of Environmental Design is a four-year preprofessional degree program leading to a Bachelor of Environmental Design degree. This program prepares students to proceed into professional master's degree programs at the CU-Denver campus or graduate programs throughout the United States. Students with a Bachelor of Environmental Design degree may pursue graduate-level programs in architecture, urban design, landscape architecture, urban and regional planning and community development, and interior design. The Environmental Design

undergraduate degree program is offered on the Boulder Campus, and the graduate degree programs are offered on the Denver Campus. (See the bulletin of the University of Colorado at Denver for details on the graduate programs.)

The Center for Environmental Design Education and Research (CEDER) provides technical assistance in architectural and graphic design, planning, and community development to community groups, individuals, and organizations.

### Facilities

Facilities for academic programs at Boulder are provided in the Environmental Design Building. On its lower floors are administrative and faculty offices, lecture rooms, and exhibit space.

A media center, workshop, photographic laboratory, slide library, and drawing studios supplement design studios, which are available throughout the building. Space is provided within the design studios for all students for academic use during the entire semester. These facilities are available to the student throughout the day and evening.

Beginning and advanced computer facilities, including graphic capabilities, are available to students.

An urban design simulation lab provides students with a facility for testing possible patterns of growth and development in the urban environment.

### Recognition of Scholarship

As a professionally oriented school, the College of Environmental Design provides an atmosphere for study and creative investigation in which the attainment of quality is held in the highest esteem. In recognition of high scholarship and professional attainment, the College grants honors at graduation in two categories: Honors and Special Honors. At an annual awards program, scholarships, prizes, and awards are given to outstanding students and faculty.

## Honors at Graduation

Students achieving a grade point average of 3.50 to 3.74 (*Honors*) and 3.75 to 4.00 (*Special Honors*) will be recognized at Commencement. Grades will be based on course work completed at the University of Colorado at Boulder.

## Scholarships, Loans, Awards, and Prizes

### SCHOLARSHIPS

Several scholarships to students in the College of Environmental Design are awarded upon recommendation of the faculty of the school. In 1961 the Educational Fund of Colorado's chapter of the American Institute of Architects was incorporated by appropriate action of its executive committee. The purpose of this fund is to advance education in architecture by granting scholarships, prizes, and financial aid to deserving students in architecture and to architects interested in research programs directly related and of value to the architectural profession.

The original Educational Fund was founded in January 1934 by William E. Fisher, F.A.I.A.; George H. Williamson, F.A.I.A.; Fred E. Mountjoy, A.I.A.; William H. Bowman, A.I.A.; and Robert K. Fuller, F.A.I.A. Kenneth R. Fuller, son of the founder, now serves as secretary of the Fund and, acting with the president and vice president of the Colorado chapter, American Institute of Architects, forms the board of directors of the Fund. This board has granted scholarships annually to students and alumni of the College of Environmental Design.

Awards provided by the AIA/Colorado Educational Fund include the Anniversary Scholarship, Arthur A. and Florence G. Fisher Travelling Scholarships, Robert K. Fuller Scholarship for Graduate Study, James M. Hunter Scholarship for Graduate Study or Travel, and the C. Gordon Sweet Scholarship for disadvantaged students.

*The Dana Soper Memorial Scholarship.* This \$2,000 grant, started in 1973, is awarded to a second-year student in Environmental Design based upon proven academic performance, personality and character, contribution to the College, and professional potential.

*The Martin Luther King, Jr. Housing Prize* is a memorial award intended to encourage the design of housing that improves the quality of living environments for low and moderate income groups.

*The Roybal and Associates Award* provides financial assistance to students of Hispanic descent so that they may continue professional education.

Design certificates are also presented to the outstanding design students at each year level.

Dean's Honor Awards and Dean's Scholar Awards are available to Colorado students on a funds-available basis. A limited number of Dean's Scholar Awards are available to nonresidents. Both are merit scholarships.

In addition, interested students may participate in faculty-student research projects funded by the Undergraduate Research Opportunities Program (UROP) for a maximum of \$600 per award.

## Advising

All students receive their academic counseling from the Academic Advisor in the Office of the Dean of the College of Environmental Design. Advising appointments may be made in person or by calling (303) 492-7711 throughout the year. Students are encouraged to discuss career options and opportunities in Environmental Design with the faculty of the College.

## Peer Counselors

The College selects and trains qualified upper-division students to be peer counselors. These counselors are available throughout the school year to assist other students by supplying information, guidance, and support in College concerns. The peer counselors are available to students during posted office hours.

## Orientation

In order to meet other new students and the faculty of the College, incoming first-year students are invited to attend a two-day overnight Orientation retreat in the mountains. Among those attending the Orientation are the Dean and faculty of the College, the Academic Advisor, upper-division peer counselors, and members of both the Chancellor's staff and the Admissions office.

## Ethics and Academic Dishonesty

Students are expected to conduct themselves in accordance with the highest standards of honesty and integrity. Cheating, plagiarism, illegal possession and distribution of examinations or answers to specific questions, alteration, forgery or falsification of official records, presenting work of another student, or performing work or taking an examination for another student are examples of acts which may lead to suspension or expulsion. Any reported

act of academic dishonesty will be referred to the Faculty Executive Committee for study and any disciplinary decision.

## Exhibits, Lectures, Trips, and Study Abroad

The regular academic program of the College of Environmental Design is supplemented by visiting lecturers who make valuable contributions to the education of the student. Exhibits are displayed within the teaching facility of the College and are open to its students, the general student body, and the public. The College also sponsors an annual lecture series.

Field trips are organized as a part of regular class activity and as extracurricular programs.

The College of Environmental Design cooperates with other divisions of the University in the presentation of the annual Creative Arts Program held each summer on the Boulder Campus.

Every other summer the College offers a study abroad course entitled Comparative European Environments. A group of about 15 interested students and two professors travel for five weeks through various countries in Europe. The course can fulfill a 3- to 6-credit seminar.

It is also possible for qualified students to study abroad and receive elective course credits toward graduation. See the Environmental Design Office and the Office of International Education for more information.

## UNDERGRADUATE DEGREE PROGRAM

The baccalaureate program in Environmental Design offers students an opportunity to develop skills as designers within the context of a strong general education. While developing skills and a knowledge base in environmental design, students enrich their understanding of the sciences, humanities, and social sciences, and bring this understanding back into the design process.

## Requirements for Admission

Candidates for regular admission to the College of Environmental Design are expected to meet the general requirements for admission to the University. Please see the Undergraduate Admission section of this *Catalog* for specific requirements and assured admission standards.

## TRANSFER STUDENTS

Qualified students transferring from other institutions will be accepted into the College of Environmental Design. Former students who have attended another college or university for one semester (12 hours or more) will be considered transfer students. Since the College of Environmental Design has a limited enrollment, all qualified students are not guaranteed admission. Transfer students must have attained a 2.75 cumulative grade point average in all previous college work. All course work except the last term, if in progress, must be completed and on the official transcript sent for admission consideration. Transfer students should make application to the Office of Admissions. Applicants must meet the general requirements for admission to the University. See the Undergraduate Admission section of this *Catalog* for Universitywide admission standards for transfer students.

Normally students should transfer before the third year of college-level work; all transfer students will be required to take the four semesters of design studio within the minimum 53 credits in the College of Environmental Design. Transfer students are admitted for both the fall and spring semesters of each year.

Letters of intent and recommendation must accompany the application. It is the responsibility of the student to be sure transcripts and other application materials are complete at the Admissions Office located in Regent Administrative Center. Only complete application files will be considered for admission.

A maximum of 60 semester hours taken at a two-year college may be applied toward the baccalaureate degree. A minimum of 53 credits taken in the College of Environmental Design is required for graduation. In general, credits in vocational-technical courses will not be accepted for transfer by the College.

## INTRAUNIVERSITY TRANSFER

Qualified students seeking admission from another division of the University of Colorado will be accepted into the College of Environmental Design. Intrauniversity Transfer (IUT) application forms are available at the Environmental Design Building, Room 168, and should be returned to the College office when complete. Application deadlines are March 1 for fall admission and October 1 for spring admission. Since the College has a limited number of openings, all qualified applicants are not guaranteed admission. Students

may reapply as many times as they desire.

Students interested in transferring should complete math and science requirements prior to admission. Calculus (MATH 1300) and Physics (PHYS 3010 with lab) are required of those interested in an architecture emphasis. For a planning emphasis, statistics is required instead of calculus. Other recommended courses for transfer applicants are University Writing Program courses, a Fine Arts basic drawing or painting course, a course in the social sciences (such as history or sociology), and a course in the humanities (such as literature, art history, or philosophy). Students are also encouraged to take introductory courses in Environmental Design which are open to nonmajors (ENVD 1000, 1014, 1024, 2001, 2003).

Intrauniversity Transfer applications are reviewed according to the following criteria:

1. CU grade point average — highest averages are above 2.75.
2. Demonstrated competency in introductory ENVD courses.
3. Priority is given to students who have completed the prerequisite course work.

Letters of intent, recommendations, and transcripts of all college courses must accompany the application. Normally students should transfer prior to the third year of college-level work. All transfer students will be required to take the four semesters of design studio within the minimum 53 credits in the College of Environmental Design.

## STRUCTURE OF THE CURRICULUM

The program in Environmental Design is structured in two basic parts: a lower-division or foundation program and an upper-division or emphasis area program. At both the upper and lower divisions the student is required to complete a minimum amount of specified course work in University departments outside of the College. This work is intended to provide the student with a breadth of exposure to various disciplines, as well as to support exploration of specific areas of interest.

## FOUNDATION PROGRAM

Courses in the lower division are generally in a survey format. They cover a broad range of materials without stressing the development of specific analytic skills and are intended to provide the student with a basic introduction to concepts, skills, and processes in major areas of design learning.

In addition to the required courses in the College, the student must complete a minimum of six courses in other departments in the University. These courses are chosen from a list of acceptable electives. The purpose of these courses, labeled "breadth electives," is to enhance the student's breadth of learning.

Many of the concepts and skills introduced in Environmental Design courses are derived from or are complemented by materials that have been developed in other disciplines. An introduction to the concepts, methods, and concerns of related fields provides students with an additional foundation upon which they can base a selection of elective courses in the upper division.

## EMPHASIS AREA PROGRAM

The upper-division program is designed to allow students to develop skills and concepts in Environmental Design by selecting courses which focus on a specific design field (e.g., architecture, urban design, or planning) or courses which provide specific analytic skills. The student interested in architecture, for example, can take courses related to the problems, issues, and concepts in this field. The objective of the upper division, however, is not to provide training in a particular design discipline per se, but to use the content of particular disciplines as a means of developing a general environmental design competency.

In addition to the required credit hours in the College, the student must complete at least 15 credit hours of "support elective" work in departments outside of the College. At least 9 of these credit hours must be at the upper-division level. Support electives should be chosen from the list of courses provided for specific emphasis areas. The student should note that the requirements listed under specific emphasis areas may exceed the minimum specified course work for an ENVD major. In no case, however, do the requirements of an emphasis area involve a student taking more than the 128 hours needed for graduation. A support elective petition must be filed with the Dean's Office prior to beginning the upper-division emphasis area program.

## Course Requirements

The course requirements for the Bachelor of Environmental Design are as follows:

*Required Professional Courses*      *Semester Hours*  
ENVD 1000/2100/3200/4000-level Design Studio  
options (four semesters in sequence) . . . . . 24

ENVD 2002 Media, and one approved upper-level media course . . . . . 6  
 ENVD 2003/3123 or 3113 Natural Science/Technology . . . . . 8  
 ENVD 2001/3111 or 3121 Societal Science . . . . . 6  
 ENVD 1014 History/Theory, and two upper-division history courses . . . . . 9  
 Minimum . . . . . 53

*Breadth Electives* . . . . . 19 minimum  
 One approved course from each area: mathematics, physical and life sciences (with lab), social science, language arts (UWRP 1850), visual communications, and humanities. Consult the College List for courses approved in each category. The mathematics, physical and life sciences, fine arts, and language arts requirements must be completed before starting upper-division ENVD courses. Calculus (MATH 1300) and Physics (3010 with lab) are required of students with architecture emphasis. Statistics is required for students with an emphasis in planning.  
*Support Electives* . . . . . 15 minimum  
 Students must take at least 15 credits of approved course work outside of the department that support their emphasis area. Nine of the 15 credits must be at the upper division.  
*General Electives* . . . . . 41  
 Students may select general electives from any department, including offerings from other colleges as well as the College of Environmental Design. Prior approval must be granted by the Dean's Office if more than 77 credits are to be taken in the College.  
 Total hours required for graduation . . . . . 128

A maximum of 15 credits is recommended for the first semester. Permission to take more than 17 credits in any given semester or fewer than 12 credits may be granted only by written petition to the Director of Undergraduate Studies.

Students intending to pursue graduate studies in architecture are advised to take the following courses:

*Semester Hours*  
 ENVD 4310 and 4410 Architecture Studio 1 and 2 . . . . . 12  
 ENVD 4112 and 4212 Architectural Graphics 1 and 2 . . . . . 6  
 AREN 4035 and 4045 Architectural Structures 1 and 2 . . . . . 6  
 AREN 4050 and 4060 Environmental Systems for Architecture 1 and 2 . . . . . 6  
 ARCH 4114 and 4214 History of Environmental Design 1 and 2 . . . . . 6

Courses are also available from the graduate programs in the CU-Denver School of Architecture and Planning on a space-available basis.

## Combined Programs and Double Majors

Official combined programs are available only in conjunction with the College of Business. Combined and double degree programs require approval of the deans of both colleges. Before a combined degree student will be admitted to courses in the College of Business, the student must obtain permission and complete an application for admission from the College of Business.

The course requirements for the combined Environmental Design and Business degree demand the completion of

more than 128 credit hours. For the specific requirements, consult the College of Environmental Design office or see the Environmental Design Student Handbook.

## Grade Point Average

Students must have a cumulative grade point average of 2.00 for all courses attempted at the University of Colorado after admission to the College of Environmental Design. A grade of C- or better is required in all ENVD courses comprising the minimum 53 credits for graduation and for the breadth and support electives.

## Residence Requirement

A student must complete the 53 credits of required professional courses in the major from the College of Environmental Design and be in residence as a full-time student for the last semester of the senior year.

## Academic Policies—Undergraduate Course of Study

The undergraduate course of study in the College of Environmental Design is four academic years in length and leads to the degree Bachelor of Environmental Design.

Students should confer with the Academic Advisor regarding specific academic standards for repeating studio and other College of Environmental Design courses. Credits for repeated courses are not counted toward the 128 credits needed for graduation.

## INDEPENDENT STUDY POLICY

Only Environmental Design students at the 3000 or 4000 level of design are ordinarily permitted to obtain independent study credit. Independent study credit may not be used to substitute for any required design studio course.

A complete prospectus of what is expected, how it shall be carried out, and what the end product might be must be submitted to the supervising faculty member no later than five days after the official beginning of a semester. Approval of the prospectus must be granted by the faculty member and the Dean before an add card for that course is given to the student involved. Students should make arrangements during preregistration or well before the semester begins.

Only students who have completed all foundation program and breadth elective requirements are permitted to take an independent study. However,

other requirements could be established depending on the proposed topic. Only students with a 3.00 grade point average or better are permitted to take an independent study. No independent study credit is given if financial or other compensation is being earned by the student for the proposed study work. Not more than 3 hours of independent study credit during one semester and not more than a total of 6 are given for the entire time the student is enrolled, unless exception is granted by the Dean.

Independent study credit is exclusive of credits earned as a teaching assistant or research assistant.

## INCOMPLETE GRADES

The College of Environmental Design does not give incomplete grades (*IW* or *IF*) except in cases of extreme emergency. By petition, a grade of *IF* may be granted. Requirements must be completed within six months.

## PASS/FAIL CREDITS

A student may choose to take up to 15 credits toward the degree in Environmental Design on a Pass/Fail basis. These credits must fall in the category of general electives. The following types of courses may not be taken on a Pass/Fail basis: breadth electives, support electives, and any course taken within the College.

## ADVANCED PLACEMENT OPPORTUNITIES

Advanced placement and college credit may be granted on the basis of the College Entrance Examination Board's advanced placement tests. For students who have taken an advanced placement course in high school and who make scores meeting University standards in the CEEB's advanced placement examination, advanced placement as well as college credit will be granted. College credit granted will be treated as transfer credit without a grade, but will count toward graduation and the meeting of other specific requirements for which it is appropriate.

## GRADE POINT AVERAGE REQUIREMENTS AND SCHOLASTIC SUSPENSION

Courses taken by students in the College of Environmental Design fall into one of five categories:

1. *Foundation Courses*—lower-division courses in Environmental Design.
2. *Breadth Electives*—taken outside of the College of Environmental Design.

3. *Emphasis Area Electives*—taken in the upper division of the College.

4. *Support Electives*—courses related to the student's emphasis, taken outside the College.

5. *General Electives*—used to complete the required 128 credits for the B.Env.D. These may include courses both in and outside of the College.

The following scholastic requirements apply to these courses. A student must achieve a grade of C- or better in foundation, breadth elective, emphasis area, and support elective courses. General electives which receive a minimum grade of D- may be credited toward the degree if the student has maintained a minimum cumulative grade point average of 2.00.

As a general rule, students who fail to meet the minimum grade point requirement (2.00) will be permitted to continue their studies on a probationary basis during the following semester. Scholastic records of students will be reviewed as soon as possible after the close of the probationary semester, and students will be informed in writing if they are to be suspended.

When a student is suspended, the reasons for the suspension will be recorded and placed in the student's file. The student will be asked to define the problems and draft a plan for dealing with them in consultation with the advisor. The student should then make an appointment with the Director of Undergraduate Studies to review the plan. It is the responsibility of the Director to sign the plan, if it is acceptable, and of the advisor to monitor the student's progress.

When academic work is called for as part of a plan for remedying problems, transfer credits from accredited institutions will be accepted within the 12 semester hours maximum established in the written policy. Boulder Campus summer session hours may be used. Students will not be allowed to register on any campus of the University of Colorado, including Continuing Education, while on suspension.

Suspended students will be readmitted on a case-by-case basis by review of the Director of Undergraduate Studies. When necessary the cases may be taken to the Executive Committee by the director for policy review.

The normal period of suspension is two regular semesters (one academic year, excluding the summer term). However, students suspended a second time will be reinstated only under unusual circumstances. Students who believe that their situations warrant a departure from these normal stipulations may petition for reinstatement.

The committee will look with favor on such petitions only if the student has shown marked improvement in academic work or if there are unusual circumstances that have contributed to the student's academic difficulties. Deadlines for petitions will be specified in the letter of suspension.

Academic work undertaken at another institution while the student is under suspension from the University of Colorado will not be credited toward a degree in the College of Environmental Design without special permission by the Dean.

### TIME OUT PROGRAM

The University offers a Time Out Program (TOP) for students who wish to take a semester or a year away from the University, but plan on returning to complete their education.

### ATTENDANCE REGULATIONS

Students are expected to attend classes regularly and to comply with the attendance regulations specified by their instructors. At the beginning of each semester instructors shall inform the students of policies governing attendance in each class.

Students who miss a final examination for illness or other good reasons must notify the instructor or the Director of Undergraduate Studies no later than the end of the day on which the examination is given.

### TRANSFER CREDITS

Credits in subjects transferred from other institutions to the University of Colorado will be limited to the number of credit hours given for similar work in the regular offerings at the University of Colorado. Exceptions to this regulation may be made by the Dean upon written petition.

In general, the College of Environmental Design does not accept vocational/technical course work in design, graphics, or construction as meeting specific course requirements of the program; nor does it consider such course work acceptable toward the College's elective requirements. Only in exceptional circumstances may a student petition the Dean of the College to request a transfer of such credits. A student may, however, ask that vocational/technical course work be considered as a basis for waiving a specific course in a required sequence. A student waived from a course must still complete the required number of credit hours in that course content band.

A grade of C- or better is required in any course for which credit is granted in transfer from another institution to the University. Grades earned in other institutions (excluding other campuses of the University of Colorado) are not computed with the student's grade point average.

### UNIVERSITY CAMPUSES

Certain professional and nonprofessional courses are available on the University's Denver Campus. These credits are applicable toward residence requirements only when earned after admission to the College.

Students in residence on the Boulder Campus in the College of Environmental Design may take work on the Denver Campus with the approval of the Dean of the College on a space-available basis.

### ENVIRONMENTAL DESIGN AND THE ROTC PROGRAM

Students matriculating in the College of Environmental Design are eligible to participate in the ROTC programs on the Boulder Campus.

Students interested in such programs should contact the professor in charge of the ROTC program of their choice (Army, Navy, Air Force), and also the Dean of the College of Environmental Design for information on residence and curriculum requirements for graduation. Credit for ROTC courses may be given upon faculty recommendation to a maximum of 8 hours. Such credit is given only if the student completes all requirements of the four-year ROTC program.

### CONVOCATIONS

All students registered in the College of Environmental Design may be required to attend convocations and special lectures scheduled throughout the year.

### RETENTION OF STUDENT WORK

The College of Environmental Design reserves the right to retain any student project submitted in fulfillment of class requirements for whatever period of time it deems necessary. This retained work is used to provide accrediting agencies with tangible evidence of performance, to serve as additional visual aid material in presentation to other students, and to make possible meaningful educational exhibits for the University community and the general public.

## TRANSFER PROGRAM IN ARCHITECTURE

The Master of Architecture program at CU-Denver is open to holders of baccalaureate degrees, including the Bachelor of Environmental Design degree at CU-Boulder. Although this graduate program normally requires three and one-half years of study for completion, a pre-architecture curriculum exists at UCB whereby students may be considered for advanced standing in the Master of Architecture program at UCD.

To be considered for such advanced standing in the UCD Master of Architecture program, students in the third and fourth years of the UCB Environmental Design degree program must take the following courses:

Architectural Structures 1 and 2  
(AREN 4035 and 4045)

Environmental Systems for Architecture 1 and 2 (AREN 4050 and 4060)

History of Environmental Design 1 and 2 (ARCH 4114 and 4214)

Architectural Graphics 1 and 2  
(ENVD 4112 and 4212)

Architecture Studio 1 and 2  
(ENVD 4310 and 4410)

These courses meet the first-year requirements of the three and one-half year graduate program in architecture at UCD. Studio work will be accepted for credit only after the faculty of the School of Architecture have reviewed the portfolio submitted as a part of the application for admission. (See Admission Requirements in the section of the

UCD catalog pertaining to the Master of Architecture degree program). In addition, graduates from the Environmental Design program at UCB who intend to pursue graduate studies in architecture at UCD must have completed a prerequisite of college physics (PHYS 3010) and college mathematics through introductory calculus (MATH 1300) before entering the UCD program.

This policy is consistent with admission policies between other schools and colleges at the University of Colorado and at similar professional schools throughout the United States.

## College of Environmental Design Faculty

**RAYMOND G. STUDER, JR.**, Dean, Professor; B. Arch., University of Texas; M. Arch., Harvard University; Ph.D. (Urban/Public Policy Planning), University of Pittsburgh.

**ERNESTO G. ARIAS**, Associate Professor; B. Arch., University of Florida; M.C.P., M. Arch., Ph.D. (Housing, Env. Psych.) Candidate, University of Pennsylvania. Registered Architect: Pennsylvania, Florida.

**C. HERBERT BOWES**, Professor Emeritus.

**C. A. BRIGGS**, Professor Emeritus.

**DEVON M. CARLSON**, Dean Emeritus.

**GERALD S. CROSS**, Professor. B.S., Rhode Island School of Design; M.S. (Design), Southern Illinois University.

**JOAN DRAPER**, Associate Professor. A.B., M. Arch., Ph.D. (Arch. Hist.), University of California, Berkeley.

**ALLEN HARLOW**, Lecturer; B. Arch., M. Arch., University of Colorado. Registered Architect: Colorado.

**SPENSER W. HAVLICK**, Professor. B.A., Beloit College; M.S., University of Colorado; Ph.D. (Ecology, Environmental Planning), University of Michigan.

**CAROLINE HINKLEY**, Lecturer; B.A., Occidental College; M.F.A., Claremont Graduate School; M.F.A., California Institute of the Arts.

**JOSEPH JUHASZ**, Associate Professor. A.B., Brown University; Ph.D. (Psych.), University of California, Berkeley.

**STEPHEN H. KENDALL**, Assistant Professor. B.S., University of Cincinnati; M. Arch. and Urban Design, Washington University, St. Louis.

**RAYMOND McCALL, JR.**, Assistant Professor. B.S., University of Wisconsin, Milwaukee; M.S., Illinois Institute of Technology; Ph.D. (Arch. Design Methods), University of California, Berkeley.

**DAVID L. PAULSON**, Professor. B.A., B. Arch., University of Minnesota; M. Arch., Harvard University. Registered Architect: Colorado, Minnesota.

**LOUIS SAUER**, Professor. B.S., Illinois Institute of Technology; M. Arch., University of Pennsylvania. Registered Architect: Pennsylvania.

**WILLEM K. T. VAN VLIET**, Visiting Associate Professor. Doctorandus, Free University of Amsterdam; M.A., Lakehead University; Ph.D., University of Toronto.

**ALLAN WALLIS**, Associate Dean, Assistant Professor. B. Arch., Cooper Union; Ph.D. (Env. Psych.), City University Graduate Center, New York.

**CHRISTOPHER L. YIP**, Assistant Professor. B.A., M. Arch., Ph.D. (Arch. Hist.), University of California, Berkeley.





# Graduate School

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## INFORMATION ABOUT THE SCHOOL

*Risa I. Palm, Dean*

### History

Graduate work at the University of Colorado began on a small scale in 1892. Following some years of development, the Graduate School was organized in 1909 with a separate faculty. Each of the four campuses of the University of Colorado system now offers graduate degree programs. The School is administered by a Dean, who also serves as the Vice President for Academic Affairs, in conjunction with the Executive Committee appointed by the President of the University and governed by the Rules of the Graduate School. In addition, there is a Dean of the Graduate School in residence on each campus.

### Degrees

The Graduate School of the University of Colorado offers instruction leading to the following advanced degrees:

#### BOULDER CAMPUS

Master of Arts (M.A.)  
Master of Science (M.S.)  
Master of Basic Science (M.B.S.)  
Master of Engineering (M.E.)  
Master of Fine Arts (M.F.A.)  
Master of Music (M.Mus.)  
Master of Music Education (M.Mus.Ed.)  
Doctor of Musical Arts (D.Mus.A.)  
Doctor of Philosophy (Ph.D.)

#### M.A. programs include:

Anthropology  
Art Education  
Art History  
Biology: Environmental, Population, and Organismic  
Biology: Molecular, Cellular, and Developmental  
Classics  
Communication  
Communication Disorders and Speech Science  
Comparative Literature  
Economics  
Education  
English Literature: Creative Writing  
English Literature  
French  
German  
History

Journalism  
Linguistics  
Mathematics  
Philosophy  
Political Science  
Psychology  
Religious Studies  
Sociology  
Spanish  
Theatre

#### M.S. programs include:

Accounting  
Aerospace Engineering Sciences  
Applied Mathematics  
Applied Physics  
Astrophysical, Planetary, and Atmospheric Sciences  
Chemical Engineering  
Chemistry  
Civil Engineering  
Computer Science  
Electrical Engineering  
Finance  
Geology  
Kinesiology  
Management Science  
Marketing  
Mechanical Engineering  
Organizational Management  
Pharmaceutical Sciences  
Physics  
Telecommunications

#### Ph.D. programs are:

Aerospace Engineering Sciences  
Anthropology  
Applied Mathematics  
Astrophysical, Planetary, and Atmospheric Sciences  
Astrophysics  
Biology: Environmental, Population, and Organismic  
Biology: Molecular, Cellular, and Developmental  
Business Administration  
Chemical Engineering  
Chemical Physics  
Chemistry  
Civil Engineering  
Classics  
Communication  
Communication Disorders and Speech Science  
Comparative Literature  
Computer Science  
Economics  
Education  
Electrical Engineering  
English  
French  
Geography  
Geology  
Geophysics  
History  
Linguistics  
Mathematical Physics  
Mathematics  
Mechanical Engineering  
Music  
Pharmaceutical Sciences  
Philosophy  
Physics  
Political Science  
Psychology  
Sociology

Spanish  
Theatre

Inquiries regarding admission to all graduate programs at the Boulder Campus should be addressed to the graduate program in which the applicant wishes to study.

#### COLORADO SPRINGS CAMPUS

The following programs at the master's level are available for completion through the Graduate School on the Colorado Springs Campus:

Applied Mathematics (M.S.)  
Basic Science (M.B.S.)  
Computer Science (M.S.)  
Education (M.A.)  
Electrical Engineering (M.S., Ph.D.)  
History (M.A.)  
Political Science (M.A.)  
Psychology (M.A.)  
Sociology (M.A.)  
Special Education (M.A.)

A Master of Public Administration (M.P.A.) degree is offered through the Graduate School of Public Affairs, and the Master of Business Administration (M.B.A.) degree is offered through the Graduate School of Business Administration.

Further details may be obtained by contacting the individual departments on the Colorado Springs Campus, P.O. Box 7150, Colorado Springs, CO 80933.

#### DENVER CAMPUS

The following graduate programs are available for completion through the Graduate School on the Denver Campus:

#### The Master of Arts (M.A.) in:

Anthropology  
Biology  
Communication and Theatre  
Economics  
Education  
English  
Geography  
History  
Mathematics  
Political Science  
Psychology  
Sociology

#### The Master of Science (M.S.) in:

Applied Mathematics  
Chemistry  
Civil Engineering  
Electrical Engineering  
Environmental Science  
Mechanical Engineering  
Technical Communications

The Master of Basic Science (M.B.S.)  
 The Master of Engineering (M.E.)  
 The Master of Education (M.Ed.)  
 The Master of Humanities (M.H.)  
 The Master of Social Science (M.S.S.)

The Doctor of Philosophy (Ph.D.) in:  
 Applied Mathematics  
 Education: Administration, Supervision, and  
 Curriculum Development

Further details may be obtained by contacting the Resident Dean of the Graduate School, University of Colorado at Denver, 1100 14th Street, Denver, Colorado 80202, or by consulting the bulletin for the University of Colorado at Denver.

Students should contact the College of Business and Administration, the College of Design and Planning, and the Graduate School of Public Affairs for graduate work within their respective programs.

## HEALTH SCIENCES CENTER

The following graduate programs are available for completion through the Graduate School on the Health Sciences Center campus.

The Master of Science (M.S.) in:

Anesthesiology  
 Biochemistry  
 Biometrics  
 Biophysics and Genetics  
 Child Health Associate  
 Genetic Counseling  
 Medical Physics  
 Nursing  
 Public Health

The Doctor of Philosophy (Ph.D.) in:

Biochemistry  
 Biometrics  
 Biophysics and Genetics  
 Cellular and Structural Biology  
 Human Genetics  
 Immunology  
 Microbiology  
 Molecular Biology  
 Neuroscience  
 Nursing  
 Pathology  
 Pharmacology  
 Physiology

An M.D.-Ph.D. program is also offered.

Inquiries regarding admission to all graduate programs at the Health Sciences Center should be addressed to the graduate program in which the applicant wishes to study, University of Colorado Health Sciences Center, 4200 East 9th Avenue, Denver, Colorado 80262.

## Research Support at the University of Colorado

The University of Colorado takes an active part in research in a wide variety of fields.

Combined research and related instructional programs sponsored within the University represent annual expenditures amounting to over \$114 million. Of this total, the expenditures on the Boulder, Denver, and Colorado Springs campuses are now approximately \$68 million per year. The sponsored research, clinical, and instructional program of the Health Sciences Center in Denver totals more than \$46 million annually. The principal sources of these funds for research and training contracts and grants are various agencies of the federal government. The University of Colorado's research activity is also supported by appropriations from the state of Colorado, private foundations, and private donors.

## Research Centers, Institutes, and Facilities

The *Institute of Arctic and Alpine Research (INSTAAR)* is an interdisciplinary research institute with ongoing programs in the Rockies, Arctic Canada, Alaska, Spitzbergen, the southern Andes, and other locations. It operates the Mountain Research Station and publishes the quarterly journal, *Arctic and Alpine Research*. In addition to about 15 research faculty, faculty from Environmental, Population and Organismic Biology, Geological Sciences, Geography, Anthropology, and other departments are associated with the Institute, as are about 25 graduate students from various departments. Disciplines within INSTAAR include plant and animal ecology, paleoecology, palynology, geochronology, climatology, glaciology, and glacial geology. Current research emphases include interdisciplinary programs on Long-Term Ecological Research on the Colorado Alpine ecosystem, ecology of the Alaska North Slope, Quaternary Studies, especially in regard to the mode of glaciation and deglaciation, and a Center for Geochronological Research, which is involved in aminoacid, fission-track, thermoluminescence and potassium/argon dating, stable isotope geochemistry, dendrochronology, and dendroclimatology.

The Mountain Research Station, located at 2,900 m (9,500 feet) in the Front Range of the Rocky Mountains and 40 km (25 miles) west of the Boulder Campus, is operated for the University by INSTAAR. The station is a national center for field studies in the biological and physical sciences and is especially well-known for long-term ecological, climatological, and atmospheric research. The facility has resident scientific and maintenance staff

and provides lodging throughout the year and cafeteria service during the summer and winter teaching programs. Classrooms, laboratories, a library, herbarium, darkroom, environmental chemistry and dendrochronology laboratories, and microcomputers are available in the John Marr Alpine Laboratory, the center of activity at the station. The station offers researchers easy access to a variety of terrestrial and aquatic habitats at altitudes from 1,500 m to 3,800 m. A wide variety of courses are offered in summer and winter in plant and animal ecology, climatology, geomorphology, and hydrology, to name a few. The station maintains the Mountain Climate Program in support of the environmental field research conducted in the area. Weather observing stations have been operated since 1952 at four altitudes between 2,200 m and 3,750 m and additional stations are established as required by new projects. The Mountain Research Station is a member of the newly-formed *Associated Field Stations of Colorado*.

The *Institute for Behavioral Genetics* is an organized research unit whose mission is to conduct and facilitate research on the genetic bases of individual differences in behavior and to conduct research training in this interdisciplinary area. This rapidly developing field brings to bear the perspectives of biochemical genetics, cytogenetics, developmental genetics, evolutionary genetics, molecular genetics, pharmacogenetics, and quantitative genetics upon behavioral research. Facilities are available for research on a variety of organisms, including humans and laboratory mice. Institute faculty currently are applying the concepts and tools of behavioral genetics to such diverse areas as alcoholism, cognitive development, drug addiction, learning disabilities, neurological diseases, personality, and psychopathology.

The *Institute of Behavioral Science* is an interdisciplinary research organization serving faculty and graduate students in the behavioral sciences. Its principal functions are to conduct and sponsor research programs involving two or more of the behavioral sciences and related fields; to provide research facilities, equipment, and administrative services for participating faculty; to facilitate graduate research training; and to disseminate information about its activities and findings to scientific groups and institutions.

The Institute conducts four research programs that constitute its principal administrative units: Research Program on Problem Behavior, Research Program on Population Processes, Research Program on Environment and

Behavior, and Research Program on Political and Economic Change. Included in IBS is the Social Science Data Analysis Center, which provides general user assistance in social science research and statistical computing.

The *Institute of Cognitive Science (ICS)* was established to promote interdisciplinary research in the fields of psychology, education, linguistics, computer science, and other cognitive sciences. Its major current research programs are concerned with cognitive factors in linguistic comprehension, decision making, memory, human-computer interaction, problem solving, speech perception, mental skills, and artificial intelligence. These programs encompass the study of individual differences, development changes, and industrial and educational applications.

The *Cooperative Institute for Research in Environmental Sciences (CIRES)* is jointly sponsored by the University of Colorado and the National Oceanic and Atmospheric Administration with support from other public and private sources. CIRES consists of more than 300 faculty, students, and staff from several scientific disciplines. Graduate students employed by CIRES conduct multidisciplinary studies of atmospheric and environmental chemistry, atmospheric and climate dynamics, environmental biochemistry and geochemistry, solid earth geophysics, and other subjects. Current research programs in which graduate students are involved include measurement of constituents and reactions in the atmosphere, acid deposition, kinetics of reactions in the stratosphere and troposphere, gas and liquid chromatography, instrumentation and detectors, mass spectrometry, analytical chemistry, microcomputer interfaced instrumentation, surface science, separation science, metal complex chemistry, aerosol chemistry, laser chemistry, leaching of toxic wastes from mining, contemporary and paleoclimatology, air-sea interactions, ocean dynamics, ice nucleation, cryosphere studies, ice sheet modeling, earthquake prediction and earthquake physics, plate tectonics, seismic wave propagation, nuclear test discrimination, rock deformation and fracture, numerical hydrodynamics, dynamics of the atmospheric boundary layer, strains and tilts associated with earth tides and secular deformation, geodesy, geophysical inverse studies, and normal modes of vibrations of the Earth.

Research performed includes theoretical studies, laboratory experimentation, and field investigations. Field studies are conducted along the Front Range and in the mountains of Colorado, in

the Aleutian Islands, Hawaii, and elsewhere. Results of this fundamental research bear on such practical societal problems as the destruction of the earth's ozone shield by pollutants, acid rain and snow, the degradation of air and water quality, energy developments such as synfuels from oil shale, toxic waste treatment and disposal, weather and climate modification, frost damage, earthquake prediction, and enhancement of fossil fuel and geothermal energy production.

The work of the approximately 60 graduate students conducting studies in CIRES is supported by grants, contracts, and gifts from NOAA, NSF, USGS, DOE, AFOSR, CMA, ARO, NASA, EPA, and private companies. The departments currently represented in CIRES are Chemistry and Biochemistry, Chemical Engineering, Geography, Geological Sciences, Electrical and Computer Engineering, Mechanical Engineering, and Physics. The Institute serves as a center for multidisciplinary collaboration of research workers from Boulder and institutions throughout the world. A visiting fellowship program enables scientists working in these fields to spend time at CIRES. A central analytical laboratory provides sophisticated analysis services, e.g., high resolution gas chromatography coupled with tandem high resolution mass spectrometry, to researchers throughout the University.

The *Center for the Study of Earth from Space (CSES)* has been established within CIRES to provide a focus for earth-related research using data acquired from space. The opportunity provided by remote sensing measurements allows a global approach to problems in the many disciplines represented in CIRES and in other institutes and departments.

The *Joint Institute for Laboratory Astrophysics (JILA)* was established in 1962 by an agreement between the University and the National Bureau of Standards. Located in the Duane Physics complex on the Boulder Campus, the institute provides facilities for advanced research and graduate training in a number of areas involving atomic and molecular physics and astrophysics. These areas include both theoretical and experimental studies of atomic interactions, spectroscopy and line broadening, chemical physics, laser physics and laser spectroscopy, precision measurements, new geophysical measurement techniques, stellar atmospheres and radiative transfer, stellar interiors, solar physics, binary X-ray sources, and the interstellar medium and galactic astronomy. Senior scientific staff are associated with the Quantum Physics and the Time and Frequency

divisions of the National Bureau of Standards, and with the University departments of Physics, Chemistry, and Astrophysical, Planetary, and Atmospheric Sciences. A brochure giving more detailed information is available on request from the Institute.

The *Center for Astrophysics and Space Astronomy (CASA)* is a newly formed research center within the APAS Department. CASA provides a new focus for campus-wide expertise in experimental, observational and theoretical astrophysics, including solar and stellar physics, interstellar medium studies, galactic and extragalactic astrophysics, and cosmology. In addition to the International Ultraviolet Explorer Satellite Regional Data Analysis Facility operated by CASA for NASA, research involving X-ray, far-UV, optical, infrared and radio satellite and ground-based facilities is being carried out by CASA staff with national and international collaboration. Additional CASA staff are involved in one of the seven new Astrophysical Theory Centers funded by NASA in 1985. The experimental effort includes sounding rocket and shuttle-based SPARTAN space astronomy and high-energy astrophysics payloads prepared for flight in 1987 to observe the LMC supernova in the early 1990s. As a new center, CASA plans to expand in three areas: toward a comprehensive "Panchromatic" Astronomical Data Analysis Center, development of a new, large optical telescope facility, and enhancement of space and ground-based astronomy instrumentation in several spectral regions.

The *Center of Atmospheric Theory and Analysis (CATA)* is a collaborative arrangement among researchers in the APAS Department, at the National Center for Atmospheric Research (NCAR), and at the National Oceanic and Atmospheric Administration (NOAA). Research activities focus on theoretical and observational aspects of the Earth's atmosphere, encompassing a broad spectrum of phenomena, such as planetary wave propagation, tropical circulations and convection, gravity wave excitation, cyclogenesis, laboratory simulation of geophysical flows, photochemistry and transport in the upper atmosphere, climate dynamics, equatorial waves, and satellite remote sensing. CATA is headquartered in the APAS Department atmospheric sciences laboratory and operates a Pyramid 90X super minicomputer, an IRIS three-dimensional graphics workstation, and a SUN-based image-processing system, all linked to the University computing network and to NCAR. Numerical calculations are carried out locally and at the NCAR supercomputing facility at which

NCAR's extensive atmospheric data base is available. A Unidata satellite receiver is also operated, through which a variety of atmospheric data, including both real-time transmissions and archived products, are available. In addition to serving as a link among investigators at the University, NCAR, and NOAA, CATA supports several visiting research appointments, enabling short- and long-term interactions with atmospheric scientists from around the world.

The *Laboratory for Atmospheric and Space Physics (LASP)* is an established center for research in terrestrial and planetary atmospheres, solar physics, and space astronomy. A leader in ultraviolet spectroscopy, LASP is located on the Boulder Campus and involves students and faculty from the Departments of Astrophysical, Planetary, and Atmospheric Sciences, Aerospace Engineering Sciences, and Physics in many experimental and theoretical research programs. Currently, it is operating the Solar Mesosphere Explorer satellite from an innovative control center in Boulder. The satellite was launched in October 1981; its payload of ultraviolet, visible, and infrared instruments was developed and built at LASP. The mission is studying the effects of minor gaseous species and variations in the sun's UV radiation on the Earth's ozone layer. In addition to the satellite operations, LASP performs the scientific analysis and interpretation of the data. The Laboratory will soon begin construction of a solar-monitoring instrument for NASA's forthcoming Upper Atmosphere Research Satellite. LASP has experiments on two current NASA spacecraft: on the Voyager mission a photopolarimeter is studying the atmospheres of Jupiter, Saturn, and Uranus; and the Pioneer Venus mission carries a programmable ultraviolet spectrometer which is examining the Venusian atmosphere and the planet's cloud tops. LASP has developed a unique data handling system for use with these space experiments as well as with earlier experiments such as the Mariner 9 Mars orbiter and the Orbiting Solar Observatory-8.

LASP is studying the application of its spacecraft operations and data management concepts to several NASA missions, including the space station. Laboratory experiments, such as a major program to develop sensitive, new photoelectric array detectors for ground-based and space astronomical observations, are also pursued on a continuing basis. Active sounding rocket programs complement the research in planetary atmospheres, atmospheric processes, and solar physics.

The *Center for Applied Humanities* attempts to demystify the humanities—and scholarship in general—by making the results of specialized research available and attractive to a wide audience of general readers. This is accomplished in three ways. First, all members of the Center must be able to write clearly and gracefully. Second, all members of the Center are published scholars whose past work demonstrates their ability to make difficult concepts accessible to any group of intelligent readers without misrepresenting those concepts. Third, all members undertake research projects of potentially broad application and of potential interest to the general public. The Center is especially interested in bringing the methods of humanistic inquiry to bear on topics in law, the arts, medicine, politics, and public literacy.

The *Center for Comparative Politics* promotes and provides institutional support for cross-national research on the political institutions, processes, and policy issues of contemporary nations. A major focus of research is the politics of ethnicity and intergroup conflict in plural societies. Others are the development and testing of data-based models of violent conflict and political crises, and the comparative study of public policy in advanced industrial societies.

The *Center for Economic Analysis* formulates and conducts research projects in economics and related fields in order to further knowledge about the nature and behavior of economic variables, to develop and refine research methodology, and to provide decision makers in both the public and private sectors with data and techniques to improve the quality of their decision making. The Center conducts research under contract and grant arrangements with governmental and private agencies. Economics graduate students participate as research assistants to gain professional research experience and to supplement their formal education.

The *Lab for Policy Studies* is a unit within the School of Education that provides a focus for the educational policy activities of faculty and students. Its activities include educational policy studies and projects, instructional programs in educational policy at the graduate level, service to governmental organizations, and coordination with other policy units on campus.

The *Center for Labor Education and Research (CLEAR)* conducts labor education programs and research in various aspects of labor relations. Non-credit courses are offered for members of organized labor as the University's service to the labor community of Colorado. Graduate students may avail

themselves of conferences with staff members and use available library facilities. CLEAR staff members also teach credit courses in other schools and colleges as related to those fields.

The *Center for Public Policy Research* stresses the integration of knowledge and practice to improve public policy. The research program includes policy analyses in such areas as energy, natural resources, poverty, growth management, and economic development, as well as the development of theory and methods for the policy sciences. The Center also supervises the public policy curriculum for the M.A. in Political Science (Public Policy option).

The *Engineering Research Center* coordinates the research activities of the College of Engineering and Applied Science. The Center has recently formed a number of interdisciplinary research centers that augment discipline-based research in traditional academic fields. Faculty and graduate students together develop interdisciplinary and, on occasion, systems-oriented research. These centers frequently conduct research in collaboration with industry and national laboratories to help assure the transfer and effective utilization of new technology. These centers compete successfully for major grants and reflect the quality of interdisciplinary research underway in the College.

Areas in which centers have been or are being formed include: optoelectronic computing systems, parallel processing, geotechnical engineering, astrodynamics, space structures and control, low-gravity fluid dynamics and transport phenomena, energy management, artificial intelligence, computer-aided design of monolithic microwave circuitry, decision-support for water and environmental systems, applied mathematics, commercialization of space, earth resource assessment, and the study of Earth from space.

In addition to the interdisciplinary centers, the Engineering Research Center helps to coordinate nearly 200 other projects, most of them conducted by individual faculty or groups of faculty and funded by governmental agencies or industry. Graduate students actively participate in nearly all of these projects.

Research activities in aerospace engineering include experimental and computational fluid mechanics, astrodynamics, orbit determination, remote sensing, control systems engineering and design, space structures and control, space-station design, and neuro-biosystems engineering.

Key activities in chemical engineering include membrane and thin-film science, biochemical engineering and biotechnology, surface science, process control, enhanced oil recovery, coal gasification and combustion, and cryogenics.

Research projects in the field of civil engineering include those in geotechnical engineering, structural mechanics and engineering, building systems engineering, construction management, and environmental and water-resources engineering.

Research in computer science includes artificial intelligence, automata, theoretical computer science, numerical optimization, parallel processing, systems, data base design, and software engineering.

Optoelectronics and optical computing systems are key research interests in electrical engineering, as are computer design and simulation, VLSI design, electromagnetic theory, solid-state devices and materials, microwave and optical guided wave structures, antennas and propagation, and robotic control systems.

Activities in mechanical engineering include combustion science, convective heat transfer, polymer science/engineering, nondestructive structural evaluation, wave propagation and scattering, and fluid mechanics.

The *McGuire Center for International Studies*, organized within the Department of Economics, is dedicated to research and graduate training in a broad range of international topics. Specialties of faculty associated with the Center include international trade and finance, monetary theory and policy, monetary history and reform, and economic development and macroeconomics. Research on questions concerning international debt is given particular emphasis and support. The Center offers opportunities for students and faculty interested in interdisciplinary work between international economics and areas such as international politics, conflict and peace studies, international business, and foreign space policy.

The *Center for International Relations* serves as a base for international studies and research at the University. Its purpose is to encourage individual and cooperative research in the field of international relations. The Center also promotes the teaching of international relations at the graduate and undergraduate levels within the Department of Political Science and the College of Arts and Sciences. Support has been received from the National Science Foundation, the National Endowment for the Humanities, the International

Institute for Communications, and UNESCO, as well as the College of Arts and Sciences and the Institute of Behavioral Science at the University of Colorado at Boulder.

The *Center for Space and Geosciences Policy* promotes research and teaching in two related areas: space policy, which encompasses the legal, political, commercial, economic, and international issues arising from the exploration and use of outer space; and geosciences policy, which focuses on those issues that arise out of the understanding of the Earth as a closely integrated system, and how people and their activities can change that system. For example, as global climate changes occur as a result of increased atmospheric carbon dioxide, there will be many socio-economic implications requiring further study.

Both of these policy areas are closely linked in a variety of ways because much of our understanding of the Earth is a result of remote sensing from space. Additional areas of interdisciplinary interest include relations between government and private enterprise in space, the utilization of lunar and other celestial resources (including related ethical issues), space arms control, jurisdictional determination in space, economic impacts of climate change, and responses to other long-term Earth systems changes, such as changes in ocean levels.

The *Business Research Division*, the research arm of the College of Business and Administration, was established in 1915.

The research effort of the Division falls into three general categories: state service, contract research, and faculty research. State service, the principal activity, focuses on assisting the Colorado business community by providing information and special studies on the state's economy and special business problems. Contract research is conducted for federal, state, and local agencies, as well as for private business firms and associations. Research includes regional and local economic base studies and studies on high tech, manufacturing, tourism, and other state industries.

The Business Research Division serves as a Census Summary Tape Processing Center and a major component of the State Data Center in cooperation with the Colorado Division of Local Government. The Division also maintains the Colorado Business/Economic Data Bank, which contains state information on Colorado economic activities.

Publications of the Division include the *Directory of Colorado Manufacturers*, the *Journal of Travel Research*, *Colorado*

*County and City Retail Sales*, *Colorado Ski and Winter Recreation Statistics*, and numerous special interest publications.

The *Center for Rural Recreation Development* was created in 1984 to serve as the College of Business and Administration's administrative unit supporting the study of recreation development in rural communities.

The Center works within three major areas: the Colorado Rural Recreation Development Project, a systematic effort to enhance community life and the economic condition of rural Colorado towns through recreation development; the Intermountain Rural Recreation Development Project, providing technical assistance to universities and professional recreation societies on rural recreation development in Wyoming, Montana, Idaho, Utah, Arizona, New Mexico, Oregon, and Washington; and the Enterprise Skill Development Project for Youth, an effort to impact institutional change in the public education system and the Job Training Partnership Act program, resulting in the establishment of school curricula that support entrepreneurial skill development for youth (Colorado, Oregon, and Minnesota).

The Center supports research conducted within the community environment that contributes to the improvement of the curriculum, future service, and the theoretical base of recreation development. Current research is being conducted on the relationship of recreation development to overall community life satisfaction and to the economic condition of a community. Information is also being sought on recreation participation patterns within select life stages and cycles of community residents.

Publications of the Center include *Recreation Systems Development: A Rural Communities Model*, *Recreation Development in the American Countryside*, and *The Enterprise Skill Development Curriculum*.

The *Economics Institute* has over 29 years of experience in training and providing orientation for foreign students who are entering graduate programs in economics, agricultural economics, and management-related fields at universities throughout the world that use English as their language of instruction. The Institute also provides a variety of training opportunities for foreign professionals. It operates a University Placement Assistance Service, and engages in research, publication, and service activities relating to economics, business, and international education. Course offerings include English, mathematics, statistics, economic theory, accounting, finance, management and

organization, management science and information systems, research and teaching methods, as well as a number of seminars and other special courses focused around the Institute's Special Lecture Series. The program is organized in quarter (ten-week) and half-quarter (five-week) terms. Participants may be admitted to up to a year of studies at the Institute, depending on beginning proficiency in English. University of Colorado credit is available for several Institute course offerings, and its courses are open to local students by special arrangement. The Institute is sponsored by the American Economic Association in cooperation with the Institute of International Education, American Agricultural Economic Association, and the University of Colorado.

## Laboratories and Special Equipment

Laboratories, special classrooms, and specialized equipment are essential to graduate training and research. Some of the special facilities at the University of Colorado are described in the following paragraphs.

*Aerospace Engineering Sciences laboratories* have the following facilities for instruction and research: three low-turbulence wind tunnels and several hotwire anemometers, including laser Doppler anemometers for turbulence, acoustic, and unsteady aerodynamic research; a laboratory for the study of the hydrodynamics of superfluid helium and geophysical fluid dynamical modeling; and bioengineering laboratories for studies in cardiac physiology, neurophysiology, and neurochemistry. Computer laboratories are equipped for use in upper-division and graduate courses, for computer-aided design, and for graduate research.

*The Astrophysical, Planetary, and Atmospheric Sciences Department* emphasizes studies of theoretical and observational astrophysics (including the sun), the atmospheres of the Earth and other planets, geophysical and astrophysical fluid dynamics, space physics, and plasma physics (including controlled thermonuclear fusion).

The Department operates the Sommers-Bausch Observatory and laboratories in experimental fluid dynamics and plasma physics. Also used are observational facilities of Cerro Tololo Inter-American Observatory in Chile; the Kitt Peak National Observatory in Tucson, Arizona; the Very Large Array (VLA) in New Mexico; and many NASA astronomical and planetary satellites. A considerable part of the teaching and

research is in collaboration with the Laboratory for Atmospheric and Space Physics, the Joint Institute for Laboratory Astrophysics, the National Center for Atmospheric Research (including the High Altitude Observatory), National Oceanic and Atmospheric Administration (e.g., Space Environment Laboratory, Aeronomy Laboratory), and the Cooperative Institute for Research in Environmental Sciences.

*Chemical Engineering research facilities* are extensive and modern. Nearly all research equipment is interfaced to microcomputer systems for automated data collection, monitoring, and control.

Studies in heterogeneous catalysis and surface science use the four ultrahigh vacuum systems located in the Chemical Engineering laboratories. These contain three Auger spectrometers, an X-ray photoelectron spectrometer (XPS, ESCA), two low-energy electron diffraction (LEED) systems, a secondary-ion mass spectrometer (SIMS), two high-resolution electron energy loss spectrometers (HREELS), three mass spectrometers, and associated surface analysis tools. Two systems have attached atmospheric pressure chambers for sample preparation and reaction on well-defined surfaces. All systems are interfaced to computers. Heterogeneous catalysis experiments on supported metal catalysts also use reactor systems equipped with a gas chromatograph, and another quadrupole mass spectrometer. Both transient and steady-state reaction studies can be carried out in this equipment. A static chemisorption system is used to measure surface areas.

Specially designed equipment is used to study combustion and pyrolysis in solid fossil fuels. A high voltage cell has been constructed to investigate electrocarbonization in coal. An infrared thermal video imaging camera is available to monitor the propagation of combustion, pyrolysis, and electrocarbonization fronts noninvasively. A microprocessor controlled muffle furnace is employed for laboratory core characterization studies of the overburden from underground coal gasification sites.

Process control studies make extensive use of the Department's real-time computer systems and studies are carried out on a variety of experimental units. A four-meter-high fluidized bed with high speed radiation densitometer and pressure transducers is used. In addition, a distillation column, packed-bed catalytic reactor, and heat exchanger are used in process control studies.

There is a complete core flooding laboratory for work in enhanced oil

recovery, leaching of oil shales, and modified *in situ* oil shale studies. Spinning drop tensiometers, a dynamic Langmuir trough, and a Wilhelmy plate apparatus are used for fluid interface characterization. Oil shale leaching experiments simultaneously measure dynamic leaching and porous media properties. A porosimeter is used to determine pore size distributions. An electromechanical vibration system for particle dynamics studies is also available.

Membrane studies use a casting machine for fabrication of asymmetric membranes. A microbalance with a computer interface is employed for gravimetric studies of evaporative membrane casting. A high pressure flow loop is used for measuring the permeation characteristics of both flat sheet and hollow fiber membranes. Both vacuum and controlled atmosphere high-temperature ovens are available for membrane annealing studies. A Perkin-Elmer differential scanning calorimeter is available for determining the glass transition temperature as well as other properties of polymeric membrane materials. An AC impedance technique is used to study ion conducting membranes. Some studies on facilitated transport are also carried out at the National Bureau of Standards in Boulder.

Equipment used for biotechnology research includes three batch fermenters, a sedimentation vessel, a crossflow microfiltration unit, two autoclaves, and a turbidity meter. One set of batch fermenters is interfaced to our distributed on-time computer study to allow for fermentation control and identification studies. The bioengineering laboratory is equipped for biophysical measurements. The equipment includes a variety of optical instruments, a phase contrast and polarizing microscope, a microscope video camera, a Cary spectrophotometer, a plant growth chamber, autoclave, and a sterile room.

A sensitive calorimeter for measuring phase changes and heats of solution in solids is under construction. Water pollution control equipment includes biological reactors and pressure vessels.

A National Science Foundation Specialized Engineering Research Equipment Grant has enabled the Department to purchase a Cambridge Stereoscan 250 MK3 scanning electron microscope. A small angle X-ray scattering camera for observing crystallinity in polymers has been obtained from a similar NSF grant. The Department also has an RCA Transmission Electron Microscope. The one-million volt transmission electron microscope in the Department of Molecular, Cellular, and Developmental



Biology is also used in the membrane and surface science research. The regional Nuclear Magnetic Resonance (NMR) facility is also available.

The Department of Civil, Environmental, and Architectural Engineering research interests and facilities include extensive research laboratories in the areas of structural mechanics and geotechnical engineering. Excellent facilities are available for research in water quality, environmental engineering, hydraulics, hydrology and water resources as well as construction management and building energy engineering. Unique to the department are a 10 g-ton and a 400 g-ton centrifuge for geotechnical, hydraulic and structural model studies. The Department has numerous computing facilities and is the College's largest computer user.

Current research covers such topics as water and wastewater treatment, alpine hydrology, hydraulic modeling, land treatment by rapid infiltration, composting of wastes and activated sludge processes, research on construction contracts using artificial intelligence, design of construction operations, risk analysis, and construction management. The area of building systems engineering includes research in energy conservation, solar applications and lighting systems. Offshore structures, centrifugal modeling, excavations, tunnelling, mine waste planning, and rock and soil mechanics are being studied. In structures, research includes focus on buckling, finite element techniques, reinforced concrete, earthquake behavior, masonry structures, and prestressed concrete.

The Computer Science Department has built a network (10 mbit Ethernet using the TCP/IP protocol) of computers to support faculty/student research and graduate instruction. The network has grown to include machines in most departments of the College of Engineering. It is managed and operated by the Academic Computing Center using Computer Science students. These students gain valuable real-world experience and find themselves very well prepared for the job market.

The network is configured as follows:

Astrophysical, Planetary, and Atmospheric Sciences	Pyramid P90x
Aerospace Engineering	Pyramid P90x
Computer Science	Vax 11/785
Computer Science	Vax 11/780
Computer Science	Pyramid P90x
Graphics Lab	2 Hewlett-Packard 9000s
Computer Science	Subnet of 35 Sun workstations
Computer Science	Subnet of 30 Hewlett-Packard Bobcat workstations
Computer Science	8 Symbolics AI workstations
Computer Science	Iris graphics workstation

Computer Science	20-node Encore multiprocessor
Computer Science	32-node Intel Hypercube
Electrical Engineering	IBM 4381
Electrical Engineering	Pyramid 90x
Electrical Engineering	Vax 11/750
Electrical Engineering	Harris H800
Graphics Lab	2 Hewlett-Packard 9000s
Electrical Engineering	10 Hewlett-Packard Bobcats
Electrical Engineering	Graphtek workstation
Mathematics	Subnet of 6 Sun workstations
MCD Biology	2 Metheus graphics workstations
Mechanical Engineering	Pyramid P90x
Mechanical Engineering	Pyramid P90x
Civil Engineering	Pyramid P90x
Supercomputer Lab	2 Sun workstations
	6 Apollos
	3 Suns
	7 Sun workstations
	Vax 750

A wide variety of terminals, graphics terminals, line printers, plotters, and letter quality laser printers are readily accessible to students.

In addition, instructional support for computer science students is excellent. Laboratories of small 2 user UNIX machines (AT&T 3B2s) support undergraduate courses; Pyramid P90x and Vax 11/785 mini computers support graduate courses. In addition an Artificial Intelligence Laboratory of 30 HP bobcats and a Networking Laboratory of 15 Sun workstations is available to students.

The Department of Electrical and Computer Engineering special equipment and facilities include a class 1,000 clean room facility for epitaxial growth and fabrication of microwave and optical devices; high-vacuum and vacuum deposition equipment for thin-films research; an integrated circuits laboratory; ion implantation equipment; crystal growing facilities; a modern systems laboratory; undergraduate laboratories in circuits, electronics, and energy conversion; a holography and optics laboratory; numerous special purpose computers; mini- and microprocessors and a computer laboratory; a roof-mounted antenna range; an anechoic chamber for studying propagation effects at microwave frequencies; a special microscope for laser manipulation of microorganisms *in vivo*; a biomicrowave laboratory, and a growing array of other bioengineering research apparatus.

The Department of Electrical and Computer Engineering has several computers on the Engineering Research Computing Facility Network (10 mbit Ethernet), primarily dedicated to faculty and student research projects. ECE machines on the network include an IBM 4381, a Pyramid P90-X, an AT&T 3B15, a Harris H800, two Metheus graphics workstations, and a Software Engineering sub-net consisting of several Sun-3 workstations. Through the

network students can access a wide variety of printers, plotters, and graphics terminals. A limited number of undergraduates also use the systems for VLSI courses and independent study projects. The Harris H800 system is used by the radar remote sensing group and the signal-processing group. Five Intel 310/286 machines are used in the Graduate Real-time Computer Laboratory. Two Hewlett-Packard 9000 minicomputers are used in conjunction with HP development stations and micros to support undergraduate microprocessor laboratories.

Mechanical Engineering laboratories provide for experimental studies of thermal and mechanical systems. Typical areas of study include heat transfer, fluid and solid mechanics, mechanical behavior of materials, combustion, and prosthetic device performance.

The Combustion Laboratory contains instrumentation for velocity, temperature, and composition measurements in chemically reacting flows. Included are systems for gas chromatography, laser-induced fluorescence spectroscopy, laser absorption spectroscopy, laser schlieren, laser interferometry, and laser doppler anemometry. The Laboratory is also equipped for computer control of the instrumentation and automatic data reduction including graphics capabilities.

The recently renovated Materials Laboratory is well equipped for the measurement of the physical and mechanical properties of polymers and polymeric matrix composites. Major facilities include a pressure dilatometer with capabilities to 200 MPa and 450°C for determination of solid and melt equations of state, a forced-oscillation dynamic mechanical analyzer as well as a large capacity torsion pendulum for measurement of modulus and damping behavior, a modern servohydraulic mechanical test system for the analysis of tensile and relaxation properties, and a uniquely configured scanning electron microscope for morphological studies. In addition, standard characterization equipment such as differential scanning calorimetry and thermogravimetric analysis is available.

The Fluid Mechanics Laboratory is equipped with several basic facilities for experimentation in fluid systems. The Stokes flow apparatus is devoted to measurement of drag in highly viscous fluid flow using laser-timer instrumentation. The Taylor-Couette apparatus incorporates thermistor sensors, laser sheet visualization, and computer data acquisition to study instabilities of fluid motion between rotating cylinders with

a radial temperature gradient. A humidity-controlled room provides an environment for studying the stability of rotating capillary rivulets. A Ling vibration exciter provides the basis for g-jitter experiments on the stability of differentially heated fluid layers. Other modern instrumentation techniques available are hot-film anemometers for velocity measurement, conductivity probes for density stratification measurements, capacitance-controlled oscillators for amplitude measurement of propagating capillary waves, and high sensitivity piezometric gages for shock wave detection.

The *Center for Space Structures and Controls (CSSC)*, which draws on faculty from Mechanical Engineering, offers a state-of-the-art computer laboratory. Its configuration calls for a network of scientific workstations—three Sun 3/50s and one Sun 3/110 with color graphics capabilities—which access a common file server. The workstations function as “computational nodes” that furnish powerful but inexpensive processing capacity of main memory to their users. The common file server furnishes a central data base of software, which facilitates course work, teaching, and research. The common operating system for the CSSC Computer Laboratory is UNIX 4.2bsd. This system has been enhanced with remote file access and networking capabilities that allow the computational nodes to operate as a cluster.

This cluster is linked through a gateway Ethernet port to the Engineering Center Research Network (ERCnet) of UNIX-based machines operated by the Computer Science Department. Connection to this network allows CSSC Computer Laboratory users to access other College-owned machines, such as the multiprocessors Encore Multimax, Alliant/FX8, and the hypercube iPSC. It also allows access to the Academic Computing Services’ cluster via remote log-in and reaches other users by electronic mail. This network is linked to UUCPnet, CSnet, and NSFnet to access off-campus facilities, such as the Princeton and Cornell supercomputer centers. It was scheduled to be linked to ARPAnet during 1987.

The CSSC Computer Laboratory also uses the computing power of the CRAY2 at NASA-AMES, the CRAY X-MP/24 at NRL, and the iPSC-128 at Los Alamos.

The *Automated Assembly Laboratory* is equipped with an IBM 7545 SCARA assembly robot, programmed by an IBM PC. This robot has four proportional degrees of freedom, plus on/off grasp. A digital input/output interface allows individual experiments to be quickly set

up and modified. An IBM PC-AT with digitizing tablet and 6-pen plotter is available for computer-aided design using CADKEY. In addition, several prototype robots, including an IBM Pompano-type and a Prab, are available for individual research projects.

Other specialized equipment includes Instron testing machines, a diffused light polariscope, a digital storage/dual beam oscilloscope, metallographs, and shaker tables.

Electrical and mechanical equipment is available for work in servo-mechanisms, modeling presses, and fabrication equipment for plastics technology; modular analog computer units; high-speed photographic equipment; a precision microscope for grain examination and film reading; time-sharing computer terminals; a servo-analyzer; an 8-track instrumentation tape recorder; and special equipment for bioengineering studies of skeletal systems and prosthetic devices.

The *Nuclear Physics Laboratory*, of the Department of Physics, conducts experimental and theoretical research in medium-energy nuclear physics. The work in theory is directed primarily to the study of relativistic effects in nuclear interactions and to developing advanced theoretical methods for understanding nuclear reaction mechanisms. Experimental work is focused on pion-nucleus interactions and charge-exchange reactions in the energy range of 100-1000 MeV. The Laboratory is well-equipped with office space, computer facilities, and shop areas for the preparation of experimental apparatus. Graduate students and faculty of the Laboratory participate in experiments carried out at the Los Alamos Meson Physics Facility, at Tri-Universities Meson Physics Facility (TRIUMF) in Vancouver, B.C., and at the Indiana University Cyclotron Facility. Support for the research effort of the Laboratory is provided by the U.S. Department of Energy. Research assistantship support is available for graduate student research in both theoretical and experimental medium-energy nuclear physics.

The *High Altitude Observatory* is an internationally recognized center for the study of solar, solar-terrestrial, and related astrophysics with emphasis on the interrelationships between these areas. Established in 1940, HAO now has its central laboratory and administrative offices in the National Center for Atmospheric Research (NCAR) building in south Boulder.

HAO is a part of NCAR, which is sponsored by the National Science Foundation. HAO’s extensive research facilities are available to and are used by graduate students pursuing ad-

vanced studies in the Departments of Astrophysical, Planetary, and Atmospheric Sciences and Physics.

## Graduate Student Advisory Council

The Graduate Student Advisory Council (GSAC) represents virtually all graduate students on the Boulder Campus of the University of Colorado. It is composed of graduate student representatives elected from 41 graduate disciplines that span most schools and colleges of the University. Although GSAC exists as part of the University of Colorado Student Union (UCSU), its broad constituency makes GSAC’s role in overall student governance unique. GSAC seeks to serve graduate students by participating in student government, by acting as an effective liaison between graduate students, the Graduate School, and individual departments, and by sponsoring special projects and workshops of specific concern to graduate students. To these ends GSAC advises and makes recommendations to the University administration through the Graduate School and the graduate faculty concerning the quality of graduate education. GSAC is also concerned with the equitable treatment of graduate students with respect to appointments, support, and University services, as well as other matters that may affect the welfare and education of graduate students. GSAC is a cosponsor of the Graduate Teacher Program (GTP). Representatives from GSAC are voting members of the Executive Committee of the Graduate School, its Boulder Campus counterpart, and the Executive Council of UCSU. GSAC representatives serve on the campus Program Review Panel (PRP) and on all Boulder Faculty Assembly subcommittees which include Budget, Academic Planning (CAPPS), Libraries, Minority Affairs, and Faculty Women. Specific services performed by GSAC include a Library Advisory Committee, the Graduate Student Handbook, and a fund-raising phonathon for the Graduate Foundation Fund Awards.

## Graduate Student Committee on Privilege

Grievances that concern graduate students and cannot be addressed through the appropriate administrative channels should be directed to the Graduate Student Committee on Privilege (GSCP). This committee consists of Graduate Student Advisory Council (GSAC) officers and the graduate student representative to the Executive Advisory Committee for the Boulder Campus

Graduate School. GSCP is designed to expedite grievance proceedings and to protect the grievant from any overt or covert discrimination or intimidation that may result from that student filing a complaint. The Committee has been endorsed by the Dean of the Graduate School, the Executive Committee of the Graduate School, and the graduate faculty. The Executive Advisory Committee handles appeals submitted by Boulder graduate students concerning action taken by faculty members, departments, or administrative officials that cannot otherwise be resolved. For more information consult the GSAC office.

## FINANCIAL AID FOR GRADUATE STUDY

### Financial Aid

Graduate students wishing to apply for long-term loans through the Perkins Loan program (formerly the National Direct Student Loan) and for part-time jobs through the College Work-Study Program should submit a Family Financial Statement (FFS) to the American College Testing (ACT) Need Analysis Service early enough to meet the April 1, 1988, priority date.

### Scholarships and Fellowships

The University of Colorado administers various forms of financial assistance for graduate students: fellowships, fellowships for protected-class individuals, traineeships, scholarships, research and teaching assistantships, and a number of awards from outside agencies.

The Graduate School offers four types of assistance: Colorado Doctoral Fellowships, Chancellor's Doctoral Fellowships, Patricia Roberts Harris Fellowships, and Colorado Graduate Grants.

*Colorado Doctoral Fellowships* are awarded to entering and continuing regular degree doctoral students. These are awarded to entering students on the basis of academic promise and to continuing students on criteria of academic success. In order for fellowships to be renewed, students holding them must reapply each year to their departments. Special fellowships, traineeships, and scholarships are also available for study in certain departments. For those entering students intending to apply for fellowships, it is required that they take the Graduate Record Examination, with the exception of D.Mus.A., M.F.A., and protected-class students.

*The Chancellor's Doctoral Fellowship Program* was instituted in the academic

year 1984-85 to recruit the most outstanding potential students for doctoral-level study at the University of Colorado. The student receives a stipend of \$12,000 and a full waiver of all tuition and fees. To be considered for this award, a student must be an entering doctoral student and be nominated to the Graduate School by the department the student will attend.

Applications for fellowships and scholarships are due in the department before the announced departmental deadline.

*Patricia Roberts Harris Fellowships* are awarded to minority and women students in the following fields: Environmental, Population, and Organismic Biology, Engineering, Mathematics, Physics, and Psychology. Students should indicate their interest in applying for this award when applying to a graduate program mentioned above. Students receive a stipend and a waiver of all tuition and fees for a period of twelve months. These fellowships are made available through a grant from the U.S. Department of Education.

The *Colorado Graduate Grant Program* is a program open to graduate students who are residents of the state of Colorado. The competition for these funds is based on need. Applications are available from the Office of Financial Aid.

For further details consult the University of Colorado brochure *Fellowships, Scholarships, and Assistantships for Graduate Students, 1988-89*.

### GRADUATE PART-TIME INSTRUCTORS AND TEACHING ASSISTANTS

Many departments employ graduate students as graduate part-time instructors (GPTI) or as teaching assistants. GPTIs are full-time, regular degree graduate students who have a master's degree or the equivalent. Teaching assistants are also full-time regular degree graduate students, but it is not necessary for them to have any previous experience. Students are compensated on the basis of the percentage of time that is worked. Tuition credits are also based on the student's percentage of time. Nonresident students employed as assistants are eligible for the nonresident tuition differential waiver for their first-year appointments only. Exceptions extending beyond the first year must be approved in advance by the respective dean.

### RESEARCH ASSISTANTS

Research activities provide opportunities for graduate students to secure part-time work as research assistants in

many departments. Students are compensated and receive tuition waivers based on the percentage of time of their appointment. General fund research assistantships are subject to the one-year rule on eligibility for waiver of the nonresident tuition differential. Research assistants must be full-time regularly enrolled graduate students.

## ADMISSION REQUIREMENTS

### General Requirements

A student who is granted admission must reflect in a moral and ethical sense a personal background acceptable to the University. The University reserves the right to deny admission to applicants whose total credentials reflect an inability to assume those obligations of performance and behavior deemed essential by the University and relevant to any of its lawful missions, processes, and functions as an educational institution.

Admission to the Graduate School is not admission to candidacy for an advanced degree. A student who wishes to become a candidate for a degree must make special application at the time and in the manner prescribed by the requirements for the degree sought. Students may be admitted to the Graduate School in either of the two categories described below.

### Regular Degree Students

Qualified students are recommended for admission to regular degree status by the appropriate department. In addition to departmental approval, an applicant for admission as a regular degree student must:

1. Hold a baccalaureate degree from a college or university of recognized standing, or have done work equivalent to that required for such a degree and equivalent to the degree given at this University.
2. Show promise of ability to pursue advanced study and research, as judged by the student's previous scholastic record.
3. Have had adequate preparation to enter graduate study in the field chosen.
4. Have at least a 2.75 (2.00 = C) undergraduate grade point average (for Engineering, 3.00).
5. Meet additional requirements for admission as established by major departments.

*Pass/Fail Grades.* In order to permit a meaningful evaluation of an applicant's scholastic record, not more than 10

percent of those credit hours that are relevant to the intended field of graduate study shall have been earned with Pass/Fail grades, nor more than 20 percent overall. Applicants whose academic record contains a larger percentage of Pass/Fail credits must submit suitable additional evidence that they possess the required scholastic ability. An applicant who does not submit satisfactory additional evidence can be admitted only as a provisional student.

## Provisional Degree Students

Students who do not meet the requirements for admission as regular degree students may be recommended for provisional degree status by the major department. With the concurrence of the Dean of the Graduate School these students are admitted to a probationary term of either one or two semesters of full-time study or its equivalent for part-time students. At the end of the specified probationary period, provisional degree students must be either admitted to regular degree status or dismissed from the graduate program to which they were provisionally admitted.

Credit earned by persons in provisional degree status may count toward a degree at this University.

Provisional degree students are required to maintain a 3.00 grade point average or higher, according to the terms of their provisional admission, each semester or summer session on all work taken, whether or not it is to be applied toward the advanced degree sought. Students who fail to maintain such a standard of performance will be subject to suspension from the Graduate School.

## Seniors at the University of Colorado

A University of Colorado senior who has satisfied the undergraduate residence requirement and does not need more than 6 semester hours of advanced subjects to meet the requirements for a bachelor's degree may be admitted to the Graduate School.

A University of Colorado senior enrolled in the College of Engineering and Applied Science who needs not more than 18 semester hours to meet the requirements for a bachelor's degree may be admitted to the Graduate School, but is not eligible for financial aid, scholarships, or fellowships as a graduate student until the equivalent of the minimum requirements for the bachelor's degree have been satisfied.

## Graduate Record Examinations

The Graduate Record Examination (GRE) is requested of applicants for fellowships and scholarships and applicants for admission as provisional degree students. At the option of any department, the Graduate Record Examination may be required of applicants for assistantships or of any student before the student's status is determined.

Students who are applying for admission in Fall 1988 should take the GRE no later than the December 1987 testing date so that their scores will be available to the graduate awards selection committee.

The Office of Research and Testing administers the GRE and other graduate and professional qualifying examinations, but does not set admissions requirements. Since these requirements vary, the specific department should be consulted before taking any graduate test.

Packets containing application/registration materials, instructions, test dates and deadlines, and fee information may be obtained just inside the west (main) entrance to Willard Administrative Center. Special problems or requests must be handled by Educational Testing Service, Box 995, Princeton, New Jersey 08541; telephone (609) 921-9000.

GRE fee waiver information is available through the Office of Financial Aid.

## Other Graduate Qualifying Examinations

Students entering professional schools and special programs may obtain application/registration materials for law school (LSAT), business school (GMAT), medical school (MCAT), dental school (DAT), National Teacher Examinations (NTE), and Miller Analogies Test (MAT) just inside the west (main) entrance to Willard Administrative Center.

## Readmission of Former and Suspended Students

Students who were previously admitted to a graduate degree program but who did not complete that degree and who have not been continuously registered at the University must:

1. Clarify their status with the department to determine their eligibility to return and pursue the same degree.
2. After receiving departmental approval, as indicated above, submit a former student application to the Office

of Admissions before enrollment levels are met or deadlines passed for the term in which they expect to return to the University.

In some instances, students who have left the degree program to which they were formerly admitted must submit a new Graduate Application Form and be reconsidered for admission by the department concerned.

Former students who wish to change from undergraduate to graduate status or from one major to another must complete the appropriate forms at the time they apply for readmission.

Students transferring from one campus to another must apply and be accepted to the new campus.

A student admitted to the Graduate School for the master's program must reapply for admission for the doctoral program.

A regular degree student who is suspended for failure to maintain a 3.00 grade point average is eligible to apply for readmission after one year. Approval or rejection of this application rests jointly with the student's major department and the Dean of the Graduate School. The final decision will be made by the Dean.

## Faculty Members

No member of the faculty above the rank of instructor may receive an advanced degree from this University.

## APPLICATION PROCEDURES

An applicant for admission must present complete application materials which include:

1. Part I and Part II of the graduate application.
2. Two official transcripts of *all* academic work completed to date.
3. A \$30 nonrefundable application fee (check or money order). No application will be processed unless this fee is paid. Foreign application fee is \$50.
4. Four reports from references.
5. Test scores and other materials as required by specific departments.

All credentials presented for admission become the property of the University of Colorado.

When a prospective degree student applies for admission, the Chair of each department or a committee named for the purpose shall decide whether an applicant shall be recommended for admission. That recommendation is further reviewed and the student is informed of the decision by the Office of Admissions. Applicants not recommended for admission will be informed

of the decision by the department. Persons who do not wish to work toward an advanced degree should see the section entitled Nondegree Students.

A completed application must be in the office of the major department at least 120 days prior to the term for which the admission is sought or earlier as may be required by the major department.

Foreign students coming from abroad should have completed applications on file in the Office of Admissions prior to March 1 for the fall semester and October 1 for the spring semester; those foreign students currently studying in the United States should follow deadlines set for United States citizens.

Applicants should be aware of the limitation on total enrollment in effect at the University of Colorado at Boulder. Acceptable applicants may find that their application cannot be processed for a specific term if the enrollment goal has been reached.

## Graduate Notification and Confirmation

After the Office of Admissions has received the department recommendation and all required credentials, the applicant will be notified regarding eligibility for admission. If eligible, the applicant will receive a Statement of Eligibility as well as a confirmation form which must be returned with the designated nonrefundable deposit before the enrollment levels are reached or the deadline passed. If the confirmation is accepted, the student will be sent information regarding registration. Should the enrollment levels be reached, the deposit will be returned. Applicants not accepted for admission will be notified by the appropriate graduate department.

## REGISTRATION

Students entering the Graduate School for the first time must have a Statement of Eligibility Form. Former students must also have a Statement of Eligibility Form, whether changing departments or returning to the same department to complete the original degree. This form is mailed from the Office of Admissions after review and processing of the approved application have been completed.

## Late Registration

Late registration will be held only if enrollment levels have not been reached. Therefore, there is no guarantee there will be a late registration. Graduate students who fail to complete

registration and pay fees during the regular registration days may be charged a late registration fee if a late registration is held. Students registering as Candidate for Degree or for thesis hours must register during the regular registration period or be subject to the late registration fee if a late registration is held (see Registration section of this *Catalog*).

## Limitation of Registration

### FULL LOAD

A graduate student will be considered to be carrying a full load during a regular semester for purposes of determining residence credit if the student is registered for not fewer than 5 semester hours in work numbered 5000 or above, at least 8 semester hours in a combination of undergraduate/graduate/professional course work acceptable for graduate credit, or any number of thesis hours.

A maximum of two-thirds of a semester of residence credit may be earned during the summer if a student registers for 3 semester hours of work in courses numbered 5000 or above, 5 semester hours of other graduate work, or any number of thesis hours.

### MAXIMUM LOAD

No graduate student may receive graduate credit toward a degree for more than 15 hours in a regular semester.

The maximum number of graduate credits that may be applied toward a degree during a summer session is 6 hours per 5-week term and 10 hours per 10-week summer session.

### UNIVERSITY EMPLOYEES

Full-time employees of the University may not undertake more than 6 credit hours per semester. Part-time employees, including assistants, may take such work as is approved by the major department.

## Course Work

A student who wishes to add a course, drop a course, or take it for no credit must follow the Drop/Add standard procedure and adhere to the Drop/Add deadlines found in the current *Schedule of Courses*. Note that after the sixth week of classes a graduate student may not drop, add, or change a course to noncredit without presenting a letter to the Dean of the Graduate School, 308 Regent Administrative Center, stating the exceptional circumstances which justify the change. This letter, endorsed by the instructor of the

course, must accompany the properly signed and completed Drop/Add form.

## Pass/Fail

No course work to be applied toward an advanced degree may be taken Pass/Fail. A graduate student may not take any course at the 5000 level or above on a Pass/Fail basis.

## Withdrawal

A graduate student who desires to withdraw from the University should go to Room 125, Regent Administrative Center, for a withdrawal interview. A student who discontinues attendance in a course without officially withdrawing will be marked as having failed the course. Except under the most extreme circumstances, graduate students are not permitted to withdraw after the last day of classes.

## Reciprocal Exchange Agreement Program

Reciprocal registration makes it possible for University of Colorado graduate students to attend class at another northern Colorado institution, including Colorado School of Mines, Colorado State University, and the University of Northern Colorado. The following conditions must be met for registration in the program:

1. The graduate student must be registered and assessed full tuition and fees during the semester the request is made.
2. The course requested must be part of the student's regular load.
3. The student must be pursuing a program leading to an advanced degree.
4. The course is not offered on the student's home campus at the time a student can take advantage of it.
5. The request is presented prior to the home campus Drop/Add deadline.
6. The request is presented any term except the graduation semester.
7. A separate request form is completed for each course taken.
8. Space is available.

For further information, contact the Office of Registrations, Regent 125, 492-6581.

## REQUIREMENTS FOR ADVANCED DEGREES

### Quality of Graduate Work

Although the work for advanced degrees is specified partly in terms of credit hours, *an advanced degree will*

not be conferred merely for the completion of a specified period of residence and the passing of a given number of courses. A student should not expect to gain from formal courses all the training, knowledge, and grasp of ideas necessary to meet the requirements for an advanced degree.

A student is required to maintain at least a *B* average in all work attempted while enrolled in the Graduate School.

For the Ph.D., a course mark below *B-* is unsatisfactory and will not be counted toward fulfilling the minimum requirements for the degree.

A student who fails to maintain a 3.00 grade point average or to make adequate progress toward completing a degree will be subject to suspension from the Graduate School with the approval of the major department. The final decision on suspension will be made by the Dean of the Graduate School.

### STUDENT ETHICS

Students are expected to adhere to the highest codes of personal and professional ethics. Students who do not meet these standards may be dismissed by the Dean upon recommendation of the Graduate Program Director.

### GRADING SYSTEM

Students should refer to the uniform grading system described in the University Policies, Programs, and Services section of this *Catalog* and note the following:

1. Work receiving the lowest passing grade, *D*, may not be counted toward a degree, nor may it be accepted for the removal of deficiencies. Marks below *B-* are not accepted for the Ph.D.

2. Should a student enter the armed forces before completing a course and an *IW* is reported, this grade may be carried on the records for the duration of the student's service provided arrangements have been made in advance with the Dean of the Graduate School.

3. An *In Progress* grade given for thesis or dissertation hours will be valid until the thesis or dissertation has been completed.

### REPEATING A COURSE

A graduate student who receives a grade of *C*, *D*, or *F* in a course may repeat that course once, upon written recommendation to the Dean by the chair of the student's advisory committee and major department, provided the course has not previously been applied toward a degree.

In calculating a student's grade point average for Graduate School purposes,

the grade for a repeated course will substitute for the old grade. Grades earned in courses taken as an undergraduate or as a nondegree student, as well as grades earned in first- and second-year foreign language courses, will not be used in calculating the Graduate School grade point average. However, all grades received will appear on the student's transcript.

### CHANGE OF DEPARTMENT OR MAJOR

A graduate student wishing to change department or major must submit a new Part I and Part II of the graduate application to the new department or school and request the former department to forward recommendations and credentials.

### USE OF ENGLISH

A student who is noticeably deficient in the use and spelling of the English language may not obtain an advanced degree from the University of Colorado. The satisfaction of this requirement depends not so much upon the ability to pass formal tests, although these may be demanded, as it does upon the habitual use of good English in all oral and written work. Ability to use the language with precision and distinction should be cultivated as an attainment of major importance.

Each department will judge the qualifications of its advanced students in the use of English. Reports, examinations, and speech will be considered in estimating the candidate's proficiency.

### Master of Arts and Master of Science

A student regularly admitted to the Graduate School and later accepted as a candidate for the degree Master of Arts or Master of Science will be recommended for the degree only after the following requirements have been met.

In general, only graduates of an approved institution who have a thorough preparation for their proposed fields of study and who do graduate work of high quality are able to attain the degree with the minimum amount of work specified below. All studies offered toward the minimum requirement for the degree must be of graduate rank. Courses taken during the fall semester of 1975 and thereafter will have graduate rank only if they are taught by members of the graduate school faculty and are in one of the two following categories: (1) courses within the major department at the 5000 level or above; (2) courses outside the major

department at any level, provided they are approved for graduate rank for a specific degree plan by the faculty of the degree-granting program and the Dean of the Graduate School. Necessary additional work required to make up deficiencies or prerequisites may be partly or entirely undergraduate courses.

The requirements stated below are minimum requirements; additional conditions set by the department will be found in the announcements of separate departments. Any department may make further regulations consistent with the general rules.

Students planning to graduate should obtain current deadline dates in the office of the Graduate School. It is the graduate student's and the department's responsibility to see that all requirements and deadlines are met (i.e., changing of *IW* grades, notifying the Graduate School of final examinations, etc.).

Departments or program committees may have additional deadlines which must be met by graduate students in that department or program. It is the student's responsibility to ascertain such requirements and to meet them as designated by the department or program chair.

### MINIMUM REQUIREMENT

The minimum requirement of graduate work for the degree Master of Arts or Master of Science may be fulfilled by following either Plan I or Plan II below.

*Plan I:* By presenting 24 semester hours of graduate work, including a thesis. At least 12 semester hours of this work must be at the 5000 level or above.

*Plan II:* By presenting 30 semester hours of graduate work, without a thesis. At least 16 semester hours of work must be at the 5000 level or above.

Plan II does not represent a free option for the student. A candidate for the Master's degree may be allowed to select Plan II only on the recommendation of the department concerned.

For either Plan I or Plan II, courses below the 5000 level may be used only if they are in departments other than the student's major department.

### MASTER'S THESIS

A graduate student who writes a thesis under Plan I must register for 4, 5, or 6 semester thesis hours (7000). The student may register for 6 hours during one semester or spread the total out over a number of semesters. The student may not register for zero thesis hours.



The final grade will be withheld until the thesis is completed; if the thesis is not finished at the end of the term in which the student is registered, an *In Progress (IP)* will be reported.

### MASTER'S DEGREE CANDIDATE

After a student has registered for the total number of thesis hours (Plan I) or has completed all course work (Plan II), he or she should, if registration is required, register as Master's Degree Candidate (9999). Students will receive three credit hours when taking this course. However, this course will not fulfill the Graduate School's minimum credit hour requirements for a master's degree. The student will not receive a letter grade for this course, but a grade of either Pass or Fail.

### LANGUAGE REQUIREMENTS

Candidates must have such knowledge of ancient and modern languages as each department requires. See special departmental requirements.

### TIME LIMIT

All work, including the comprehensive-final examination and the filing of the thesis with the Graduate School (if Plan I is followed), must be completed within four years or six consecutive summers. Students who fail to complete all requirements within this time limit must have an annual statement filed by the department program director stating the reasons why the program faculty believe the student should be allowed to continue in the program. Course work taken more than six years prior to the completion of final requirements (comprehensive exam and/or filing of thesis) will not be accepted for the degree unless validated by a *special* examination. A candidate for the master's degree is expected to complete the work with reasonable continuity.

Students whose residence in this University is interrupted by military service may apply to the Dean of the Graduate School for an extension of time.

### CREDIT BY TRANSFER

Work already applied toward a master's degree received from another institution cannot be accepted for transfer toward the master's degree at the University of Colorado; extension work completed at another institution cannot be transferred; and correspondence work, except to make up deficiencies, is not recognized.

All work accepted by transfer must come within the six-year time limit or be validated by *special* examination. A course in which a grade of *C* or lower

was received will not be accepted for transfer.

Credit will not be transferred until the student has established, in the Graduate School of this University, a satisfactory record of at least one semester in residence; such transfer will not reduce the residence requirement at this University, but it may reduce the amount of work to be done in formal courses.

Excess undergraduate credits from another institution may not be transferred to the Graduate School. Seniors in this University may, however, transfer a limited amount of advanced resident work (up to 9 semester hours) provided such work:

1. Is completed with a grade of *B* or above in the senior year at this University.
2. Comes within the six-year time limit.
3. Has not been applied toward another degree.
4. Is recommended for transfer by the department concerned and is approved by the Dean of the Graduate School.

The maximum amount of work that may be transferred to this University, dependent upon the master's degree sought, is noted below:

Degree	Semester Hours
M.A. or M.S. . . . . .	9
M.E. . . . . .	9
M.Mus. . . . . .	9
M.Mus.Ed. . . . . .	9
M.F.A. . . . . .	18

Requests for transfer of credit to be applied toward an advanced degree must be made on the form specified for this purpose and submitted to the Graduate School by the beginning of the semester prior to that in which the student will graduate. This form is to be completed by the student, endorsed by his advisor, the department chair or the designated representative, and the dean of the college if applicable, and sent to the Graduate School. An official transcript of credit must accompany the request. (Information required: course title, number, credit hours, when and where taken, grade received, and certification that student was enrolled in graduate school at the time.) To be eligible for courses to be considered for transfer, a student must have an overall *B* average in all courses taken at the University of Colorado in the Graduate School.

### TRANSFER OF NONDEGREE STUDENT CREDIT HOURS

A department may recommend to the Graduate Dean the acceptance of as many as 9 *total* hours of credit toward the requirements for a master's degree

for courses taken either as a student at another recognized graduate school, as a nondegree student at this University, or both. In addition, the department may recommend to the Graduate Dean the acceptance of credit for courses taken as a nondegree student at this University during the term *for which* the student applied for admission to the Graduate School, provided such admission date was delayed through no fault of the student's. A grade of *B* or better must be obtained in any course work transferred in this manner.

### CONTINUING EDUCATION COURSE WORK

Students may use the resources of the Division of Continuing Education in the pursuit of graduate study only if they obtain proper academic approval from the major department and the Graduate Dean in advance.

### RESIDENCE

In general the residence requirements can be met only by residence at this University for at least two semesters or at least three summer sessions. For full residence a student must be registered within the time designated at the beginning of a semester and must carry the equivalent of at least 5 semester hours of work in courses numbered 5000 or above, or at least a combination of 8 semester hours of other course work acceptable for graduate credit. See Limitation of Registration, Full Load for requirements for full residence credit during the summer. Students who are noticeably deficient in their general training or in the specific preparation required by the department cannot expect to obtain a degree in the minimum time specified.

Assistants and other employees of the University may fulfill the residence requirements of one year in two semesters, provided their duties do not require more than half time. Full-time employees may not satisfy the residence requirement of one year in fewer than four semesters.

### CANDIDACY

A student who wishes to become a candidate for a master's degree must file an application in the Dean's office not later than 10 weeks prior to the completion of the comprehensive-final examination.

This application must be made on forms obtainable at the Dean's office and in appropriate departments and must be signed by the major department, certifying that the student's work is satisfactory and that the program

outlined in the application meets the requirements set for the student.

### THESIS REQUIREMENTS

A thesis, which may be of a research, expository, critical, or creative type, is required of every master's degree candidate under Plan I. Every thesis presented in partial fulfillment of the requirements for an advanced degree must:

1. Deal with a definite topic related to the major field.
2. Be based upon independent study and investigation.
3. Represent the equivalent of from 4 to 6 semester hours of work.
4. Receive the approval of the major department at least 30 days (in some departments, 90 days) before the commencement at which the degree is to be conferred.
5. Be essentially complete at the time the comprehensive-final examination is given.
6. Comply in mechanical features with specifications of the Graduate School.

Two weeks prior to the date on which the degree is to be conferred, two formally approved, typewritten copies of the thesis, complete with abstracts, must be filed in the Graduate School.

The thesis must be signed by two professors in the student's major field. All approved theses are kept on file in the library. The thesis binding fee must be paid when the thesis is deposited in the Graduate School.

### COMPREHENSIVE-FINAL EXAMINATIONS

Each candidate for a master's degree is required to take a comprehensive-final examination *after* the other requirements for the degree have been substantially completed. This examination may be given near the end of the last semester of residence while the candidate is still taking required courses for the degree, provided satisfactory progress is being made in those courses.

The following rules applying to the comprehensive-final examination must be observed:

1. A student must be registered when the examination is taken.
2. Notice of the examination must be filed by the major department in the Dean's office at least one week prior to the examination.
3. The examination is to be given by a committee of three graduate faculty members appointed by the department concerned with approval of the Dean of the Graduate School.

4. The examination, which may be oral or written, or both, must cover the thesis, which should be essentially complete at the time, as well as other work done in the University in formal courses and seminars in the major field.

5. The examination must include all work presented for the degree. The examination on transferred work will be given by representatives of the corresponding fields of study in this University.

6. A student who fails the comprehensive-final examination may not attempt the examination again until at least three months have elapsed and until such work as may be prescribed by the examining committee has been completed. The student may retake the examination only once.

### SUPPLEMENTAL EXAMINATIONS

Supplemental examinations should be simply an extension of the original examination and given immediately. If the student fails the supplemental examination, three months must elapse before he or she may attempt the comprehensive examination again.

### Doctor of Philosophy

The Doctor of Philosophy degree is the highest academic degree conferred by the University. To state the requirements for the degree in terms of credit hours would be misleading, since the degree is not conferred merely upon the satisfactory completion of a course of study, however faithfully pursued. Students who receive this degree must demonstrate that they are proficient in some broad subject of learning and that they can critically evaluate work in this field; furthermore, they must have shown the ability to work independently in their chosen field and must have made an original contribution of significance to the advancement of knowledge. The technical requirements stated below are minimal requirements for all candidates for the degree; additional conditions set by the departments will be found in the announcements of separate departments. Any department may make additional regulations consistent with these general rules.

Studies leading to the Doctor of Philosophy degree must be chosen so as to contribute to special competence and a high order of scholarship in a broad field of knowledge. A field of study chosen by the student may be in one department or it may include two or more closely related departments. The criterion as to what constitutes an acceptable field of study shall be that

the student's work must contribute to an organized program of study and research without regard to the organization of academic departments within the University.

Students planning to graduate should obtain current deadline dates in the office of the Graduate School. It is the graduate student's and the department's responsibility to see that all requirements and deadlines are met (i.e., changing of *W* grades, notifying the Graduate School of final examinations, etc.).

Departments or program committees may have additional deadlines which must be met by graduate students in that department or program. It is the student's responsibility to ascertain such requirements and to meet them as designated by the department or program chair.

### MINIMUM COURSE REQUIREMENT

A minimum of 30 semester hours of courses numbered 5000 or above is required for the degree, but the number of hours of formal courses will ordinarily exceed this minimum. Unless otherwise specified by departmental requirements, all 5000-level or above courses taken for the master's degree at the University of Colorado may be applied toward the doctor's degree at the University. Students who have been admitted to the Graduate School with deficiencies may expect to receive little or no residence credit until the deficiencies have been removed.

### THESIS CREDIT HOUR REQUIREMENT

To complete the requirements for the Ph.D. degree, a student must register for a total of at least 30 hours of doctoral thesis credit, with not more than 10 of these credit hours in any one semester. Not more than 10 thesis hours may be taken preceding the semester of taking comprehensive examinations. In addition, up to 10 hours may be taken in the semester in which the student passes comprehensives. Thesis credit does not apply toward the minimum 30 hours of required course work specified above, and will not be included in calculation of the student's grade point average. Only the grades of *A*, *B*, *C*, and *IP* shall be used.

Course work and work on the thesis may proceed concurrently throughout the doctoral program. However, at no time shall a doctoral student register for more than 15 hours of 5000-level and above courses. Normally a student

must have earned at least three and not more than six semesters of residency before admission to candidacy.

### QUALITY OF WORK

Students are expected to complete with distinction all work in the formal courses in which they enroll. A course mark below *B-* is unsatisfactory and will not be counted toward fulfilling the minimum requirements for the degree. Upon recommendation by the advisory committee and the executive officer of the department and with the approval of the Dean, a student may be required to withdraw at any time for failure to maintain satisfactory progress toward the degree.

### ADVISORY COMMITTEE

As soon as the field of specialization has been chosen, the candidate will request the faculty member with whom the candidate wishes to work to act as chair of the advisory committee. The chair, with the advice and approval of the executive officer of the department, may select two or more others to serve on the committee, so that the several fields related to the student's special interest will be represented. A purpose of the advisory committee (beyond guiding the student throughout his graduate study) is to ensure against too narrow specialization. The student shall obtain the signature of the chair of the committee (thereby signifying the chair's willingness to act) on the Application for Admission to Candidacy Form. Any change in the membership of the advisory committee is to be reported to the Graduate School.

### RESIDENCE

*The student must be properly registered to earn residence credit.* The minimal residence requirement shall be six semesters of scholarly work beyond the attainment of an acceptable bachelor's degree. Mere attendance shall not constitute residence as the word is here used. Residence must be earned for course work completed with distinction, for participation in seminars, or for scholarly research performed here or elsewhere under the auspices of the University of Colorado.

As a guiding policy in determining residence credit for employed students, those who are employed in three-fourths to full-time work which does not contribute directly to their program toward a degree may not earn more than one-half residence credit in any semester. Students who are employed more than one-fourth time and less than three-fourths time in work that

does not contribute directly to the degree may earn not more than three-fourths residence credit. Those who have one-fourth time employment or less may earn full residence credit. (All these provisions are subject to the definition of residence credit given in the preceding paragraph.) In case the interpretation of residence credit for any student needs to be clarified, a decision will be made by the chair of the student's advisory committee, the executive officer of the student's major department, and the Dean of the Graduate School.

Two semesters of residence credit may be allowed for a master's degree from another institution of approved standing, but at least four semesters of residence credit, two of which must be consecutive in one academic year, must be earned for work (course and/or dissertation) taken at this University.

### PRELIMINARY EXAMINATION

Each department will satisfy itself (by examination or other means) that students who signify intent to undertake study for the Ph.D. degree are qualified to do so. The means by which each department makes this evaluation shall be specified in departmental requirements. Students who are thus evaluated will be notified immediately of the results. The results of this preliminary evaluation shall be reported to the Office of the Graduate School on the Application for Candidacy Form filed by the student at least two weeks before the comprehensive examination is attempted.

### LANGUAGE REQUIREMENT

Students are required to meet the following language requirements:

#### Communication Requirement

1. All graduate students for whom English is the native language are required to demonstrate at least fourth-semester college proficiency in a foreign language of their choice. This requirement may be satisfied in the following ways:

- a. The student's undergraduate transcript may be presented, showing completion with a grade of *C* or better of at least 3 semester hours of a fourth-semester undergraduate college course in a foreign language. This requirement can also be met if the transcript certifies that the student demonstrated this level of proficiency in an examination administered by the undergraduate college instead of having formally passed the required

courses. The transcript must accompany the student's Application for Admission to Candidacy when it is submitted to the Graduate School.

- b. The student may take the Graduate School Foreign Language Test (GSFLT) at the Testing Office before or after admission to the Graduate School. Students should check with the Graduate School for the passing score required for each language.
- c. If the student wishes to demonstrate competence in a language for which the GSFLT is not available, a test designed and administered by the appropriate language department at the University of Colorado may be taken, with the passing criterion to be set comparable to the above GSFLT criterion.
- d. The student may register at the University for any fourth-semester course in a foreign language and pass it with a grade of *C* or better. (Registration in such courses is contingent upon the language department's approval.)

A student who elects b, c, or d above must complete the requirements before the Ph.D. comprehensive examination may be scheduled.

2. Students whose native language is not English will, by passing their courses and completing their graduate work at the University, demonstrate sufficient ability in English to meet the communication requirement.

### Special Languages

When special languages are needed as tools to read foreign literature in a particular field, the individual academic departments may require further training in foreign languages for all their Ph.D. graduate students. The choice and number of languages as well as the required levels of skill and the methods of testing these skills are determined by the individual departments.

### CREDIT BY TRANSFER

Resident graduate work of high quality earned in another institution of approved standing will not be accepted for transfer to apply toward the doctorate until the student has established in this Graduate School a satisfactory record in residence, but such credit must be transferred before the student makes application for admission to candidacy for the degree. Such transfer will not reduce the minimum residence requirement at this University, but it may reduce the amount of work to be done in formal courses.

The maximum amount of work which may be transferred to this University to be applied toward the Ph.D. is 30 semester hours. All requests for transfer of credit must have the approval of the student's graduate program director.

### COMPREHENSIVE EXAMINATION

Before admission to candidacy for the Ph.D. degree, the student must pass a comprehensive examination in the field of concentration and related fields. This examination may be oral, written, or both, and will test the student's mastery of a broad field of knowledge, not merely the formal course work completed. The oral part is open to members of the faculty. *The student must be registered at the time the comprehensive examination is attempted.*

The examination shall be conducted by an examining board appointed by the Chair of the department concerned and approved by the Dean. The board shall consist of the advisory committee and additional members as necessary to a minimum of five. A successful candidate must receive the affirmative votes of a majority of the members of the examination board. In case of failure, the examination may be attempted once more after a period of time determined by the examining board.

### APPLICATION FOR ADMISSION TO CANDIDACY

A student must make formal application for admission to candidacy for the Ph.D. degree on forms supplied by the Graduate School office at least two weeks before the comprehensive examination is attempted.

A student shall have earned at least three semesters of residence, shall have passed the language requirements, and shall have passed the comprehensive examination before admission to candidacy for the degree.

### CONTINUOUS REGISTRATION REQUIREMENT

Following successful completion of comprehensive examinations, students must register continuously. Students will register for and be charged for 10 dissertation hours of credit for each full-time term of doctoral work. For each term of part-time enrollment, students will be charged for 7 dissertation hours, except that students not making use of campus facilities may petition the Graduate School for 3-credit-hour status. Continuous registration for dissertation hours during the academic year will be required until completion of the thesis defense. It is expected that

the student and advisor will consult each semester as to the number of hours for which the student will register, consistent with the classifications identified above.

### THESIS REQUIREMENTS

A thesis based upon original investigation and showing mature scholarship and critical judgment as well as familiarity with tools and methods of research must be written upon some subject approved by the student's major department. To be acceptable, this dissertation should be a worthwhile contribution to knowledge in the student's special field. It must be finished and submitted in typewritten form at least 30 days (in some departments, 90 days) before the day of the final examination and must be formally approved and made available for inspection by the examining committee before the final examination may be taken.

All dissertations must comply in mechanical features with the specifications of the Graduate School.

It is the student's responsibility to notify the Graduate School of the *exact* title of the dissertation at least six weeks prior to the commencement at which the student will graduate. This title will be printed in the commencement program.

One formally approved, typewritten copy of the thesis, including abstract, plus one additional copy of the title page and abstract, must be filed in the Graduate School office at least 18 days before the date on which the degree is to be conferred.

The abstract, not to exceed 350 words, will be published in *Dissertation Abstracts International*. The determination of what constitutes an adequate abstract shall rest with the major department.

All theses must be signed by no fewer than two members of the major department staff who are regularly engaged in graduate instruction.

All approved theses are kept on file in the library.

When the thesis is deposited in the Graduate School, the candidate must pay the thesis-binding fee and sign an agreement with *University Microfilms International* to allow for publication in *Dissertation Abstracts International* and to grant *University Microfilms International* the right to reproduce and sell (a) copies of the manuscript in microform and/or (b) copies of the manuscript made from microform. The author retains all rights to publish and/or sell the dissertation by any means at any time except by reproduction from negative microform.

### FINAL EXAMINATION

After the thesis has been accepted, a final examination of the thesis and related topics will be conducted. This examination will be wholly or partly oral, the oral part being open to anyone. The examination will be conducted by a committee appointed by the Dean of the Graduate School, which will consist of at least five persons, one of whom must be from outside the student's department. More than one dissenting vote will disqualify the candidate in the final examination.

Arrangements for the final examination must be made in the Dean's office at least two weeks in advance. The examination must be scheduled not later than 18 days before the date on which the degree is to be conferred. A student must be registered for either 7 or 10 dissertation hours at the time of the final examination.

### TIME LIMIT

All doctoral students are expected to complete all degree requirements within six years from the date of the start of course work in the program. A student who fails to complete the degree within the six-year time limit must have an annual statement filed with the Dean by the program director giving evidence of adequate progress and requesting that the student be allowed to continue in the program. The statement must be endorsed by three members of the student's advisory committee. If the request is approved, the student may continue in the program for one additional year. If the Dean does not approve the request, the student may be dropped from the program, with the concurrence of the department. If the Dean and the program director cannot come to an agreement, the final decision will be made by the Executive Committee.

The six-year rule is applicable regardless of when the student passes the comprehensive examination.

## Interdisciplinary Programs

See departmental listings in the college and school sections of this *Catalog* for descriptions of graduate programs.

The following are descriptions of interdisciplinary programs.

### BEHAVIORAL GENETICS

The Institute for Behavioral Genetics (IBG) offers a training program in behavioral genetics but is not a degree-granting unit of the University. The goal

of the program is to train scientists capable of working both within their academic disciplines and in the broad interdisciplinary of behavioral genetics. The program features a core set of courses and continuous research apprentice training with one or more IBG faculty members and furnishes valuable opportunities for interaction among scholars with widely varying academic backgrounds. A student wishing to specialize in behavioral genetics must be regularly enrolled as a graduate student in an academic department of the University and must satisfy all requirements of that department.

The training program has two levels. The goal of Level I is to establish minimal competency in behavioral genetics. The requirements include successful performance in PSYC 5102 (Behavioral Genetics), PSYC 5112 (Concepts in Behavioral Genetics), and two semesters of PSYC 7102 (Seminar in Behavioral Genetics). Level II includes the following additional requirements: competence in general genetics (e.g., EPOB 2200), quantitative genetics (PSYC 5122), and molecular genetics (e.g., PSYC 5232); one graduate level statistics course; and at least two semesters of research in behavioral genetics (PSYC 7012).

Students at either level must have an IBG faculty member as an advisor to guide their course work and research training. Trainees aspiring to Level II competency also must have an advisory committee consisting of faculty members from both IBG and the student's academic department. In addition to guiding the student's course work and research training, the advisory committee will evaluate the student's progress and may impose additional requirements.

Further information about this interdisciplinary training program can be obtained from the Institute.

## CHEMICAL PHYSICS

The purpose of the interdepartmental doctoral program in Chemical Physics is to prepare students for research in such interdisciplinary fields as atomic and molecular radiative processes, nuclear and electron magnetic resonance spectroscopy, laser chemistry and physics, X-ray crystallography, molecular quantum mechanics, statistical mechanics, quantum chemistry, kinetics, and chemistry and physics of the surface and condensed state.

Students wishing to pursue graduate work leading to the Ph.D. degree in Chemical Physics should apply for admission to, and will be formally associated with, either the Department of

Chemistry or the Department of Physics, in accordance with their undergraduate backgrounds.

Entering students will take the qualifying examination in the area of their undergraduate major, but the comprehensive examination will test their knowledge in the relevant aspects of both chemistry and physics. Certain requirements associated with the regular Ph.D. programs in the participating departments will be replaced by some in the complementary field; each student's program of course work and research will be individually planned according to the student's special needs.

Some of the courses that will be used in planning most programs in Chemical Physics are listed below. For descriptions of their contents, refer to the listings of the participating departments.

<i>Semester Hours</i>	
CHEM 5011 and 5061 Advanced Inorganic Chemistry	6
CHEM 5311 and 5321 Advanced Organic Chemistry	6
CHEM 5541 Chemical Dynamics	3
CHEM 5531 Statistical Mechanics	3
CHEM 5561 Physical Chemistry of Macromolecules	3
CHEM 5581 Quantum Chemistry	3
CHEM 5591 Advanced Molecular Spectroscopy	3
CHEM 6411 Advanced Topics in Physical Chemistry	3
CHEM 8991 or PHYS 8990 Doctor's Thesis	30
PHYS 5210 Theoretical Mechanics	3
PHYS 5250 and 5260 Introduction to Quantum Mechanics	6
PHYS 7310 and 7320 Electromagnetic Theory	6
PHYS 7230 Statistical Mechanics	3
PHYS 7530 Chemical Physics	3
PHYS 7550 Atomic and Molecular Spectra	3

The program is administered by an interdepartmental committee. For further information, contact either the Chair, Department of Chemistry, or the secretary, Department of Physics.

## GEOPHYSICS

The interdisciplinary, interdepartmental doctoral program in Geophysics is designed to encourage students with a variety of undergraduate backgrounds to pursue graduate study in the physics of the Earth, with special emphasis on the interior of the planet. They specialize in one of the sub-fields of geophysics, while gaining a broad, general background in the discipline and in-depth education in the relevant parts of the parent fields of geology, physics, and engineering. Students enter the program by applying for admission to the Graduate School through one of the following departments: Geological Sciences; Physics; Astrophysical, Planetary, and Atmospheric Sciences; Aerospace Engineering Sciences; Civil, Environmental, and Architectural Engineering; Electrical and Computer Engineering; or

Mechanical Engineering. The choice of department is determined by the student's long-term professional goals. The student remains affiliated with this department throughout the program. Upon satisfactory performance on the Ph.D. preliminary examination given by the home department, the student may formally apply for admission to the Geophysics Ph.D. program.

The program is administered by the Geophysics Graduate Program Committee, on which each of the participating departments is represented. The comprehensive examination and the dissertation defense are under the direction of this committee, with a faculty member of the home department normally chairing these procedures. The number of specified courses required for the program is kept to the minimum needed to provide a uniform background and general preparation for research. Students are expected to fill out their course work from the broad offerings of the University in appropriate subject matter. The required courses are as follows. (For course numbers and course descriptions see the listings under the participating departments.)

Earth and Planetary Physics 1, 2, 3  
One year of intermediate-level mathematical physics or engineering analysis  
Seminar in geophysics (registration for credit twice)

Other courses that are not required of all students, but are highly recommended as part of this core program are:

Geophysical Instrumentation  
Dynamics of Continuous Media  
Advanced Seismology

Exceptional research opportunities are available through the University research institutes, especially the Cooperative Institute for Research in Environmental Sciences (CIRES) and the Joint Institute for Laboratory Astrophysics (JILA), as well as within the special laboratories of the participating departments. Financial support is provided through teaching assistantships in the student's department or research assistantships in the various research programs. Assistantships are awarded on a competitive basis and may be given to students who express a strong interest in the program when they apply for admission to the Graduate School, prior to formal admission to the Geophysics program. For further information, call or write any of the participating departments listed above or write Carl Kisslinger, CIRES, Campus Box 449, University of Colorado at Boulder, Boulder, Colorado 80309-0449.

## MASTER OF BASIC SCIENCE PROGRAM

The program is an interdisciplinary one leading to the Master of Basic Science degree. It provides an opportunity for present and prospective mathematics and science professionals and others to extend and/or broaden their training in computer science, mathematics, museology, and the natural sciences at advanced undergraduate and graduate levels. These professionals would include public school teachers, industrial scientists, engineers, business persons, and others.

The student may elect the mathematics, museology, or science option as described below. Wide latitude is possible in the details of a degree plan so that each student may follow a course of study most pertinent to his or her interest. Each degree plan must be approved by the M.B.S. Executive Committee.

The Master of Basic Science degree is supervised by an administrative committee appointed by the Dean of the Graduate School with representation from the following departments:

Anthropology; Astrophysical, Planetary, and Atmospheric Sciences; Environmental, Population, and Organismic Biology; Chemistry; Computer Science; Geological Sciences; Mathematics; Molecular, Cellular, and Developmental Biology; Museum; and Physics. The Deans of the College of Arts and Sciences and the Graduate School are *ex officio* members.

Application should be made to the Master of Basic Science Program, Campus Box 249, University of Colorado at Boulder, Boulder, Colorado 80309-0249.

### REQUIREMENTS FOR ADMISSION

General regulations for admission to the Graduate School apply (see Admission Requirements).

### REQUIREMENTS FOR THE MASTER OF BASIC SCIENCE DEGREE

1. To be considered for admission to the Master of Basic Science program, a student must present at least 40 semester hours in the natural sciences and mathematics, preferably including one year of calculus. Students may be admitted to the program with a deficiency in calculus, but must remedy the deficiency within two years after admission by completing one year of calculus (or other courses in mathematical subjects on approval by the Executive Committee) with a grade of C or better.

2. For the nonthesis option, 30 semester hours of basic science courses

numbered 3000 and above, taught by members of the graduate faculty, and selected from two or more departments. For the thesis option, 24 hours of basic science courses numbered 3000 and above, taught by members of the graduate faculty, and selected from two or more departments. Of the required hours for either option, 12 hours or more must be from courses numbered 5000 and above. Thesis credit does not count toward these 12 hours. Courses fulfilling program requirements may be selected only from among the departments listed below. See mathematics, museology, and science options below.

Anthropology (Museology option only)  
Astrophysical, Planetary, and Atmospheric Sciences  
Chemistry  
Computer Science  
Environmental, Population, and Organismic Biology  
Geology  
Mathematics  
Molecular, Cellular, and Developmental Biology  
Museum (Museology option only)  
Physics

All courses applied toward the degree must be taken over a period of five years or six successive summers. A maximum of 9 hours of graduate-level course credit of B or better grade transferred from other institutions may be applied toward the M.B.S. degree, provided that such credit has been approved by both the M.B.S. Executive Committee and the appropriate University of Colorado department. Students already in the program must obtain approval prior to enrolling in courses they may wish to transfer.

3. For the nonthesis option, completion of a paper describing a research project or other specialized study on a topic approved by the Executive Committee. For the thesis option, completion of a thesis which must meet the general requirements of the Graduate School for M.A. or M.S. theses and must be approved by the Executive Committee. Approval of the topic, for either option, is given on the basis of a written explanation or precis submitted no later than the end of the semester in which the student completes 21 hours of course credit or the completion of the third year after entering the program, whichever is earlier. The final paper must be approved by the student's committee.

4. Minimum grade point average: courses on the 3000 and 4000 level will be accepted toward the degree only with grades of A or B; 5000- and 6000-level courses will be accepted toward the degree with grades of A, B, or C. The student must have a B average in all courses taken subsequent to admission to the program, including courses not actually offered for the degree.

5. Verbal and quantitative portions of the Graduate Record Examination (GRE). Science and Mathematics advanced portions of the examination are optional.

### MATHEMATICS EMPHASIS

1. A reasonable degree of competence is required in the fields of analysis, algebra, and geometry. A minimum of 15 semester hours of upper-division courses (3000-level or above) in mathematics must be offered for the degree, including at least 3 hours of analysis, 6 hours of algebra, and 3 hours of geometry.

2. One upper-division sequence of at least 6 semester hours in any of the physical and biological sciences named above. With permission, two independent one-semester courses in the same area may be substituted for the one-year sequence.

3. Upper-division electives in science, mathematics, or computer science, to complete an approved 30-hour degree plan. Of these 30, 12 hours or more must be from courses numbered 5000 and above. The 30 hours may also include 3 semester hours of courses or seminars in secondary school mathematics teaching, history of mathematics or science, or philosophy of mathematics or science.

### MUSEOLOGY EMPHASIS

1. At least 8 but not more than 12 semester hours of courses offered by the Museum. Alternatives are the sequence MUSM 4011-4021-4031, or MUSM 4011 and a selection of additional courses in Museum. Students are required to take 3 semester hours in small business management and are permitted to take an additional 3 semester hours in the College of Business and Administration. The total Museum-Business semester hours may not exceed 15.

2. An upper-division sequence (3000 level or above) of at least 6 semester hours in one of the departments (other than Museum) represented in the program.

3. Upper-division electives in science, mathematics, or computer science to complete an approved 30-semester-hour degree plan. Of these 30, 12 hours or more must be from courses numbered 5000 and above.

### SCIENCE EMPHASIS

Within the science emphasis there are two choices: the nonthesis option or the thesis option.

1. In either option the student must take an upper-division sequence (3000



level or above) of at least 6 semester hours in each of two of the physical and biological sciences named above. With permission, two independent one-semester courses in the same area may be substituted for one of the one-year sequences.

2. For the nonthesis option, upper-division electives in science, mathematics, or computer science to complete an approved 30-semester-hour degree plan. For the thesis option, upper-division electives in science, mathematics, or computer science to complete an approved 24-semester-hour degree plan. Of the required hours for either option, 12 hours or more must be from courses numbered 5000 and above, not to include thesis credit. The required hours may also include 3 semester hours of upper-division courses or seminars in secondary school teaching, history of science, or philosophy of science.

3. Thesis Option. The student who plans to present a thesis for the M.B.S. degree must report this to the Executive Committee of the M.B.S. program not later than the second semester. The student's choice of a thesis advisor must be approved by the Executive Committee at this time.

## MASTER OF ENGINEERING PROGRAM

The Master of Engineering degree program is administered by the Graduate School through the departments of Engineering. The requirements for admission and for quality and quantity of academic work are the same as for the Master of Science awarded in the College of Engineering and Applied Science.

The principal difference between the Master of Engineering and the Master of Science degrees is that the Master of Engineering degree does not require a residency on campus. It is intended to meet the needs of those practicing engineers who are working full time outside the University. It also allows participants to pursue an integrated program of studies by specializing in one engineering discipline and selecting courses from other engineering fields and business subjects related to the individual student's professional work. A successful program to meet these needs requires greater flexibility in operation than is normally possible or intended under the existing Master of Science degree program.

The program is offered both on campus and through the Center for Advanced Training in Engineering and Computer Science (CATECS), which delivers graduate courses taught on the

Boulder Campus to business, industry, and government agencies by live television with two-way audio communication. Engineers, computer scientists, and technical managers may earn a master's degree in several areas of concentration without driving to campus. Annually, CATECS offers 40 graduate courses to approximately 500 students at 45 industrial sites. These courses are also available by videotape to sites outside the signal range.

Each prospective student is required to present a well-defined objective in order to be admitted to the program. Once accepted, each student will select or be assigned to a faculty advisor. An academic program is then developed to meet this objective in consultation with faculty advisors.

### REQUIREMENTS

The requirements for the degree are 30 credit hours plus a written report on a creative investigation, which may be related to the student's professional work. The report will be of the same general quality as that required for the thesis for the Master of Science degree and must be defended orally. Although the report does not in itself carry credit, it may be based upon work done for credit under independent study. A student must be registered during the semester of the oral defense. At least 15 credit hours must be in a particular engineering discipline at the 5000 level or above. The additional 15 credit hours may be selected from the same discipline, other engineering fields, or business. Credit in courses below the 4000 level will not apply toward degree requirements.

Requirements relating to the following items are the same as those for the Master of Science degree as awarded in the College of Engineering and Applied Science: admission to Graduate School, application procedures, registration, quality of graduate work, status, credit by transfer, and admission to candidacy. Applicants may petition for credit for up to an additional 3 hours of transfer credit. The time limit to complete this program is six years.

The admission of each student to graduate study, approval of the degree program, admission to candidacy for the degree, and approval of the awarding of a degree are to originate through a specific department of the College of Engineering and Applied Science, or the appropriate degree program steering committee, in the same manner as for the established Master of Science program. An advisory committee, consisting of not fewer than three faculty members, will be appointed for each student by the major department promptly upon the student's beginning

work toward the degree. At that time a plan of study shall be completed and a copy placed on record with the office of the Associate Dean of Engineering for graduate and research programs and Associate Dean of the Graduate School. Changes in the plan must have the concurrence of the committee and must be reported to the Dean.

The members of each advisory committee shall be chosen from the various interdisciplinary academic areas represented in the student's program and will be from more than one department. The advisory committee guides the student and is responsible for approving the individual's degree program and admission to candidacy; it approves the student's written report and the awarding of the degree.

The student should see also the requirements of the departments involved.

## MATHEMATICAL PHYSICS

In recent years the increasingly mathematical character of many branches of physics has opened up numerous opportunities for fruitful interplay of the ideas of mathematics with those of physics. At the same time increasing specialization in both fields has, if anything, reduced the possibility of communication between the two disciplines, so that students of mathematics have less time to study physics and vice versa. This contrasts strongly with the period up to the first quarter of this century, when there was close contact between the two fields, many great mathematicians were deeply involved in physics problems, and a number of important mathematical ideas had their origin in the study of nature itself.

It is against this background that the Departments of Mathematics and Physics offer an interdisciplinary doctoral program in Mathematical Physics, with the following general objectives:

1. To attract students to and prepare them for research in modern mathematical physics and the relevant mathematics.
2. To promote collaboration and cooperation between the Departments of Mathematics and of Physics.
3. To institute courses pertinent to mathematical physics not already offered in either department.
4. To develop a strong center of mathematical physics at this University.

Initially the number of students involved in the program will be small, and it should be possible for the steering committee to follow their progress individually and closely. It therefore seems unnecessary and undesirable to spell out in complete detail a rigid set of requirements and regulations.

The design of the program is outlined below.

1. *Administration of the Program.* The Mathematical Physics Program is guided by a steering committee composed of members of the Departments of Mathematics and Physics. This steering committee administers the program within the rules of the Graduate School.

2. *Admission Requirements.* The requirements for entrance into the program are acceptance as a degree student either in the Department of Mathematics or in the Department of Physics and a good undergraduate background in both physics and mathematics, obtained by either a double major in undergraduate study or a major in one of the fields combined with suitable subsequent study of undergraduate courses in the other. Acceptance into the program is decided by the steering committee on the basis of the foregoing requirements and the student's general promise. Satisfaction of the second requirement is evaluated in each case individually, partly on the basis of the student's transcript and partly on the basis of a written examination on undergraduate work in the second field. For a student enrolled in the Department of Mathematics, that examination is the Physics Department's Preliminary Examination given to entering Physics graduate students at the beginning of each fall term. For a student enrolled in the Physics Department, it is a similar examination on undergraduate mathematics administered by the steering committee or by a faculty member designated by the committee. The examination is partly diagnostic; as result of it, the steering committee or the student's advisor may recommend further study of certain subjects.

3. *Advisory Committee.* Each student in the program, as soon as his field of specialization has been chosen, requests the staff member with whom he wishes to work to act as chair of his advisory committee. The chair, with the advice and approval of the steering committee, selects one member of the graduate faculty from the Department of Mathematics and one from the Department of Physics to serve on the student's advisory committee. A purpose of the advisory committee (beyond guiding the student throughout his graduate study) is to insure against too narrow a specialization.

4. *Course Requirements.* To prepare for the Ph.D. in Mathematical Physics, each student must take appropriate course work in the Department of Mathematics and the Department of Physics. The program of study must be approved by the advisory committee and should be designed in part to prepare the student for the second-year

examination (see 5 below) in the department in which the student is matriculated. In addition, the candidate is expected to pass at least two distinct graduate-level core courses in the second field (see table below) and at least two semesters of the advanced mathematical physics courses (MATH or PHYS 7030, 7040, 7050, and 7060).

Core Courses in the Second Field  
*Mathematics Courses for Physics Students*  
 MATH 6210, 6220 Topology  
 MATH 6130 Algebra  
 MATH 6230, 6240 Differential Geometry  
 MATH 6310, 6320 Real Analysis  
 MATH 8330, 8340 Functional Analysis

*Physics Courses for Mathematics Students*  
 PHYS 5210 Mechanics  
 PHYS 5250, 5260, 7270, 7280 Quantum Mechanics  
 PHYS 7310, 7320 Electromagnetism  
 PHYS 7230, 7240 Statistical Mechanics  
 PHYS 7770 Theory of Relativity

These are in addition to subjects like ordinary and partial differential equations, linear algebra, and complex variables required of all physics students and covered, for example, in mathematical physics.

5. *Examination Requirements.* Each student in the Mathematical Physics program must pass the second-year examination in the department in which the student is matriculated (i.e., the Physics comprehensive or the Mathematics preliminary examination) according to the rules of that department. The second-year examination constitutes the comprehensive examination required by the Graduate School.

6. *Transferring Into and Out of the Program.* Transfer into the program is possible at any time, subject to the entrance requirements mentioned above, and also transfer out of it, because a student in the program retains status as a regular degree student in the department of his primary field. Formal acceptance into the program is usually deferred until the student has passed the second-year examination but any student who is interested in the program and has an appropriate background is urged to apply for the program as soon as possible.

7. *Master's Degree.* Master's degrees in Mathematical Physics are not given. Students who, for any reason, become master's degree candidates, will be transferred out of the Mathematical Physics program into a regular department major.

8. *Research Requirements.* Each successful participant in the program is required to submit and to defend a thesis describing original research performed by himself. The student may carry out his research under the direction of any graduate faculty member in the Department of Mathematics or the Department of Physics.

9. *Language Requirement.* Each student in the program must fulfill the language requirement of the department in which the student has matriculated.

## TELECOMMUNICATIONS

The Telecommunications program is interdisciplinary, involving the School of Journalism and Mass Communication, the Departments of Communication, Electrical and Computer Engineering, Mechanical Engineering, Economics, Political Science, Computer Science, and the College of Business. The program leads to a Master of Science degree in Telecommunications. The object of this 16-month program is to provide a graduate professional education for persons interested in the management of telecommunications systems. Such positions require knowledge of the technical aspects of communication theory, governmental regulations relating to telecommunications, and the sociological and economic aspects of the operation and growth of telecommunications systems.

It is expected that participants in the program will include both mid-career professional persons and beginning graduate students.

Inquiries should be directed to Chair, Graduate Committee on Telecommunications, Engineering Center, OT 1-6, Campus Box 425, University of Colorado at Boulder, Boulder, CO 80309-0425.

The minimum duration of the program is 12 months. However, most students are expected to pursue a 16-month curriculum to enhance their background as well as establish a strong grasp of the various issues in telecommunications.

A suitable academic program is planned for each individual. Some of the course offerings are listed below.

*Fall Semester (first year)*  
 TLEN 5040 Engineering Economy  
 TLEN 5200 Computers in Telecommunications  
 TLEN 5300 Introduction to Communication Systems Theory  
 TLEN 5310 Telecommunications Systems  
 TLEN 5600 Telecommunications Seminar  
 TLEN 5106 The Political System and Telecommunications  
 TLEN 6950 Master's Thesis  
 MKTG 5030 Fundamentals of Marketing  
 ORMG 5040 Fundamentals of Management and Organization  
 FNCE 5050 Fundamentals of Finance  
 INFS 5000 Introduction to Computing  
 INFS 6450 Information Systems and Management  
 JOUR 5644 Radio/TV Station Organization and Operation  
*Spring Semester*  
 TLEN 5320 Telecommunications Laboratory  
 TLEN 5330 Data Communications I  
 TLEN 5350 Trends in Satellite Communication Systems  
 TLEN 5360 Telephone Systems  
 TLEN 5600 Telecommunications Seminar  
 TLEN 6950 Master's Thesis  
 JOUR 6211 New Media and Development  
 ECON 5697 Government and Business

- EMEN 5010 Introduction to Engineering Management
- CSCI 7143 Topics in Computer Systems
- Summer Session*
- TLEN 5300 Introduction to Telecommunications System Theory
- TLEN 5500 Cable TV
- TLEN 5110 Contemporary Issues in Telecommunications Policy
- TLEN 5510 Defense Communications
- TLEN 5520 Telecommunications Standards
- TLEN 6950 Master's Thesis
- Fall Semester (second year)*
- TLEN 5400 Traffic and Queuing Theory
- TLEN 5430 Data Communications 2
- TLEN 5210 Data and Computer Networks
- TLEN 5460 Telecommunication Switching Laboratory
- TLEN 6950 Master's Thesis

Students entering the program are expected to be fluent in mathematics through trigonometry, and calculus is desirable. They are advised to review

such material if necessary before commencing course work. It is also expected that they will have taken a minimum of at least high school physics, with some college physics recommended.

Electives will normally be taken at the 5000 level. For students without a previous technical background, and as a review for students with a technical background, TLEN 5330 (Introduction to Telecommunications System Theory) is recommended.

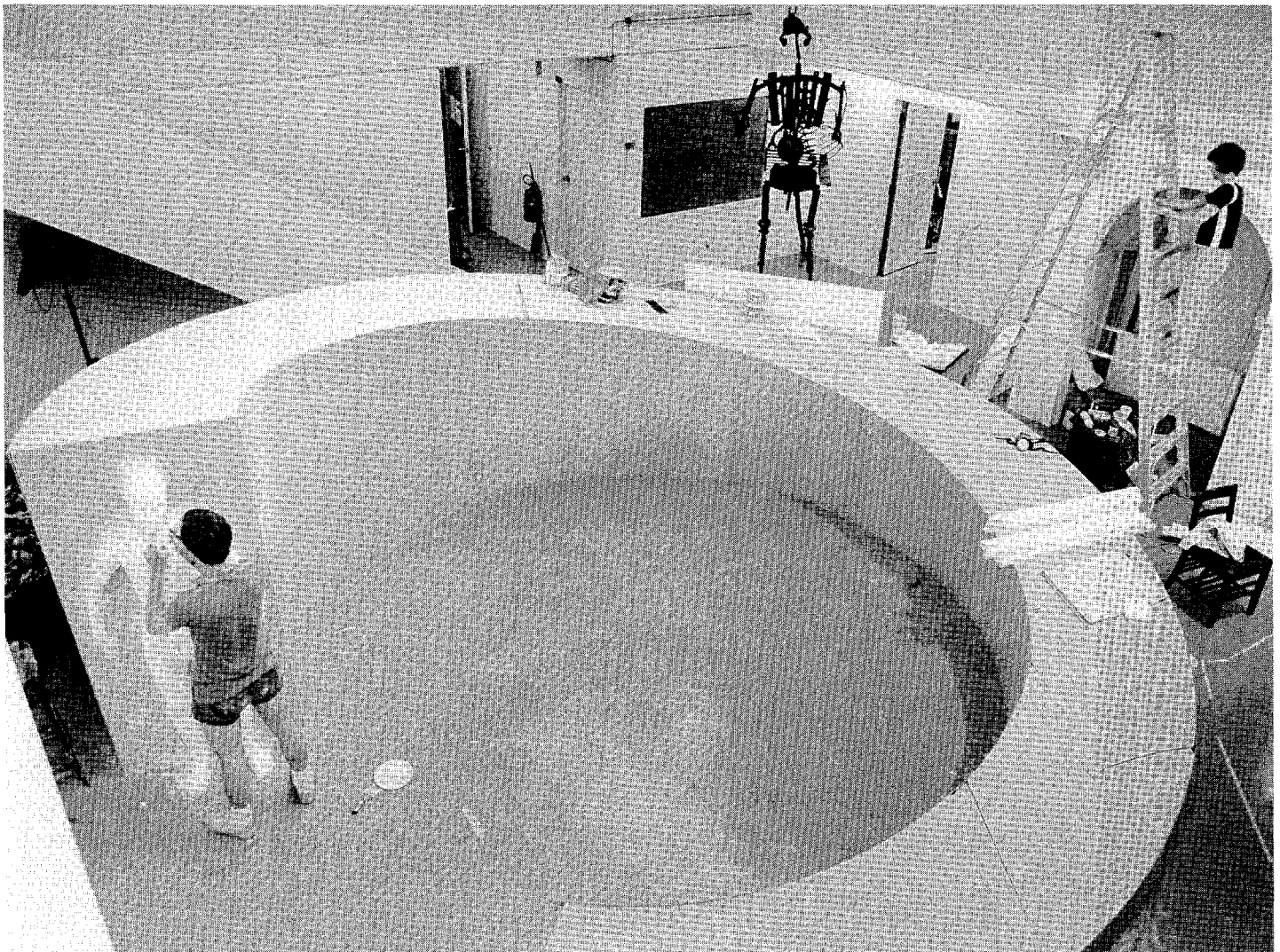
TLEN 5320 (Telecommunications Laboratory) is designed for students lacking prior experience with electrical equipment. TLEN 5330 is normally a prerequisite.

TLEN 5660 (Seminar) is required for two semesters and is scheduled on a weekly basis. It carries 1 hour of credit per semester, and exposes the student to a range of topics by speakers representing many different sides of the telecommunications industry.

Students with no prior experience in computer programming will need to take an elementary computer course as part of their curriculum.

A minimum of 32 hours is needed to graduate, but students are encouraged to take at least 40 hours.

Students will register for a total of 6 hours of thesis credit hours in consultation with their advisor.



# School of Journalism and Mass Communication

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## INFORMATION ABOUT THE SCHOOL

*Willard D. Rowland, Jr., Dean*

### History and Purpose

Formal instruction in journalism began at the University in 1909. Journalism was made a department of the College of Arts and Sciences in 1922 and became the College of Journalism within the College of Arts and Sciences in 1937. The Board of Regents authorized a separate School of Journalism effective with Fall Semester 1962. In 1985, the name of the school was changed to the School of Journalism and Mass Communication to reflect its broad range of professional activities.

The School of Journalism and Mass Communication provides a sound academic foundation for the student who plans a career in some phase of journalism or mass communication. The School offers its majors superior professional instruction with a broad education in the liberal arts. It conducts research into mass communication and provides service to the mass media, other state educational institutions (including high schools), and the public at large. The School of Journalism and Mass Communication makes courses available to nonjournalism majors within the limits of space and equipment, upon which majors properly have first claim.

### Career Opportunities

The School offers programs in Advertising, News-Editorial, Public Relations, Broadcast News, and Broadcast Production Management. Graduates find careers in newspapers, magazines, radio, television, advertising and public relations firms, science, industry, government, and in secondary and higher education. The School of Journalism and Mass Communication assists students in career planning and job placement.

### Accreditation

The School of Journalism and Mass Communication is accredited by the Accrediting Council on Education for Journalism and Mass Communications. It is a fundamental principle of the ACEJMC that education for journalism be broadly based. Accordingly, undergraduate mass communication students at the University of Colorado take approximately three-fourths of their college work in the arts and sciences and approximately one-fourth in journalism and mass communication courses.

Accredited programs, as described by the Accrediting Council on Education for Journalism and Mass Communications, are distinguished by the following characteristics:

1. They maintain a professional curriculum with one or more specialties leading to a bachelor's degree and/or advanced degree or degrees in Journalism.
2. They carry on the professional training of general practitioners for the field of journalism while giving due consideration to service, the profession, and research.
3. They strive to serve national media as well as media of their own states.
4. They are committed to a philosophy of professional training that places strong emphasis on liberal arts studies.
5. They provide close relationships between students and teachers.

### Facilities

*Laboratories.* Students work in laboratories designed for reporting, editing, advertising, graphics, radio, television, cable television, and photojournalism. They have opportunities to use videotape cameras and recorders, video display terminals, radio and television studios, and the Associated Press wire service.

*Reading Room.* A reading room for students contains daily and weekly newspapers from Colorado and elsewhere, professional and general magazines, and other material.

*Internships.* Majors are encouraged to seek internships, and the School assists in internship placement. In addition to working for the School's newspaper, the *Campus Press*, students intern with weekly and daily newspapers, advertising and public relations agencies, social service agencies, businesses, and radio and television stations. Students also work for the *Colorado Daily*, the campus cable network, and KUCB (the University radio station).

### Honors

Journalism and Mass Communication students may graduate with general honors and/or school honors. Students interested in general honors must consult the Honors Program office. The School may award the bachelor's degree with honors to students who have a 3.25 cumulative grade point average and a 3.50 grade point average in Journalism and Mass Communication courses, complete an independent study in Journalism and Mass Communication involving scholarly research effort, and demonstrate a high degree of professional skill. Application for School honors must be made to the Dean at the beginning of the student's final semester.

Students whose academic records rank in the upper 10 percent are eligible for election to Kappa Tau Alpha in recognition of outstanding scholastic achievement.

### Scholarships, Loans, and Awards

The following scholarships, loan funds, and awards are available annually to officially admitted Journalism and Mass Communication majors.

More detailed information is available in the School of Journalism and Mass Communication office. Applications must be submitted to the Dean of the School by February 15 of the year in which the scholarship is to become effective.

Dominic Manzanares Memorial Scholarship, awarded to a minority and/or Colorado resident

Christopher Michael Burns Memorial Scholarship, awarded to a student in the advertising sequence

Colorado Press Women Scholarship, awarded to a woman student

Denver Press Club Scholarship, awarded to a senior from the Denver metropolitan area

Mile High Kennel Club-Denver Press Club Scholarship, awarded to a senior from the Denver metropolitan area

Denver Woman's Press Club, Frances Belford Wayne Merit Award, awarded to a woman student

Boulder Press Club Scholarship

Cervi Memorial Scholarship

Winton Lemen Scholarship

Marcella Gibbons Hertzog Scholarship, endowed by Georgene Carlson

J. Ember Sterling Memorial Scholarship

Noni Lann Endowed Scholarship

Raymond B. Johnson Award Faculty Scholarship

L. C. Paddock Memorial Scholarship

Alvin G. Flanagan Scholarship

Lisa Gorman Memorial Scholarship

Blumberg Prize, awarded to an outstanding graduating senior in the broadcast sequence

KMGH-TV Special Merit Award, awarded to an outstanding broadcast major

Raymond B. Johnson Memorial Fund, provided for student loans

William M. Long Memorial Fund, provided for student loans

Sid Wells Memorial Fund, provided for student loans

## Student Organizations

Through an elected student government, students conduct a wide range of activities and assist in formation of policies of the School.

The School has chapters of the Society of Professional Journalists, Sigma Delta Chi; Women in Communication; the American Advertising Federation; and the Public Relations Student Society of America.

## Study Abroad Programs

The School of Journalism and Mass Communication, along with the Office of International Education, encourages students to participate in the University's study abroad programs. Since the year of study abroad usually is undertaken during the junior year, prospective majors are urged to plan early and seek advising from the Journalism and Mass

Communication faculty. Programs are offered in Costa Rica, Egypt, France, Germany, Great Britain, Israel, Italy, Mexico, Peru, Spain, and Taiwan. In addition to a Journalism and Mass Communication degree, students can earn an area studies degree in the College of Arts and Sciences during a five-year period including study abroad semesters. Information and application forms are available at the Office of International Education, Environmental Design Building 92, Campus Box 123, University of Colorado at Boulder, Boulder, Colorado 80309-0123.

## UNDERGRADUATE DEGREE PROGRAMS

### Requirements for Admission

The undergraduate degree offered is the Bachelor of Science degree.

Students planning to major in Journalism and Mass Communication at the University of Colorado normally enroll as Pre-Journalism and Mass Communication freshmen in the College of Arts and Sciences or complete their freshman and sophomore years in some other collegiate institution.

University of Colorado students wishing to transfer into the School of Journalism and Mass Communication must file an application for Intrauniversity Transfer with the School early in the second semester of their sophomore year (October 1 in Fall, March 1 in Spring).

Students may be admitted to the School if they:

1. Complete a minimum of 60 semester hours with a grade point average of at least 2.50.
2. Fulfill the Content Areas of Study requirements in the College of Arts and Sciences.
3. Complete both JOUR 1001 and JOUR 2001.
4. Establish a grade point average of at least 2.50 in all Journalism and Mass Communication courses completed or in progress at the time of application.

Meeting the minimum requirements, however, does not guarantee a student admission to the School of Journalism and Mass Communication.

### Pre-Journalism and Mass Communication

1. Pre-Journalism and Mass Communication students are enrolled in the College of Arts and Sciences until eligible to transfer into the School of Journalism and Mass Communication, which

normally occurs at the end of the sophomore year. These students must consult with advisors in the School.

2. Pre-Journalism and Mass Communication majors normally take courses that meet the Content Areas of Study requirement in the College of Arts and Sciences. They are also encouraged to take writing courses and a foreign language.

3. Students wishing to transfer to the School of Journalism and Mass Communication must fill out an Intrauniversity Transfer (IUT) and a letter of application by October 1 for spring admission and March 1 for fall admission. Students must indicate the major sequence in which they wish to enroll.

### Transfer Credits

Credit in subjects transferred from other institutions to the University of Colorado is limited to the amount of credit given for similar work at the University of Colorado. Transfer credits in Journalism and Mass Communication are limited to 12 semester credits from four-year institutions and 6 semester credits from two-year institutions. All transfer credit is subject to approval of the Dean of the School. A proficiency examination in journalistic writing and language skills may be required of those who wish to transfer credit equivalent to JOUR 2001.

### Requirements for Graduation

A total of 124 semester hours with a grade point average of not less than 2.25 overall and 2.50 in Journalism and Mass Communication courses is required for the B.S. degree. Of these 124, at least 40 must be upper-division credits—12 hours must be upper division in an area of concentration, and 28-34 must be in journalism. No student may take more than 34 hours of journalism in the 124 hours required for graduation. The upper limit is imposed to insure wide exposure of majors to liberal arts courses. Students who wish to develop expertise in a particular specialty are advised to take courses in science, business, political science, or a relevant area.

### DOUBLE-DEGREE PROGRAMS

Some students complete requirements in two fields and in some cases receive two degrees from the University. Such double-degree programs are available combining Journalism and Mass Communication with Business or disciplines in the College of Arts and Sciences. Students must make application for a



double-degree program in both the School of Journalism and Mass Communication and the College of Business and Administration, the College of Arts and Sciences, or the College of Music. Any other such combined programs must be arranged by consulting both schools or colleges involved.

## RESIDENCE REQUIREMENTS

A candidate for a degree from the School of Journalism and Mass Communication must earn the last 30 hours in residence in the School. This may include courses taken on the Boulder, Denver, or Colorado Springs campuses.

## SENIOR REQUIREMENTS

Seniors should file a diploma card with the School by October 1 for December graduation, March 1 for May graduation, and June 1 for August graduation. Diploma cards are available at the office of the School of Journalism and Mass Communication.

## Journalism and Mass Communication Sequences

Five areas of professional study are available in the School of Journalism and Mass Communication.

## ADVERTISING

Advertising is designed to prepare students for careers with newspapers, magazines, radio, television, and advertising and public relations firms.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media . . . . .	3
JOUR 2001 Mass Media Writing . . . . .	3
JOUR 3403 Principles of Advertising . . . . .	3
JOUR 3453 Advertising Copy and Layout . . . . .	3
JOUR 3463 Advertising Media . . . . .	3
JOUR 3471 Advertising Research . . . . .	3
JOUR 3771 History of Journalism . . . . .	3
JOUR 4403 Advertising Campaigns . . . . .	4
JOUR 4931 Internship or JOUR 3913 Advertising Practicum . . . . .	3
Journalism electives . . . . .	0-6
MKTG 3000 Principles of Marketing . . . . .	3
ECON 2010 Principles of Microeconomics . . . . .	3
ECON 2020 Principles of Macroeconomics . . . . .	3

## BROADCAST NEWS

Broadcast News is designed to prepare students as news directors, reporters, editors, and writers for television or radio stations.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media . . . . .	3
JOUR 2001 Mass Media Writing . . . . .	3
JOUR 3001 Reporting of Public Affairs . . . . .	3
JOUR 3471 Advertising Research or JOUR 4791 Mass Communication and Public Opinion . . . . .	3
JOUR 3604 Radio and TV News . . . . .	3
JOUR 3644 Principles of Broadcast Production . . . . .	3
JOUR 3771 History of Journalism . . . . .	3
JOUR 4624 Advanced Radio-TV News . . . . .	3
JOUR 4651 Mass Communication Law . . . . .	3
Journalism electives . . . . .	1-7

## BROADCAST PRODUCTION MANAGEMENT

Broadcast Production Management is designed to prepare students for other careers in radio or television, including positions in programming, advertising, promotion, and management.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media . . . . .	3
JOUR 2001 Mass Media Writing . . . . .	3
JOUR 3403 Principles of Advertising . . . . .	3
JOUR 3471 Advertising Research or JOUR 4791 Mass Communication and Public Opinion . . . . .	3
JOUR 3604 Radio and TV News . . . . .	3
JOUR 3644 Principles of Broadcast Production . . . . .	3
JOUR 3674 TV Production 2 . . . . .	3
JOUR 3771 History of Journalism . . . . .	3
JOUR 4644 Radio, TV Station Organization and Operation . . . . .	3
Journalism electives . . . . .	1-7

## NEWS-EDITORIAL

News-Editorial is designed to prepare students for positions as reporters, editors, and writers for newspapers, news services, magazines, trade and technical publications, company publications, and government.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media . . . . .	3
JOUR 2001 Mass Media Writing . . . . .	3
JOUR 3001 Reporting of Public Affairs . . . . .	3
JOUR 3471 Advertising Research or JOUR 4791 Mass Communication and Public Opinion . . . . .	3
JOUR 3552 News Editing . . . . .	3
JOUR 3771 History of Journalism . . . . .	3
JOUR 4002 Reporting 2 . . . . .	3
JOUR 4502 Advanced Reporting . . . . .	3
JOUR 4552 Advanced Editing . . . . .	3
JOUR 4651 Mass Communication Law . . . . .	3
Journalism electives . . . . .	1-7

## PUBLIC RELATIONS

Public Relations is designed to prepare students as public relations practitioners. The curriculum emphasizes courses in public relations principles and practices, as well as basic writing courses.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media . . . . .	3
JOUR 2001 Mass Media Writing . . . . .	3
JOUR 3001 Reporting of Public Affairs . . . . .	3
JOUR 3471 Advertising Research or JOUR 4791 Mass Communication and Public Opinion . . . . .	3
JOUR 3771 History of Journalism . . . . .	3
JOUR 4272 Principles of Public Relations . . . . .	3
JOUR 4282 Public Relations Programs . . . . .	3
JOUR 4292 Public Relations Practices or JOUR 4931 Internship . . . . .	3
JOUR 4651 Mass Communication Law . . . . .	3
And at least one of the following:	
JOUR 3102 Press Photography . . . . .	3
JOUR 3552 News Editing . . . . .	3
JOUR 3604 Radio and TV News . . . . .	3
JOUR 4802 Magazine Article Writing . . . . .	3
JOUR 4831 Publication Design and Production . . . . .	3
Journalism electives . . . . .	0-4

## MASTER'S DEGREE PROGRAM

A Master of Arts degree in Journalism and Mass Communication is awarded

after the student has demonstrated advanced understanding of the role of mass media in society as well as competence or potential as a professional. Students may come into the graduate program with or without a foundation of educational or practical experience in journalism and mass communication. Upon completion of the program, students may enter or return to journalism, teach, or continue graduate studies in a doctoral program.

Graduate students should read carefully Requirements for Advanced Degrees in the Graduate School section of the *Catalog*.

Journalism and Mass Communication courses are available as a minor in other fields of advanced study to which they are logically related.

## Requirements

Graduate students without adequate educational or practical experiences in the profession will be required to take basic prerequisite courses. Such requirements will be determined individually.

Candidates for the master's degree in Journalism and Mass Communication pursue either of two plans, depending upon the background of the student at the time of admission. In either case, the student must present a minor of at least three courses in a supporting field. A minimum of 31 semester hours of graduate-level work is required for Plan I (Thesis). A minimum of 37 semester hours of graduate-level work is required for Plan II (Professional Project).

Every effort is made to suit the course work, both within the Journalism and Mass Communication curriculum and in supporting fields, to each candidate's interests and goals. For details about the program write to the Coordinator of the Graduate Program, School of Journalism and Mass Communication, Campus Box 287, University of Colorado at Boulder, Boulder, Colorado 80309-0287.

## ACADEMIC POLICIES

### Advising Requirements

Majors and premajors are required to consult an advisor *each* registration period. Advising is available from faculty and staff throughout the academic year, and major advising sheets are provided for each sequence. However, the student is ultimately responsible for the fulfillment of all degree requirements.



## Attendance Regulations

Students are expected to attend classes regularly and to comply with the attendance regulations specified by their instructors. At the beginning of each semester, students will be informed by their instructors of policies governing attendance in their classes. A student who does not attend any of the first week's sessions of a class during a term will be dropped from the class.

## Uniform Grading and Pass/Fail, Drop/Add, and Withdrawal Procedures

The University has general policies concerning grades, Pass/Fail, Drop/Add, and withdrawal procedures. These policies are outlined in the University Policies, Programs, and Services section of this *Catalog*.

In addition to the University's general policies, School of Journalism and Mass Communication majors may not take any Journalism and Mass Communication course Pass/Fail, but any other course may be taken Pass/Fail. Up to 16 hours of nonjournalism courses may be taken Pass/Fail, except for transfer students for whom the limit is 1 hour in every 8 attempted at the University of Colorado. Only 6 hours of Pass/Fail may be taken in any one semester. Students may withdraw at any time *prior* to the start of the final examination period. Students are encouraged to consider the Time Out Program when their withdrawal from the University is temporary.

## Scholastic Suspension

Majors (students who have transferred into the School of Journalism

and Mass Communication) are subject to suspension if they do not maintain a cumulative University grade point average of 2.25 and a cumulative Journalism and Mass Communication grade point average of 2.50.

Students whose grade point averages fall below either of these levels are normally placed on probation for one semester during which they have an opportunity to raise their averages to the required levels. Students whose averages continue below the required levels are subject to suspension from the School of Journalism and Mass Communication and will be notified in writing.

Scholastic records will be reviewed as soon as possible after each semester, and students will be informed in writing if they are to be placed on probation or suspension.

The normal period of suspension is two regular semesters (one academic year, excluding summer sessions). The period of suspension will be stated in the suspension notice to the student. A student suspended a second time will be reinstated only on the basis of unusual circumstances, which the student should state in a petition to the Dean of the School.

## School of Journalism and Mass Communication Faculty

**WILLARD D. ROWLAND, JR.**, Dean, Professor. B.A., Stanford University; M.A., University of Pennsylvania; Ph.D., University of Illinois.

**SAMUEL J. ARCHIBALD**, Associate Professor. B.A., University of Colorado; M.A., American University.

**JOANNE EASLEY ARNOLD**, Associate Dean, Associate Professor. B.A., M.A., Ph.D., University of Colorado.

**JAMES E. BRINTON**, Professor Emeritus.

**MALCOLM A. DEANS**, Senior Instructor Emeritus.

**CHARLES FRAZER**, Associate Professor. B.A., Rutgers University; M.A., Fairfield University; Ph.D., University of Illinois.

**HAROLD E. HILL**, Professor Emeritus.

**STEPHEN B. JONES**, Assistant Dean, Instructor. B.A., M.A., West Virginia University; Ph.D., University of Utah.

**FRANK L. KAPLAN**, Associate Professor. B.A., M.A., University of Southern California; Ph.D., University of Wisconsin.

**SAM KUCZUN**, Professor. B.S., M.S., Boston University; Ph.D., University of Minnesota.

**POLLY E. McLEAN**, Assistant Professor. B.A., Richmond College, City University of New York; M.S., Columbia University; Ph.D., University of Texas.

**WILLIAM I. McREYNOLDS**, Associate Professor. B.J., M.J., University of Texas; Ph.D., University of Minnesota.

**SANDRA E. MORIARTY**, Professor. B.J., University of Missouri; M.S., Ph.D., Kansas State University.

**MARGUERITE J. MORITZ**, Assistant Professor. B.S., M.S., Northwestern University.

**ROBERT B. RHODE**, Professor Emeritus.

**RUSSELL E. SHAIN**, Professor. B.A., University of Kentucky; M.S., Ph.D., University of Illinois.

**ARDYTH SOHN**, Associate Professor. B.A., University of Illinois; M.S., Ph.D., Southern Illinois University.

**DON S. SOMERVILLE**, Professor Emeritus.

**A. GAYLE WALDROP**, Professor Emeritus.

**LILLIAN WILKINS**, Assistant Professor. B.A., B.J., University of Missouri; M.A., Ph.D., University of Oregon.

# School of Law

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## INFORMATION ABOUT THE SCHOOL

*Gene R. Nichol, Jr., Dean  
(effective July 1, 1988)  
Clifford J. Calhoun, Acting Dean  
(through June 30, 1988)*

## History and Purpose

The School of Law was established in 1892. It is a charter member of the Association of American Law Schools, organized in 1901, and has been on the list of approved law schools of the American Bar Association since the first publication of such a list in 1923. Such approval is based upon high scholastic standards, a three-year program of full-time resident study, a well-qualified faculty, good library facilities, and high admission qualifications. At the University of Colorado School of Law, a relatively small student body of 450 and a favorable faculty-student ratio produce classes of a size that encourages discussion. Classes normally consist of no more than about 80 students, and many are much smaller. In addition, faculty are readily available for informal conferences with individual students.

Courses are offered in a wide range of law-related subject matter (see course descriptions). Students are free to take almost all second- and third-year courses as electives after a required first-year curriculum. Special emphasis in areas of particular curricular strength at the Law School such as commercial law, natural resources, and criminal law and procedure is possible. Graduates are academically qualified to take the bar examination in all 50 states provided that, in choosing their curricula, students comply with any individual requirements of states in which they intend to practice.

## Law Building and Law Library

The School of Law is housed in the Fleming Law Building, located in the southeastern part of the campus. Teaching facilities include an excellent library, classrooms, seminar rooms, a complete trial and appellate courtroom,

and videotape equipment. The building also contains suites for the Legal Aid and Defender Clinical Program, Natural Resources Law Center, Natural Resources Litigation Clinic, offices for various student organizations, faculty and administrative offices, and a student lounge. The building has ample space to accommodate the student body of 450 now enrolled.

The law library contains one of the best legal reference collections in the western United States. The collection consists of approximately 210,000 volumes and microform equivalents. Students and faculty have ready access to a comprehensive collection of American case law from all jurisdictions, statutes of all of the states (in annotated form when available), and the major digests, encyclopedias, periodicals, and texts dealing with American law. The English and Canadian materials are almost as complete, and there are substantial holdings in other Commonwealth materials. A collection of books in German, French, and international law provides a basis for comparative law studies.

## Prelegal Preparation

The School of Law at the University of Colorado prescribes no specific pre-law curriculum. Students should pursue their interests, the offerings of their particular colleges, and their personal objectives in studying law. In general, the prelaw student should place primary emphasis on the acquisition of excellent methods of study, thought, and communication, especially writing. Obviously, these skills can be acquired in a number of different areas, and successful law students and lawyers have college majors in almost every field. College courses should be chosen with care to produce a balanced pattern of skills and insights. An undergraduate major field should be one which requires rigorous application of one's abilities.

## Methods of Instruction

Law school classes are conducted primarily as discussions rather than as lectures. Judicial opinions and statutes

are critically analyzed and the principles extracted are used in arguments about hypothetical situations. Other methods of instruction include research and writing, seminars, and practical experience both in clinical programs and by simulation.

Transmission of knowledge of established law is only one element of legal education. The School of Law seeks to train students to use the law, to research and analyze relevant materials, to speak and write effectively, and to evaluate arguments. Significant changes in the law occur frequently and knowledge of specific laws may become obsolete, but the skills to analyze, argue, and evaluate endure.

## Career Services

The Law School's Office of Career Services offers a range of services to students as they attempt to define their career goals and to obtain part-time and summer employment during law school and full-time employment following graduation. The placement library contains information about legal and law-related careers in general, as well as materials which describe the practice of law in many large and small private firms, corporations, public and community legal agencies, and governments at all levels. The staff is available to assist students in the preparation of resumes and cover letters and to discuss interviewing techniques. The Office sponsors numerous seminars at which alumni and friends of the School of Law discuss the recruitment process, different types of law practice, and career opportunities available to Law School graduates.

With 143 of the 150 members of the class which graduated in 1986 reporting on their employment status (approximately six months after graduation), more than 91 percent were employed. Approximately 55 percent were in full-time positions with law firms, 20 percent were clerking for judges, and 13 percent were employed by governments on local, state, and federal levels. The remainder were occupied in business, legal services, the military, and academic areas, with approximately three percent choosing nonlegal employment.

The information supplied showed that the average beginning salary for a 1986 graduate was approximately \$30,000 per year. A large percentage of graduates remain in Colorado, but graduates of the School of Law have located throughout the country and in Canada.

## Part-Time Employment

The study of law is essentially a full-time task. Most students devote from 50 to 70 hours a week to classroom attendance, preparation for class, and other activities directly related to their legal education, such as participation in appellate briefing and argument competition, and work in the school's Clinical Program. As a consequence, the opportunity for self-support through employment while attending law school is limited. Students may not accept outside employment during the critical first year; however, law-related employment for a limited number of hours may actually enhance the educational experience of second- and third-year students. Students may not commit themselves to employment of more than 20 hours per week, or schedule employment which will interfere with class attendance.

The Law School's Office of Career Services assists students who wish to secure law-related employment. The University's Office of Career Services and Cooperative Education aids those who wish to find conventional employment or work-study placement.

## Lectureships and Professorships

The Charles Inglis Thomson Trust Fund, created in 1913, enables the School of Law to bring a leading authority in a selected field of law to the school as a visiting professor. Recent Thomson Professors have included Richard C. Maxwell, Harry R. Chadwick Senior Professor at Duke and former dean of UCLA Law School (1982); Archibald Cox, Carl M. Loeb University Professor at Harvard Law School, former Solicitor General of the United States, and Special Watergate Prosecutor (1983); Alfred F. Conard, Henry M. Butzel Professor Emeritus at the University of Michigan Law School (1984); Willard H. Pedrick, the founding dean of Arizona State University Law School (1985); Victor G. Rosenblum, professor of law at Northwestern University, former president of Reed College, and president-elect of the Association of American Law Schools (1986); and Father Robert Drinan, professor of law at Georgetown University Law

Center, former dean of Boston College, and former Congressman (1987).

In 1955, a trust fund was established in memory of John R. Coen to bring to the School of Law each year a prominent jurist, scholar, or other public figure to deliver a lecture to the students and faculty of the School of Law. Lecturers in the series have included Marc A. Franklin, Frederick I. Richman Professor of Law, Stanford Law School; Harry T. Edwards, Judge, United States Court of Appeals for the District of Columbia Circuit; Charles L. Black, Sterling Professor of Law at Yale Law School; Ruth Bader Ginsburg, Judge, United States Court of Appeals for the District of Columbia Circuit; A. Leon Higginbotham, Jr., Judge, United States Court of Appeals for the Third Circuit; Guido Calabresi, Yale Law School; Richard Posner, University of Chicago Law School; Brigitte M. Bodenheimer, University of California at Davis School of Law; Leonard Boudin, Rabinowitz, Boudin & Standard, New York City; Rex E. Lee, Solicitor General of the United States, former dean, Brigham Young University School of Law; Irving Younger, Cornell University Law School; and Marvin E. Frankel, former Judge, United States District Court for the Southern District of New York. The 1987 Coen Lecturer was Kent Greenawalt, Cardozo Professor of Law, Columbia University.

## Special Programs

The Legal Aid and Defender Program allows students supervised by full-time clinical faculty who are experienced trial attorneys to represent low income clients in civil and criminal cases in Colorado courts and before administrative agencies.

The Natural Resources Litigation Clinic involves students in administrative and judicial proceedings concerning environmental problems. Students in this program work closely with clinical faculty on a range of issues, e.g., water resource and mineral development, land use, and energy development. Instruction is primarily conducted on a one-to-one (faculty-to-student) basis, in addition to clinic group meetings to discuss issues and strategies of general interest.

## Order of the Coif

The Order of the Coif is a national law school honor society founded to encourage legal scholarship and to advance the ethical standards of the profession. The University of Colorado is one of only 67 law schools entitled to award the Order of the Coif. Members

are selected for demonstrated scholarship from among seniors ranking scholastically in the top 10 percent of their class.

## Activities

The School of Law offers many activities in addition to those available for students in the University as a whole. The Rothgerber Moot Court Competition, Trial Practice Competitions, and Jessup International Law Moot Court Competition offer students an opportunity to refine their research skills, as well as develop skills in advocacy at the trial and appellate levels. In the Rothgerber and Jessup competitions, students thoroughly prepare and brief hypothetical cases and then argue before panels of distinguished judges and lawyers. In Trial Practice Competitions, students prepare and try hypothetical cases.

The *University of Colorado Law Review*, a professional journal edited entirely by students, publishes scholarly articles and comments on matters of concern to the legal profession at both the national and state levels.

The Student Bar Association represents the interests of law students generally. Other student organizations include the American Bar Association Law Student Division, the Nicholas R. Doman Society of International Law, the American Civil Liberties Union, American Indian Law Students Association, Black Law Students Association, Hispanic Law Students Association, Colorado Trial Lawyers' Association, Federalist Society, Environmental Law Society, Jewish Law Students Association, Phi Alpha Delta and Phi Delta Phi Legal Fraternities, and Women's Law Caucus. Student organizations regularly sponsor programs of interest to the bar and community, such as Women in the Law Day, and a symposium on Energy Mineral Development in the Rocky Mountains.

## Expenses and Financial Aid

Colorado residents enrolled in the School of Law paid \$2,492 in tuition and fees for the 1987-88 academic year; nonresidents paid \$7,190. The School of Law Office of Admissions will tentatively classify applicants as in-state or out-of-state students, but the final decision will be made by the Tuition Classification Officer. For more information concerning in-state and out-of-state classification, consult the University Policies, Programs, and Services section of this *Catalog*.

Living expenses, books, and incidental costs in the amount of approximately \$6,500 per year should be added to tuition figures in estimating yearly expenditures.

Grants are available on a limited basis to eligible in-state students and are awarded on the basis of need and timeliness of filing the financial aid application. Out-of-state students may not be awarded grants from state funds under present state policy but may be considered for loans and Work-Study. Students applying for financial aid, including grants, Perkins Loans (formerly NDSL), Work-Study, and Guaranteed Student Loans (GSL) must file the Family Financial Statement (FFS) of the American College Testing (ACT) Need Analysis Service. This application may be obtained from local high schools or colleges and must be properly completed and submitted early enough to ensure that it is received by ACT in Iowa City, Iowa not later than the University of Colorado at Boulder priority date of April 1, 1988.

The financial aid application will not be processed until a student has been officially admitted to the School of Law. The deadline for admission is determined each year through consultation between the School of Law and the Office of Financial Aid. In order to ensure early consideration for admission to the School of Law, the application for admission must be received by the School of Law no later than February 15, 1988. Students missing the admission deadline will be considered late, even if they met the financial aid application filing deadline. Students missing either deadline will be precluded from consideration for most types of need-based aid programs. The ACT code number for the University of Colorado at Boulder is 0532. The Guaranteed Student Loan, PLUS Loan, and Supplemental Loan to Students (SLS) require a separate application, which can be obtained from the Office of Financial Aid.

The School of Law also participates in the Law Plan, a program which includes the GSL and SLS, as well as the Law Access Loan. Students do not qualify for the Law Plan if they have already borrowed as much money as the Law Plan loan programs allow.

All students who receive financial aid are required to understand and comply with minimum standards of satisfactory academic progress. The Office of Financial Aid Satisfactory Academic Progress Policy is available to students upon request at the University's Office of Financial Aid.

For further information regarding financial assistance, contact either the

Office of Financial Aid, Campus Box 106, University of Colorado at Boulder, Boulder, Colorado 80309-0106, (303) 492-5091; or the Director of Admissions and Financial Aid, School of Law, Campus Box 403, University of Colorado at Boulder, Boulder, Colorado 80309-0403, (303) 492-7203.

## ADMISSION PROCEDURES

### Requirements and Standards

The School of Law grants admission to qualified applicants who have received a baccalaureate degree from a properly accredited institution, based on at least 90 semester hours or 135 quarter hours of credit.

The applicant must also show substantial intellectual promise and give evidence of high moral and ethical standards. The entering class in 1986 had median GPAs of 3.40 and median LSAT scores in the 80th percentile.

While admission standards are based heavily on undergraduate grade point average and the Law School Admission Test score, other factors are also important because they may indicate ability and motivation, and because diversity in the student body contributes to the educational process. Other factors that are considered include variation in economic, social, or cultural background; geographic diversity; variation in undergraduate or graduate program or institution; unusual employment or other experience; demonstrated and unusual quality of leadership; special achievement in overcoming personal handicaps or disadvantages; and the ability to contribute the perspectives of racial or ethnic minorities or other distinctive communities. In its efforts to offer equal opportunity for obtaining a legal education, the Law School will take race affirmatively into account as an important factor in the competitive weighing of individual applications. Colorado residency is also given special consideration, since the University is a state-supported school.

Personal interviews are neither required nor encouraged. Every applicant is invited to submit a personal statement and to ask people familiar with his or her ability to write letters of recommendation in support of the application.

Beginning students are admitted in the fall semester and only on a full-time basis. The School of Law does not have an evening division of study.

The School conducts an introductory summer program for those persons admitted whose qualifications suggest

that prior assistance may be particularly helpful for successful law study. In addition, tutorial assistance will be available for first-year students who desire it and whose qualifications suggest that this type of support might be beneficial.

Usually 5 to 10 second-year transfer students are accepted each year. Decisions are based heavily on law school performance, in addition to the factors considered for beginning students.

Because of the large number of applications which must be processed, the deadlines set must be strictly observed.

### How and When to Apply

1. Request application blanks and instructions from the School of Law, Fleming Law Building, Campus Box 403, University of Colorado at Boulder, Boulder, Colorado 80309-0403.

2. Students must return a completed Application for Admission, an LSAT/LSDAS Law School Application Matching Form, and a nonrefundable application fee by February 15. Late applications will be considered but those which are timely will be reviewed first. Some forms of financial aid will be jeopardized by late application. All applicants who seek financial aid should ensure compliance with the ACT deadline described in this *Catalog*. In addition, the following credentials must be completed and received by February 15 (with each item mailed directly from its source to the School of Law):

- a. An evaluation of all college and nonlaw school postgraduate work undertaken that is provided by the Law School Data Assembly Service. The evaluation must be based on not less than the equivalent of six semesters or nine quarters of regular undergraduate college work. To obtain registration forms, applicants should write directly to Law School Admissions Services, Box 2000, Newtown, Pennsylvania 18940. A registration form to utilize the service must have been received by LSDAS no later than January 21.
- b. Results of the Law School Admission Test. The test is administered by the Law School Admissions Services, Box 2000, Newtown, Pennsylvania 18940, four times each year at a number of places. Applicants should take the test no later than December in the year prior to the term they expect to attend the School of Law. For further information and arrangements contact the Law School Admissions Service.

- c. At least one letter of evaluation from a college instructor from whom a course has been taken and, if the applicant has entered into postgraduate employment, from a person having supervision over the applicant's work. The evaluator should be someone who has had the opportunity to observe and can write about the applicant's abilities and performance.
- d. A personal statement, emphasizing factors that may contribute to the diversity of the student body, any special accomplishments or characteristics that would indicate a likelihood of success in law school, and anything else that might be of interest, such as reasons for choosing to pursue law studies. Ethnic, cultural, and linguistic heritage, including parental background, should be emphasized.

The applicant is responsible for arranging for submission of the above supporting documents, including materials from the Law School Data Assembly Service, and for ensuring that materials are received by the School of Law prior to established deadlines.

Because of the large number of applications that must be processed, the deadlines must be met. Late applications will be accepted, but they will be considered only after all of the timely applications. Only the strongest late applicants have any substantial chance of admission.

## Transfer Students

Transfer students must meet all standards and requirements set forth above for students who have not previously attended law school.

Applicants must arrange to have sent, in addition to the above items: (1) two copies of transcripts of all law school work undertaken and (2) upon completion of all law school work, a letter from the law school dean stating that the applicant is in good standing and eligible to continue without condition.

Students who have been accepted for admission and who have attended a law school not on the approved list of the American Bar Association will not receive credit for work completed in that law school.

Students who have previously attended other fully accredited law schools may receive advanced-standing credit for work done in such law schools in an amount and on such conditions as determined by the Office of the Dean. In no event will credit be given toward graduation for any course

taken in another law school in which a grade of less than *C* or its equivalent has been recorded.

## Confirmation

As credentials are completed, the Admissions Committee will act upon applications. In most cases notification of an initial decision (admit, hold, or deny) should be received by April 1. A waiting list will be established in early May and efforts will be made to notify students on the list promptly of the likelihood of their admission. Applicants who are accepted for admission must send a nonrefundable deposit, which will be credited toward tuition for the first semester, to the School of Law no later than the time stated (normally within two weeks) in the letter giving notice of admission.

## Transcripts — Withdrawal of Admission

At least one week prior to enrolling in the School of Law, all students who have been admitted and have confirmed their admission must submit two official transcripts from *each* college and law school attended showing all college and postgraduate work completed. Such transcripts must show the student has received a baccalaureate degree from a properly accredited institution. These transcripts must also show any subsequent work which was undertaken whether or not the work was included in the LSDAS evaluation. If such subsequent work is not of substantially similar quality to that included in the LSDAS evaluation, or if the transcripts fail to show the student has received the required baccalaureate degree, the student's prior admission may be withdrawn.

## Summer Session

Any student who has completed at least one year in an accredited law school may register for courses offered during the summer session upon submission of a summer application form together with a letter of good standing from his or her law school. Students may register for a number of courses offered in the summer. The maximum number of credit hours to be earned during the summer session will be determined by the Dean's Office.

The summer curriculum is designed for students with advanced standing. All courses offered in the School of Law will run for the full session unless otherwise announced. A *Schedule of Summer Courses* with an application form may be obtained by writing to the

Director of Admissions, School of Law, Campus Box 403, University of Colorado at Boulder, Boulder, Colorado 80309-0403.

## GRADUATION REQUIREMENTS

The right to change the academic performance requirement and requirements for graduation is expressly reserved to the Dean and faculty.

The Juris Doctor (J.D.) degree will be conferred on students who have satisfactorily completed the six-semester curriculum in accordance with School of Law rules. All law school work must be taken in residence; that is to say, in the classroom or under direct personal supervision of the instructor and not by correspondence or extension. No credit toward graduation from the School of Law will be given for any pre-law courses.

The requirements for the J.D. degree are:

1. Completion of 89 semester hours of credit with a numerical average of 72 or better.
2. Completion of all required courses. These are listed under School of Law Curriculum.
3. Completion of one seminar.
4. Study for at least six semesters or equivalent in residence (i.e., passing at least 10 semester hours of study in the classroom or under direct supervision of the instructor) at this or some other accredited law school, with at least 42 hours in residence at the School of Law. If a student is not in residence at the University of Colorado School of Law during the last two semesters, a total of 64 hours in residence is required at the School.

Half a semester's time and residence credit may be earned in a summer session. By enrolling in two summer sessions and taking a minimum of 5 hours of work in each, the student can obtain a full semester of residence credit and earn a degree one semester earlier than normal.

5. Satisfaction of any conditions imposed at the time of admission.

## Joint Degrees

The School of Law participates with the Graduate School of Business Administration in a joint degree program through which qualified students may satisfy the requirements for both the J.D. and the M.B.A. degrees in a four-year program of coordinated study at the two schools. Through this program, each school will accept a specified number of hours of course work taken

at the other as part of the requirements for completion of their respective degrees. School of Law credit for work in the Business School is conditioned upon completion of the M.B.A. program and requires a grade of *B-* or better in all business courses taken as part of the joint degree program. School of Law credit for work in the Business School is treated on a pass basis and is not computed in class rank or used in the computation of the cumulative 72 grade point average requirement for graduation from the School of Law.

To become eligible for the joint J.D.-M.B.A. degree program, a student must apply separately to and be admitted by each of the two schools under their respective admissions procedures and standards. Students may elect the joint degree program at the time of initial application to both schools or during the first year of study at either school.

A student enrolled in the joint degree program may commence studies under the program in either the School of Law or the Business School. However, a student in the joint program is required by the School of Law to take the first year of the Juris Doctor curriculum as a unit exclusively in the School of Law. Otherwise, the student may take courses in the Business School or in the School of Law, or both, as the student may desire and as may be necessary to meet the requirements of the degree programs of the two schools.

No student in the joint degree program shall be allowed to take fewer than 9 semester hours or more than 16 semester hours during any term (excluding summer terms) without receiving the consent of the program advisor in each school in which courses are being taken.

### **CREDIT FOR COURSES TAKEN**

The School of Law will grant credit toward the Juris Doctor degree for up to 9 semester hours of acceptable performance in graduate-level courses taken by a joint degree program student at the Business School, and up to 12 semester hours of credit for such performance if 3 of such semester hours are in ACCT 5010, Fundamentals of Accounting. A student must earn a grade of *B-* or higher in the Business School course in order for the performance to be acceptable for School of Law credit.

The Business School will grant credit toward the Master of Business Administration degree for up to 9 semester hours of acceptable performance in School of Law courses taken by a joint degree program student, will waive any

business law course requirement, and will waive or otherwise modify other requirements so that a joint degree program student will be able to obtain the M.B.A. degree with not more than 46 semester hours of Business School course credit exclusive of credit given for School of Law courses under the program. A student must have earned a grade of *C-* or equivalent in the School of Law course in order for the performance to be acceptable for Business School credit.

### **TERMINATION OF JOINT DEGREE ENROLLMENT OR OF GOOD STANDING**

Students in the joint degree program who do not maintain the academic or ethical standards of either school may be terminated from the joint degree program. Students in good standing in one school, but not the other, may be allowed to continue in the school in which they are in good standing. However, students who do not complete the joint degree program will be required to meet the regular degree requirements (J.D. or M.B.A.) which were in effect when they entered the program for that degree.

### **Tax Emphasis Degree Program**

The School of Law offers a program of law study which leads to a Juris Doctor degree with an emphasis in the area of taxation.

This program is designed to provide a student with a credential which the School of Law believes will be attractive to many potential employers. The degree will signify taxation law experience beyond the experience normally obtained by law graduates, and intermediate between the normal law school experience and that obtained in a Masters of Taxation degree program. The School believes that a number of employers desire law graduates with additional experience in the taxation area, but are unwilling to incur the additional expense required, or are unable to provide the full-time work in the tax area necessary, to hire a person with a graduate tax degree.

The Tax Emphasis Degree Program requires a participating student to earn not fewer than 95 semester hours of course credit for graduation (as contrasted with the usual 89 semester hours), and to earn at least 18 of these semester hour credits in the area of taxation. These 18 hours must include: Income Taxation; Advanced Taxation;

Federal Estate and Gift Tax; at least one tax planning course (Business Planning, Estate Planning, or Real Estate Planning); and Tax Policy if available at the School of Law or, if not offered, either the Tax Policy course at the Business School or Public Finance in the Economics Department.

A sufficient additional number of elective credits, to make up the minimum 18 hours, must be chosen from among the tax courses in the School of Law or from among the graduate tax offerings in the Business School approved for law credit.

Business School and Economics Department courses taken for School of Law credit under the Tax Emphasis Degree Program are limited to 6 semester hours of credit and must have received prior approval for cross-listing from the Curriculum Committee, or from the Dean to the extent approval authority is delegated to the Dean. (Courses which cover the same subject matter as courses taught at the School of Law will not normally be approved for cross-listing under the School of Law's cross-listing standards; however, if there is only a partial overlap in coverage, cross-listing credit may be provided for the nonoverlapping portion of the course.)

A student must receive at least a *B* in the Business School course or in the Public Finance course in order for the course to count for School of Law credit under the program. The Business School or Public Finance courses will be treated as pass/fail courses for the School of Law transcript; that is, these courses will count toward the 95 hours required for the degree but will not be taken into account in computing the law student's grade point average.

A student may take more than the required 18 semester hours of tax courses under the Tax Emphasis Degree Program. However, in order to ensure that the student's law program is sufficiently broad, the faculty requires that not less than 70 semester hours of credit must be received in courses outside of the taxation area.

A student should be able to complete this program within the normal three-year law degree period if the student plans the program of law study effectively and takes either a summer session of law study or a somewhat heavier than average load in each semester after the first year of law study. Law students who wish to participate in the program should contact the Registrar of the School of Law for enrollment forms. Students may fill out the forms during the spring of their first year.



## ACADEMIC POLICIES

### Honor System

On the premise that academic dishonesty is incompatible with the dignity and responsibility of the legal profession, the School of Law operates under an honor code which is subscribed to by all entering students. The honor code is a system of rules administered by student officers and demands high ethical conduct, prohibiting, for example, resorting to unauthorized sources in examinations. The same code also allows students considerable individual freedom and responsibility.

### Grading and Point System

Grades are recorded by the University of Colorado as *A*, *A-*, *B+*, *B*, *B-*, *C+*, *C*, *C-*, *D+*, *D*, *D-*, or *F*.

The School of Law also grades on a numerical basis: *A* = 93-100; *A-* = 90-92; *B+* = 86-89; *B* = 83-85; *B-* = 80-82; *C+* = 76-79; *C* = 73-75; *C-* = 70-72; *D+* = 66-69; *D* = 63-65; *D-* = 60-62; *F* = 50-59.

One semester hour of credit represents one 50-minute class period per week through a semester.

In courses designated as Pass/Fail or pass/graded, the grade of *Pass* is given when in the judgment of the instructor the quality and quantity of work is such that on a graded basis the work would be the equivalent of at least a *C* (72). If the instructor judges the work not the equivalent of a *C* (72), the work is assigned that letter and numerical grade between the *F* (50) and *C-* (71) which the instructor determines is appropriate.

### Academic Performance Requirements

Subject to certain qualifications for which the rules of the School of Law should be consulted, students with a cumulative grade point average below 72 at the end of any session or semester are normally excluded at the end of the next semester of attendance, unless by then their cumulative grade point average has been raised to 72.

### Normal Course Load; Dropping Courses

The normal course load is about 14 or 15 hours per semester. Students may not register for more than 16 hours or fewer than 10 hours without special permission, and first-year students must obtain permission in order to register for less than a full schedule. A student who discontinues a course at any time

without notifying the Office of the Dean and processing the necessary papers will receive an *F* (50). All first-year students must obtain the permission of the Dean's Office prior to dropping any course.

No student shall be permitted to drop without discredit any seminar or other course with enrollment limited below the maximum at any time after enrollment for the course has reached capacity, except by approval of the Dean's Office upon a petition showing good cause. Second- and third-year students may not be permitted to drop any seminar or course with enrollment limited below the maximum which did not reach capacity without discredit after the end of the fifth week, or any other course without discredit after the tenth week of any semester or the fourth week of the summer session, except by approval of the Dean's Office of a petition showing good cause.

### Withdrawals

Students may withdraw from the School of Law at any time up to two days before the beginning of final examinations by obtaining permission of the Dean's Office.

### Transcripts of Credit

Official transcripts of credit should be ordered from the Office of Academic Records transcript section, Regent Administrative Center 125. Official transcripts are prepared only at the student's request and must be submitted in person or in writing. Requests for letters of certification indicating class standing, numerical averages, and attendance dates may be made in person or by writing to the School of Law Registrar, Room 141.

### Classification of Students

To be ranked in the second-year class, a student must have passed 31 semester hours of work; to be ranked in the third-year class, 59 hours of work.

### Attendance

Class attendance is of great importance. A student who has been absent from more than 20 percent of the total number of classes in a course will ordinarily be excluded from the final examination and will not receive a passing grade in the course.

## SCHOOL OF LAW CURRICULUM

The curriculum of the School of Law is designed to give students a thorough training in fundamental principles of English and American law, to permit moderate specialization in areas of personal interest, and to prepare them to practice in any state or country where Anglo-American law prevails.

The first-year curriculum of contracts, torts, civil procedure, criminal law, property, legal writing, and appellate advocacy is required of all students. The second and third years are largely elective; the only required courses are constitutional law, professional responsibility, a seminar, and either trial advocacy or two semesters in the legal aid and defender program. A maximum of 11 clinical hours is allowed to count toward the graduation requirement of 89 hours.

Students have the responsibility of planning their second- and third-year schedules so as to complete all required courses and obtain a full schedule of work in each semester.

The value of the course in semester hour credits is indicated by the figure following the identifying department number. For example, in LAWS 5101-3, LAWS 5101 is the identifying department number, and the -3 indicates that the course is for 3 hours of credit.

*The right to change the schedule of courses and instructors is expressly reserved to the Dean and faculty.*

### Program for the Academic Year

#### FIRST-YEAR REQUIRED COURSES

LAWS 5213-1 Appellate Court Advocacy  
LAWS 5303-3 Civil Procedure 1  
LAWS 5313-3 Civil Procedure 2  
LAWS 5101-3 Contracts 1  
LAWS 5111-3 Contracts 2  
LAWS 5503-4 Criminal Law  
LAWS 5226-2 Legal Writing  
LAWS 5624-3 Property 1  
LAWS 5634-3 Property 2  
LAWS 5425-4 Torts 1  
LAWS 5435-2 Torts 2

#### SECOND- AND THIRD-YEAR COURSES BY CATEGORY

Business  
LAWS 6201-3 Agency-Partnership  
LAWS 7201-3 Antitrust  
LAWS 7021-3 Bankruptcy  
LAWS 7211-3 Business Planning  
LAWS 7051-2 Commercial Drafting  
LAWS 6001-4 Commercial Transactions  
LAWS 7301-2 Copyright and Unfair Competition  
LAWS 6251-4 Corporations  
LAWS 7001-3 Creditors and Bankruptcy: A Survey  
LAWS 7011-3 Creditors' Remedies and Debtors' Protection  
LAWS 7541-2 Employment Discrimination  
LAWS 7321-2 Entertainment Law  
LAWS 7611-2 International Business Transactions  
LAWS 6501-3 Labor Law  
LAWS 6281-3 Legal Accounting

LAWS 7311-2 Patent and Trademark  
 LAWS 7024-3 Real Estate Planning  
 LAWS 7401-3 Securities Regulation  
 LAWS 9251-2 Seminar: Advanced Corporate Law  
 LAWS 9501-2 Seminar: Labor Arbitration  
 LAWS 9411-2 Seminar: Mergers and Acquisitions

#### International

LAWS 6200-2 Comparative Law  
 LAWS 7058-3 Conflict of Laws  
 LAWS 7065-3 Immigration Law  
 LAWS 7611-2 International Business Transactions  
 LAWS 7406-1 International Moot Court Competition  
 LAWS 6400-3 Public International Law  
 LAWS 9410-2 Seminar: International Economic Development  
 Policy and Law  
 LAWS 7607-3 Taxation of Foreign Source Income

#### Jurisprudence and Perspective Courses

LAWS 6200-2 Comparative Law  
 LAWS 7058-3 Conflict of Laws  
 LAWS 6308-3 Economic Analysis of Law  
 LAWS 7128-3 Jurisprudence  
 LAWS 6318-2 Law and Economics  
 LAWS 7218-2 Legal History  
 LAWS 6118-3 Legal Process  
 LAWS 9118-2 Seminar: Experiments in Legal Process  
 LAWS 9418-2 Seminar: Legal Imagination  
 LAWS 9318-2 Seminar: Problems in Law and Economics  
 LAWS 9518-2 Seminar: Public Choice and Theories  
 of Justice

#### Natural Resources

LAWS 7725-3 American Indian Law  
 LAWS 7202-3 Environmental Law  
 LAWS 7122-2 Mining Law  
 LAWS 7102-3 Oil and Gas  
 LAWS 6002-3 Public Land Law  
 LAWS 9112-2 Seminar: Advanced Natural Resources  
 LAWS 9302-2 Seminar: Advanced Problems in Water  
 Resource Management  
 LAWS 9122-2 Seminar: Mining Law  
 LAWS 9502-2 Seminar: Wildlife Management Law  
 LAWS 7307-3 Taxation of Natural Resources  
 LAWS 6302-3 Water Resources

#### Practice and Procedure

LAWS 7205-3 Administrative Law  
 LAWS 7051-2 Commercial Drafting  
 LAWS 7303-3 Complex Civil Litigation  
 LAWS 6045-3 Criminal Procedure  
 LAWS 7045-3 Criminal Procedure: Adjudicative Process  
 LAWS 6353-3 Evidence  
 LAWS 7003-3 Federal Courts  
 LAWS 7603-2 Law Firm Practice  
 LAWS 7409-3 Legal Negotiation and Dispute Resolution  
 LAWS 7255-3 Local Government  
 LAWS 6103-2 Professional Responsibility (required course)  
 LAWS 7433-3 Remedies  
 LAWS 9713-2 Seminar: Alternatives to the Adversary System  
 LAWS 9613-2 Seminar: Civil Liberties Litigation

#### Practice — Clinical

LAWS 7159-2 Advanced Trial Advocacy  
 LAWS 7409-3 Legal Negotiation and Dispute Resolution  
 LAWS 6009-4 Legal Aid: Civil Practice 1  
 LAWS 6019-3 Legal Aid: Civil Practice 2  
 LAWS 6029-4 Legal Aid: Criminal Practice 1  
 LAWS 6039-3 Legal Aid: Criminal Practice 2  
 LAWS 7209-3 Natural Resource Litigation Clinic  
 LAWS 7109-2 Trial Advocacy  
 LAWS 7509-1 Trial Competition

#### Property

LAWS 7154-3 Land Use Planning  
 LAWS 7024-3 Real Estate Planning  
 LAWS 6004-3 Real Property Security and Conveyancing  
 LAWS 9254-2 Seminar: Problems in Local Government and  
 Land Use Planning  
 LAWS 6104-3 Wills and Trusts

#### Public

LAWS 7205-3 Administrative Law  
 LAWS 7725-3 American Indian Law  
 LAWS 6005-4 Constitutional Law (required course)  
 LAWS 6045-3 Criminal Procedure  
 LAWS 7045-3 Criminal Procedure: Adjudicative Process  
 LAWS 7105-3 Domestic Relations  
 LAWS 7055-2 Education Law  
 LAWS 7003-3 Federal Courts  
 LAWS 7015-3 First Amendment  
 LAWS 7065-3 Immigration Law  
 LAWS 7705-2 Legislative Drafting  
 LAWS 7255-3 Local Government  
 LAWS 9055-2 Seminar: Church and State Relations  
 LAWS 9015-3 Seminar: Constitutional Theory  
 LAWS 9005-2 Seminar: Equal Protection  
 LAWS 9025-2 Seminar: First Amendment  
 LAWS 9425-2 Seminar: Law and Medicine  
 LAWS 9715-2 Seminar: Law and Mental Health  
 LAWS 9045-2 Seminar: Law of Corrections

LAWS 9254-2 Seminar: Problems in Local Government and  
 Land Use Planning  
 LAWS 9415-2 Seminar: Products Liability  
 LAWS 9525-2 Seminar: Social Legislation

#### Research and Writing

LAWS 7051-2 Commercial Drafting  
 LAWS 7846-1 Independent Legal Research  
 LAWS 7856-2 Independent Legal Research  
 LAWS 7896-1 Independent Legal Research—Law Review  
 LAWS 7906-2 Independent Legal Research—Law Review  
 LAWS 7406-1 International Moot Court Competition  
 LAWS 7705-2 Legislative Drafting  
 LAWS 7106-1 Rothgerber Moot Court Competition  
 LAWS 7509-1 Trial Competition

#### Taxation

LAWS 7217-2 Advanced Estate Planning  
 LAWS 6107-3 Advanced Taxation  
 LAWS 7211-3 Business Planning  
 LAWS 6157-3 Corporate Taxation  
 LAWS 7207-3 Federal Estate and Gift Tax  
 LAWS 6007-4 Income Taxation  
 LAWS 7024-3 Real Estate Planning  
 LAWS 9407-2 Seminar: Tax Policy  
 LAWS 7607-3 Taxation of Foreign Source Income  
 LAWS 7307-3 Taxation of Natural Resources

## School of Law Faculty

**GENE R. NICHOL, JR.**, Dean (effective July 1, 1988), Professor. B.A., Oklahoma State University; J.D., University of Texas School of Law.

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**CHARLES F. WILKINSON**, Professor. B.A., Denison University; LL.B., Stanford Law School.

## LIBRARY FACULTY

**BARBARA BINTLIFF**, Associate Law Librarian. B.A., Central Washington State College; M.L.L., J.D., University of Washington.

**JANE HAMES**, Assistant Law Librarian for Public Services. B.A., University of Missouri; J.D., M.A., University of Denver.

**RICHARD JOST**, Assistant Law Librarian. B.A., State University of New York at Cortland; M.A., The American University; M.A., University of Denver.

**LEANNE KUNKLE WALTHER**, Assistant Law Librarian. B.A., Cedar Crest College; M.A., University of Denver.

## PROFESSIONAL STAFF

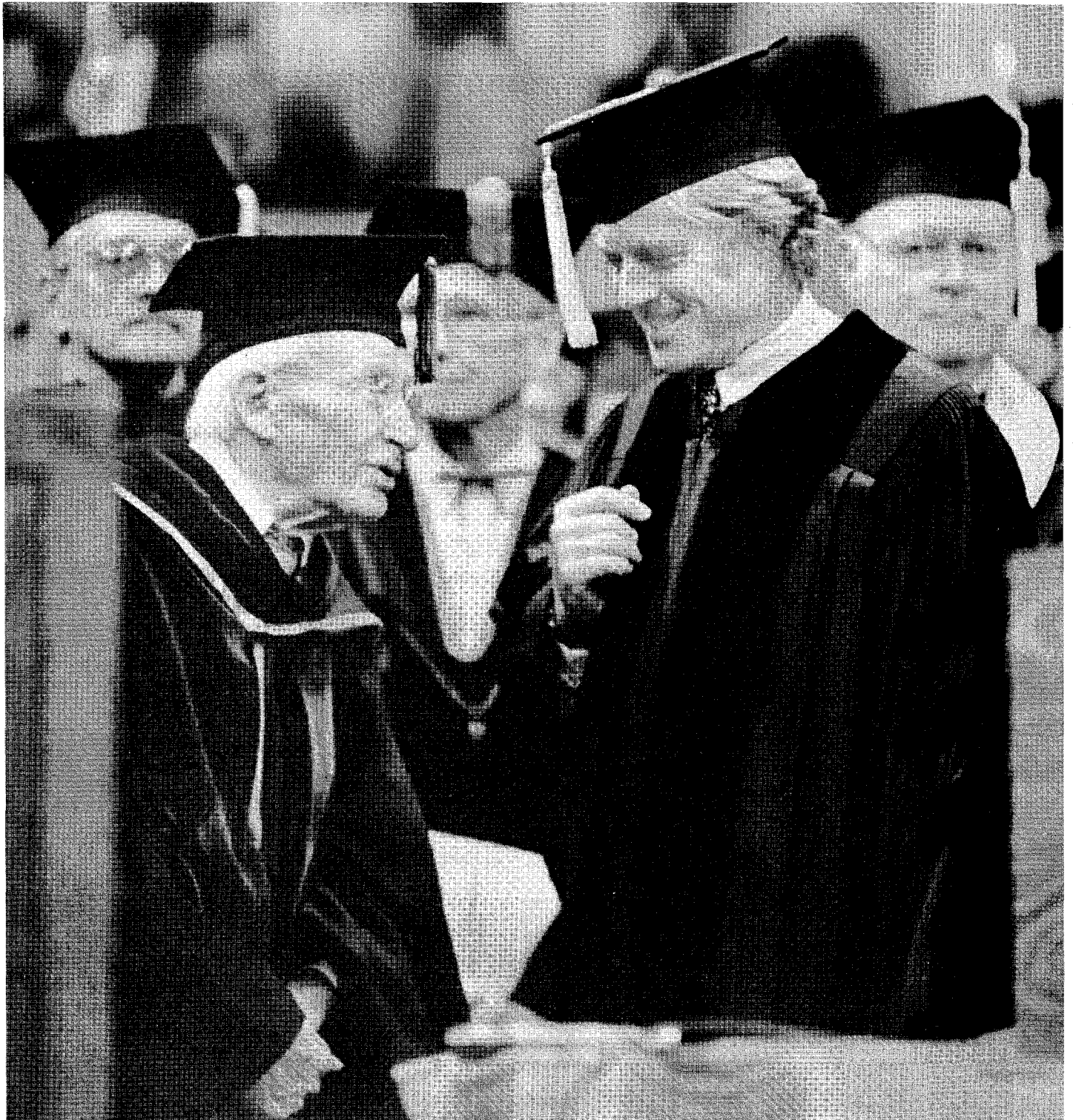
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# College of Music

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## INFORMATION ABOUT THE COLLEGE

Robert R. Fink, Dean

### History and Purpose

The College of Music was established by the Regents of the University of Colorado in 1920 and is a full institutional member of the National Association of Schools of Music.

The College of Music is organized to provide specialized training in music to prepare for professional work or advanced study; a background in music education that will prepare students to teach music in the elementary and secondary schools; and training in music as a basis for general cultural attainment.

The widely varied functions of music in the world today present many challenging and interesting opportunities for persons in the profession as teachers, performers, creative artists, technicians, and commercial personnel. While these different pursuits require specialized emphases, the faculty of the College of Music recognizes the musical and educational experiences that are common to all. Each curriculum of the College of Music is designed, therefore, to present music as an integrated whole. Solo performance and technique, ensemble performance, historical and theoretical studies, concert and recital opportunities, and elective courses both inside and outside the College are intended to give the student a balanced approach to musical understanding and musicianship. The faculty has assumed the responsibility of making students aware of this unity in the curriculum and will strive to point out the relevance of each part to the whole. It is the student's responsibility to attempt to develop all the techniques and approaches presented in the curriculum. Only with the contributions of both faculty and students can the aim of the curriculum be achieved: the development of well-trained musicians.

In addition to training in the various professions of music, the College has the responsibility of providing general music studies and activities for the

nonmajor; a broad cultural program (concerts, recitals, lectures) for the University community, as well as the public at large; favorable conditions for research in music; and service activities to the state and nation.

### Facilities

The Music Building and Macky Auditorium contain studios, classrooms, rehearsal rooms, and practice rooms in which students work. In Macky Auditorium the equipment includes seven practice organs, as well as two performance organs: a large four-manual Austin and a Casavant tracker.

The Music Library, located in the Music Building, contains 100,000 books, scores, sound recordings, and periodicals. These include 40,000 scores, 40,000 sound recordings, 20,000 books, and 250 periodicals. Computerized facilities are provided for listening to recordings and practicing ear training. A computer terminal is available for computer-based reference searching.

The Library provides a collection of scores, collected editions and complete works of composers, bibliographies, dictionaries, histories, and treatises. The record collection contains many rare music recordings for research and teaching purposes.

The total facilities of the College of Music include 86 practice rooms; 54 studios and offices; band, choral, opera and orchestral rehearsal halls; piano and electronic laboratories; and auditoriums with seating capacities of 2,000, 500, 200 and 120.

### Major Fields and Degrees

Undergraduate instruction in the College of Music leads to the Bachelor of Arts in Music, the Bachelor of Music, and the Bachelor of Music Education degrees. In addition to a substantial core of studies in music, the Bachelor of Arts in Music program allows a wide choice of study in areas outside of music. The Bachelor of Music areas of concentration are in composition, history and literature of music, performance, and voice theatre. The major

areas in the Bachelor of Music Education are in teaching choral, general, or instrumental music.

Qualified students may receive both the Bachelor of Music and Bachelor of Music Education degrees by taking the required extra work (approximately 30 additional hours). Intent to be admitted to candidacy for both degrees should be indicated as soon as possible, preferably in the sophomore year. Written approval of the Dean of the College of Music is required.

Additional information concerning undergraduate degrees is presented in the various undergraduate curricula listed elsewhere in this *Catalog*. Questions regarding particular details of the various curricula and questions concerning how students may work toward combination degrees in Music and Engineering, Music and Business, and others may be directed to the Associate Dean for Undergraduate Studies, College of Music.

Graduate instruction in the College of Music leads to the degrees Master of Music, Master of Music Education, Doctor of Musical Arts and Doctor of Philosophy. Major fields in the Master of Music and Doctor of Musical Arts degrees are conducting, composition, and pedagogy and performance. The Master of Music Education degree is designed to provide advanced instruction for teachers in the elementary and secondary schools. The Doctor of Philosophy is a research degree for all fields of music and music education.

Graduate degrees are offered through the Graduate School and additional information will be found in the Graduate School section of this *Catalog* as well as in the curricula listed later in this section. Correspondence regarding details not included in this publication should be directed to the Associate Dean for Graduate Studies, College of Music.

### International Study

The College encourages the educational breadth that comes with study abroad. The program in Regensburg, Germany, for instance, open to students at the junior level or above, offers applied music study for all instruments and voice as well as music history and

music education. Further information is available from the Office of International Education.

## Programs

Each year the College offers over 400 recitals, concerts, lectures and other programs by students, faculty and distinguished visitors. Most of the programs are free and open to the public.

## Organizations

The student body of the College of Music has its own government: the Associated Students of the College of Music and the Graduate Music Student Council. Honorary music fraternities are Phi Mu Alpha, Sigma Alpha Iota, Kappa Kappa Psi, and Tau Beta Sigma. Pi Kappa Lambda, the national scholastic honorary music fraternity, is also an active organization on this campus. Music education majors are eligible for membership in the student chapter of the Music Educators' National Conference.

## Scholarships, Grants, and Awards

Several scholarships are designed specifically for students in the College of Music:

- Dean's Honor Awards
- Applied Music Scholarships
- Charles A. Byers Scholarship in Choral Music Education
- William Clendenin History Award
- College of Music Associates Scholarship Endowment Awards
- Wallace F. Fiske Memorial Scholarships
- Jessie and Albert Henry Scholarships
- Charles Haertling Piano Scholarship
- Glenn Miller Scholarships
- Peercy-Roth Memorial Scholarship
- Theodore Presser Scholarship
- Frank "Crick" Streamer Memorial Scholarship
- Howard Waltz Scholarship
- Honors String Awards
- Talent and Creativity Awards

## ACADEMIC POLICIES

College of Music policies stated below are in addition to Universitywide Campus Policies found in this *Catalog*.

### Normal Course Schedule

The normal academic load for an undergraduate student in the College of Music is 16 to 19 (maximum 20) semester hours. Schedules of fewer than 12 or more than 19 hours must have approval of the Associate Dean for Undergraduate Studies of the College of Music.

See Limitation of Registration under the Graduate School portion of this *Catalog* for graduate student course load stipulations.

## Pass/Fail Option

The Pass/Fail option is open only to undergraduate students. Pass/Fail hours are to be selected from nonmusic courses and are in addition to those that may be taken in honors, physical education, and student teaching. Courses so elected will be taken according to the Pass/Fail policies of the college or school concerned.

Pass/Fail hours that transfer students, from departments within the University or from other institutions, can apply toward degree requirements are limited to 1 in every 8 semester hours earned in the College of Music.

## Attendance

Students are expected to attend classes regularly and to comply with the attendance requirements specified by their instructors. For performance groups, these requirements include attendance at concerts and trips as well as rehearsals. Unexplained absences from three consecutive class periods will be reported to the student's associate dean's office by the instructor concerned.

## Scholastic Requirements

Any undergraduate student who has a cumulative or semester grade point average below 2.00 will automatically be placed on probation for the following semester. (Cumulative grade point average is calculated on grades earned at this University.) If, at the end of the probationary period, the semester grade point average is not 2.00 or above, automatic suspension for the following two semesters will result.

Any undergraduate student who has a cumulative or semester grade point average of 1.50 or below will automatically be suspended for the following two semesters. However, students who are on probation or who are suspended may attend the summer session to attempt to raise their grade point averages.

Undergraduate students under scholastic suspension may petition for readmission and may receive a personal hearing before the Associate Dean for Undergraduate Studies.

Graduate students should see "Quality of Graduate Work" under the Graduate School portion of this *Catalog* for scholastic requirements.

## Academic Ethics

Students are expected to conduct themselves in accordance with the

highest standards of honesty and integrity. Cheating, plagiarism, illegitimate possession and disposition of examinations, alteration, forgery, or falsification of official records, and similar acts or the attempt to engage in such acts are grounds for suspension or expulsion from the University.

In particular, students are advised that plagiarism consists of any act involving the offering of the work of someone else as their own. It is recommended that students consult with their instructors as to the proper preparation of reports, papers, etc., in order to avoid this and similar offenses.

## Appeals

Students have the right to appeal decisions of academic dishonesty and to petition for exceptions to the academic policies stated in this *Catalog*. Appeals should be directed to the Office of the Dean.

## Dissertations, Theses, Recitals, Projects, and Individual Study

A copy of all scholarly student papers which generate credit (dissertations, theses, projects, lecture recitals and other document-producing activities), whether undergraduate or graduate, will be placed in the Music Library. More than one copy may be required in individual degree programs. To ensure that degree requirements have been met and the document is appropriate for placement in the Music Library, all faculty-approved documents must be presented to the appropriate associate dean's office at least two weeks before the graduation date.

Any recital which is required for graduation will be recorded. Arrangements will be made through the College of Music office, and a recording fee will be charged. The original tape recording will be placed in the Music Library.

## UNDERGRADUATE DEGREE PROGRAMS

### Admission Requirements

In addition to the entrance requirements of the University outlined in the Undergraduate Admissions section, freshmen and transfer students must meet College of Music entrance requirements. A knowledge of the rudiments of music and basic sight reading ability is assumed. Possession of elementary skills on piano is useful in all areas of music study. History and literature

majors should have a performance skill. Instrumental majors and singers should possess a well-grounded technique sufficient to play and sing music of moderate difficulty.

### AUDITIONS

*An audition and/or interview is required for all entering undergraduate music majors.* Audition dates for students entering Summer 1988, Fall 1988, or Spring 1989, will be held on the following Saturdays: January 23 and February 6, 13, and 20. A separate audition date for string instruments only is set for March 5. Additional audition dates may be arranged by calling the College of Music. These auditions will be held on the Boulder Campus. Applicants may substitute non-returnable cassette recordings which should be approximately 10 minutes in length. Write to the College of Music, Associate Dean for Undergraduate Studies, for audition-interview application forms.

### PROVISIONAL ADMISSION

Applicants who meet all admission requirements except the distribution of high school subjects may petition the Associate Dean for Undergraduate Studies for admission as a provisional student. Such applicants must offer at least three units of English and six additional units in academic fields.

### TRANSFER STUDENTS

Transfer students from within the University and from other universities must meet the general requirements of the University and the specific requirements of the College of Music, including the audition. Further, resident students who have taken course work only through the Division of Continuing Education must have a 2.00 (C) grade point average in such work before being eligible to apply for admission to the College of Music. Nonresident students must have a 2.50 grade point average.

### DROPPING A COURSE

Students may drop a course in the College of Music any time up to two days before the beginning of final examinations by obtaining the written permission of their instructor and their Associate Dean.

### WITHDRAWAL

Students may withdraw from the College of Music any time through the last day of classes by obtaining the signature of the undergraduate Associate Dean of Music.

### NONDEGREE STUDENTS

With the written permission of the instructor, special students may take any class offered by the College of Music except private applied instruction. However, those students intending to become degree students the following semester may petition the Dean for permission to register for private applied instruction.

### Requirements for Graduation

The degrees Bachelor of Arts in Music, Bachelor of Music, and Bachelor of Music Education will be granted by the University, upon recommendation of the faculty of the College of Music, to those who have successfully completed prescribed requirements.

Students must file an appropriate request-to-graduate form by May 1 in the office of the Associate Dean for Undergraduate Studies if they anticipate completing requirements in December, May, or August of the following academic year.

### RESIDENCE REQUIREMENT

Of the hours required for graduation, 56 must be completed in residence in the College of Music. This may be reduced by the faculty for excellent work done in this University and for high scholarship exhibited at previous institutions attended. In no case shall the minimum be fewer than 40 hours distributed over three semesters. At least 9 hours in applied music (private instruction) must be earned in this College for the degrees Bachelor of Music and Bachelor of Music Education, and 6 hours for the degree Bachelor of Arts in Music.

### CONVOCATION/RECITAL ATTENDANCE REQUIREMENT

All degree students are required to register for Music Convocation (CONV 1999-0) for a minimum of six semesters. Transfer students are not required to register during their last two semesters. Graduation will not be permitted until this requirement is met. Deficiencies can be removed by registration only during the academic year.

Each semester, students will be given a list of 15 convocations/recitals from which a minimum of seven must be attended to receive a passing grade. Events in which the student participates will not count toward this requirement. Monitors will be present at each event to distribute and collect attendance slips.

### ENSEMBLE REQUIREMENTS

All students enrolled in applied music must participate in a University ensemble appropriate to and required by their degree programs. Any student who studies applied music beyond degree requirements must participate concurrently in a University ensemble. Double majors are required to be in only one ensemble at a time. Waivers in degree requirements for ensembles, or substitutions, will be by petition to the Dean. University ensembles that meet ensemble requirements are Concert Band, Marching Band, Symphonic Band, Symphony Orchestra, Wind Ensemble, University Choir, University Singers, Womens Chorus (limit 2 years), Opera Production (limit 2 semesters), Collegiate Chorale, and Collegium Musicum.

### HONORS

Upon recommendation of the faculty, honors may be awarded to students who show outstanding ability and who have demonstrated superior musicianship and scholastic accomplishment through a minimum 3.70 GPA.

### Bachelor of Arts in Music Degree

The degree Bachelor of Arts in Music has as its goal a broad education in music within a liberal arts context. Although students may elect within their programs special courses which will permit them to pursue graduate study or a profession in such areas as arts management, composition, music-journalism, music librarianship, or musicology, the major emphasis is on development of basic musicianship, an ability to perform music, and a broad knowledge of intellectual principles of music as an art.

A minimum of 124 semester hours with an overall grade point average of 2.00 must be earned for the Bachelor of Arts in Music degree. Of these hours at least 72 must be in nonmusic courses. Thirty must be at the 3000 or 4000 level. A minimum of 40 hours and a maximum of 54 hours is required in music courses.

The normal pattern for private applied instruction in this degree is one half-hour lesson per week for 2 semester hours of credit or one hour lesson for 3 semester hours credit, although some of this study may take place in class instruction. The minimum proficiency is equal to the Bachelor of Music Education sophomore level. Not more than 16 semester hours of credit in private instruction may be used toward the degree.



The student is required to register for 2 hours of ensemble and may elect 2 additional hours to be applied to the degree.

A recital may be given with permission of the Chair of the faculty concerned and the student's advisor.

Students are required to write a senior thesis in accord with their goals and interests. Preparation and selection of topics are required in a junior research seminar. The approved thesis is due in the Office of the Associate Dean for Undergraduate Studies two weeks before the end of the semester of graduation. See *Guidelines for the Preparation of Formal Undergraduate Theses* (available in the Associate Dean's office) for complete procedures relating to the thesis.

The student may choose to complete requirements from a wide selection of courses offered. If the student wishes to select courses forming a concentrated area of interest, this determination must be made in consultation with the major advisor by the beginning of the sophomore year. Possible areas of interest are listed following the degree requirements.

### MINIMUM REQUIREMENTS

In addition to the general requirements listed above, the following specific requirements must be met:

1. Two semesters of English composition or literature.
2. Basic proficiency in one foreign language equal to three semesters at the university level. This requirement also may be fulfilled by three years of study in high school in one language or by passing a University proficiency examination.
3. Nonmusic electives to fulfill the minimum requirement of 72 semester hours of credit.
4. Ten semesters of study in the humanities, natural sciences, and social sciences: two two-semester combinations from two of the areas, and one two-semester combination from the third.

### COURSES AND CURRICULA

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	4
University Ensemble	2
MUSC 1001, 1011 Theory 1	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1	2
MUSC 1802, 1812 Introduction to Music 1,2	6
English Language or Literature	6
Foreign Language	8
<i>Sophomore Year</i>	
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	2
MUSC 2001 Theory 2	3
MUSC 2021 Theory and Ear Training Laboratory 2	1

MUSC 3802, 3812 History of Music	6
Foreign Language	4
Electives in Liberal Arts	12
Free Electives	4

#### *Junior Year*

CONV 1999 Convocation (two semesters)	0
MUSC 3987 B.A. in Music Research Seminar	1
MUSC 4061 Analysis 1	2
Elective in Music History	3
Requirement in Humanities	6
Requirement in Social Sciences	6
Electives in Liberal Arts	9
Free Electives	6

#### *Senior Year*

MUSC 4907 Senior Thesis	2
Requirement in Humanities	6
Requirement in Social Sciences	6
Requirement in Natural Sciences	6
Elective in Liberal Arts	3
Free Elective	2

### CONCENTRATED INTEREST AREAS

Requirements are not specified for any of the concentrated interest areas. All courses in interest areas are selected with the agreement of students and their advisors.

#### American Folk Music

The basic requirements in performance are two years of study in voice and/or American folk instruments (30 minutes per week)—banjo, fiddle, guitar, mandolin. Among these five media, the student has one major area (two semesters) and two minor areas (one semester each). Continuing education registrations and fee payment arrangements must be cleared through the College of Music Dean's Office.

Students may select, in consultation with their advisor, courses in black studies, American literature, folklore, American art history, American history, American society and thought, jazz, world music, American popular song, and America's art and vernacular music.

#### Arts Management

In addition to Arts Management Techniques (MUSC 4107), courses in the College of Business and Administration are required in the Arts Management concentration. These courses are considered as part of the requirement of 72 hours outside of music. Students must inform the Associate Dean for Undergraduate Studies in Music of specific courses they will be taking by the tenth week of the preceding semester. Courses in journalism and in critical writing are frequently recommended for this concentration. With approval from the Associate Dean for Undergraduate Studies, an internship may be substituted for the Senior Thesis.

### Jazz Studies

Students may select courses in history of jazz, jazz performance, jazz improvisation and arranging, as well as independent studies in jazz theory to make up a concentration in Jazz Studies.

### Music-Broadcasting

Courses under the Music-Broadcasting concentration are recommended in communications, journalism, and theatre and dance, as well as in such special music courses as History of Opera.

### Music-Business

Permission to elect business courses may be obtained from the College of Music Associate Dean for Undergraduate Studies, after which the student must petition the College of Business and Administration Dean for permission to enroll in core business courses. Information concerning available courses will be available through advising.

### Music-Dance

A broad distribution of courses in all areas of dance is recommended for this concentration.

### Music-Elementary Education Certificate

This concentration of courses allows a student to study music and, at the same time, gain certification for teaching in the elementary classroom. It does not lead to certification for teaching music.

Information concerning requirements for certification should be obtained from the School of Education. Students should choose MUSC 3103, Teaching General Music, and coordinate courses rather than the more general music requirements for elementary certification. This concentration requires very careful planning.

### Music History

A broad distribution of analysis and music history courses is recommended for this concentration. Planning with a member of the history and literature faculty is required.

### Music-Journalism

Courses in all aspects of journalistic writing in addition to all areas of music literature are recommended for this concentration.

## Music-Theatre

Students may select courses in all aspects of theatre: acting, stage design, and history of theatre.

## Music Theory

The concentration in Music Theory is concerned with all courses involved in music theory: analysis, counter-point, scoring and arranging, and elementary composition.

## Pedagogy

Each area of performance has studies in literature, performance, and pedagogy which may be selected with the advisor for concentrations in pedagogy.

## Bachelor of Music Degree

The four-year professional curriculum leading to the Bachelor of Music degree emphasizes creative skill, academic achievement, and artistic performance in music. Concentration areas are offered in church music, composition, history and literature of music, performance, and voice theatre. The performance areas include guitar, organ, piano, string instruments, voice, and wind/percussion instruments.

Performance concentration area students will devote a large portion of their time to developing their vocal or instrumental skills. Proficiency levels (freshman, sophomore, junior and senior) have been established for each instrument and voice and are checked at least once a year by juries. Students who cannot meet the proficiency requirements after two semesters of study will receive a grade of *Incomplete Fail or Incomplete Withdrawal* and cannot progress to the next level until the proficiency is achieved. Advisors will provide students with proficiency and repertoire requirements. In connection with applied study, attendance at a literature-performance class is required.

A half recital in the junior year and a full public recital in the senior year are required of students in the performance concentration areas except church music and voice theatre. Students should check with their advisor about preview policies.

A thesis is required of students in the composition area and in the history and literature area. For composition students the thesis will be an original composition; for history and literature students, a major paper. Students should check with their advisor for details.

A thesis is required of church music students and may consist of several minor research projects, choral

arrangements, composition projects, or the preparation and production of a short cantata. A senior project is required of students in the voice theatre area. This project may be a senior recital, major role, or direction or design of a major show.

Specific performance group requirements are controlled by the degree plan in each concentration area and are subject to the advisor's judgment in the best interest of the student.

Requirements in theory, history and literature of music, and electives in general education give the performance major an excellent theoretical and cultural background.

A minimum of 244 credit points, with a C overall grade point average and 122 semester hours, must be earned for the Bachelor of Music degree. Most concentration areas require more than 122 hours.

## CHURCH MUSIC CONCENTRATION AREA

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
PMUS 1597 Applied Organ Instruction (and Literature Class)	8
Class Minor in Performance	2
University Ensemble	2
MUSC 1001, 1011 Theory 1	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1	2
MUSC 1802, 1812 Introduction to Music 1,2	6
Electives in Liberal Arts	6
<i>Sophomore Year</i>	
CONV 1999 Convocation (two semesters)	0
PMUS 2597 Applied Organ Instruction (and Literature Class)	8
University Ensemble	2
MUSC 2265 Service Playing Techniques	2
MUSC 2001 Theory 2	3
MUSC 2021 Theory and Ear Training Laboratory 2	1
MUSC 4011, 4021 Counterpoint	4
MUSC 3174 Conducting 1	2
Electives in Liberal Arts	9
Free Electives	3
<i>Junior Year</i>	
CONV 1999 Convocation (two semesters)	0
PMUS 3597 Applied Organ Instruction (and Literature Class)	8
University Ensemble	2
MUSC 4265, 4275 Improvisation	4
MUSC 3802, 3812 History of Music	6
Electives in Liberal Arts	9
Free Elective	3
<i>Senior Year</i>	
PMUS 4597 Applied Organ Instruction (and Literature Class)	8
University Ensemble	2
MUSC 4245, 4255 Church Music	6
MUSC 4907 Senior Thesis	2
Electives in Liberal Arts	6
Free Electives	6

## COMPOSITION CONCENTRATION AREA

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	4
University Ensemble	2
PMUS 1711 Composition (and Composition Seminar)	6

MUSC 1001, 1011 Theory 1	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1	2
MUSC 1802, 1812 Introduction to Music 1,2	6
Electives in Liberal Arts	6
<i>Sophomore Year</i>	
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	4
University Ensemble	2
PMUS 2711 Composition (and Composition Seminar)	4
MUSC 2001 Theory 2	3
MUSC 2021 Theory and Ear Training Laboratory 2	1
MUSC 2071 Instrumentation	2
MUSC 4011, 4021 Counterpoint	4
Electives in Liberal Arts	12
<i>Junior Year</i>	
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	4
University Ensemble	2
PMUS 3711 Composition (and Composition Seminar)	6
MUSC 4001 Contemporary Theory	2
MUSC 3802, 3812 History of Music	6
Electives in Liberal Arts	12
<i>Senior Year</i>	
Applied Instruction (and Literature Class)	4
University Ensemble	2
PMUS 4711 Composition (and Composition Seminar)	6
MUSC 4907 Senior Thesis	0
MUSC 4041 Orchestration	2
MUSC 4061, 4071 Analysis 1, 2	4
MUSC 3174 or 3176 Conducting 1	2
Free Electives	12

## HISTORY AND LITERATURE CONCENTRATION AREA

In addition to the requirements applying to all Bachelor of Music curricula, a second year proficiency is required in one foreign language.

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	4
University Ensemble	2
MUSC 1802, 1812 Introduction to Music 1, 2	6
MUSC 1001, 1011 Theory 1	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1	2
English Composition Elective	6
Foreign Language	8
<i>Sophomore Year</i>	
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	4
PMUS 1105 Keyboard Musicianship	2
University Ensemble	2
MUSC 3802, 3812 History of Music	6
MUSC 2001 Theory 2	3
MUSC 2021 Theory and Ear Training Laboratory 2	1
MUSC 4011 Counterpoint	2
History of Western Civilization 1,2	6
Foreign Language	8
<i>Junior Year</i>	
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	4
University Ensemble	2
Period and Topical Courses in Music History (4000 Level)	8
MUSC 3842 Special Studies	2
MUSC 4021 Counterpoint	2
MUSC 4061, 4071 Analysis 1, 2	4
Elective in Liberal Arts	2
Free Electives	6
<i>Senior Year</i>	
Applied Instruction (and Literature Class)	4
University Ensemble	2
Period and Topical Courses in Music History (4000 Level)	8
MUSC 4907 Senior Thesis	4

MUSC 3174 or 3176 Conducting 1 . . . . . 2  
 Free Electives . . . . . 8

**GUITAR PERFORMANCE  
 CONCENTRATION AREA**

*Freshman Year Semester Hours*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 1547 (Applied Guitar Instruction and  
 Literature Class) . . . . . 8  
 PMUS 1105 Keyboard Musicianship Class . . . . . 2  
 PMUS 1386 Guitar Ensemble (duets only) . . . . . 2  
 MUSC 1001, 1011 Theory 1 . . . . . 6  
 MUSC 1021, 1031 Theory and Ear Training  
 Laboratory 1 . . . . . 2  
 MUSC 1802, 1812 Introduction to Music 1, 2 . . . . . 6  
 Electives in Liberal Arts . . . . . 6

*Sophomore Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 2547 Applied Guitar Instruction (and  
 Literature Class) . . . . . 8  
 PMUS 2105 Keyboard Musicianship . . . . . 2  
 MUSC 2365 Introduction to Accompanying  
 Ensemble . . . . . 2  
 MUSC 2001 Theory 2 . . . . . 3  
 MUSC 2021 Theory and Ear Training  
 Laboratory 2 . . . . . 1  
 Elective in Theory . . . . . 2  
 Electives in Liberal Arts . . . . . 12

*Junior Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 3547 Applied Guitar Instruction (and  
 Literature Class) . . . . . 7  
 PMUS 3919 Junior Recital . . . . . 1  
 Ensemble . . . . . 2  
 MUSC 3802, 3812 History of Music . . . . . 6  
 MUSC 3174 or 3176 Conducting 1 . . . . . 2  
 Electives in Liberal Arts . . . . . 12

*Senior Year*  
 PMUS 4547 Applied Guitar Instruction (and  
 Literature Class) . . . . . 7  
 PMUS 4919 Senior Recital . . . . . 1  
 Ensemble . . . . . 2  
 MUSC 4061 Analysis 1 . . . . . 2  
 Electives in Music . . . . . 4  
 Free Electives . . . . . 12

**ORGAN PERFORMANCE  
 CONCENTRATION AREA**

*Freshman Year Semester Hours*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 1597 Applied Organ Instruction  
 (and Literature Class) . . . . . 8  
 Class Minor in Performance . . . . . 2  
 University Ensemble . . . . . 2  
 MUSC 1001, 1011 Theory 1 . . . . . 6  
 MUSC 1021, 1031 Theory and Ear Training  
 Laboratory 1 . . . . . 2  
 MUSC 1802, 1812 Introduction to Music 1, 2 . . . . . 6  
 Electives in Liberal Arts . . . . . 6

*Sophomore Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 2597 Applied Organ Instruction  
 (and Literature Class) . . . . . 8  
 Class Minor in Performance . . . . . 2  
 University Ensemble . . . . . 2  
 MUSC 2265 Service Playing Techniques . . . . . 2  
 MUSC 2001 Theory 2 . . . . . 3  
 MUSC 2021 Theory and Ear Training  
 Laboratory 2 . . . . . 1  
 MUSC 4011, 4021 Counterpoint . . . . . 4  
 MUSC 3174 Conducting 1 . . . . . 2  
 Electives in Liberal Arts . . . . . 6  
 Free Elective . . . . . 3

*Junior Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 3597 Applied Organ Instruction  
 (and Literature Class) . . . . . 7  
 PMUS 3919 Junior Recital . . . . . 1  
 University Ensemble . . . . . 2  
 MUSC 4265, 4275 Improvisation . . . . . 4

MUSC 4285, 4295 Organ Survey . . . . . 6  
 MUSC 3802, 3812 History of Music . . . . . 6  
 Electives in Liberal Arts . . . . . 6

*Senior Year*  
 PMUS 4597 Applied Organ Instruction  
 (and Literature Class) . . . . . 7  
 PMUS 4919 Senior Recital . . . . . 1  
 University Ensemble . . . . . 2  
 Electives in Liberal Arts . . . . . 12  
 Free Electives . . . . . 9

**PIANO PERFORMANCE  
 CONCENTRATION AREA**

*Freshman Year Semester Hours*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 1617 Applied Piano Instruction  
 (and Literature Class) . . . . . 8  
 Class Minor in Performance . . . . . 2  
 MUSC 1001, 1011 Theory 1 . . . . . 6  
 MUSC 1021, 1031 Theory and Ear Training  
 Laboratory 1 . . . . . 2  
 MUSC 1802, 1812 Introduction to Music 1, 2 . . . . . 6  
 PHIL 1100 Ethics or PHIL 1440 Introductory  
 Logic . . . . . 3  
 Elective in Liberal Arts . . . . . 3

*Sophomore Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 2617 Applied Piano Instruction (and  
 Literature Class) . . . . . 8  
 Class Minor in Performance . . . . . 2  
 Chamber Music . . . . . 1  
 MUSC 2325 Applied Harmony for the Keyboard . . . . . 2  
 MUSC 2365 Introduction to Accompanying . . . . . 2  
 MUSC 2001 Theory 2 . . . . . 3  
 MUSC 2021 Theory and Ear Training  
 Laboratory 2 . . . . . 1  
 Elective in Theory . . . . . 2  
 Electives in Liberal Arts . . . . . 12

*Junior Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 3617 Applied Piano Instruction (and  
 Literature Class) . . . . . 7  
 PMUS 3919 Junior Recital . . . . . 1  
 Chamber Music . . . . . 2  
 Band, Orchestra, or Choir . . . . . 2  
 MUSC 3345, 3355 Piano Pedagogy 1, 2 . . . . . 4  
 MUSC 3802, 3812 History of Music . . . . . 6  
 MUSC 3174 Conducting 1 . . . . . 2  
 Electives in Liberal Arts . . . . . 9

*Senior Year*  
 PMUS 4617 Applied Piano Instruction  
 (and Literature Class) . . . . . 7  
 PMUS 4919 Senior Recital . . . . . 1  
 Chamber Music . . . . . 1  
 MUSC 4325 Piano Literature . . . . . 2  
 MUSC 4345 Piano Pedagogy 3 . . . . . 2  
 MUSC 4061 or 4071 Analysis 1, 2 . . . . . 2  
 Elective in Liberal Arts . . . . . 3  
 Free Electives . . . . . 12

**STRING PERFORMANCE  
 CONCENTRATION AREA: HARP,  
 STRING BASS, VIOLA, VIOLIN,  
 AND VIOLONCELLO**

*Freshman Year Semester Hours*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 Applied String Instruction (and Literature Class) . . . . . 8  
 PMUS 1105 Keyboard Musicianship . . . . . 2  
 Class Minor in Performance . . . . . 2  
 PMUS 1328 Orchestra . . . . . 2  
 MUSC 1001, 1011 Theory 1 . . . . . 6  
 MUSC 1021, 1031 Theory and Ear Training  
 Laboratory 1 . . . . . 2  
 MUSC 1802, 1812 Introduction to Music 1, 2 . . . . . 6  
 Electives in Liberal Arts . . . . . 3

*Sophomore Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 Applied String Instruction (and Literature Class) . . . . . 8  
 Class Minor in Performance . . . . . 2

Chamber Music . . . . . 2  
 PMUS 1328 Orchestra . . . . . 2  
 MUSC 2001 Theory 2 . . . . . 3  
 MUSC 2021 Theory and Ear Training  
 Laboratory 2 . . . . . 1  
 MUSC 2071 Instrumentation . . . . . 2  
 Theory Elective . . . . . 2  
 MUSC 3176 Conducting 1 . . . . . 2  
 Electives in Liberal Arts . . . . . 9

*Junior Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 Applied String Instruction (and Literature Class) . . . . . 7  
 PMUS 3919 Junior Recital . . . . . 1  
 Chamber Music . . . . . 2  
 PMUS 3328 Orchestra . . . . . 2  
 MUSC 3802, 3812 History of Music . . . . . 6  
 Electives in Liberal Arts . . . . . 12

*Senior Year*  
 Applied String Instruction (and Literature Class) . . . . . 7  
 PMUS 4919 Senior Recital . . . . . 1  
 Chamber Music . . . . . 1  
 PMUS 3328 Orchestra . . . . . 2  
 Electives in Liberal Arts . . . . . 6  
 Free Electives . . . . . 12

**VOICE PERFORMANCE  
 CONCENTRATION AREA**

One year of study at the university level of each of two languages is required of vocal performance majors.

*Freshman Year Semester Hours*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 1707 Applied Voice Instruction  
 (and Literature Class) . . . . . 8  
 PMUS 1105 Keyboard Musicianship . . . . . 2  
 Choir . . . . . 2  
 MUSC 1444 Italian Diction and Repertoire . . . . . 2  
 MUSC 1454 English Diction and Repertoire . . . . . 2  
 MUSC 1001, 1011 Theory 1 . . . . . 6  
 MUSC 1021, 1031 Theory and Ear Training  
 Laboratory 1 . . . . . 2  
 MUSC 1802, 1812 Introduction to Music 1, 2 . . . . . 6  
 Elective in Liberal Arts (including foreign  
 language) . . . . . 3

*Sophomore Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 2707 Applied Voice Instruction  
 (and Literature Class) . . . . . 8  
 PMUS 2105 Keyboard Musicianship 2 . . . . . 2  
 Choir . . . . . 2  
 MUSC 2001 Theory 2 . . . . . 3  
 MUSC 2022 Theory and Ear Training  
 Laboratory 2 . . . . . 1  
 Elective in Theory . . . . . 2  
 Electives in Liberal Arts (including foreign  
 language) . . . . . 15

*Junior Year*  
 CONV 1999 Convocation (two semesters) . . . . . 0  
 PMUS 3707 Applied Voice Instruction  
 (and Literature Class) . . . . . 7  
 PMUS 3919 Junior Recital . . . . . 1  
 PMUS 4134, 4144 Opera Theatre . . . . . 3  
 Choir . . . . . 1  
 MUSC 4464 French Diction and Repertoire . . . . . 3  
 MUSC 4474 German Diction and Repertoire . . . . . 3  
 MUSC 3802, 3821 History of Music . . . . . 6  
 Electives in Liberal Arts (including foreign  
 language) . . . . . 6  
 Free Elective . . . . . 3

*Senior Year*  
 PMUS 4707 Applied Voice Instruction  
 (and Literature Class) . . . . . 7  
 PMUS 4919 Senior Recital . . . . . 1  
 Choir . . . . . 2  
 Pedagogy Elective . . . . . 2  
 MUSC 4772 History of Opera . . . . . 3  
 MUSC 3174 Conducting 1 . . . . . 2  
 DNCE Beginning Ballet . . . . . 1  
 Electives in Liberal Arts . . . . . 5  
 Free Electives . . . . . 9

## WIND/PERCUSSION INSTRUMENTS PERFORMANCE CONCENTRATION AREA

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters) . . . . .	0
Applied Wind/ Percussion Instruction (and Literature Class) . . . . .	8
PMUS 1105 Keyboard Musicianship . . . . .	2
Class Minor in Performance . . . . .	2
Band or Orchestra . . . . .	2
MUSC 1001, 1011 Theory 1 . . . . .	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1 . . . . .	2
MUSC 1802, 1812 Introduction to Music 1, 2 . . . . .	6
Electives in Liberal Arts . . . . .	6
<i>Sophomore Year</i>	
CONV 1999 Convocation (two semesters) . . . . .	0
Applied Wind/ Percussion Instruction (and Literature Class) . . . . .	8
Class Minor in Performance . . . . .	2
Chamber Music . . . . .	2
Band or Orchestra . . . . .	2
MUSC 2001 Theory 2 . . . . .	3
MUSC 2021 Theory and Ear Training Laboratory 2 . . . . .	1
MUSC 2071 Instrumentation . . . . .	2
Elective in Music Theory . . . . .	2
Electives in Liberal Arts . . . . .	12
<i>Junior Year</i>	
CONV 1999 Convocation (two semesters) . . . . .	0
Applied Wind/ Percussion Instruction (and Literature Class) . . . . .	7
PMUS 3919 Junior Recital . . . . .	1
Chamber Music . . . . .	2
Band or Orchestra . . . . .	2
MUSC 3802, 3812 History of Music . . . . .	6
MUSC 3176 Conducting 1 . . . . .	2
Electives in Liberal Arts . . . . .	12
<i>Senior Year</i>	
Applied Wind/ Percussion Instruction (and Literature Class) . . . . .	7
PMUS 4919 Senior Recital . . . . .	1
Chamber Music . . . . .	2
Band or Orchestra . . . . .	2
Free Electives . . . . .	12

## VOICE THEATRE CONCENTRATION AREA

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters) . . . . .	0
PMUS 1707 Applied Voice Instruction (and Literature Class) . . . . .	6
PMUS 1105 Keyboard Musicianship . . . . .	2
Choir . . . . .	2
MUSC 1444 Italian Diction and Repertoire . . . . .	2
MUSC 1454 English Diction and Repertoire . . . . .	2
MUSC 1001, 1011 Theory 1 . . . . .	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1 . . . . .	2
MUSC 1802, 1812 Introduction to Music 1, 2 . . . . .	6
Elective in Liberal Arts . . . . .	5
<i>Sophomore Year</i>	
CONV 1999 Convocation (two semesters) . . . . .	0
PMUS 2707 Applied Voice Instruction (and Literature Class) . . . . .	6
PMUS 2105 Keyboard Musicianship 2 . . . . .	2
Choir . . . . .	2
MUSC 2001 Theory 2 . . . . .	3
MUSC 2021 Theory and Ear Training Laboratory 2 . . . . .	1
Elective in Theory . . . . .	2
MUSC 3174 Conducting 1 . . . . .	2
THTR Text Analysis for Beginners . . . . .	3
THTR Acting: Beginning . . . . .	3
Electives in Liberal Arts . . . . .	7
Free Electives . . . . .	2
<i>Junior Year</i>	
CONV 1999 Convocation (two semesters) . . . . .	0
PMUS 3707 Applied Voice Instruction (and Literature Class) . . . . .	6
PMUS 4138 Opera Theatre . . . . .	2
MUSC 3802, 3812 History of Music . . . . .	6

THTR Acting: Intermediate . . . . .	3
THTR 2005 Stagecraft . . . . .	3
Electives in Liberal Arts . . . . .	12
<i>Senior Year</i>	
PMUS 4707 Applied Voice Instruction (and Literature Class) . . . . .	6
PMUS 4919 Senior Recital (or Major Role, or Design or Direction of a Major Production) . . . . .	0
PMUS 4148 Opera Theatre . . . . .	4
THTR 2095 History of Fashion 2 . . . . .	3
Elective in Theatre and Dance . . . . .	3
Electives in Liberal Arts . . . . .	4
Free Electives . . . . .	12

## Bachelor of Music Education Degree

The program leading to the Bachelor of Music Education degree is designed to provide superior preparation for the teaching of music in the primary and secondary schools. The various demands made upon music teachers and the opportunities open to them have been carefully considered in formulating the courses of study.

Although most students may ultimately specialize in either general music, choir, band, or orchestral work, some may be called upon in their first professional positions to teach in two or three of these fields. Even the music educator who teaches in only one of these areas must have a sufficiently broad knowledge of the entire music program to be able to understand the role of music in contemporary American education and interpret the music program to colleagues and laymen. The courses of study are designed to provide a suitable balance between specialization and generalization.

## COURSES AND CURRICULA

Three basic curricula are provided for the candidate pursuing the Bachelor of Music Education degree: choral, general music, and instrumental emphases. Within each basic curriculum, options are provided so that students may vary their programs in accordance with their needs and interests.

A minimum of 132 semester hours with an overall grade point average of 2.50 must be earned for the Bachelor of Music Education degree. Forty semester hours in liberal arts are required.

## LIBERAL ARTS REQUIREMENTS

All students entering the music education program, whether freshmen, transfers, or those holding a degree, shall meet the general education requirements of the new Core Curriculum Courses that are designated by the College of Music Curriculum Committee for the Bachelor of Music Education degree. Students should check with their advisors each semester before final selection of courses.

## ADMISSION TO THE TEACHER CERTIFICATION PROGRAM

Teacher education is a campuswide function at the University of Colorado. Admission to the music education program in the College of Music does not constitute admission to the Teacher Certification Program. Students must apply to the School of Education through the Chair of the Music Education faculty for admission to this program no later than the second semester of the junior year. *Students may not register for EDUC 4122 and student teaching until they are admitted to the Teacher Certification Program.*

Requirements for recommended admission to the Teacher Certification Program are:

1. Minimum grade point average of 3.00 in music and music education, and a minimum overall grade point average of 2.50.
2. Minimum grade of *B* in the key methods course in the teaching area.
3. Satisfactory completion of, or registration for, all required courses through the junior year.
4. Satisfactory functional piano ability as demonstrated by passing the proficiency examination or completion of prescribed course work.
5. Satisfactory performance ability as demonstrated by meeting the sophomore proficiency requirements in an applied area of study.
6. Satisfactory scores on the California Achievement Test.
7. Recommendation by the music education faculty.

An interview with each student is held by the members of the music education faculty during the second semester of the sophomore year to review the student's progress and qualifications for admission to the Teacher Certification Program.

## STUDENT TEACHING

Students wishing to receive student teaching assignments must make application to the School of Education through the Chair of the Music Education faculty early in the semester preceding the student teaching semester. Prerequisites for student teaching are:

1. Admission to the Teacher Certification Program.
2. A minimum grade point average of 2.50.
3. Completion of all required music education and education courses in a music education curriculum.
4. Satisfactory performance ability as demonstrated by meeting the junior proficiency requirements in a private applied area of study.

5. Recommendation by the Music Education faculty.

**CHORAL MUSIC EMPHASIS**

The required hours in a performance class minor may be used to meet minor voice requirements and/or piano proficiency. Four of the required seven semesters of ensemble registration must be in a choir.

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
Class Minor in Performance	2
University Ensemble	2
MUSC 1001, 1011 Theory 1	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1	2
MUSC 1802, 1812 Introduction to Music 1, 2	6
Electives in Liberal Arts	12

<i>Sophomore Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
Class Minor in Performance	2
University Ensemble	2
MUSC 2103 The School Music Curriculum	3
MUSC 3113 Introduction to the Arts	3
MUSC 2001 Theory 2	3
MUSC 2021 Theory and Ear Training Laboratory 2	1
MUSC 3802, 3812 History of Music	6
Electives in Liberal Arts	9

<i>Junior Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
University Ensemble	2
MUSC 3193 Vocal Pedagogy and Literature for Young Voices	1-2
MUSC 3174, 3184 Conducting 1, 2	4
MUSC 3123 Teaching Choral Music Instrumental or General Music Minor	3
EDUC 4102 Foundations of American Education	3
EDUC 4112 Educational Psychology and Adolescent Development	3
EDUC 4232 Teaching Reading in the Content Areas	3
CDSS 2500 Voice and Diction	3
Elective in Liberal Arts	3

<i>Senior Year</i>	<i>Semester Hours</i>
Applied Instruction (and Literature Class)	3
University Ensemble	1
Teaching Brass, String or Woodwind Instruments (MUSC 3223, 3163, or 3153)	3
Instrumental or General Music Minor	3
MUSC 4103 Introduction to Student Teaching	1
MUSC 4193 Student Teaching Seminar	1
Elective in Music Theory	2
EDUC 4122 Principles and Methods of Secondary Education	3
EDUC 4463 Teaching Exceptional Children	2
EDUC 4701 or 4712 Student Teaching	8

**GENERAL MUSIC EMPHASIS**

The required hours in a performance class minor may be used to meet minor voice requirements and/or piano proficiency. Four of the required seven semesters of ensemble registration must be in a choir.

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
Class Minor in Performance	2
University Ensemble	2
MUSC 1001, 1011 Theory 1	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1	2
MUSC 1802, 1812 Introduction to Music 1, 2	6
Electives in Liberal Arts	12

<i>Sophomore Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
Class Minor in Performance	2
University Ensemble	2
MUSC 2103 The School Music Curriculum	3
MUSC 3113 Introduction to the Arts	3
MUSC 4153 Percussion Class and Pedagogy	1
MUSC 2001 Theory 2	3
MUSC 2021 Theory and Ear Training Laboratory 2	1
MUSC 3802, 3812 History of Music	6
Electives in Liberal Arts	9

<i>Junior Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
University Ensemble	2
MUSC 3193 Vocal Pedagogy and Literature for Young Voices	1-2
MUSC 3103 Teaching General Music	3
MUSC 3133 Classroom Instrument Laboratory: Guitar	2
MUSC 3174, 3184 Conducting 1, 2	4
EDUC 4102 Foundations of American Education	3
EDUC 4112 Educational Psychology and Adolescent Development	3
EDUC 4232 Teaching Reading in the Content Areas	3
EDUC 4463 Teaching Exceptional Children	2
CDSS 2500 Voice and Diction	3
Elective in Liberal Arts	3

<i>Senior Year</i>	<i>Semester Hours</i>
Applied Instruction (and Literature Class)	3
University Ensemble	1
Teaching Brass, String or Woodwind Instruments (MUSC 3223, 3163, or 3153)	3
Choral or Instrumental Minor	3
MUSC 4103 Introduction to Student Teaching	1
MUSC 4193 Student Teaching Seminar	1
Elective in Theory	2
EDUC 4122 Principles and Methods of Secondary Education	3
EDUC 4701 or 4712 Student Teaching	8

**INSTRUMENTAL MUSIC EMPHASIS**

The required hours in performance class minor may be used to meet minor voice requirements and/or piano proficiency. For string players, four of the required seven semesters of ensemble registration must be in an orchestra. For wind and percussion players, four semesters must be in a band, of which two must be in marching band.

<i>Freshman Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
Class Minor in Performance	2
University Ensemble	2
MUSC 1001, 1011 Theory 1	6
MUSC 1021, 1031 Theory and Ear Training Laboratory 1	2
MUSC 1802, 1812 Introduction to Music 1, 2	6
Electives in Liberal Arts	12

<i>Sophomore Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
Class Minor in Performance	1
University Ensemble	2
MUSC 2103 The School Music Curriculum	3
MUSC 3113 Introduction to the Arts	3
MUSC 3223 Teaching Brass Instruments	3
MUSC 2001 Theory 2	3
MUSC 2021 Theory and Ear Training Laboratory 2	1
Elective in Theory	2
MUSC 3802, 3812 History of Music	6
Electives in Liberal Arts	6

<i>Junior Year</i>	<i>Semester Hours</i>
CONV 1999 Convocation (two semesters)	0
Applied Instruction (and Literature Class)	6
University Ensemble	2
MUSC 3193 Vocal Pedagogy and Literature for Young Voices	1-2
MUSC 3143 Teaching Instrumental Music	3
MUSC 3153 Teaching Woodwind Instruments	3
MUSC 3163 Teaching String Instruments	3
MUSC 3176, 3186 Conducting 1, 2	4
MUSC 4153 Percussion Class and Pedagogy	1
EDUC 4102 Foundations of American Education	3
EDUC 4112 Educational Psychology and Adolescent Development	3
Electives in Liberal Arts	6

<i>Senior Year</i>	<i>Semester Hours</i>
Applied Instruction (and Literature Class)	3
University Ensemble	1
MUSC 4103 Introduction to Student Teaching	1
MUSC 4193 Student Teaching Seminar	1
EDUC 4122 Principles and Methods of Secondary Education	3
EDUC 4232 Teaching Reading in the Content Areas	3
EDUC 4463 Teaching Exceptional Children	2
EDUC 4701 or 4712 Student Teaching	8
CDSS 2500 Voice and Diction	3

**GRADUATE DEGREE PROGRAMS**

All graduate degrees in Music are granted by the Graduate School of the University of Colorado upon the recommendation of the faculty of the College of Music and approval by the administrative officers of the Graduate School. The information supplied here is supplemental to and must be read in conjunction with the information contained in the Graduate School section of this *Catalog*. Information applicable to Master of Music and Master of Music Education degrees is discussed under the heading Master of Arts and Master of Science in the Graduate School section; information pertaining to Doctor of Philosophy in Music and Doctor of Musical Arts degrees is discussed under the heading Doctor of Philosophy. Other information regarding rules applying to graduate degree students in music may be found in supplements to the *Catalog* and in the *Graduate Studies in Music Handbook*, both available in the office of the Associate Dean for Graduate Studies.

**Financial Aid**

In addition to the opportunities for financial aid described in the Graduate School section, the College of Music grants teaching assistantships to approximately forty students each year. Applications for these positions must be filed with the Associate Dean for Graduate Studies by January 31 of the preceding academic year. There are also scholarships offered by the various faculties and grants-in-aid given for various College-related responsibilities.

## Admission Requirements

Admission requirements for specific degree programs that supplement the Graduate School requirements are discussed in the degree program descriptions which follow. Students are urged to take the analytical and subject (advanced music) portions of the Graduate Record Examination in addition to the verbal and quantitative sections. GRE scores are specifically requested from applicants for fellowships and are required both for admission to and for fellowship grants in the Ph.D. in Music program.

## Preliminary Examinations

Students who expect to begin work on a master's or doctoral degree must report to the Music Building two days prior to the beginning of their first term for preliminary examinations. At least one week before that time, the student must give written notice to the College of Music Office of the Associate Dean for Graduate Studies.

Areas covered in these examinations include analysis, aural perception, counterpoint, history and literature, the major field, and written theory. Any deficiencies uncovered by these examinations must be removed early in the program. In no instance can application for candidacy or required examinations be approved until the deficiencies are removed. Thesis and dissertation projects may not be completed while preliminary-examination deficiencies remain.

Results from the major-field examination serve as one basis for recommending specific course work in the program. The major-field examination in composition covers music literature and compositional methods; in history and literature, essay questions cover score analysis and identification of terms; the music-education examination covers general knowledge of philosophy and history of music education, organization and supervision of music teaching, and methods and materials for the individual areas of vocal, string and instrumental music; for performance majors, musical styles as well as problems of performance and pedagogy are covered.

## COLLEGE TEACHING AREA

For graduate students in music who intend to teach at the college level and who have had no prior college teaching experience, a teaching module of at least 6 hours of courses is recommended. This module can consist of professional education courses, music

education courses, teaching-skills courses, and teaching practica. The teaching-area module is not normally used toward the minimum 30-hour course requirement for the program.

## Master of Music Degree

The major fields for this degree are composition, conducting, literature of music, performance, and the double major of performance and pedagogy. Conducting students may concentrate in choral, orchestral, or wind ensemble/band areas. Performance and pedagogy majors may concentrate in piano, string instruments, voice, or wind/percussion instruments.

Major works in the conducting degrees include advanced conducting, analytical studies, score reading, orchestration, arranging, performance-related writing, and conducting practica; in music literature, courses in music history and literature and a thesis; in pedagogy, courses in the psychology of music, the pedagogy and literature of a specific performing area, and thesis; in performance, applied study, recitals, and recital-related papers.

Choral conducting, percussion, string, and wind majors are required to participate in a music ensemble. Faculty chairs will advise students concerning the appropriate choice of ensemble.

## PREREQUISITES

As noted in the Graduate School section, students are expected to present undergraduate preparation equivalent to that expected for the bachelor's degree at this University. Normally this will be a Bachelor of Music degree in the proposed concentration.

In advance of admission, composition majors shall submit both scores and tapes of their original work and music literature majors examples of their research papers; performance majors must submit a repertoire list and arrange for an audition or submit a nonreturnable cassette tape of their performance.

## PROGRAM OF STUDY

The Graduate School considers the Master of Music degree a Plan II program which requires a minimum of 30 semester hours of course work including thesis projects. Most students will find it necessary to exceed this minimum in order to meet the musical and academic standards demanded by the qualifying and comprehensive-final examinations. Outlines of specific programs may be secured from the office of the Associate Dean for Graduate Studies.

There are four specific areas of study in music: music education, music history and literature, theory/composition, and performance/pedagogy. A student must select a major (at least 10 hours) in one of these four areas and a minor (at least 6 hours) from one of the remaining three. The student may also elect a secondary emphasis consisting of at least 8 hours in another area of music or outside of music. A minimum of 10 hours must be elected outside the major in all Master of Music degrees.

The student's program will be directed by the faculty chair for the chosen major (or a designated substitute), a second professor from the major area, and a professor from the minor area. During the first semester of residence, the student should complete a tentative degree plan and obtain the approval of the advisor(s) and the Associate Dean for Graduate Studies.

## EXAMINATIONS

In addition to the preliminary examinations, master's degree students in music must take qualifying and comprehensive-final examinations. The procedures and deadlines for registering for these examinations, except the master's qualifying examination, will be found in the Graduate School section of this *Catalog*. The qualifying examination must be taken no later than the semester preceding the comprehensive-final examination.

## RECITAL/THESIS REQUIREMENTS

1. For the major in composition: composition during the period of graduate study of several works of major proportion, at least one of which must receive public performance.
2. For the major in conducting: a public practicum and a performance-related or other scholarly document.
3. For the major in music literature: two written projects that provide focus to the candidate's work.
4. For the major in performance: recital(s) or performance preparation from a repertoire list and, in some cases, research papers, or a combination of part or all of these, as required by the major faculty.
5. For the major in performance and pedagogy: a full-length recital or proficiency examination before a faculty committee and documentation of research in pedagogy.

## Master of Music Education Degree

The Master of Music Education program is designed to augment the



student's undergraduate preparation in music education with the more advanced training required for service as both a teacher and a supervisor. In addition to contemporary methods and materials, this advanced study includes attention to aesthetic, philosophical, and psychological theories and principles of teaching music in today's schools.

### PREREQUISITES

The applicant is expected to present undergraduate preparation equivalent to that required for the Bachelor of Music Education degree at this University. No audition is required.

### PROGRAM OF STUDY

The Master of Music Education degree has three components: a professional music-education component, a minor area of study within music, and an area of specialization related to music education. Each component will total approximately 10 hours, with a total of 30 semester hours comprising the minimum requirement for the degree.

The professional music-education component focuses on history of music education, philosophy, psychology of music and musical learning, research, curriculum, and administration. Two courses are required in this area: Foundations of Music Education, and Research in Teaching Music. Elective courses within professional music education will complete study in this area. Examples of desirable electives are Psychology of Music Learning, Teaching Music Through Performance, Comprehensive Musicianship for Teachers, and Directions of Contemporary Aesthetic Education.

The minor area of study is provided to develop both knowledge and craft in music to a more highly refined level. Six hours may be elected in music history and literature, music theory, or music performance/pedagogy. Four hours are electives in music outside the major. Studies in music performance, as well as other study, must be at the graduate level. One member of the student's committee will be from the minor area, and it is assumed that at least some part of the student's study will be with that faculty member.

The area of specialization will be selected and structured by the student and an advisor, based on the student's interests and abilities. Concentration may be in the traditional areas of choral, general, or instrumental music. Other options include the related arts, e.g., music and dance, musical theatre,

music and fine arts, etc., or a more individualized area relating to the student's professional interests.

An important aspect of the Master of Music Education degree is the culminating paper. This paper will be completed and reported in the course Topics in Music Education. Ideas for the paper should be formulated to some degree throughout the student's program.

Normally the course work for the degree can be completed in one academic year plus one summer or in four summer terms. However, since courses in music education are available in late afternoons, teachers within commuting distance to Boulder can earn a significant portion of credit toward the degree during the academic year without taking a leave from their teaching position.

## Doctor of Musical Arts Degree

The Doctor of Musical Arts is a professional degree for creative and performing students who possess the talent as well as the breadth of knowledge, background, outlook, and scholarly capacity requisite to a doctoral program. Fields of study are composition, instrumental conducting and literature, literature and performance of choral music, performance, and performance and pedagogy. Performance concentration areas are organ, piano, and string instruments. Performance and pedagogy concentration areas are piano, string instruments, voice, and winds/percussion. Outlines of specific programs may be obtained from the office of the Associate Dean for Graduate Studies.

### PREREQUISITES

Entrance requirements include a master's degree in music or demonstrated equivalency comparable to that of the Master of Music degree at this University; submission of performance tapes or, for composers, tapes of compositions and original scores; a personal audition and interview, when possible; and evidence of written English-language proficiency and scholarly research such as term papers or theses.

### PROGRAM REQUIREMENTS

The description of the program which follows supplements the requirements applying to all graduate students found in the Graduate School section and in the introductory section of Graduate Degree Programs in this College of Music section. Information on quality of work, credit by transfer, application

for admission to candidacy, comprehensive examination, and final examination found under the Ph.D. description is applicable to the D.Mus.A. degree. D.Mus.A. degree work must be completed within seven years of first registration and within four semesters after completing the comprehensive examination.

*Residence Requirements.* Residence will be three semesters or the equivalent in summer sessions beyond the master's degree, of which at least two academic-year semesters must be in residence at this University and must be consecutive. Not more than one-half semester of residence credit may be earned in a summer session. The student must be registered as a full-time student to earn residence credit.

A student who drops out of school before earning residency must apply for readmission in time to complete the necessary administrative details. Such students should investigate the Time Out Program before dropping out, in order to ensure their readmission.

*Continuous Registration.* After the residence requirements for the Doctor of Musical Arts program have been satisfied, a student must enroll and pay tuition for fall and spring semesters of each year until attaining the degree or formally resigning. After a student has enrolled in all required dissertation courses, he or she will enroll in MUSC 8978, Precandidate for Doctor of Musical Arts degree, until having become a candidate for the degree. After becoming a candidate, the student will enroll in MUSC 8979, Candidate for Doctor of Musical Arts degree, until the degree is completed. This continuous registration is independent of whether or not the student is in residence at the University.

*Degree Plan.* A degree plan should be presented to the Associate Dean for Graduate Studies and the Doctor of Musical Arts Advisory Committee no later than the second semester of residence. The major-area D.Mus.A. program coordinator and the student's major professor(s) are responsible for helping the student formulate this plan. The plan will include proposed members of the student's doctoral committee, projected remedial and supporting course work, suggested dissertation projects, and tentative dates for the comprehensive and final examinations.

*Language Requirement.* The one foreign language used to satisfy the D.Mus.A. language requirement must be approved by the student's advisory committee. Additional language work will be required for voice students.

*Course Requirements.* Students must take a minimum of 30 hours of seminar

and dissertation work. Two doctoral seminars in the major area are required; prerequisites include 6 hours each in graduate-level music history and theory. Some areas require specific course work prior to or in conjunction with work on dissertation projects. In other instances students may be advised to take course work in preparation for the comprehensive examination. Applied music instruction may be elected for the duration of the residency requirement.

**Dissertation.** The D.Mus.A. dissertation consists of a specified number of performances, projects, and documents. The student's permanent advisory committee will assist the student in meeting degree requirements. While dissertation outlines for the various major areas are listed below, individual instances may require the permanent advisory committee to exercise discretionary flexibility in tailoring dissertation requirements to the student's artistic and educational advantage.

Normally, if students show only minor weaknesses on their preliminary examinations, they will be advised to begin work on the dissertation concurrently with preparation for the comprehensive examinations.

## AREA DISSERTATION REQUIREMENTS

### Composition

- PMUS 8971 Dissertation Project: Compositions
- PMUS 8972 Dissertation Project: Compositions
- PMUS 8973 Dissertation Project: Composition recital (or equivalent in performance of compositions)
- PMUS 8974 Dissertation Project: Composition recital (or equivalent in performance of compositions)
- PMUS 8975 Dissertation Project: Research-lecture
- PMUS 8976 Dissertation Project: Research-lecture
- MUSC 8976 Major Composition Project

### Instrumental Conducting and Literature

- PMUS 8971 Dissertation Project: Conducting practicum
- PMUS 8972 Dissertation Project: Conducting practicum
- PMUS 8973 Dissertation Project: Demonstration of rehearsal procedures and techniques and solution of score analysis problems
- PMUS 8974 Dissertation Project: Solution of problems in the crafts of arranging and editing
- PMUS 8975 Dissertation Project: Lecture-demonstration
- PMUS 8976 Dissertation Project: Lecture-demonstration
- MUSC 8971 Dissertation Document
- MUSC 8972 Dissertation Document
- MUSC 8970 Repertoire Project

### Literature and Performance of Choral Music

- PMUS 8971 Dissertation Project: Choral practicum
- PMUS 8972 Dissertation Project: Choral practicum

- PMUS 8973 Dissertation Project: Choral projects in rehearsal techniques and score reading
- PMUS 8974 Dissertation Project: Choral student's performance-demonstration in arranging, continuo realization, editing, and transcription of notation
- PMUS 8975 Dissertation Project: Research-lecture
- PMUS 8976 Dissertation Project: Research-lecture
- MUSC 8971 Dissertation Document
- MUSC 8972 Dissertation Document
- MUSC 8970 Repertoire Project

### Performance: Organ, Piano, Strings

- PMUS 8971 Dissertation Project: Solo recital
- PMUS 8972 Dissertation Project: Solo recital
- PMUS 8973 Dissertation Project: Chamber-music recital
- PMUS 8974 Dissertation Project: Chamber-music recital
- PMUS 8975 Dissertation Project: Research-lecture
- PMUS 8976 Dissertation Project: Research-lecture
- MUSC 8971 Dissertation Document
- MUSC 8972 Dissertation Document
- MUSC 8973 Dissertation Document
- MUSC 8974 Dissertation Document (not required for organ)
- MUSC 8970 Repertoire Project

### Performance and Pedagogy: Piano, Strings, Wind/Percussion

- PMUS 8971 Dissertation Project: Recital
- PMUS 8972 Dissertation Project: Recital
- PMUS 8973 Dissertation Project: Recital (or a third research-lecture)
- PMUS 8974 Dissertation Project: Pedagogy Practicum (wind and percussion only)
- PMUS 8975 Dissertation Project: Research-lecture
- PMUS 8976 Dissertation Project: Research-lecture
- MUSC 8971 Dissertation Document
- MUSC 8972 Dissertation Document
- MUSC 8973 Dissertation Document (not required if PMUS 8973 is a research-lecture)
- MUSC 8970 Repertoire Project (not required of wind and percussion)
- MUSC 8975 Major Document

### Performance and Pedagogy: Voice

- PMUS 8971 Dissertation Project: Solo recital
- PMUS 8972 Dissertation Project: Solo recital
- PMUS 8973 Dissertation Project: Chamber-music recital
- PMUS 8975 Dissertation Document
- PMUS 8976 Dissertation Project: A project on vocal literature or performance
- MUSC 8970 Repertoire Project
- MUSC 8975 Major Pedagogical Document

## Doctor of Philosophy Degree in Music

The Doctor of Philosophy in Music degree is intended for those students who seek a terminal degree with emphasis on research. The two principal areas of study are musicology and music education; however, a combination of these or other emphases is possible depending upon the student's research interests and the availability of faculty. See the Ph.D. description found in the Graduate School section of this *Catalog* for information concerning minimum course requirements, thesis credit hour and continuous registration requirements, quality of work, advisory

committee, residence, preliminary examination, language requirement, credit by transfer, application for admission to candidacy, comprehensive examination, thesis requirement, final examination, and time limit. The information that follows supplements that information.

### PREREQUISITES

Students applying to the Ph.D. program should have a master's degree or equivalent in a music field related to their intended area of study. Letters of recommendation, completed major papers, and satisfactory scores on the Graduate Record Examination (verbal, quantitative, and advanced test in music are required) are a part of the student's application for the degree. Upon being accepted to the degree program, the student must pass the preliminary examination and begin working toward basic requirements, i.e., foreign language, statistics, music courses, or any other work that must be taken at the precandidate level, during the first year of study.

### COURSE WORK AND COMPREHENSIVE EXAMINATION

A minimum of 30 hours of course work, distributed in qualifying and major areas, is required. In completing the qualifying requirements, students should select a minimum of 12 hours of course work in such knowledge areas as music philosophy and aesthetics, history and culture, and psychology and sociology, and such skill areas as music bibliography and historiography, music analysis, and experimental and descriptive research. In preparing for the qualifying examinations, the student should show a breadth encompassing at least four of the six categories above and depth (two or more courses or the equivalent) in at least two of these categories. The student should also do at least 12 hours of course work in preparing for the major-area portion of the comprehensive examination. This portion of the program should be under the guidance of the student's advisory committee. At least two Ph.D. seminars must be taken as part of the course work described above.

The comprehensive examination consists of two parts: a qualifying section which encompasses broad knowledge prerequisite to specialization, and a major-area section which covers the background relevant to the specialty. These sections can be taken separately, the qualifying section preceding the major area. The student is admitted to candidacy following the successful completion of both sections.

The examination committees for the two sections of the comprehensive can vary according to the categories which the student chooses for the qualifying portion and for the major-area portion. Members of the Ph.D. advisory committee advise the student in preparation for the qualifying section of the comprehensive examination, and members of the thesis committee advise for the major-area section.

## DISSERTATION

See Thesis Requirements related to the Doctor of Philosophy degree in the Graduate School section of this *Catalog* regarding dissertation work.

## College of Music Faculty

**ROBERT FINK**, Dean, Professor (Theory). B.Mus., M.Mus., Ph.D., Michigan State University.

**PHILIP AAHOLM**, Professor (Clarinet). B.A., M.M., University of Wisconsin; D.M.A., University of Arizona.

**WAYNE BAILEY**, Associate Director of Bands, Assistant Professor. B.M., Iowa State University; M.M., University of Michigan; D.Mus.A., University of Colorado.

**FRANK BAIRD**, Professor Emeritus.

**GRETCHEN HIERONYMUS BEALL**, Professor (Music Education). B.A., University of Iowa; M.S., Ed.D., University of Illinois.

**GIORA BERNSTEIN**, Professor (Violin). Diploma, Juilliard School of Music; M.F.A., Brandeis University; D.M.A., Boston University.

**JAMES BRODY**, Assistant Professor (Oboe). B.M., Ohio State University; M.M., Indiana University.

**STEVEN M. BRUNS**, Assistant Professor (Theory, Composition). B.M.E., Northern State College, Aberdeen, SD; M.M., University of Wisconsin.

**STORM BULL**, Professor Emeritus.

**CHARLES BYERS**, Professor Emeritus.

**WALTER COLLINS**, Professor (Choral, Theory). A.B., B.Mus., Yale University; M.A., Ph.D., University of Michigan.

**LOUIS CUNNINGHAM**, Professor Emeritus.

**JURGEN de LEMOS**, Associate Professor (Violoncello). Artistic Examination of State, State Academy of Music, Munich, Germany.

**BARBARA DOSCHER**, Associate Professor (Voice). B.A., Grinnell College; B.Mus., M.Mus., D.Mus.A., University of Colorado.

**GUY DUCKWORTH**, Professor (Piano). B.A., University of California, Los Angeles; M.A., Professional Diploma, Ed.D., Columbia University.

**CHARLES EAKIN**, Professor (Theory, Composition). B.M., Manhattan School of Music; M.A., Carnegie Institute of Technology; Ph.D., University of Minnesota.

**CECIL EFFINGER**, Professor Emeritus.

**OLIVER ELLSWORTH**, Associate Professor (History and Literature). B.A., M.A., Ph.D., University of California, Berkeley.

**PAUL ERHARD**, Instructor (Double Bass). B.M., Eastman School of Music; M.M., Juilliard School of Music.

**JOHN GALM**, Associate Professor (History, Percussion). B.Mus., M.Mus., Performer's Certificate, Eastman School of Music.

**VINCENT GNOJEK**, Lecturer (Saxophone). B.Mus.Ed., University of Colorado; M.A., Hunter College of New York and Mannes College of Music, New York City.

**LUIS GONZALEZ**, Associate Professor (Theory and Composition). M.M., D.M.A., Peabody Conservatory.

**LARRY GRAHAM**, Professor (Piano). B.M., M.S., Juilliard School of Music.

**ROBERT HARRISON**, Assistant Professor (Voice). B.A., Milton College; M.M., University of Wisconsin; D.M.A., University of Arizona.

**KUNIAKI HATA**, Professor (Voice). B.M., Osaka College of Music (Japan); B.A., Tokyo University of Arts.

**DEBORAH HAYES**, Associate Professor (History and Literature). A.B., Oberlin College; A.M., Ph.D., Stanford University.

**EVERETT HILTY**, Professor Emeritus.

**HELEN LUNN HOPE**, Lecturer (Harp). Attended Chestnut Hill College.

**WARNER IMIG**, Dean and Professor Emeritus.

**DENNIS JACKSON**, Professor (Voice). B.A., Texas Wesleyan College; M.M., Wichita State University; Ph.D., University of Michigan.

**LAWRENCE KAPTEIN**, Assistant Professor (Choral, Music Education). B.Mus.Ed., Willamette University; M.A., Portland State University; D.M.A., University of Southern California.

**WILLIAM KEARNS**, Professor (History and Literature). B.S., M.A., Ohio State University; Ph.D., University of Illinois.

**DENES KOROMZAY**, Professor Adjunct (Viola). Artist Diploma, Franz Liszt Academy of Music.

**DORIS PRIDONOFF LEHNERT**, Associate Professor (Piano). Attended University of Southern California, Juilliard School of Music, and University of Connecticut.

**OSWALD LEHNERT**, Professor (Violin, Viola). Special Studies, Chicago Musical College; Juilliard School of Music; University of Connecticut.

**ALAN LUHRING**, Associate Professor (History and Literature). B.A., University of Minnesota; M.A., Ph.D., Stanford University.

**KEVIN MCCARTHY**, Associate Dean for Undergraduate Studies, Associate Professor (Music Education). B.Mus.Ed., University of Notre Dame; M.Mus., Michigan State University; Ph.D., Case Western Reserve University.

**ALDEN MCKINLEY**, Professor Emeritus.

**HUGH McMILLEN**, Professor Emeritus.

**ALLAN McMURRAY**, Director of Bands, Professor (Trumpet). B.A., California State University, Long Beach; M.Mus., University of Wisconsin. Additional study, University of Michigan.

**ROBERT OLSON**, Professor (Bassoon, Theory). B.M., Northern Illinois University; M.M., Michigan State University; D.Mus.A., University of Washington.

**PAUL PARMELEE**, Professor (Piano). B.Mus., Performer's Certificate, Eastman School of Music; M.Mus., University of Colorado; D.Mus., Florida State University.

**JOHN PATON**, Professor (Voice). B.M., Cincinnati Conservatory; M.M., Performer's Certificate, Eastman School of Music.

**DAVID PINKOW**, Associate Professor (Horn and Theory). B.Mus., Eastman School of Music; M.F.A.,

Carnegie-Mellon University; D.M.A., University of Maryland.

**WILLIAM REEVES**, Professor Emeritus.

**BARBARA KINSEY SABLE**, Professor (Voice). B.A., College of Wooster; M.A., Teachers College, Columbia University; D.Mus., Indiana University.

**GORDON SANDFORD**, Professor (Music Education). A.B., San Jose State College; A.M., University of Redlands; Ph.D., University of Southern California.

**TERRY SAWCHUK**, Instructor (Trumpet). B.M., M.M., University of Michigan.

**F. WAYNE SCOTT**, Professor (Theory and Composition). B.S.C., Creighton University; B.Mus., M.Mus., University of Colorado.

**TERRY SMITH**, Associate Professor Adjunct (Percussion). B.Mus.Ed., University of Colorado; M.M., University of Michigan; D.Mus.A., University of Colorado.

**ROBERT SPILLMAN**, Professor (Piano). B.M., M.M., Eastman School of Music.

**WILLIAM STANLEY**, Instructor (Trombone). B.Mus.Ed., University of Kansas; M.M., University of Illinois.

**WILLIAM STARR**, Professor Adjunct (Violin, Viola). B.A., M.M., Eastman School of Music.

**THOMAS G. STEIN**, Lecturer (Tuba). B.M., M.M., University of Michigan.

**BARBARA THIEM**, Assistant Professor Adjunct (Violoncello). Study at Staatliche Hochschule fur Musik (Cologne, Germany); M.Mus., Indiana University.

**RICHARD TOENSING**, Professor (Theory and Composition). B.Mus., St. Olaf College; M.Mus., D.M.A., University of Michigan.

**DON VOLLSTEDT**, Associate Professor (Organ and Church Music). B.M., Lawrence College; M.S.M., Union Theological Seminary.

**MARK WAIT**, Assistant to the Vice President for Academic Affairs, Professor (Piano). B.M., Wichita State University; M.Mus., Kansas State University; D.M.A., Peabody Conservatory.

**HELEN WALKER-HILL**, Assistant Professor Adjunct (Piano). B.A., University of Toledo; M.M., Smith College; Diplome, École Normal de Musique, Paris; D.Mus.A., University of Colorado.

**KEITH WALLINGFORD**, Professor Emeritus.

**HOWARD WALTZ**, Professor Emeritus.

**LYNN WHITTEN**, Associate Dean for Graduate Studies, Professor (Choral). B.A., Wayland College; M.M., University of Texas; D.Mus.A., University of Southern California.

**CHARLES WOLZIEN**, Lecturer (Guitar). B.Mus., San Francisco Conservatory; M.Mus., University of Colorado.

**KAREN YONOVITZ**, Assistant Professor (Flute, Woodwind Chamber Music). B.Mus.Ed., Baldwin-Wallace College Conservatory of Music; M.Mus., Yale University.

## TAKACS QUARTET:

**ANDRAS FEJER**, Assistant Professor (Cello). Graduate, Franz Liszt Academy of Music, Budapest.

**GABOR ORMAI**, Assistant Professor (Viola). Graduate, Franz Liszt Academy of Music, Budapest.

**KAROLY SCHRANZ**, Assistant Professor (Violin). Graduate, Franz Liszt Academy of Music, Budapest.

**GABOR TAKACS-NAGY**, Assistant Professor (Violin). Graduate, Franz Liszt Academy of Music, Budapest.

# School of Pharmacy

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## INFORMATION ABOUT THE SCHOOL

Louis Diamond, Dean

In April 1911, the Board of Regents of the University of Colorado authorized the establishment of a School of Pharmacy. As approved by the Board of Regents, in the near future the School of Pharmacy will move from the Boulder Campus to the University of Colorado Health Sciences Center in Denver. A preprofessional pharmacy program will continue to be available on the Boulder Campus in the College of Arts and Sciences.

## DEGREES

### Bachelor of Science in Pharmacy

The five-year course of study in the School of Pharmacy leads to the Bachelor of Science (Pharmacy) degree.

The School of Pharmacy is a member of the American Association of Colleges of Pharmacy and is accredited by the American Council on Pharmaceutical Education.

### Graduate Degrees

The faculty of the School of Pharmacy, through the Graduate School, offers the Master of Science and Doctor of Philosophy degrees in the Pharmaceutical Sciences.

## PHARMACEUTICAL SCIENCES

The Master of Science and the Doctor of Philosophy degrees in the Pharmaceutical Sciences are offered with the following fields of specialization: pharmacology, toxicology, neurosciences, medicinal chemistry, and biopharmaceutics.

Students accepted into the graduate program typically have a baccalaureate degree in pharmacy, biology, chemistry, or biopsychology. Students wishing to pursue graduate work in the pharmaceutical sciences leading to an advanced degree should read carefully

the Graduate School section for minimum requirements, quality of work, residence, application for admission to candidacy, thesis requirements, etc.

### Molecular and Environmental Toxicology Graduate Program

This program is a graduate specialty conducted within the Pharmaceutical Sciences graduate program. Students participating in the program are required to take courses in general and specialized aspects of toxicology and to conduct their research in an area of toxicological relevance.

### Rho Chi

Rho Chi is a national pharmacy honor society whose fundamental objective is to promote the advancement of the pharmaceutical sciences through the encouragement and recognition of intellectual scholarship. The Alpha Theta Chapter was established at the University in 1947. Charters for chapters of this organization are granted only to groups in schools or colleges of pharmacy who are members in good standing of the American Association of Colleges of Pharmacy. To be eligible for membership, students must be in the highest 20 percent of their class, have attained at least a 3.00 grade point average, and have completed at least 116 semester hours applicable toward the degree (or be within three semesters of graduation), of which at least 45 semester hours must have been completed in residency after enrollment in the School of Pharmacy. Also, they must have demonstrated capacity for achievement in the art and science of pharmacy and the allied sciences as evidenced by strength of character, personality, and leadership, and be approved by the Dean of the School of Pharmacy.

## RECOGNITION OF ACADEMIC ACHIEVEMENT

Honors at graduation are conferred in recognition of high scholarship and professional achievement. Graduates

may be recognized either for their achievements in the Honors Program or on academic merit alone.

## Honors Program

Qualified students are provided the opportunity to participate in the School of Pharmacy Honors Program. Successful completion of the program entitles participants to graduate with honors, which are awarded and indicated accordingly on the diploma and in the Commencement program.

## Dean's List

The Dean's List honors students who have achieved a grade point average of 3.50-4.00 during the previous semester. Students will be recognized via correspondence from the Dean. A list of these students will be publicized in the School of Pharmacy.

## Academic Merit

Students achieving a grade point average of 3.50-3.74 (*cum laude*), 3.75-3.89 (*magna cum laude*) and 3.90-4.00 (*summa cum laude*) will be recognized on this basis at Commencement. The grade point average will be calculated from both Pre-Pharmacy and Pharmacy course work for those students who have not received a prior bachelor's degree. In the case of students who have a previous degree, the grade point average will be calculated on the basis of Pharmacy School performance alone.

## SCHOLARSHIPS AND LOANS

Students needing financial assistance for their education should contact the Office of Financial Aid, University of Colorado at Boulder, Boulder, Colorado 80309-0106. In addition, several scholarships and loans are designed specifically for students who have been enrolled in the professional program in the School of Pharmacy for one academic year. These scholarships are awarded upon recommendation of the Financial Aid Committee of the School of Pharmacy. Information may be

obtained from the School of Pharmacy office.

## UNDERGRADUATE DEGREE PROGRAM

### Requirements for Admission

To be admitted to the School of Pharmacy, applicants must satisfy the requirements of the University as well as specific requirements of the School of Pharmacy. Two academic years of preprofessional study are required to qualify for admission to the School of Pharmacy. Students must complete the preprofessional courses or their equivalents with a grade of C or better before enrolling in the School of Pharmacy. The courses may not be taken under a Pass/Fail option.

To be eligible for admission, an applicant must have attained a cumulative grade point average of at least 2.00. However, a 2.00 average is a minimal requirement only and does not assure admission to the School of Pharmacy. Each year the Committee on Pharmacy Admissions will establish the grade point average to be used in the selection of applicants.

Selection of applicants for admission will be made according to policies established by the faculty of the School of Pharmacy.

The Pharmacy College Admission Test is optional and is recommended for students whose overall grade point average is below 2.50.

### Application Process

Applications for admission to the School of Pharmacy are considered for the fall semester only and should be submitted directly to the School of Pharmacy by March 1 (but will be accepted until the enrollment limit is reached) of the year in which admission is desired. Students will be notified of their status after their credentials have been evaluated. Provisional admission is granted when course work is still in progress. The student is responsible for making certain that a supplementary transcript is mailed to the School of Pharmacy when the course work is completed. Failure to submit this transcript may result in refusal of admission. Former students who were enrolled in the School of Pharmacy must meet the readmission requirements of the University and be accepted by the School of Pharmacy.

### Intrauniversity Transfers

Students who desire to transfer to the School of Pharmacy from other schools or colleges on the Boulder Campus must submit an Intrauniversity Transfer application to the School of Pharmacy office, Ekeley W181. The School of Pharmacy will take responsibility for requesting from the Office of Academic Records transcripts from other institutions previously filed with the University, and the University of Colorado at Boulder transcript.

### Transfer Students

Students desiring to transfer from other accredited collegiate institutions must submit an application, application fee, and official transcripts from all institutions attended to the School of Pharmacy. In most cases, the School of Pharmacy will accept for transfer credit those courses which the University accepts.

### Requirements for Graduation

Upon the recommendation of the faculty and satisfactory completion of the required courses, candidates will be awarded the degree Bachelor of Science (Pharmacy). Students must complete the five-year curriculum and a sufficient number of additional acceptable electives to make a minimum of 160 semester hours. The minimum grade point average required of all Pharmacy students for graduation is a 2.00 (C), based upon all course work attempted while registered in the School of Pharmacy and determined by the cumulative averages compiled by the Office of Academic Records. Moreover, a minimum grade point average of 2.00 (C) in all professional pharmacy courses is required.

### RESIDENCE

The American Association of Colleges of Pharmacy requires that a minimum of three academic years of residence work must be completed in an approved school or college of pharmacy, regardless of the amount of college credit that may be accepted from other types of institutions. It further provides that none of the professional courses in pharmacy may be taken through correspondence.

To be eligible to receive the degree in Pharmacy, students who bring advanced credit from other schools or colleges of pharmacy will be required to complete a minimum of two academic years or four semesters of residence work at this University, and

transfer credit will be limited to a maximum of 102 semester hours.

To qualify for a semester of residence work, a student must register for and satisfactorily pass at least 12 hours in the School of Pharmacy in one semester. If a student takes a reduced schedule of less than 12 hours for the semester, or attends the summer session, pharmacy residence will be granted in proportion to the number of hours successfully completed. A candidate for the degree must present at least six semesters of residence from an approved school or college of pharmacy before the degree may be awarded. Pharmacy residence will not be granted for enrollment at other campuses or for courses offered through the Division of Continuing Education.

### ORDER OF STUDIES FOR BACHELOR OF SCIENCE (PHARMACY) DEGREE

#### First and Second Years (Preprofessional)

To be considered for admission to the School of Pharmacy, applicants must have completed the following requirements with a grade of C or better:

	<i>Semester Hours</i>
Chemistry, general (with laboratory) (CHEM 1111 and 1131) . . . . .	10
Chemistry, organic (with laboratory) (CHEM 3311, 3331, 3321, and 3341) . . . . .	8
Biology (one year of general zoology or a combination of general zoology and botany with laboratory) (MCDB 1050 and 1060; or EPOB 1210, 1220, 1230, 1240) . . . . .	8
Mathematics (college algebra and trigonometry) (MATH 1010 and 1020; or 1100) OR (calculus) (MATH 1300) . . . . .	5
Physics, general (with laboratory) (PHYS 2010) . . . . .	5
English composition (University Writing Program) . . . . .	6
Microeconomics (ECON 2010) . . . . .	4
Communication principles (COMM 1020) . . . . .	3
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Additional requirements are listed below. Although applicants are encouraged to complete these courses prior to admission to the School of Pharmacy, deficiencies in these courses may be corrected after enrollment.

General education . . . . .	9
Social sciences (psychology, sociology, or cultural anthropology) . . . . .	6
	15

#### Third Year (Professional)

<i>Fall Semester</i>	
PHAR 3040 Pharmacy Orientation . . . . .	1
PHAR 3050 Pharmaceutical Calculations . . . . .	1
PHCH 3700 Pharmaceutical Chemistry . . . . .	3
PHAD 3810 Laws of Pharmacy . . . . .	3
EPOB 3430 Human Physiology . . . . .	5
CHEM 4611 Survey of Biochemistry . . . . .	3
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<i>Spring Semester</i>	
PHAR 3060 Pharmacy Practice . . . . .	1
PHCH 3750 Physiological and Clinical Chemistry . . . . .	3

BIPH 3080 Drug Action . . . . .	4
BIPH 3900 Molecular and Cellular Pathology . . . . .	3
BIPH 3901 Pathophysiology . . . . .	2
PHAD 3830 Pharmacy Financial Management . . . . .	3
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## Fourth Year (Professional)

### Fall Semester

PHAR 4100 Pharmaceutics 1 . . . . .	4
PCOL 4520 Mechanisms of Drug Action 1 . . . . .	5
PHCH 4720 Medicinal Chemistry 1 . . . . .	3
BIPH 4500 Infectious Disease . . . . .	3
PHAR 4120 Industrial Tours . . . . .	0
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### Spring Semester

PHAR 4110 Pharmaceutics 2 . . . . .	4
PCOL 4530 Mechanisms of Drug Action 2 . . . . .	5
PHCH 4730 Medicinal Chemistry 2 . . . . .	3
PCOL 4740 Toxicology . . . . .	2
PHAD 4860 Pharmacy Management . . . . .	3
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## Fifth Year (Professional)

### Fall Semester

CNLP 4210 Clinical Pharmacy and Therapeutics . . . . .	6
CNLP 4220 Therapeutic Aspects of Nonprescription Products . . . . .	3
CNLP 4250 Drug Literature Evaluation . . . . .	2
CNLP 4490 Clinical Pharmacokinetics . . . . .	3
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### Spring Semester

CNLP 4910 Community Pharmacy Externship 1 . . . . .	4
CNLP 4912 Institutional Pharmacy Externship 1 . . . . .	4
CNLP 49XX Clinical Pharmacy Rotation (Elective) . . . . .	4
CNLP 49XX Clinical Pharmacy Rotation (Elective) . . . . .	4
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## ACADEMIC POLICIES

Students are responsible for knowing and complying with the academic requirements and regulations of the School as well as those of the University of Colorado. Students must also meet basic standards of performance established for each class in respect to attendance, promptness in completing assignments, correct English usage, accuracy in calculations, and neatness and general quality of workmanship. Fulfillment of these fundamental responsibilities must be recognized by the student as an essential prerequisite to achieving satisfactory academic standing and to being recommended by the faculty for a degree.

### Academic Ethics

Students are expected to conduct themselves in accordance with the highest standards of honesty and integrity. The acts of or the intent to engage in the acts of cheating, plagiarism, illegitimate possession and/or disposition of examinations, and similar acts, are grounds for suspension or expulsion from the University. Students are advised that plagiarism consists of any act involving the offering of the work of someone else as the student's own.

### Academic Dishonesty

The Committee on Academic Dishonesty in the School of Pharmacy is composed of all members of the professorial faculty and is chaired by the Dean. It is responsible for all cases of academic ethics as described above and within the stipulations of the University's discipline code as described in the Unit Administrators Handbook.

### Advising

Academic advising can be obtained by coming into the main office of the School of Pharmacy (Ekeley W181) or by calling (303) 492-5594.

### Orientation

The School of Pharmacy does not have a formal orientation. Orientation to the School, profession, curriculum, and other pertinent information is handled through the Pharmacy Orientation course required in the first professional year of study.

### Course of Study

The course of study is three academic years (six semesters), leading to the Bachelor of Science (Pharmacy) degree. The course work is organized in a prescribed sequential manner which provides for an excellent general and professional background.

The proper sequence of both the professional and nonprofessional courses in the curriculum must be maintained. Students will not be permitted to advance into the fifth year of the course of study until all deficiencies and all third and fourth year courses are satisfactorily completed. In addition, the professional, cumulative, and semester grade point averages must be 2.00 (C). Students may not register for any third, fourth, or fifth year professional course unless all professional prerequisites have been satisfied with an acceptable passing grade.

The normal academic load is 15 to 17 semester hours, and students must be officially registered for each course to receive credit. Permission to take more than 18 or less than 12 hours may be granted only by the Dean. Students must be registered for at least 12 hours of credit on the Boulder Campus to qualify for a semester of residency in the School of Pharmacy. Approved electives should be added, if necessary, to complete the registration load for each semester.

The first two years of professional pharmacy courses (third and fourth

years) are taught on the Boulder Campus. The fifth year is taught in Denver at the University of Colorado Health Sciences Center. The fifth year program involves didactic courses taught during the fall semester with the spring semester devoted entirely to pharmacy practice clerkships. Students are held responsible for providing their own transportation to and from the assigned clerkship sites.

### Grading System, Drop/Add and Withdrawal

The School of Pharmacy follows the University's general policies on the grading system, Drop/Add, and withdrawal procedures and policies outlined in the University Policies, Programs, and Services section of this *Catalog*.

### Credit/No Credit

In order to receive credit, all courses must be listed on the student's current Course Enrollment Verification Form in the Office of Registrations. Students must register for Credit or No Credit by the twelfth day of instruction in the semester. No changes in Credit/No Credit registration will be permitted after that date. Students enrolled for No Credit are expected to do all of the work for the course. All professional courses must be taken for credit.

### Pass/Fail

In addition to the University's general Pass/Fail policies, the School of Pharmacy does not permit use of the Pass/Fail option for nonprofessional or professional courses required for graduation. After enrollment in the School of Pharmacy, a maximum of 6 hours of nonprofessional electives may be taken to apply toward the degree under the Pass/Fail option.

### Incomplete Grades

A grade of Incomplete is reported in the School of Pharmacy only on account of illness or an equally serious emergency which prevents the student from completing the work required in a course. Incompletes will be given only upon agreement between the Dean and the instructor concerned. An Incomplete must be removed the next term that the student attends classes. No credit hours or grades are awarded until the Incomplete is removed.

Pharmacy students taking courses in the College of Arts and Sciences or Business will be subject to the grading system used in the respective departments in which the courses are offered.



## Repetition of Courses

When a student fails a course or is required to repeat a course, credit toward graduation will be granted only once, but the grades in both courses will be included in the overall grade point average. None of the professional courses in pharmacy may be taken through correspondence.

## Class Standing

When students register in the School of Pharmacy, they are classified according to year in their course of study. Thus, a student who is taking the second preprofessional year will be classified as a second-year student; a student in the first professional year will be a third-year student; and the second and third professional years will be referred to as the fourth and fifth years, respectively. The classifications of sophomore, junior, and senior are not used in the School of Pharmacy.

## Class Attendance

Successful work in the School of Pharmacy is dependent upon regular class attendance. At the beginning of each semester, instructors will inform students in their classes of policies governing attendance. Students who are unavoidably absent should make arrangements with instructors to make up the work missed.

## Scholastic Requirements

To remain in good standing in the School of Pharmacy, the professional, cumulative, and semester grade point averages must be maintained at a 2.00 (C). If any individual grade point average should drop below 2.00, students will be duly notified by the Dean that they have been placed on scholastic probation for one semester. In addition to being placed on probation, students may have a mandatory reduction of academic load and extracurricular activities imposed. Any grade point average below 2.00 (C) at the end of the fall semester of the fifth year will prevent students from participating in the clerkship program during the spring semester.

Students on academic probation must improve their record by attaining a 2.00 (or better) grade point average for the next semester. Any student on probation who does not show such improvement will be placed on scholastic suspension. Credits received at other institutions while under scholastic suspension will not be accepted as transfer credit by the School of Pharmacy. A

student under scholastic suspension may apply for readmission after one semester and, if reinstated, will be on probation for two semesters, during which time the student must achieve a cumulative 2.00 grade point average. A student suspended a second time will not be reinstated.

No student will be permitted to take fifth-year professional courses unless all deficiencies and professional courses in the third and fourth years have been satisfactorily completed. The professional, cumulative, and semester grade-point averages must be at least a 2.00 (C) before entering the fifth-year course of study. In addition, the School of Pharmacy reserves the right to use a qualifying examination during the second semester of the fourth year to certify appropriate knowledge from the basic science courses.

In order to graduate from the School of Pharmacy, a student must have both a cumulative 2.00 grade point average for all courses attempted and a 2.00 grade point average in all professional pharmacy courses, including human physiology and biochemistry.

## Scholastic Advancement and Appeals

Under extraordinary circumstances, a student may appeal certain School of Pharmacy decisions. An appeal is granted only by the Dean of the School of Pharmacy. Each appeal consists of a written petition in which the student states the problem and a workable solution. The appeal is then considered by the Scholastic Advancement and Appeals Committee, composed of School of Pharmacy faculty. Students appear before this committee to substantiate their positions and answer questions. The committee then makes an advisory decision to the Dean.

## Convocations

All students registered in the School of Pharmacy are required to attend convocations and special lectures scheduled throughout the year. Usually the programs will be scheduled during the day, but occasionally it may be necessary to attend an evening program. The purpose of the convocations and special lectures is to augment regular classroom lectures and to give students the opportunity to meet and hear outstanding visitors.

## Industrial Tours

All students in the School of Pharmacy are required to participate in field trips to visit pharmaceutical industries.

Transportation is the only expense to the student.

## Credits at the Denver and Colorado Springs Campuses

While professional courses are not available at the Denver and Colorado Springs campuses, students may complete the two preprofessional years of study, as well as the nonprofessional and elective courses required in the pharmacy curriculum, at these campuses.

## School of Pharmacy Faculty

**LOUIS DIAMOND**, Dean, Professor of Pharmacology. B.S. (Phar.), M.S., Ph.D., University of Maryland.

**RALPH J. ALTIERE**, Associate Professor of Pharmacology. B.S., Manhattan College; M.S., New York University; M.S., Ph.D., New York Medical College.

**GLENN D. APPELT**, Professor of Pharmacology. B.S. (Phar.), M.S., University of Texas; Ph.D., University of Colorado.

**RONALD F. BAARS**, Associate Professor Adjoint of Clinical Pharmacy. B.Pharm., Washington State University; Pharm.D., University of Kentucky.

**DUANE C. BLOEDOW**, Associate Dean for Academic Affairs, Associate Professor of Pharmaceutics. B.S. (Phar.), South Dakota State University; Ph.D., Washington State University.

**ELLIOTT J. BLUMENTHAL**, Instructor in Pharmacy. B.A., M.S., Ph.D., University of Denver; M.S., University of Colorado Health Sciences Center.

**THOMAS A. BRANIGAN**, Assistant Professor Adjoint of Clinical Pharmacy. B.S. (Phar.), Pharm.D., University of Nebraska.

**L. HAROLD CARTER**, Pharmacist. B.S., Wake Forest College; B.S. (Phar.), University of North Carolina.

**ALLEN CHAPMAN**, Associate Professor Attendant of Clinical Pharmacy. B.S. (Phar.), M.S., University of Colorado.

**LARRY C. CLARK**, Assistant Professor Adjoint of Clinical Pharmacy. B.S.(Phar.), Pharm.D., University of Maryland.

**ALLAN C. COLLINS**, Professor of Pharmacology. B.S. (Phar.), M.S., Ph.D., University of Wisconsin.

**VAUGHN L. CULBERTSON**, Assistant Professor of Clinical Pharmacy. B.S.(Phar.), Pharm.D., University of Nebraska.

**C. DAVID ELM**, Pharmacist IV, Assistant Professor Adjoint of Pharmacy. B.S. (Phar.), M.S., Ph.D., University of Colorado.

**V. GENE ERWIN**, Professor of Pharmacology. B.S. (Phar.), M.S., Ph.D., University of Colorado.

**JOSEPH GAL**, Associate Professor of Pharmacy. B.S.C., American University (Cairo); M.S., Illinois Institute of Technology; Ph.D., University of California.

**BRADLEY D. HAAS**, Assistant Professor Adjoint of Clinical Pharmacy. Pharm.D., University of Nebraska.

**SHARON K. HAMMERICH**, Assistant Professor Adjoint of Clinical Pharmacy. Pharm.D., University of Southern California.

**FRANCIS C. HAMMERNESS**, Professor Emeritus.

**ARNOLD J. HENNIG**, Professor of Pharmacy. B.S. (Phar.), Ph.D., University of Wisconsin.

**ELAINE M. HILL**, Director of Drug Information Services, Assistant Professor of Clinical Pharmacy. B.S. (Phar.), University of Connecticut; Pharm.D., University of Florida.

**MICHAEL A. JONES**, Assistant Professor of Clinical Pharmacy. B.S. (Phar.), University of New Mexico; Pharm.D., University of Minnesota.

**TONY E. JONES**, Professor Emeritus.

**MARTI J. JUDSON**, Assistant Professor Adjoint of Clinical Pharmacy. B.S. (Phar.), University of Kansas; Pharm.D., University of Southern California.

**GARY KREIGER**, Assistant Professor Adjoint of Pharmacology/Toxicology. B.A., M.D., University of North Carolina.

**ALVIN M. MALKINSON**, Associate Professor of Biochemical Pharmacology. B.A., University of Buffalo; Ph.D., Johns Hopkins University.

**MICHAEL J. MARKS**, Assistant Professor Attendant of Pharmacology. B.S., University of Wisconsin; M.S., Ph.D., University of Michigan.

**SHIRLEY H. OSTRY**, Assistant Professor Adjoint of Clinical Pharmacy. B.S. (Phar.), Pharm.D., Creighton University.

**DENNIS R. PETERSEN**, Associate Dean for Research and Graduate Studies, Associate Professor of Pharmacogenetics-Pharmacology. B.S., Sul Ross State University; M.S., Ph.D., University of Wyoming.

**NANCY J. ROBERTSON**, Assistant Professor Adjoint of Clinical Pharmacy. B.S. (Phar.), University of Colorado; Pharm.D., University of Missouri.

**DAVID ROSS**, Assistant Professor of Pharmaceutical Chemistry. B.S. (Phar.), Ph.D., University of Aston in Birmingham.

**JAMES A. RUTH**, Associate Professor of Medicinal Chemistry-Chemical Pharmacology. B.S., University of Kansas; Ph.D., Northwestern University.

**RAYMOND F. SCHMELTER**, Assistant Professor Adjoint of Clinical Pharmacy. B.S. (Phar.), M.S., Ph.D., Purdue University.

**MERRICK L. SHIVELY**, Assistant Professor of Pharmaceutics. B.S. (Pharm.), Ph.D., University of Connecticut.

**CHARLES D. SINTEK**, Assistant Professor Adjoint of Clinical Pharmacy. B.S. (Phar.), University of Nebraska; M.S., University of Iowa.

**ANDREW SMOLEN**, Assistant Professor Attendant of Pharmacology. B.S., M.S., University of Wyoming; Ph.D., University of Colorado.

**JOHN B. SULLIVAN**, Associate Professor Adjoint of Pharmacology-Toxicology. B.S., Spring Hill College; M.D., University of Alabama.

**JOHN A. THOMPSON**, Associate Professor of Medicinal Chemistry. A.B., Clark University; Ph.D., University of California.

**JEANNE M. WEHNER**, Assistant Professor of Pharmacology. B.S., Madonna College; Ph.D., University of Minnesota.

**DENISE A. WOLTEMATH**, Assistant Professor Adjoint of Clinical Pharmacy. Pharm.D., University of Nebraska.



# Reserve Officers Training Corps

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## ALL ROTC PROGRAMS

Enrollment in ROTC programs is open to both men and women, and ROTC courses are open to all students whether or not they are enrolled in ROTC programs.

All services provide undergraduate and selected graduate students with the opportunity to combine academic study with a military officer's educational program. The three services conduct courses in their respective areas leading to regular or reserve commissions upon graduation. The Navy also offers a program leading to regular or reserve commissions in the Marine Corps.

## AIR FORCE AEROSPACE STUDIES

U.S. Air Force ROTC offers two programs leading to a commission in the U.S. Air Force upon receipt of the baccalaureate degree. Graduate students may be commissioned upon the completion of 12 hours of the Professional Officer Course and a six-week field training program. Course work is offered in the fall and spring semesters only.

## Standard Four-Year Course

The program is in three parts: the General Military Course for lower-division (freshman and sophomore) students, the Professional Officer Course for upper-division students, and the Leadership Laboratory (attended by all students). Completion of the General Military Course is a prerequisite for entry into the Professional Officer Course. Completion of a four-week field training program is required prior to commissioning.

## Modified Two-Year Program

This program is offered to full-time, regularly enrolled degree students at both the undergraduate and graduate levels who will have two years remaining at the University of Colorado at Boulder when they enroll. Selection is

on a competitive basis. Applicants should apply directly to the Professor of Aerospace Studies no later than January 15 of the spring semester immediately preceding the academic year in which they desire to enroll. Those selected for this program must complete a six-week field training program during the summer months as a prerequisite for entry into the Professional Officer Course the following fall or spring semester.

## Flight Opportunities

Prior to entry into the junior year, qualified Air Force ROTC male and female students can compete for pilot allocations through the Weighted Professional Officer Course Selection System (WPSS). All qualified pilot candidates will attend Light Aircraft Training for ROTC in the summer following their junior year where they will receive an orientation to flying.

## Air Force College Scholarship Program

Students participating in Air Force ROTC may be eligible to compete for Air Force ROTC College Scholarships. Students selected for this program are placed on grants that provide tuition, book allowance, nonrefundable educational fees, and subsistence of \$100 per month, tax free. (Scholarship cadets are required to take one course in composition, one course in mathematical reasoning, and one year in a foreign language.) All cadets enrolled in the Professional Officer Course receive \$100 per month subsistence during the regular academic year. Students are also eligible to compete for three and one-half, three, two and one-half, or two-year scholarships open to both men and women.

AFROTC credit for graduation varies with each college. Students should contact the appropriate college or the Professor of Aerospace Studies for determination of credit.

## Supplemental Course and Language Requirements

All AFROTC scholarship students in the General Military Course must successfully complete a course in English composition before they can advance to the Professional Officer Course. All AFROTC scholarship students must also successfully complete one year in an Indo-European or Asian language prior to commissioning. All Professional Officer Course students must successfully complete a course in mathematical reasoning prior to commissioning.

## USAF Nurse Corps

Air Force ROTC also makes it possible for qualified applicants of nursing schools to enroll in its programs and, upon completion of all academic and licensing requirements, receive commissions as second lieutenants in the USAF Nurse Corps.

## NAVAL SCIENCE

Naval Science course work is offered in the fall and spring semesters only.

All naval science students enroll in NAVR 1010, 1020, 2010, and 2020. Those desiring commissions in the U.S. Navy enroll in NAVR 3010, 3020, 4010, and 4020 for upper-division work.

Those desiring commissions in the U.S. Marine Corps enroll in NAVR 3101 and 4101 for upper-division work.

## Scholarship Programs

NROTC offers two-year and four-year scholarship programs, and two-year and four-year college (non-scholarship) programs. Navy scholarships may be earned while the student is enrolled in the college program. Scholarship students receive tuition and fees, books, and a \$100 per month subsistence allowance. College program students receive a \$100 per month subsistence allowance during their last two years in the program.

Naval science scholarship students must complete course work in calculus, physics, specified technical electives, and foreign language. Students should check with their naval science instruc-

tor to determine specific course offerings which fulfill the above requirements.

## Degree Credits

The number of NROTC semester hours of credit that may count toward degree requirements is determined by the individual colleges. Students should therefore determine their college's policy when formulating their degree plan.

## Commissioned Service

Opportunities for commissioned service are available in surface, subsurface, and aviation specialties in the U.S. Navy. Opportunities in ground and aviation specialties are available in the U.S. Marine Corps. Men and women students interested in other programs leading to commissions in either the U.S. Navy or U.S. Marine Corps are encouraged to contact the NROTC unit on campus. All commissioned opportunities require that the student be working toward, and receive, a college degree.

## U.S. ARMY MILITARY SCIENCE

The Department of Military Science offers programs leading to an officer's commission in the active Army, U. S. Army Reserve, or National Guard, in conjunction with earning an undergraduate or graduate degree. Military Science courses are designed to supplement a regular degree program by offering practical leadership and management experience.

## Four-Year Program

The four-year program consists of two phases: the Basic Course (freshman and sophomore years) and the Advanced Course (junior and senior years). The Basic Course offers a 2- or 3-credit course each semester, covering Army history and organization, and military leadership and management. Laboratory sessions provide the opportunity to apply leadership skills while learning basic land navigation and drill. Enrollment in the Basic Course incurs no military obligation.

The Advanced Course covers leadership, tactics and unit operations, training techniques, military law, and professional ethics, and includes a leadership practicum each semester. The Summer Advanced Camp at Fort Lewis, Washington, provides challenging leadership

training, and is a prerequisite for commissioning.

## Two-Year Program

The two-year program consists of the Advanced Course, preceded by an on-campus summer program, when offered, or a six-week summer ROTC Basic Camp. Veterans or students who have participated in Junior ROTC, Civil Air Patrol, or similar organizations may be eligible for enrollment in the Advanced Course without attendance at Basic Camp or completion of the Basic Course. Inquiries on advanced placement should be directed to the Professor of Military Science.

## Scholarship Programs

Four-year college scholarships are available to high school seniors, who should apply before December of their senior year. Competition for two- and three-year scholarships is open to all University of Colorado students, whether or not they are currently enrolled in ROTC. Scholarship students receive full tuition, laboratory fees, a book allowance, and an allowance of \$100 per month for each academic year. Scholarship cadets may be required to serve up to four years on active duty after commissioning. Students interested in the scholarship program should contact the Professor of Military Science no later than the beginning of the spring semester to apply for the following academic year.

## Simultaneous Membership Program

Nonscholarship students entering the advanced phase of instruction will be given the opportunity to participate with a Reserve or National Guard unit as an officer trainee. Students participating in this program can earn over \$100 per month in addition to the monthly allowances from the Reserve or National Guard.

## Professional Education

Military science students are required before commissioning to complete courses in written communication, human behavior, and military history. Scholarship cadets have an additional requirement to complete a foreign language. A list of the specific courses which fulfill these requirements can be obtained from the student's military science instructor.

## ROTC Faculty

### AEROSPACE STUDIES

**VINCENT P. MICUCCI**, Colonel, USAF, Professor of Aerospace Studies. B.S., University of Notre Dame; M.S., Southern Methodist University; M.A., Texas Christian University.

**DAVID D. COCKRELL**, Captain, USAF, Assistant Professor of Aerospace Studies. B.S., East Carolina University; M.S., University of Arkansas.

**SCOTT H. GREENE**, Captain, USAF, Assistant Professor of Aerospace Studies. B.S., Minot State College; M.Ed., Utah State University.

**LOIS E. HALCHIN**, Captain, USAF, Assistant Professor of Aerospace Studies. B.A., Bucknell University; M.P.A., University of Pittsburgh.

**RONALD R. MAYNARD**, Captain, USAF, Assistant Professor of Aerospace Studies. B.A., University of Maryland; M.A., University of Southern California.

### NAVAL SCIENCE

**HARRY R. BOURLAND II**, Captain, USN, Professor of Naval Science. B.A., University of New Mexico; M.A., Central Michigan University; M.A., George Washington University, Industrial College of the Armed Forces.

**TERRY L. TIPPETT**, Commander, USN, Associate Professor of Naval Science. B.S., U.S. Naval Academy; M.S., University of Southern California.

**ROBERT G. WILCOX**, Major, USMC, Assistant Professor of Naval Science. B.S., U.S. Naval Academy; M.S., University of Brussels.

**KENNETH R. PATTERSON**, Lieutenant, USN, Assistant Professor of Naval Science. B.A., M.S., California State University, Sacramento.

**CHARLES A. EDMONSON**, Lieutenant, USN, Assistant Professor of Naval Science. B.S., California State Polytechnic Institute; Ph.D., Colorado State University.

**ERIC R. ELLEFSEN**, Lieutenant, USNR, Freshman Instructor. B.A., University of California, Berkeley.

### MILITARY SCIENCE (U.S. ARMY)

**RAY E. MADSEN**, Associate Professor of Military Science. B.S., Utah University; M.A., U.S. Naval Post Graduate School.

**RICKI A. FELL**, Assistant Professor of Military Science. B.A., Eastern Washington University; M.S., Central Michigan.

**STEVEN M. GONZALES**, Assistant Professor of Military Science. B.A., Washington and Jefferson College; M.A., Webster University.

**BRIAN J. O'CONNOR**, Assistant Professor of Military Science. B.S., Loyola University of Chicago; M.S., University of Southern California.

**DALLAS D. OWENS**, Assistant Professor of Military Science. B.A., University of North Carolina; M.S., Utah State University; Ph.D., University of Tennessee.

**JEANETTE B. STERNER**, Assistant Professor of Military Science. B.A., Oklahoma City University; M.S., Trinity University and University of Texas Medical School.

# Course Number Translation Table

CU-Boulder has adopted a four-digit course numbering system in conjunction with the implementation of the new Student Information System. The following table shows three-digit course numbers and their corresponding new

four-digit designations. Discontinued three-digit courses and new four-digit courses are not included in the Translation Table.

The new course numbers are listed alphabetically by college or school and

department. They are then grouped by the last digit and are ordered numerically within that group.

Questions about the courses should be directed to the academic departments offering the courses.

Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.
<b>College of Arts and Sciences</b>							
<b>AMERICAN STUDIES</b>							
AM S 200	AMST 2000	ANTH 380	ANTH 3800	ANTH 482	ANTH 4820	ANTH 558	ANTH 5580
AM S 201	AMST 2010	ANTH 405	ANTH 4000	ANTH 940	ANTH 4840	ANTH 559	ANTH 5590
AM S 930	AMST 3840	ANTH 407	ANTH 4010	ANTH 941	ANTH 4850	ANTH 560	ANTH 5600
AM S 396	AMST 3960	ANTH 402	ANTH 4020	ANTH 401	ANTH 4910	ANTH 561	ANTH 5610
AM S 940	AMST 4840	ANTH 403	ANTH 4030	ANTH 505	ANTH 5000	ANTH 576	ANTH 5760
AM S 495	AMST 4950	ANTH 404	ANTH 4040	ANTH 507	ANTH 5010	ANTH 578	ANTH 5780
AM S 496	AMST 4960	ANTH 406	ANTH 4060	ANTH 502	ANTH 5020	ANTH 580	ANTH 5800
		ANTH 408	ANTH 4080	ANTH 503	ANTH 5030	ANTH 581	ANTH 5810
		ANTH 410	ANTH 4100	ANTH 504	ANTH 5040	ANTH 586	ANTH 5830
		ANTH 411	ANTH 4110	ANTH 506	ANTH 5060	ANTH 950	ANTH 5840
		ANTH 412	ANTH 4120	ANTH 508	ANTH 5080	ANTH 501	ANTH 5910
		ANTH 414	ANTH 4140	ANTH 509	ANTH 5090	ANTH 999	ANTH 6940
		ANTH 415	ANTH 4150	ANTH 510	ANTH 5100	ANTH 700	ANTH 6950
		ANTH 420	ANTH 4200	ANTH 511	ANTH 5110	ANTH 600	ANTH 7000
		ANTH 421	ANTH 4210	ANTH 512	ANTH 5120	ANTH 601	ANTH 7010
		ANTH 422	ANTH 4220	ANTH 513	ANTH 5130	ANTH 602	ANTH 7020
		ANTH 423	ANTH 4230	ANTH 514	ANTH 5140	ANTH 603	ANTH 7030
		ANTH 424	ANTH 4240	ANTH 515	ANTH 5150	ANTH 604	ANTH 7040
		ANTH 418	ANTH 4270	ANTH 519	ANTH 5190	ANTH 613	ANTH 7130
		ANTH 428	ANTH 4280	ANTH 520	ANTH 5200	ANTH 614	ANTH 7140
		ANTH 433	ANTH 4330	ANTH 521	ANTH 5210	ANTH 615	ANTH 7150
		ANTH 434	ANTH 4340	ANTH 522	ANTH 5220	ANTH 630	ANTH 7300
		ANTH 435	ANTH 4350	ANTH 523	ANTH 5230	ANTH 960	ANTH 7840
		ANTH 496	ANTH 4360	ANTH 524	ANTH 5240	ANTH 800	ANTH 8990
		ANTH 438	ANTH 4380	ANTH 518	ANTH 5270	ANTH 426	ANTH 4269
		ANTH 450	ANTH 4500	ANTH 528	ANTH 5280	ANTH 431	ANTH 4419
		ANTH 451	ANTH 4510	ANTH 533	ANTH 5330	ANTH 432	ANTH 4429
		ANTH 452	ANTH 4520	ANTH 534	ANTH 5340	ANTH 483	ANTH 4789
		ANTH 453	ANTH 4530	ANTH 535	ANTH 5350	ANTH 484	ANTH 4799
		ANTH 454	ANTH 4540	ANTH 598	ANTH 5360	ANTH 526	ANTH 5269
		ANTH 455	ANTH 4550	ANTH 538	ANTH 5380	ANTH 531	ANTH 5419
		ANTH 456	ANTH 4560	ANTH 539	ANTH 5390	ANTH 532	ANTH 5429
		ANTH 457	ANTH 4570	ANTH 540	ANTH 5400	ANTH 583	ANTH 5789
		ANTH 458	ANTH 4580	ANTH 549	ANTH 5490	ANTH 584	ANTH 5799
		ANTH 459	ANTH 4590	ANTH 550	ANTH 5500		
		ANTH 460	ANTH 4600	ANTH 551	ANTH 5510	<b>ARTS AND SCIENCES</b>	
		ANTH 461	ANTH 4610	ANTH 552	ANTH 5520	A S 160	FARR 1600
		ANTH 491	ANTH 4710	ANTH 553	ANTH 5530	A S 260	FARR 2600
		ANTH 492	ANTH 4720	ANTH 554	ANTH 5540	A S 221	ARSC 2211
		ANTH 476	ANTH 4760	ANTH 555	ANTH 5550	A S 130	ARSC 1303
		ANTH 480	ANTH 4800	ANTH 556	ANTH 5560	A S 227	ARSC 2274
		ANTH 481	ANTH 4810	ANTH 557	ANTH 5570	A S 250	ARSC 2504

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
A S	399	ARSC	3935	APAS	650	APAS	7500	EPOB	408	EPOB	4080	EPOB	504	EPOB	5040
A S	940	ARSC	4909	APAS	651	APAS	7510	EPOB	410	EPOB	4100	EPOB	507	EPOB	5070
A S	490	ARSC	4949	APAS	652	APAS	7520	EPOB	411	EPOB	4110	EPOB	508	EPOB	5080
<b>ASIAN STUDIES</b>				APAS	653	APAS	7530	EPOB	412	EPOB	4120	EPOB	510	EPOB	5100
A ST	101	ASIA	1010	APAS	654	APAS	7540	EPOB	413	EPOB	4130	EPOB	511	EPOB	5110
A ST	102	ASIA	1020	APAS	655	APAS	7550	EPOB	414	EPOB	4140	EPOB	512	EPOB	5120
A ST	920	ASIA	2840	APAS	750	APAS	7920	EPOB	415	EPOB	4150	EPOB	513	EPOB	5130
A ST	930	ASIA	3840	APAS	800	APAS	8990	EPOB	416	EPOB	4160	EPOB	514	EPOB	5140
A ST	499	ASIA	4830	APAS	319	APAS	3191	EPOB	417	EPOB	4170	EPOB	515	EPOB	5150
A ST	940	ASIA	4840	APAS	320	APAS	3201	EPOB	497	EPOB	4190	EPOB	516	EPOB	5160
<b>ASTROPHYSICAL, PLANETARY, AND ATMOSPHERIC SCIENCES</b>				APAS	595	APAS	5951	EPOB	496	EPOB	4200	EPOB	517	EPOB	5170
APAS	111	APAS	1110	APAS	596	APAS	5961	EPOB	432	EPOB	4220	EPOB	520	EPOB	5180
APAS	112	APAS	1120	<b>BIBLIOGRAPHY</b>				EPOB	498	EPOB	4240	EPOB	597	EPOB	5190
APAS	115	APAS	1150	BIB	301	BIBL	3010	EPOB	499	EPOB	4250	EPOB	596	EPOB	5200
APAS	121	APAS	1210	BIB	930	BIBL	3900	EPOB	426	EPOB	4260	EPOB	598	EPOB	5240
APAS	122	APAS	1220	BIB	940	BIBL	4900	EPOB	427	EPOB	4270	EPOB	599	EPOB	5250
APAS	920	APAS	2840	<b>BIOLOGICAL SCIENCES</b>				EPOB	428	EPOB	4280	EPOB	526	EPOB	5260
APAS	321	APAS	3210	<b>Environmental, Population, and Organismic Biology</b>				EPOB	429	EPOB	4290	EPOB	527	EPOB	5270
APAS	322	APAS	3220	EPOB	121	EPOB	1210	EPOB	430	EPOB	4300	EPOB	528	EPOB	5280
APAS	350	APAS	3500	EPOB	122	EPOB	1220	EPOB	431	EPOB	4310	EPOB	529	EPOB	5290
APAS	351	APAS	3510	EPOB	123	EPOB	1230	EPOB	432	EPOB	4320	EPOB	530	EPOB	5300
APAS	352	APAS	3520	EPOB	124	EPOB	1240	EPOB	433	EPOB	4330	EPOB	531	EPOB	5310
APAS	391	APAS	3710	EPOB	123	EPOB	1230	EPOB	434	EPOB	4340	EPOB	532	EPOB	5320
APAS	392	APAS	3720	EPOB	124	EPOB	1240	EPOB	435	EPOB	4350	EPOB	533	EPOB	5330
APAS	393	APAS	3730	EPOB	124	EPOB	1240	EPOB	442	EPOB	4360	EPOB	534	EPOB	5340
APAS	394	APAS	3740	EPOB	100	EPOB	1300	EPOB	446	EPOB	4370	EPOB	535	EPOB	5350
APAS	395	APAS	3750	EPOB	101	EPOB	1310	EPOB	447	EPOB	4380	EPOB	542	EPOB	5360
APAS	421	APAS	4210	EPOB	102	EPOB	1320	EPOB	448	EPOB	4390	EPOB	546	EPOB	5370
APAS	422	APAS	4220	EPOB	107	EPOB	1410	EPOB	484	EPOB	4400	EPOB	547	EPOB	5380
APAS	440	APAS	4400	EPOB	108	EPOB	1420	EPOB	409	EPOB	4410	EPOB	548	EPOB	5390
APAS	940	APAS	4840	EPOB	920	EPOB	1840	EPOB	486	EPOB	4420	EPOB	584	EPOB	5400
APAS	505	APAS	5050	EPOB	302	EPOB	3020	EPOB	487	EPOB	4440	EPOB	509	EPOB	5410
APAS	511	APAS	5110	EPOB	303	EPOB	3030	EPOB	489	EPOB	4460	EPOB	586	EPOB	5420
APAS	514	APAS	5140	EPOB	303	EPOB	3030	EPOB	490	EPOB	4470	EPOB	587	EPOB	5440
APAS	515	APAS	5150	EPOB	316	EPOB	3160	EPOB	491	EPOB	4480	EPOB	589	EPOB	5460
APAS	522	APAS	5220	EPOB	317	EPOB	3170	EPOB	492	EPOB	4490	EPOB	590	EPOB	5470
APAS	525	APAS	5250	EPOB	380	EPOB	3180	EPOB	451	EPOB	4510	EPOB	591	EPOB	5480
APAS	530	APAS	5300	EPOB	320	EPOB	3200	EPOB	452	EPOB	4520	EPOB	592	EPOB	5490
APAS	540	APAS	5400	EPOB	395	EPOB	3240	EPOB	453	EPOB	4530	EPOB	551	EPOB	5510
APAS	541	APAS	5410	EPOB	325	EPOB	3250	EPOB	454	EPOB	4540	EPOB	555	EPOB	5550
APAS	554	APAS	5540	EPOB	340	EPOB	3400	EPOB	455	EPOB	4550	EPOB	557	EPOB	5560
APAS	556	APAS	5560	EPOB	342	EPOB	3420	EPOB	457	EPOB	4560	EPOB	559	EPOB	5570
APAS	570	APAS	5700	EPOB	343	EPOB	3430	EPOB	459	EPOB	4570	EPOB	560	EPOB	5580
APAS	571	APAS	5710	EPOB	345	EPOB	3450	EPOB	460	EPOB	4580	EPOB	563	EPOB	5630
APAS	572	APAS	5720	EPOB	346	EPOB	3460	EPOB	463	EPOB	4630	EPOB	564	EPOB	5640
APAS	573	APAS	5730	EPOB	350	EPOB	3500	EPOB	464	EPOB	4640	EPOB	565	EPOB	5650
APAS	750	APAS	5920	EPOB	351	EPOB	3510	EPOB	465	EPOB	4650	EPOB	566	EPOB	5660
APAS	600	APAS	6000	EPOB	352	EPOB	3520	EPOB	361	EPOB	4660	EPOB	567	EPOB	5670
APAS	598	APAS	6630	EPOB	353	EPOB	3530	EPOB	467	EPOB	4670	EPOB	568	EPOB	5680
APAS	601	APAS	6650	EPOB	363	EPOB	3630	EPOB	468	EPOB	4680	EPOB	569	EPOB	5690
APAS	999	APAS	6940	EPOB	374	EPOB	3650	EPOB	469	EPOB	4690	EPOB	572	EPOB	5700
APAS	700	APAS	6950	EPOB	375	EPOB	3660	EPOB	472	EPOB	4700	EPOB	574	EPOB	5740
APAS	615	APAS	7150	EPOB	385	EPOB	3700	EPOB	474	EPOB	4740	EPOB	575	EPOB	5750
APAS	516	APAS	7160	EPOB	372	EPOB	3720	EPOB	475	EPOB	4750	EPOB	576	EPOB	5760
APAS	517	APAS	7170	EPOB	941	EPOB	3840	EPOB	476	EPOB	4760	EPOB	577	EPOB	5770
APAS	620	APAS	7200	EPOB	399	EPOB	3930	EPOB	477	EPOB	4770	EPOB	578	EPOB	5780
APAS	624	APAS	7240	EPOB	400	EPOB	4000	EPOB	478	EPOB	4780	EPOB	579	EPOB	5790
APAS	630	APAS	7300	EPOB	401	EPOB	4010	EPOB	479	EPOB	4790	EPOB	580	EPOB	5800
APAS	542	APAS	7420	EPOB	402	EPOB	4020	EPOB	480	EPOB	4800	EPOB	581	EPOB	5810
APAS	543	APAS	7430	EPOB	403	EPOB	4030	EPOB	481	EPOB	4810	EPOB	582	EPOB	5820
				EPOB	404	EPOB	4040	EPOB	482	EPOB	4820	EPOB	950	EPOB	5840
				EPOB	437	EPOB	4050	EPOB	500	EPOB	5000	EPOB	501	EPOB	6000
				EPOB	438	EPOB	4060	EPOB	502	EPOB	5020	EPOB	610	EPOB	6100
				EPOB	407	EPOB	4070	EPOB	503	EPOB	5030	EPOB	611	EPOB	6110



## 208 Course Number Translation Table / Biological Sciences

Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.
EPOB 612	EPOB 6120	MCDB 593	MCDB 4850	BLST 476	BLST 4692	CHEM 631	CHEM 6311		
EPOB 613	EPOB 6130	MCDB 497	MCDB 4970	BLST 477	BLST 4702	CHEM 652	CHEM 6411		
EPOB 614	EPOB 6140	MCDB 505	MCDB 5050			CHEM 651	CHEM 6511		
EPOB 615	EPOB 6150	MCDB 506	MCDB 5060	<b>CHEMISTRY</b>					
EPOB 616	EPOB 6160	MCDB 507	MCDB 5070	CHEM 100	CHEM 1001	CHEM 685	CHEM 6601		
EPOB 617	EPOB 6170	MCDB 508	MCDB 5080	CHEM 102	CHEM 1011	CHEM 681	CHEM 6711		
EPOB 618	EPOB 6180	MCDB 513	MCDB 5130	CHEM 102	CHEM 1031	CHEM 682	CHEM 6731		
EPOB 619	EPOB 6190	MCDB 514	MCDB 5140	CHEM 101	CHEM 1051	CHEM 600	CHEM 6801		
EPOB 620	EPOB 6200	MCDB 518	MCDB 5190	CHEM 104	CHEM 1071	CHEM 963	CHEM 6901		
EPOB 621	EPOB 6210	MCDB 520	MCDB 5200	CHEM 103	CHEM 1111	CHEM 999	CHEM 6941		
EPOB 622	EPOB 6220	MCDB 522	MCDB 5220	CHEM 106	CHEM 1131	CHEM 700	CHEM 6951		
EPOB 623	EPOB 6230	MCDB 523	MCDB 5230	CHEM 107	CHEM 1151	CHEM 610	CHEM 7001		
EPOB 624	EPOB 6240	MCDB 530	MCDB 5300	CHEM 108	CHEM 1171	CHEM 611	CHEM 7011		
EPOB 625	EPOB 6250	MCDB 544	MCDB 5440	CHEM 331	CHEM 3311	CHEM 612	CHEM 7021		
EPOB 626	EPOB 6260	MCDB 547	MCDB 5470	CHEM 333	CHEM 3321	CHEM 613	CHEM 7031		
EPOB 627	EPOB 6270	MCDB 590	MCDB 5500	CHEM 332	CHEM 3331	CHEM 614	CHEM 7041		
EPOB 628	EPOB 6280	MCDB 591	MCDB 5510	CHEM 334	CHEM 3341	CHEM 620	CHEM 7101		
EPOB 629	EPOB 6290	MCDB 568	MCDB 5680	CHEM 335	CHEM 3351	CHEM 621	CHEM 7111		
EPOB 630	EPOB 6300	MCDB 570	MCDB 5700	CHEM 337	CHEM 3361	CHEM 622	CHEM 7121		
EPOB 631	EPOB 6310	MCDB 572	MCDB 5720	CHEM 336	CHEM 3371	CHEM 623	CHEM 7131		
EPOB 632	EPOB 6320	MCDB 575	MCDB 5750	CHEM 338	CHEM 3381	CHEM 642	CHEM 7201		
EPOB 633	EPOB 6330	MCDB 578	MCDB 5780	CHEM 401	CHEM 4011	CHEM 643	CHEM 7211		
EPOB 634	EPOB 6340	MCDB 582	MCDB 5820	CHEM 418	CHEM 4181	CHEM 644	CHEM 7221		
EPOB 635	EPOB 6350	MCDB 583	MCDB 5830	CHEM 440	CHEM 4401	CHEM 645	CHEM 7231		
EPOB 636	EPOB 6360	MCDB 597	MCDB 5970	CHEM 450	CHEM 4411	CHEM 646	CHEM 7241		
EPOB 637	EPOB 6370	MCDB 533	MCDB 6000	CHEM 451	CHEM 4511	CHEM 647	CHEM 7251		
EPOB 638	EPOB 6380	MCDB 545	MCDB 6450	CHEM 452	CHEM 4531	CHEM 648	CHEM 7261		
EPOB 639	EPOB 6390	MCDB 999	MCDB 6940	CHEM 454	CHEM 4541	CHEM 649	CHEM 7271		
EPOB 999	EPOB 6940	MCDB 700	MCDB 6950	CHEM 454	CHEM 4541	CHEM 640	CHEM 7281		
EPOB 700	EPOB 6950	MCDB 605	MCDB 7050	CHEM 453	CHEM 4551	CHEM 660	CHEM 7401		
EPOB 800	EPOB 8990	MCDB 601	MCDB 7790	CHEM 455	CHEM 4561	CHEM 661	CHEM 7411		
		MCDB 960	MCDB 7840	CHEM 471	CHEM 4611	CHEM 662	CHEM 7421		
		MCDB 599	MCDB 7910	CHEM 481	CHEM 4711	CHEM 663	CHEM 7431		
		MCDB 800	MCDB 8990	CHEM 482	CHEM 4731	CHEM 664	CHEM 7441		
				CHEM 486	CHEM 4761	CHEM 665	CHEM 7451		
				CHEM 943	CHEM 4901	CHEM 666	CHEM 7461		
				CHEM 501	CHEM 5011	CHEM 667	CHEM 7471		
				CHEM 506	CHEM 5061	CHEM 668	CHEM 7481		
				CHEM 511	CHEM 5111	CHEM 669	CHEM 7491		
				CHEM 516	CHEM 5161	CHEM 670	CHEM 7501		
				CHEM 517	CHEM 5171	CHEM 690	CHEM 7601		
				CHEM 518	CHEM 5181	CHEM 692	CHEM 7621		
				CHEM 531	CHEM 5311	CHEM 693	CHEM 7631		
				CHEM 532	CHEM 5321	CHEM 694	CHEM 7641		
				CHEM 533	CHEM 5331	CHEM 695	CHEM 7651		
				CHEM 560	CHEM 5441	CHEM 696	CHEM 7661		
				CHEM 551	CHEM 5511	CHEM 697	CHEM 7671		
				CHEM 552	CHEM 5521	CHEM 698	CHEM 7681		
				CHEM 553	CHEM 5531	CHEM 800	CHEM 8991		
				CHEM 550	CHEM 5541				
				CHEM 555	CHEM 5551	<b>CHICANO STUDIES</b>			
				CHEM 556	CHEM 5561	CHST 103	CHST 1031		
				CHEM 557	CHEM 5571	CHST 435	CHST 4351		
				CHEM 558	CHEM 5581	CHST 486	CHST 4681		
				CHEM 559	CHEM 5591	CHST 400	CHST 4002		
				CHEM 581	CHEM 5711	CHST 127	CHST 1273		
				CHEM 582	CHEM 5731	CHST 221	CHST 2213		
				CHEM 587	CHEM 5771	CHST 302	CHST 3023		
				CHEM 588	CHEM 5781	CHST 315	CHST 3153		
				CHEM 601	CHEM 6011	CHST 430	CHST 4303		
				CHEM 602	CHEM 6021	CHST 104	CHST 1044		
				CHEM 625	CHEM 6101	CHST 381	CHST 3814		
				CHEM 626	CHEM 6111	CHST 382	CHST 3824		
				CHEM 635	CHEM 6201	CHST 101	CHST 1015		
				CHEM 641	CHEM 6211	CHST 313	CHST 3135		
MCDB 101	MCDB 1010								
MCDB 105	MCDB 1050	<b>BLACK STUDIES</b>							
MCDB 106	MCDB 1060	BLST 910	BLST 1840						
MCDB 312	MCDB 3120	BLST 200	BLST 2000						
MCDB 310	MCDB 3140	BLST 203	BLST 2030						
MCDB 315	MCDB 3150	BLST 204	BLST 2040						
MCDB 313	MCDB 3200	BLST 220	BLST 2200						
MCDB 335	MCDB 3350	BLST 221	BLST 2210						
MCDB 384	MCDB 3400	BLST 235	BLST 2350						
MCDB 401	MCDB 4010	BLST 236	BLST 2360						
MCDB 492	MCDB 4100	BLST 237	BLST 2370						
MCDB 592	MCDB 4110	BLST 240	BLST 2400						
MCDB 414	MCDB 4140	BLST 241	BLST 2410						
MCDB 418	MCDB 4190	BLST 255	BLST 2550						
MCDB 420	MCDB 4200	BLST 260	BLST 2600						
MCDB 422	MCDB 4220	BLST 280	BLST 2800						
MCDB 423	MCDB 4230	BLST 281	BLST 2810						
MCDB 483	MCDB 4320	BLST 300	BLST 3000						
MCDB 484	MCDB 4400	BLST 302	BLST 3020						
MCDB 489	MCDB 4410	BLST 930	BLST 3840						
MCDB 444	MCDB 4440	BLST 400	BLST 4000						
MCDB 447	MCDB 4470	BLST 450	BLST 4500						
MCDB 490	MCDB 4500	BLST 451	BLST 4510						
MCDB 491	MCDB 4510	BLST 465	BLST 4650						
MCDB 465	MCDB 4650	BLST 471	BLST 4710						
MCDB 466	MCDB 4660	BLST 480	BLST 4800						
MCDB 468	MCDB 4680	BLST 940	BLST 4840						
MCDB 472	MCDB 4720	BLST 495	BLST 4950						
MCDB 475	MCDB 4750	BLST 232	BLST 2722						
MCDB 930	MCDB 4840	BLST 233	BLST 2732						

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course					
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.				
CHST	910	CHST	3905	GR	465	CLAS	4653	CLAS	521	CLAS	5089	CDSS	551	CDSS	5302				
CHST	940	CHST	4905	GR	930	CLAS	4843	CLAS	523	CLAS	5099	CDSS	552	CDSS	5332				
CHST	201	CHST	2517	GR	500	CLAS	5003	CLAS	515	CLAS	5159	CDSS	554	CDSS	5362				
CHST	202	CHST	2527	GR	521	CLAS	5213	CLAS	526	CLAS	5269	CDSS	567	CDSS	5402				
CHST	427	CHST	4277	GR	540	CLAS	5403	CLAS	586	CLAS	5419	CDSS	634	CDSS	5602				
CHST	460	CHST	4607	GR	550	CLAS	5503	CLAS	525	CLAS	5429	CDSS	270	CDSS	2304				
<b>CLASSICS</b>				GR	493	CLAS	5803	CLAS	583	CLAS	5789	CDSS	271	CDSS	2314				
CLAS	101	CLAS	1010	GR	494	CLAS	5813	CLAS	584	CLAS	5799	CDSS	470	CDSS	4704				
CLAS	110	CLAS	1100	GR	600	CLAS	6923	CLAS	614	CLAS	6149	CDSS	471	CDSS	4714				
CLAS	111	CLAS	1110	GR	950	CLAS	7843	<b>COMMUNICATION</b>								CDSS	570	CDSS	5524
CLAS	112	CLAS	1120	GR	600	CLAS	7923	COMM	102	COMM	1020	CDSS	574	CDSS	5544				
CLAS	202	CLAS	2020	LAT	101	CLAS	1014	COMM	124	COMM	1240	CDSS	575	CDSS	5554				
CLAS	210	CLAS	2100	LAT	102	CLAS	1024	COMM	203	COMM	2030	CDSS	573	CDSS	5574				
CLAS	930	CLAS	2840	LAT	103	CLAS	1034	COMM	215	COMM	2150	CDSS	572	CDSS	5614				
CLAS	330	CLAS	3300	LAT	211	CLAS	2114	COMM	250	COMM	2500	CDSS	580	CDSS	5644				
CLAS	333	CLAS	3330	LAT	311	CLAS	3114	COMM	320	COMM	3200	CDSS	584	CDSS	5674				
CLAS	361	CLAS	3610	LAT	312	CLAS	3124	COMM	335	COMM	3350	CDSS	670	CDSS	5684				
CLAS	411	CLAS	4110	LAT	321	CLAS	3214	COMM	419	COMM	4000	CDSS	308	CDSS	3006				
CLAS	412	CLAS	4120	LAT	322	CLAS	3224	COMM	418	COMM	4030	CDSS	304	CDSS	3106				
CLAS	413	CLAS	4130	LAT	331	CLAS	3314	COMM	420	COMM	4200	CDSS	508	CDSS	6106				
CLAS	416	CLAS	4160	LAT	332	CLAS	3324	COMM	421	COMM	4210	CDSS	608	CDSS	7106				
CLAS	450	CLAS	4500	LAT	402	CLAS	4024	COMM	423	COMM	4230	CDSS	509	CDSS	7206				
CLAS	495	CLAS	4820	LAT	424	CLAS	4244	COMM	424	COMM	4240	CDSS	469	CDSS	4918				
CLAS	930	CLAS	4840	LAT	425	CLAS	4254	COMM	426	COMM	4260	CDSS	399	CDSS	4938				
CLAS	511	CLAS	5110	LAT	432	CLAS	4324	COMM	427	COMM	4270	CDSS	657	CDSS	5878				
CLAS	512	CLAS	5120	LAT	455	CLAS	4554	COMM	450	COMM	4500	CDSS	617	CDSS	5888				
CLAS	513	CLAS	5130	LAT	461	CLAS	4614	COMM	930	COMM	4840	CDSS	658	CDSS	5898				
CLAS	516	CLAS	5160	LAT	490	CLAS	4824	COMM	931	COMM	4850	CDSS	656	CDSS	5908				
CLAS	550	CLAS	5500	LAT	930	CLAS	4844	COMM	399	COMM	4930	CDSS	677	CDSS	5918				
CLAS	580	CLAS	5800	LAT	500	CLAS	5004	COMM	518	COMM	5030	CDSS	676	CDSS	5928				
CLAS	581	CLAS	5810	LAT	502	CLAS	5024	COMM	520	COMM	5200	CDSS	678	CDSS	5938				
CLAS	595	CLAS	5820	LAT	524	CLAS	5244	COMM	521	COMM	5210	CDSS	669	CDSS	6918				
CLAS	950	CLAS	6840	LAT	525	CLAS	5254	COMM	523	COMM	5230	CDSS	659	CDSS	6928				
CLAS	999	CLAS	6940	LAT	532	CLAS	5324	COMM	524	COMM	5240	CDSS	689	CDSS	6938				
CLAS	105	CLAS	1051	LAT	555	CLAS	5554	COMM	526	COMM	5260	CDSS	795	CDSS	7918				
CLAS	106	CLAS	1061	LAT	561	CLAS	5614	COMM	527	COMM	5270	CDSS	796	CDSS	7928				
CLAS	402	CLAS	4021	LAT	593	CLAS	5804	COMM	527	COMM	5270	CDSS	798	CDSS	8918				
CLAS	403	CLAS	4031	LAT	594	CLAS	5814	COMM	700	COMM	6940	CDSS	797	CDSS	8928				
CLAS	405	CLAS	4051	LAT	590	CLAS	5824	COMM	800	COMM	8990	CDSS	940	CDSS	4849				
CLAS	407	CLAS	4071	LAT	600	CLAS	6924	<b>COMMUNICATION</b>								CDSS	950	CDSS	5849
CLAS	408	CLAS	4081	LAT	950	CLAS	7844	<b>DISORDERS AND</b>								CDSS	952	CDSS	5859
CLAS	409	CLAS	4091	LAT	600	CLAS	7924	<b>SPEECH SCIENCE</b>								CDSS	951	CDSS	5869
CLAS	476	CLAS	4761	CLAS	109	CLAS	1105	CDSS	101	CDSS	1000	CDSS	953	CDSS	5879				
CLAS	502	CLAS	5021	CLAS	107	CLAS	1115	CDSS	210	CDSS	2000	CDSS	960	CDSS	7849				
CLAS	503	CLAS	5031	CLAS	109	CLAS	1125	CDSS	200	CDSS	2500	CDSS	962	CDSS	7859				
CLAS	505	CLAS	5051	CLAS	404	CLAS	4009	CDSS	305	CDSS	3120	CDSS	961	CDSS	7869				
CLAS	507	CLAS	5071	CLAS	461	CLAS	4019	CDSS	301	CDSS	3200	CDSS	963	CDSS	7879				
CLAS	508	CLAS	5081	CLAS	420	CLAS	4039	CDSS	411	CDSS	4010	<b>COMPARATIVE</b>							
CLAS	509	CLAS	5091	CLAS	427	CLAS	4049	CDSS	456	CDSS	4560	<b>LITERATURE</b>							
CLAS	576	CLAS	5761	CLAS	428	CLAS	4059	CDSS	601	CDSS	5000	C LT	535	COML	5350				
CLAS	603	CLAS	6011	CLAS	432	CLAS	4079	CDSS	511	CDSS	5010	C LT	536	COML	5360				
CLPH	601	CLAS	6012	CLAS	426	CLAS	4269	CDSS	510	CDSS	5020	C LT	537	COML	5370				
CLPH	609	CLAS	6092	CLAS	431	CLAS	4319	CDSS	525	CDSS	5120	C LT	542	COML	5420				
CLPH	610	CLAS	6102	CLAS	486	CLAS	4419	CDSS	520	CDSS	5200	C LT	543	COML	5430				
CLPH	700	CLAS	6952	CLAS	425	CLAS	4429	CDSS	609	CDSS	6000	C LT	544	COML	5440				
CLPH	800	CLAS	8992	CLAS	483	CLAS	4789	CDSS	999	CDSS	6940	C LT	545	COML	5450				
GR	101	CLAS	1013	CLAS	484	CLAS	4799	CDSS	700	CDSS	6950	C LT	546	COML	5460				
GR	102	CLAS	1023	CLAS	504	CLAS	5009	CDSS	698	CDSS	7830	C LT	547	COML	5470				
GR	311	CLAS	3113	CLAS	561	CLAS	5019	CDSS	800	CDSS	8990	C LT	548	COML	5480				
GR	312	CLAS	3123	CLAS	520	CLAS	5039	CDSS	450	CDSS	4502	C LT	549	COML	5490				
GR	421	CLAS	4213	CLAS	527	CLAS	5049	CDSS	451	CDSS	4512	C LT	580	COML	5610				
GR	440	CLAS	4403	CLAS	528	CLAS	5059	CDSS	501	CDSS	5202	C LT	562	COML	5620				
GR	450	CLAS	4503	CLAS	524	CLAS	5069	CDSS	532	CDSS	5232	C LT	563	COML	5630				
				CLAS	532	CLAS	5079	CDSS	556	CDSS	5262	C LT	564	COML	5640				

210 Course Number Translation Table / Comparative Literature

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
C LT	565	COML	5650	ECON	551	ECON	5514	ECON	960	ECON	8909	ENGL	401	ENGL	4012
C LT	566	COML	5660	ECON	552	ECON	5524	ECON	800	ECON	8999	ENGL	484	ENGL	4102
C LT	585	COML	5790	ECON	577	ECON	5574					ENGL	419	ENGL	4192
C LT	584	COML	5820	ECON	571	ECON	5714					ENGL	420	ENGL	4202
C LT	583	COML	5830	ECON	578	ECON	5784					ENGL	421	ENGL	4212
C LT	940	COML	5840	ECON	587	ECON	5794					ENGL	422	ENGL	4222
C LT	601	COML	6010	ECON	676	ECON	8764					ENGL	423	ENGL	4232
C LT	602	COML	6020	ECON	677	ECON	8774					ENGL	424	ENGL	4242
C LT	603	COML	6030	ECON	678	ECON	8784					ENGL	425	ENGL	4252
C LT	604	COML	6040	ECON	679	ECON	8794					ENGL	426	ENGL	4262
C LT	950	COML	6840	ECON	353	ECON	3535					ENGL	427	ENGL	4272
C LT	999	COML	6940	ECON	354	ECON	3545					ENGL	428	ENGL	4282
C LT	700	COML	6950	ECON	453	ECON	4535					ENGL	430	ENGL	4302
C LT	697	COML	6970	ECON	454	ECON	4545					ENGL	431	ENGL	4312
C LT	800	COML	8990	ECON	456	ECON	4565					ENGL	432	ENGL	4322
				ECON	553	ECON	5535					ENGL	433	ENGL	4332
				ECON	554	ECON	5545					ENGL	434	ENGL	4342
				ECON	556	ECON	5565					ENGL	435	ENGL	4352
				ECON	653	ECON	8535					ENGL	436	ENGL	4362
				ECON	654	ECON	8545					ENGL	445	ENGL	4452
				ECON	691	ECON	8555					ENGL	446	ENGL	4462
				ECON	656	ECON	8565					ENGL	450	ENGL	4502
				ECON	658	ECON	8585					ENGL	451	ENGL	4512
				ECON	461	ECON	4616					ENGL	452	ENGL	4522
				ECON	561	ECON	5616					ENGL	453	ENGL	4532
				ECON	666	ECON	8666					ENGL	454	ENGL	4542
				ECON	667	ECON	8676					ENGL	455	ENGL	4552
				ECON	668	ECON	8686					ENGL	456	ENGL	4562
				ECON	469	ECON	4697					ENGL	457	ENGL	4572
				ECON	476	ECON	4767					ENGL	460	ENGL	4602
				ECON	569	ECON	5697					ENGL	461	ENGL	4612
				ECON	576	ECON	5767					ENGL	465	ENGL	4652
				ECON	675	ECON	8757					ENGL	466	ENGL	4662
				ECON	381	ECON	3818					ENGL	470	ENGL	4672
				ECON	480	ECON	4808					ENGL	471	ENGL	4682
				ECON	481	ECON	4818					ENGL	472	ENGL	4692
				ECON	483	ECON	4838					ENGL	473	ENGL	4702
				ECON	580	ECON	5808					ENGL	479	ENGL	4712
				ECON	583	ECON	5838					ENGL	490	ENGL	4722
				ECON	581	ECON	6818					ENGL	491	ENGL	4732
				ECON	582	ECON	6828					ENGL	492	ENGL	4742
				ECON	680	ECON	7808					ENGL	493	ENGL	4752
				ECON	681	ECON	7818					ENGL	494	ENGL	4762
				ECON	607	ECON	8808					ENGL	495	ENGL	4772
				ECON	608	ECON	8818					ENGL	496	ENGL	4782
				ECON	683	ECON	8828					ENGL	497	ENGL	4792
				ECON	684	ECON	8838					ENGL	498	ENGL	4802
				ECON	498	ECON	4309					ENGL	521	ENGL	5213
				ECON	401	ECON	4319					ENGL	522	ENGL	5223
				ECON	402	ECON	4329					ENGL	523	ENGL	5233
				ECON	910	ECON	4909					ENGL	524	ENGL	5243
				ECON	631	ECON	6339					ENGL	525	ENGL	5253
				ECON	535	ECON	6359					ENGL	526	ENGL	5263
				ECON	536	ECON	6369					ENGL	527	ENGL	5273
				ECON	537	ECON	6379					ENGL	529	ENGL	5293
				ECON	538	ECON	6389					ENGL	594	ENGL	5303
				ECON	940	ECON	6909					ENGL	500	ENGL	5004
				ECON	999	ECON	6949					ENGL	501	ENGL	5014
				ECON	700	ECON	6959					ENGL	502	ENGL	5024
				ECON	635	ECON	8359					ENGL	503	ENGL	5034
				ECON	636	ECON	8369					ENGL	504	ENGL	5044
				ECON	637	ECON	8379					ENGL	505	ENGL	5054
				ECON	638	ECON	8389					ENGL	506	ENGL	5064
				ECON	950	ECON	8909					ENGL	507	ENGL	5074



212 Course Number Translation Table / Fine Arts

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
FA H	467	FINE	4619	FA H	999	FINE	6949	FR	517	FREN	5170	ITAL	492	ITAL	4710
FA H	435	FINE	4629	FA H	700	FINE	6959	FR	520	FREN	5200	ITAL	493	ITAL	4720
FA H	437	FINE	4639	<b>FRENCH AND ITALIAN</b>				FR	521	FREN	5210	<b>GEOGRAPHY</b>			
FA H	445	FINE	4649					<b>French</b>							
FA H	447	FINE	4659	FR	101	FREN	1010	FR	531	FREN	5310	GEOG	930	GEOG	3840
FA H	469	FINE	4669	FR	102	FREN	1020	FR	532	FREN	5320	GEOG	399	GEOG	3930
FA H	456	FINE	4709	FR	105	FREN	1050	FR	533	FREN	5330	GEOG	416	GEOG	4160
FA H	400	FINE	4719	FR	201	FREN	2010	FR	535	FREN	5350	GEOG	443	GEOG	4430
FA H	494	FINE	4729	FR	211	FREN	2110	FR	536	FREN	5360	GEOG	950	GEOG	5840
FA H	477	FINE	4809	FR	212	FREN	2120	FR	542	FREN	5420	GEOG	599	GEOG	5930
FA H	460	FINE	4919	FR	214	FREN	2140	FR	543	FREN	5430	GEOG	616	GEOG	6160
FA H	463	FINE	4939	FR	260	FREN	2600	FR	547	FREN	5470	GEOG	617	GEOG	6170
FA H	504	FINE	5009	FR	301	FREN	3010	FR	548	FREN	5480	GEOG	618	GEOG	6180
FA H	561	FINE	5019	FR	302	FREN	3020	FR	549	FREN	5490	GEOG	619	GEOG	6190
FA H	506	FINE	5029	FR	303	FREN	3030	FR	551	FREN	5510	GEOG	999	GEOG	6940
FA H	507	FINE	5039	FR	305	FREN	3050	FR	552	FREN	5520	GEOG	700	GEOG	6950
FA H	527	FINE	5049	FR	306	FREN	3060	FR	557	FREN	5570	GEOG	951	GEOG	7840
FA H	528	FINE	5059	FR	311	FREN	3110	FR	560	FREN	5600	GEOG	800	GEOG	8990
FA H	510	FINE	5069	FR	312	FREN	3120	FR	597	FREN	5770	GEOG	100	GEOG	1001
FA H	532	FINE	5079	FR	370	FREN	3700	FR	586	FREN	5860	GEOG	101	GEOG	1011
FA H	508	FINE	5089	FR	401	FREN	4010	FR	599	FREN	6840	GEOG	319	GEOG	3191
FA H	509	FINE	5099	FR	402	FREN	4020	FR	950	FREN	6850	GEOG	320	GEOG	3201
FA H	576	FINE	5109	FR	403	FREN	4030	FR	999	FREN	6940	GEOG	325	GEOG	3251
FA H	578	FINE	5119	FR	405	FREN	4050	FR	700	FREN	6950	GEOG	332	GEOG	3321
FA H	579	FINE	5129	FR	406	FREN	4060	FR	601	FREN	7010	GEOG	335	GEOG	3351
FA H	566	FINE	5139	FR	407	FREN	4070	FR	603	FREN	7030	GEOG	339	GEOG	3391
FA H	515	FINE	5159	FR	408	FREN	4080	FR	604	FREN	7040	GEOG	421	GEOG	4211
FA H	580	FINE	5209	FR	409	FREN	4090	FR	605	FREN	7050	GEOG	422	GEOG	4221
FA H	581	FINE	5219	FR	410	FREN	4100	FR	611	FREN	7110	GEOG	431	GEOG	4241
FA H	536	FINE	5229	FR	411	FREN	4110	FR	612	FREN	7120	GEOG	432	GEOG	4291
FA H	584	FINE	5239	FR	412	FREN	4120	FR	613	FREN	7130	GEOG	433	GEOG	4331
FA H	585	FINE	5249	FR	413	FREN	4130	FR	614	FREN	7140	GEOG	437	GEOG	4371
FA H	582	FINE	5259	FR	417	FREN	4170	FR	629	FREN	7290	GEOG	438	GEOG	4381
FA H	583	FINE	5269	FR	420	FREN	4200	FR	634	FREN	7340	GEOG	450	GEOG	4501
FA H	571	FINE	5309	FR	421	FREN	4210	FR	638	FREN	7380	GEOG	451	GEOG	4511
FA H	542	FINE	5319	FR	425	FREN	4250	FR	655	FREN	7550	GEOG	516	GEOG	5161
FA H	592	FINE	5329	FR	431	FREN	4310	FR	671	FREN	7710	GEOG	521	GEOG	5211
FA H	593	FINE	5339	FR	432	FREN	4320	FR	672	FREN	7720	GEOG	522	GEOG	5221
FA H	595	FINE	5349	FR	433	FREN	4330	FR	675	FREN	7750	GEOG	524	GEOG	5241
FA H	516	FINE	5359	FR	435	FREN	4350	FR	800	FREN	8990	GEOG	532	GEOG	5291
FA H	570	FINE	5409	FR	436	FREN	4360	<b>Italian</b>				GEOG	533	GEOG	5331
FA H	571	FINE	5419	FR	442	FREN	4420					ITAL	101	ITAL	1010
FA H	573	FINE	5429	FR	443	FREN	4430	ITAL	102	ITAL	1020	GEOG	538	GEOG	5381
FA H	572	FINE	5439	FR	447	FREN	4470	ITAL	207	ITAL	2070	GEOG	539	GEOG	5391
FA H	505	FINE	5449	FR	448	FREN	4480	ITAL	208	ITAL	2080	GEOG	550	GEOG	5501
FA H	574	FINE	5459	FR	449	FREN	4490	ITAL	211	ITAL	2110	GEOG	523	GEOG	5951
FA H	575	FINE	5469	FR	451	FREN	4510	ITAL	212	ITAL	2120	GEOG	525	GEOG	5961
FA H	587	FINE	5479	FR	452	FREN	4520	ITAL	213	ITAL	2130	GEOG	621	GEOG	6211
FA H	548	FINE	5489	FR	460	FREN	4600	ITAL	312	ITAL	3120	GEOG	630	GEOG	6301
FA H	588	FINE	5509	FR	495	FREN	4750	ITAL	313	ITAL	3130	GEOG	198	GEOG	1982
FA H	565	FINE	5609	FR	940	FREN	4840	ITAL	321	ITAL	3210	GEOG	199	GEOG	1992
FA H	567	FINE	5619	FR	945	FREN	4850	ITAL	322	ITAL	3220	GEOG	200	GEOG	2002
FA H	535	FINE	5629	FR	501	FREN	5010	ITAL	360	ITAL	3600	GEOG	525	GEOG	5961
FA H	537	FINE	5639	FR	503	FREN	5030	ITAL	401	ITAL	4010	GEOG	621	GEOG	6211
FA H	545	FINE	5649	FR	505	FREN	5050	ITAL	402	ITAL	4020	GEOG	630	GEOG	6301
FA H	547	FINE	5659	FR	506	FREN	5060	ITAL	402	ITAL	4020	GEOG	198	GEOG	1982
FA H	556	FINE	5709	FR	507	FREN	5070	ITAL	411	ITAL	4110	GEOG	199	GEOG	1992
FA H	577	FINE	5809	FR	508	FREN	5080	ITAL	413	ITAL	4130	GEOG	200	GEOG	2002
FA H	950	FINE	5909	FR	509	FREN	5090	ITAL	420	ITAL	4200	GEOG	525	GEOG	5961
FA H	560	FINE	5919	FR	510	FREN	5100	ITAL	425	ITAL	4250	GEOG	621	GEOG	6211
FA H	562	FINE	5929	FR	511	FREN	5110	ITAL	428	ITAL	4280	GEOG	630	GEOG	6301
FA H	563	FINE	5939	FR	512	FREN	5120	ITAL	451	ITAL	4510	GEOG	198	GEOG	1982
FA H	960	FINE	6909	FR	513	FREN	5130	ITAL	452	ITAL	4520	GEOG	199	GEOG	1992
FA H	649	FINE	6919					ITAL	470	ITAL	4700	GEOG	200	GEOG	2002
												GEOG	340	GEOG	3402
												GEOG	341	GEOG	3412
												GEOG	342	GEOG	3422
												GEOG	381	GEOG	3812
												GEOG	386	GEOG	3862
												GEOG	461	GEOG	4612
												GEOG	462	GEOG	4622
												GEOG	466	GEOG	4662
												GEOG	467	GEOG	4672
												GEOG	471	GEOG	4712
												GEOG	472	GEOG	4722
												GEOG	473	GEOG	4732

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course					
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.				
GEOG	474	GEOG	4742	GEOL	405	GEOL	4050	GEOL	558	GEOL	5580	GEOL	958	GEOL	5848				
GEOG	475	GEOG	4752	GEOL	410	GEOL	4100	GEOL	559	GEOL	5590	GEOL	949	GEOL	4849				
GEOG	482	GEOG	4822	GEOL	411	GEOL	4110	GEOL	561	GEOL	5610	GEOL	959	GEOL	5849				
GEOG	483	GEOG	4832	GEOL	412	GEOL	4120	GEOL	562	GEOL	5620	<b>GERMANIC LANGUAGES AND LITERATURES</b>							
GEOG	487	GEOG	4872	GEOL	413	GEOL	4130	GEOL	564	GEOL	5640								
GEOG	488	GEOG	4882	GEOL	414	GEOL	4140	GEOL	565	GEOL	5650								
GEOG	489	GEOG	4892	GEOL	420	GEOL	4200	GEOL	567	GEOL	5670								
GEOG	490	GEOG	4902	GEOL	425	GEOL	4250	GEOL	568	GEOL	5680								
GEOG	515	GEOG	5152	GEOL	435	GEOL	4350	GEOL	569	GEOL	5690								
GEOG	529	GEOG	5292	GEOL	436	GEOL	4360	GEOL	570	GEOL	5700								
GEOG	561	GEOG	5612	GEOL	447	GEOL	4470	GEOL	571	GEOL	5710								
GEOG	562	GEOG	5622	GEOL	448	GEOL	4480	GEOL	572	GEOL	5720								
GEOG	564	GEOG	5642	GEOL	453	GEOL	4530	GEOL	573	GEOL	5730								
GEOG	566	GEOG	5662	GEOL	459	GEOL	4590	GEOL	574	GEOL	5740								
GEOG	567	GEOG	5672	GEOL	464	GEOL	4640	GEOL	575	GEOL	5750								
GEOG	571	GEOG	5712	GEOL	465	GEOL	4650	GEOL	576	GEOL	5760								
GEOG	572	GEOG	5722	GEOL	467	GEOL	4670	GEOL	577	GEOL	5770								
GEOG	573	GEOG	5732	GEOL	470	GEOL	4700	GEOL	578	GEOL	5780								
GEOG	574	GEOG	5742	GEOL	940	GEOL	4840	GEOL	579	GEOL	5790								
GEOG	575	GEOG	5752	GEOL	493	GEOL	4940	GEOL	580	GEOL	5800								
GEOG	640	GEOG	6402	GEOL	495	GEOL	4950	GEOL	950	GEOL	5840								
GEOG	671	GEOG	6712	GEOL	496	GEOL	4960	GEOL	960	GEOL	5850								
GEOG	672	GEOG	6722	GEOL	497	GEOL	4970	GEOL	593	GEOL	5940								
GEOG	673	GEOG	6732	GEOL	499	GEOL	4990	GEOL	627	GEOL	6270								
GEOG	674	GEOG	6742	GEOL	503	GEOL	5030	GEOL	631	GEOL	6310								
GEOG	305	GEOG	3053	GEOL	504	GEOL	5040	GEOL	632	GEOL	6320								
GEOG	306	GEOG	3063	GEOL	505	GEOL	5050	GEOL	653	GEOL	6530								
GEOG	401	GEOG	4013	GEOL	507	GEOL	5070	GEOL	596	GEOL	6610								
GEOG	402	GEOG	4023	GEOL	510	GEOL	5100	GEOL	597	GEOL	6620								
GEOG	404	GEOG	4043	GEOL	512	GEOL	5120	GEOL	598	GEOL	6630								
GEOG	405	GEOG	4053	GEOL	514	GEOL	5140	GEOL	655	GEOL	6650								
GEOG	406	GEOG	4063	GEOL	516	GEOL	5160	GEOL	582	GEOL	6660								
GEOG	409	GEOG	4093	GEOL	517	GEOL	5170	GEOL	698	GEOL	6670								
GEOG	410	GEOG	4103	GEOL	519	GEOL	5190	GEOL	678	GEOL	6680								
GEOG	417	GEOG	4173	GEOL	520	GEOL	5200	GEOL	679	GEOL	6690								
GEOG	498	GEOG	4983	GEOL	521	GEOL	5210	GEOL	999	GEOL	6940								
GEOG	531	GEOG	5013	GEOL	523	GEOL	5230	GEOL	700	GEOL	6950								
GEOG	504	GEOG	5043	GEOL	525	GEOL	5250	GEOL	970	GEOL	6960								
GEOG	506	GEOG	5063	GEOL	526	GEOL	5260	GEOL	800	GEOL	8990								
GEOG	509	GEOG	5093	GEOL	527	GEOL	5270	GEOL	463	GEOL	4241								
GEOG	510	GEOG	5103	GEOL	528	GEOL	5280	GEOL	460	GEOL	4291								
GEOG	602	GEOG	5183	GEOL	530	GEOL	5300	GEOL	941	GEOL	4841								
GEOG	598	GEOG	5983	GEOL	531	GEOL	5310	GEOL	563	GEOL	5241								
<b>GEOLOGICAL SCIENCES</b>				GEOL	533	GEOL	5330	GEOL	560	GEOL	5291	GER	597	GRMN	5470				
				GEOL	534	GEOL	5340	GEOL	951	GEOL	5841	GER	950	GRMN	5900				
				GEOL	535	GEOL	5350	GEOL	961	GEOL	5851	GER	610	GRMN	5910				
				GEOL	536	GEOL	5360	GEOL	595	GEOL	5951	GER	720	GRMN	6100				
				GEOL	539	GEOL	5390	GEOL	942	GEOL	4842	GER	721	GRMN	6110				
				GEOL	540	GEOL	5400	GEOL	952	GEOL	5842	GER	710	GRMN	6300				
				GEOL	541	GEOL	5410	GEOL	477	GEOL	4023	GER	711	GRMN	6310				
				GEOL	542	GEOL	5420	GEOL	409	GEOL	4093	GER	731	GRMN	6410				
				GEOL	107	GEOL	1070	GEOL	543	GEOL	5430	GEOL	943	GEOL	4843	GER	999	GRMN	6940
				GEOL	113	GEOL	1130	GEOL	544	GEOL	5440	GEOL	509	GEOL	5093	GER	700	GRMN	6950
GEOL	114	GEOL	1140	GEOL	545	GEOL	5450	GEOL	615	GEOL	5183	GER	250	GRMN	2501				
GEOL	153	GEOL	1530	GEOL	546	GEOL	5460	GEOL	953	GEOL	5843	GER	480	GRMN	4501				
GEOL	301	GEOL	3010	GEOL	547	GEOL	5470	GEOL	944	GEOL	4844	<b>Scandinavian Program</b>							
GEOL	302	GEOL	3020	GEOL	548	GEOL	5480	GEOL	954	GEOL	5844								
GEOL	307	GEOL	3070	GEOL	549	GEOL	5490	GEOL	945	GEOL	4845					NORW	101	NORW	1010
GEOL	312	GEOL	3120	GEOL	550	GEOL	5500	GEOL	955	GEOL	5845					NORW	102	NORW	1020
GEOL	331	GEOL	3310	GEOL	551	GEOL	5510	GEOL	946	GEOL	4846					NORW	910	NORW	1900
GEOL	340	GEOL	3400	GEOL	552	GEOL	5520	GEOL	956	GEOL	5846					NORW	211	NORW	2110
GEOL	341	GEOL	3410	GEOL	555	GEOL	5550	GEOL	947	GEOL	4847					NORW	920	NORW	2900
GEOL	342	GEOL	3420	GEOL	556	GEOL	5560	GEOL	957	GEOL	5847					NORW	930	NORW	3900
GEOL	404	GEOL	4040	GEOL	557	GEOL	5570	GEOL	948	GEOL	4848					NORW	940	NORW	4900



## 214 Course Number Translation Table / Germanic Languages and Literature

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
SCAN	910	SCAN	1900	HIST	439	HIST	4112	HIST	162	HIST	1045	HIST	325	HIST	3417
SCAN	920	SCAN	2900	HIST	423	HIST	4122	HIST	910	HIST	2845	HIST	457	HIST	4217
SCAN	930	SCAN	3900	HIST	425	HIST	4222	HIST	911	HIST	2845	HIST	458	HIST	4227
SCAN	940	SCAN	4900	HIST	426	HIST	4232	HIST	311	HIST	3115	HIST	459	HIST	4327
SCAN	225	SCAN	2251	HIST	431	HIST	4312	HIST	341	HIST	3155	HIST	360	HIST	4617
SWED	101	SWED	1010	HIST	432	HIST	4412	HIST	317	HIST	3415	HIST	361	HIST	4627
SWED	102	SWED	1020	HIST	643	HIST	6012	HIST	347	HIST	3455	HIST	658	HIST	6317
SWED	910	SWED	1900	HIST	632	HIST	6112	HIST	940	HIST	3845	HIST	758	HIST	7257
SWED	211	SWED	2110	HIST	633	HIST	6122	HIST	941	HIST	3845	HIST	181	HIST	1018
SWED	212	SWED	2120	HIST	613	HIST	6212	HIST	450	HIST	4115	HIST	182	HIST	1028
SWED	920	SWED	2900	HIST	734	HIST	7052	HIST	434	HIST	4125	HIST	126	HIST	1038
SWED	930	SWED	3900	HIST	733	HIST	7162	HIST	451	HIST	4215	HIST	120	HIST	1208
SWED	940	SWED	4900	HIST	727	HIST	7252	HIST	452	HIST	4225	HIST	121	HIST	1308
<b>HISTORY</b>				HIST	141	HIST	1113	HIST	456	HIST	4235	HIST	122	HIST	1408
HIST	101	HIST	1010	HIST	142	HIST	1123	HIST	453	HIST	4315	HIST	123	HIST	1608
HIST	102	HIST	1020	HIST	235	HIST	2433	HIST	449	HIST	4325	HIST	124	HIST	1708
HIST	111	HIST	1030	HIST	306	HIST	3113	HIST	454	HIST	4415	HIST	270	HIST	2718
HIST	112	HIST	1040	HIST	336	HIST	3153	HIST	465	HIST	4425	HIST	321	HIST	3018
HIST	207	HIST	2170	HIST	323	HIST	3713	HIST	466	HIST	4435	HIST	320	HIST	3628
HIST	208	HIST	2180	HIST	353	HIST	3753	HIST	950	HIST	5845	HIST	318	HIST	3718
HIST	901	HIST	2840	HIST	413	HIST	4013	HIST	951	HIST	5845	HIST	481	HIST	4118
HIST	902	HIST	3840	HIST	445	HIST	4033	HIST	650	HIST	6115	HIST	482	HIST	4128
HIST	441	HIST	4110	HIST	446	HIST	4043	HIST	669	HIST	6325	HIST	417	HIST	4218
HIST	442	HIST	4120	HIST	398	HIST	4063	HIST	665	HIST	6425	HIST	418	HIST	4238
HIST	498	HIST	4840	HIST	440	HIST	4123	HIST	666	HIST	6435	HIST	488	HIST	4318
HIST	499	HIST	4850	HIST	443	HIST	4133	HIST	750	HIST	7155	HIST	489	HIST	4328
HIST	600	HIST	5000	HIST	444	HIST	4143	HIST	765	HIST	7475	HIST	491	HIST	4338
HIST	601	HIST	5010	HIST	447	HIST	4153	HIST	766	HIST	7485	HIST	478	HIST	4428
HIST	500	HIST	5020	HIST	448	HIST	4163	HIST	960	HIST	7845	HIST	473	HIST	4618
HIST	685	HIST	5050	HIST	433	HIST	4223	HIST	961	HIST	7845	HIST	474	HIST	4628
HIST	690	HIST	5060	HIST	435	HIST	4413	HIST	298	HIST	2616	HIST	472	HIST	4648
HIST	785	HIST	6050	HIST	436	HIST	4423	HIST	299	HIST	2626	HIST	475	HIST	4718
HIST	790	HIST	6060	HIST	427	HIST	4613	HIST	316	HIST	3116	HIST	476	HIST	4728
HIST	999	HIST	6940	HIST	428	HIST	4623	HIST	346	HIST	3156	HIST	378	HIST	4738
HIST	700	HIST	6950	HIST	428	HIST	4623	HIST	314	HIST	3416	HIST	376	HIST	4748
HIST	800	HIST	8990	HIST	493	HIST	4713	HIST	314	HIST	3416	HIST	376	HIST	4748
HIST	105	HIST	1051	HIST	494	HIST	4723	HIST	345	HIST	3466	HIST	681	HIST	6018
HIST	106	HIST	1061	HIST	495	HIST	4733	HIST	467	HIST	4116	HIST	691	HIST	6318
HIST	211	HIST	2511	HIST	642	HIST	6113	HIST	468	HIST	4126	HIST	671	HIST	6618
HIST	212	HIST	2521	HIST	647	HIST	6123	HIST	480	HIST	4146	HIST	675	HIST	6718
HIST	913	HIST	2841	HIST	635	HIST	6413	HIST	492	HIST	4326	HIST	125	HIST	1009
HIST	301	HIST	3011	HIST	628	HIST	6613	HIST	463	HIST	4516	HIST	324	HIST	3019
HIST	302	HIST	3511	HIST	693	HIST	6723	HIST	464	HIST	4526	HIST	395	HIST	4019
HIST	332	HIST	3551	HIST	697	HIST	6733	HIST	461	HIST	4536	HIST	396	HIST	4029
HIST	943	HIST	3841	HIST	745	HIST	7153	HIST	462	HIST	4546	HIST	400	HIST	4619
HIST	402	HIST	4021	HIST	746	HIST	7163	HIST	470	HIST	4556	HIST	680	HIST	6019
HIST	403	HIST	4031	HIST	728	HIST	7653	HIST	486	HIST	4566	HIST	656	HIST	6329
HIST	407	HIST	4071	HIST	794	HIST	7773	HIST	487	HIST	4576	<b>HUMANITIES</b>			
HIST	408	HIST	4081	HIST	229	HIST	2114	HIST	668	HIST	6116	HUM	101	HUMN	1010
HIST	409	HIST	4091	HIST	308	HIST	3014	HIST	663	HIST	6516	HUM	102	HUMN	1020
HIST	411	HIST	4511	HIST	338	HIST	3054	HIST	670	HIST	6526	HUM	300	HUMN	3000
HIST	412	HIST	4521	HIST	305	HIST	3414	HIST	654	HIST	6536	HUM	416	HUMN	4160
HIST	421	HIST	4711	HIST	335	HIST	3454	HIST	661	HIST	6616	HUM	940	HUMN	4840
HIST	953	HIST	5841	HIST	415	HIST	4314	HIST	767	HIST	7156	HUM	305	HUMN	3051
HIST	603	HIST	6011	HIST	419	HIST	4414	HIST	763	HIST	7556	HUM	306	HUMN	3061
HIST	621	HIST	6511	HIST	420	HIST	4424	HIST	770	HIST	7566	HUM	407	HUMN	4082
HIST	722	HIST	7551	HIST	437	HIST	4434	HIST	761	HIST	7656	HUM	409	HUMN	4092
HIST	963	HIST	7841	HIST	438	HIST	4444	HIST	258	HIST	2117	HUM	410	HUMN	4102
HIST	810	HIST	8991	HIST	401	HIST	4614	HIST	215	HIST	2417	HUM	408	HUMN	4122
HIST	309	HIST	3012	HIST	634	HIST	6414	HIST	216	HIST	2427	HUM	303	HUMN	3033
HIST	339	HIST	3052	HIST	740	HIST	7464	HIST	201	HIST	2517	HUM	304	HUMN	3043
HIST	303	HIST	3112	HIST	676	HIST	8764	HIST	202	HIST	2527	HUM	401	HUMN	4003
HIST	304	HIST	3212	HIST	151	HIST	1015	HIST	271	HIST	2717	HUM	302	HUMN	4013
				HIST	152	HIST	1025	HIST	312	HIST	3317	HUM	411	HUMN	4093
				HIST	161	HIST	1035	HIST	342	HIST	3357				

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
HUM	402	HUMN	4004	PE	235	PHED	2010	LING	593	LING	5030
HUM	415	HUMN	4155	PE	237	PHED	2020	LING	520	LING	5200
HUM	482	HUMN	4825	PE	238	PHED	2030	LING	524	LING	5240
<b>KINESIOLOGY</b>				PE	239	PHED	2040	LING	541	LING	5410
PE	101	KINE	1010	PE	240	PHED	2050	LING	542	LING	5420
PE	920	KINE	2840	PE	241	PHED	2060	LING	543	LING	5430
PE	298	KINE	2910	PE	242	PHED	2070	LING	545	LING	5450
PE	320	KINE	3200	PE	260	PHED	2080	LING	597	LING	5570
PE	323	KINE	3230	PE	261	PHED	2090	LING	560	LING	5600
PE	342	KINE	3420	PE	262	PHED	2100	LING	561	LING	5610
PE	350	KINE	3500	PE	263	PHED	2110	LING	562	LING	5620
PE	371	KINE	3710	PE	264	PHED	2120	LING	950	LING	5900
PE	372	KINE	3720	PE	266	PHED	2130	LING	999	LING	6940
PE	445	KINE	4450	PE	267	PHED	2140	LING	700	LING	6950
PE	446	KINE	4460	PE	268	PHED	2150	LING	600	LING	7000
PE	448	KINE	4480	PE	225	PHED	2300	LING	610	LING	7100
PE	454	KINE	4540	PE	402	PHED	2310	LING	611	LING	7110
PE	465	KINE	4650	PE	293	PHED	2500	LING	641	LING	7410
PE	466	KINE	4660	PE	295	PHED	2510	LING	642	LING	7420
PE	467	KINE	4670	PE	279	PHED	2790	LING	643	LING	7430
PE	468	KINE	4680	PE	280	PHED	2800	LING	691	LING	7510
PE	490	KINE	4700	PE	346	PHED	3460	LING	692	LING	7520
PE	930	KINE	4850	PE	369	PHED	3690	LING	681	LING	7560
PE	940	KINE	4860	PE	401	PHED	4010	LING	697	LING	7570
PE	437	KINE	4930	PE	413	PHED	4130	LING	960	LING	7900
PE	501	KINE	5010	PE	415	PHED	4150	LING	750	LING	8100
PE	502	KINE	5020	PE	417	PHED	4170	LING	724	LING	8240
PE	503	KINE	5030	PE	418	PHED	4180	LING	741	LING	8410
PE	514	KINE	5140	PE	419	PHED	4190	LING	742	LING	8420
PE	552	KINE	5520	PE	484	PHED	4200	LING	743	LING	8430
PE	555	KINE	5550	PE	429	PHED	4290	LING	717	LING	8530
PE	560	KINE	5600	PE	449	PHED	4490	LING	738	LING	8540
PE	562	KINE	5620	PE	458	PHED	4580	LING	781	LING	8560
PE	563	KINE	5630	PE	485	PHED	4830	LING	797	LING	8570
PE	564	KINE	5640	<b>LATIN AMERICAN STUDIES</b>				LING	800	LING	8990
PE	565	KINE	5650	LA M	495	LAMS	3804	<b>English as a Second Language</b>			
PE	566	KINE	5660	LA M	940	LAMS	4854	ESL	180	ESLG	1110
PE	567	KINE	5670	LA M	498	LAMS	4815	ESL	181	ESLG	1120
PE	568	KINE	5680	<b>LINGUISTICS</b>				ESL	182	ESLG	1210
PE	570	KINE	5700	LING	100	LING	1000	ESL	183	ESLG	1220
PE	571	KINE	5710	LING	150	LING	1500	ESL	184	ESLG	1310
PE	572	KINE	5720	LING	200	LING	2000	ESL	185	ESLG	1320
PE	575	KINE	5750	LING	211	LING	2110	<b>MATHEMATICS</b>			
PE	579	KINE	5790	LING	220	LING	2200	MATH	101	MATH	1010
PE	580	KINE	5800	LING	229	LING	2800	MATH	102	MATH	1020
PE	588	KINE	5810	LING	920	LING	2900	MATH	107	MATH	1070
PE	585	KINE	5820	LING	343	LING	3430	MATH	108	MATH	1080
PE	592	KINE	5830	LING	350	LING	3500	MATH	110	MATH	1100
PE	950	KINE	5840	LING	389	LING	3800	MATH	111	MATH	1110
PE	601	KINE	6010	LING	493	LING	4030	MATH	112	MATH	1120
PE	602	KINE	6020	LING	422	LING	4220	MATH	130	MATH	1300
PE	620	KINE	6200	LING	424	LING	4240	MATH	940	MATH	1840
PE	640	KINE	6400	LING	441	LING	4410	MATH	230	MATH	2300
PE	662	KINE	6620	LING	442	LING	4420	MATH	240	MATH	2400
PE	690	KINE	6830	LING	456	LING	4560	MATH	281	MATH	2510
PE	699	KINE	6840	LING	497	LING	4570	MATH	272	MATH	2720
PE	999	KINE	6940	LING	460	LING	4600	MATH	275	MATH	2750
PE	700	KINE	6950	LING	461	LING	4610	MATH	311	MATH	3110
<b>Physical Education</b>				LING	462	LING	4620	MATH	313	MATH	3130
PE	113	PHED	1130	LING	498	LING	4810	MATH	314	MATH	3140
PE	176	PHED	1140	LING	499	LING	4830	MATH	315	MATH	3150
PE	177	PHED	1150	LING	940	LING	4900	MATH	317	MATH	3170
PE	197	PHED	1160					MATH	321	MATH	3210
								MATH	352	MATH	3720
								MATH	414	MATH	4180
								MATH	422	MATH	4220
								MATH	427	MATH	4270
								MATH	431	MATH	4310
								MATH	432	MATH	4320
								MATH	443	MATH	4430
								MATH	445	MATH	4450
								MATH	446	MATH	4460
								MATH	447	MATH	4470
								MATH	448	MATH	4480
								MATH	481	MATH	4510
								MATH	482	MATH	4520
								MATH	487	MATH	4570
								MATH	465	MATH	4650
								MATH	466	MATH	4660
								MATH	451	MATH	4710
								MATH	455	MATH	4730
								MATH	472	MATH	4800
								MATH	553	MATH	5030
								MATH	554	MATH	5040
								MATH	515	MATH	5150
								MATH	509	MATH	5180
								MATH	543	MATH	5430
								MATH	545	MATH	5460
								MATH	549	MATH	5470
								MATH	550	MATH	5480
								MATH	587	MATH	5570
								MATH	510	MATH	5800
								MATH	511	MATH	6110
								MATH	512	MATH	6120
								MATH	513	MATH	6130
								MATH	514	MATH	6140
								MATH	516	MATH	6160
								MATH	501	MATH	6210
								MATH	502	MATH	6220
								MATH	523	MATH	6230
								MATH	524	MATH	6240
								MATH	531	MATH	6310
								MATH	532	MATH	6320
								MATH	535	MATH	6350
								MATH	536	MATH	6360
								MATH	541	MATH	6410
								MATH	542	MATH	6420
								MATH	533	MATH	6470
								MATH	534	MATH	6480
								MATH	581	MATH	6510
								MATH	582	MATH	6520
								MATH	584	MATH	6540
								MATH	585	MATH	6550
								MATH	588	MATH	6580
								MATH	560	MATH	6600
								MATH	561	MATH	6610
								MATH	562	MATH	6620
								MATH	563	MATH	6630
								MATH	565	MATH	6650
								MATH	571	MATH	6710
								MATH	572	MATH	6720
								MATH	573	MATH	6730
								MATH	574	MATH	6740
								MATH	950	MATH	6900
								MATH	700	MATH	6950
								MATH	653	MATH	7030

216 Course Number Translation Table / Mathematics

Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.		
MATH 654	MATH 7040	<b>MUSEUM</b>		CHIN 950	CHIN 5900	PHIL 491	PHIL 4010		
MATH 655	MATH 7050	MUSM 941	MUSM 4840	CHIN 481	CHIN 4811	PHIL 403	PHIL 4030		
MATH 656	MATH 7060	MUSM 940	MUSM 4900	CHIN 482	CHIN 4821	PHIL 404	PHIL 4040		
MATH 613	MATH 8130	MUSM 951	MUSM 5840	CHIN 483	CHIN 4831	PHIL 407	PHIL 4070		
MATH 603	MATH 8230	MUSM 950	MUSM 5900	<b>Japanese</b>					
MATH 604	MATH 8240	MUSM 401	MUSM 4011	JPN 101	JPNS 1010	PHIL 408	PHIL 4080		
MATH 625	MATH 8250	MUSM 402	MUSM 4021	JPN 102	JPNS 1020	PHIL 411	PHIL 4090		
MATH 626	MATH 8260	MUSM 501	MUSM 5011	JPN 910	JPNS 1900	PHIL 425	PHIL 4250		
MATH 607	MATH 8270	MUSM 502	MUSM 5021	JPN 211	JPNS 2110	PHIL 426	PHIL 4260		
MATH 608	MATH 8280	MUSM 446	MUSM 4462	JPN 212	JPNS 2120	PHIL 438	PHIL 4380		
MATH 635	MATH 8330	MUSM 421	MUSM 4932	JPN 920	JPNS 2900	PHIL 409	PHIL 4390		
MATH 636	MATH 8340	MUSM 546	MUSM 5462	JPN 311	JPNS 3110	PHIL 444	PHIL 4440		
MATH 637	MATH 8370	MUSM 521	MUSM 5932	JPN 312	JPNS 3120	PHIL 460	PHIL 4600		
MATH 638	MATH 8380	MUSM 422	MUSM 4933	JPN 930	JPNS 3900	PHIL 470	PHIL 4700		
MATH 647	MATH 8430	MUSM 522	MUSM 5933	JPN 411	JPNS 4110	PHIL 473	PHIL 4730		
MATH 648	MATH 8440	MUSM 448	MUSM 4484	JPN 412	JPNS 4120	PHIL 474	PHIL 4740		
MATH 649	MATH 8470	MUSM 423	MUSM 4934	JPN 940	JPNS 4900	PHIL 490	PHIL 4800		
MATH 650	MATH 8480	MUSM 548	MUSM 5484	JPN 950	JPNS 5900	PHIL 495	PHIL 4950		
MATH 681	MATH 8510	MUSM 523	MUSM 5934	JPN 221	JPNS 2211	PHIL 510	PHIL 5020		
MATH 682	MATH 8520	MUSM 425	MUSM 4935	JPN 483	JPNS 4811	PHIL 580	PHIL 5080		
MATH 671	MATH 8750	MUSM 525	MUSM 5935	JPN 484	JPNS 4821	PHIL 511	PHIL 5090		
MATH 672	MATH 8760	MUSM 426	MUSM 4936	<b>PHILOSOPHY</b>					
MATH 960	MATH 8900	MUSM 526	MUSM 5936	PHIL 100	PHIL 1000	PHIL 508	PHIL 5100		
MATH 800	MATH 8990	MUSM 434	MUSM 4927	PHIL 102	PHIL 1100	PHIL 522	PHIL 5200		
MATH 505	MATH 6174	MUSM 435	MUSM 4937	PHIL 104	PHIL 1200	PHIL 503	PHIL 5210		
MATH 537	MATH 6404	MUSM 534	MUSM 5927	PHIL 103	PHIL 1300	PHIL 523	PHIL 5230		
MATH 538	MATH 6414	MUSM 535	MUSM 5937	PHIL 106	PHIL 1400	PHIL 514	PHIL 5240		
MATH 583	MATH 6534	MUSM 449	MUSM 4498	PHIL 112	PHIL 1440	PHIL 526	PHIL 5260		
MATH 617	MATH 8174	MUSM 549	MUSM 5498	PHIL 105	PHIL 1600	PHIL 595	PHIL 5290		
MATH 618	MATH 8184	<b>NATURAL SCIENCE</b>				PHIL 106	PHIL 1400	PHIL 530	PHIL 5300
MATH 639	MATH 8304	NASC 123	NASC 1230	PHIL 112	PHIL 1440	PHIL 534	PHIL 5340		
MATH 640	MATH 8314	NASC 124	NASC 1240	PHIL 107	PHIL 1700	PHIL 565	PHIL 5350		
MATH 631	MATH 8324	NASC 125	NASC 1250	PHIL 110	PHIL 1750	PHIL 538	PHIL 5380		
MATH 632	MATH 8334	NASC 910	NASC 1870	PHIL 192	PHIL 1800	PHIL 509	PHIL 5390		
MATH 633	MATH 8364	NASC 330	NASC 3180	PHIL 220	PHIL 2200	PHIL 542	PHIL 5400		
MATH 634	MATH 8374	NASC 321	NASC 3410	PHIL 202	PHIL 2220	PHIL 544	PHIL 5440		
MATH 673	MATH 8714	NASC 322	NASC 3420	PHIL 203	PHIL 2230	PHIL 549	PHIL 5490		
MATH 674	MATH 8724	NASC 323	NASC 3430	PHIL 294	PHIL 2290	PHIL 560	PHIL 5600		
MATH 689	MATH 8115	NASC 324	NASC 3440	PHIL 209	PHIL 2390	PHIL 570	PHIL 5700		
MATH 690	MATH 8135	NASC 930	NASC 3870	PHIL 244	PHIL 2440	PHIL 598	PHIL 5800		
MATH 688	MATH 8205	NASC 940	NASC 4870	PHIL 292	PHIL 2800	PHIL 950	PHIL 5840		
MATH 691	MATH 8315	NASC 325	NASC 3251	PHIL 920	PHIL 2840	PHIL 646	PHIL 6040		
MATH 692	MATH 8325	NASC 326	NASC 3261	PHIL 300	PHIL 3000	PHIL 647	PHIL 6050		
MATH 694	MATH 8405	<b>ORIENTAL LANGUAGES AND LITERATURES</b>				PHIL 301	PHIL 3010	PHIL 999	PHIL 6940
MATH 693	MATH 8435	<b>Chinese</b>				PHIL 310	PHIL 3060	PHIL 700	PHIL 6950
MATH 697	MATH 8505	CHIN 101	CHIN 1010	PHIL 316	PHIL 3160	PHIL 690	PHIL 6960		
MATH 695	MATH 8605	CHIN 102	CHIN 1020	PHIL 320	PHIL 3200	PHIL 800	PHIL 8990		
MATH 696	MATH 8705	CHIN 910	CHIN 1900	PHIL 326	PHIL 3260	PHIL 581	PHIL 5081		
MATH 698	MATH 8805	CHIN 211	CHIN 2110	PHIL 330	PHIL 3300	PHIL 591	PHIL 5091		
MATH 699	MATH 8815	CHIN 212	CHIN 2120	PHIL 335	PHIL 3350	PHIL 810	PHIL 8991		
<b>Applied Mathematics</b>				CHIN 212	CHIN 2120	PHIL 343	PHIL 3430	PHIL 582	PHIL 5082
A M 135	APPM 1350	CHIN 920	CHIN 2900	PHIL 315	PHIL 3360	PHIL 592	PHIL 5092		
A M 136	APPM 1360	CHIN 301	CHIN 3100	PHIL 340	PHIL 3400	PHIL 583	PHIL 5083		
A M 137	APPM 1370	CHIN 311	CHIN 3110	PHIL 341	PHIL 3410	PHIL 593	PHIL 5093		
A M 138	APPM 1380	CHIN 312	CHIN 3120	PHIL 342	PHIL 3420	PHIL 584	PHIL 5084		
A M 235	APPM 2350	CHIN 321	CHIN 3210	PHIL 343	PHIL 3430	PHIL 586	PHIL 5086		
A M 236	APPM 2360	CHIN 322	CHIN 3220	PHIL 344	PHIL 3440	PHIL 589	PHIL 5089		
A M 237	APPM 2370	CHIN 930	CHIN 3900	PHIL 305	PHIL 3450	<b>PHYSICS</b>			
<b>MEDIEVAL STUDIES</b>				CHIN 411	CHIN 4110	PHYS 101	PHYS 1010		
M ST 402	MEDV 4020	CHIN 412	CHIN 4120	PHYS 102	PHYS 1020	PHYS 111	PHYS 1110		
M ST 502	MEDV 5020	CHIN 499	CHIN 4230	PHYS 112	PHYS 1120	PHYS 114	PHYS 1140		
		CHIN 940	CHIN 4900	PHYS 115	PHYS 1150	PHYS 116	PHYS 1160		

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
PHYS	297	PHYS	1810	PHYS	597	PHYS	6620	PSC	446	PSCI	4231	PSC	510	PSCI	5012
PHYS	298	PHYS	1820	PHYS	598	PHYS	6630	PSC	447	PSCI	4241	PSC	513	PSCI	5032
PHYS	299	PHYS	1830	PHYS	655	PHYS	6650	PSC	448	PSCI	4251	PSC	514	PSCI	5042
PHYS	301	PHYS	2010	PHYS	582	PHYS	6680	PSC	449	PSCI	4261	PSC	519	PSCI	5072
PHYS	302	PHYS	2020	PHYS	678	PHYS	6680	PSC	492	PSCI	4271	PSC	560	PSCI	5112
PHYS	207	PHYS	2070	PHYS	679	PHYS	6690	PSC	430	PSCI	4301	PSC	563	PSCI	5122
PHYS	208	PHYS	2080	PHYS	999	PHYS	6940	PSC	940	PSCI	4841	PSC	565	PSCI	5132
PHYS	212	PHYS	2120	PHYS	700	PHYS	6950	PSC	501	PSCI	5011	PSC	599	PSCI	5902
PHYS	213	PHYS	2130	PHYS	602	PHYS	7010	PSC	503	PSCI	5031	PSC	699	PSCI	6902
PHYS	214	PHYS	2140	PHYS	603	PHYS	7030	PSC	504	PSCI	5041	PSC	700	PSCI	6952
PHYS	215	PHYS	2150	PHYS	604	PHYS	7040	PSC	505	PSCI	5051	PSC	510	PSCI	7012
PHYS	216	PHYS	2160	PHYS	605	PHYS	7050	PSC	509	PSCI	5061	PSC	513	PSCI	7032
PHYS	297	PHYS	2810	PHYS	606	PHYS	7060	PSC	550	PSCI	5071	PSC	514	PSCI	7042
PHYS	298	PHYS	2820	PHYS	516	PHYS	7160	PSC	553	PSCI	5081	PSC	519	PSCI	7072
PHYS	299	PHYS	2830	PHYS	517	PHYS	7170	PSC	554	PSCI	5091	PSC	560	PSCI	7112
PHYS	940	PHYS	2840	PHYS	644	PHYS	7230	PSC	555	PSCI	5101	PSC	563	PSCI	7122
PHYS	941	PHYS	2850	PHYS	645	PHYS	7240	PSC	656	PSCI	5141	PSC	565	PSCI	7132
PHYS	942	PHYS	2860	PHYS	627	PHYS	7270	PSC	599	PSCI	5901	PSC	599	PSCI	7902
PHYS	321	PHYS	3210	PHYS	628	PHYS	7280	PSC	699	PSCI	6901	PSC	699	PSCI	8902
PHYS	322	PHYS	3220	PHYS	631	PHYS	7310	PSC	700	PSCI	6951	PSC	800	PSCI	8992
PHYS	331	PHYS	3310	PHYS	632	PHYS	7320	PSC	501	PSCI	7011	PSC	521	PSCI	5013
PHYS	332	PHYS	3320	PHYS	690	PHYS	7440	PSC	503	PSCI	7031	PSC	523	PSCI	5023
PHYS	317	PHYS	3330	PHYS	691	PHYS	7450	PSC	504	PSCI	7041	PSC	525	PSCI	5033
PHYS	318	PHYS	3340	PHYS	652	PHYS	7510	PSC	505	PSCI	7051	PSC	526	PSCI	5043
PHYS	370	PHYS	3350	PHYS	653	PHYS	7530	PSC	509	PSCI	7061	PSC	527	PSCI	5053
PHYS	375	PHYS	3370	PHYS	656	PHYS	7550	PSC	550	PSCI	7071	PSC	529	PSCI	5073
PHYS	305	PHYS	3450	PHYS	687	PHYS	7710	PSC	553	PSCI	7081	PSC	572	PSCI	5083
PHYS	497	PHYS	3810	PHYS	688	PHYS	7720	PSC	554	PSCI	7091	PSC	574	PSCI	5093
PHYS	498	PHYS	3820	PHYS	692	PHYS	7730	PSC	555	PSCI	7101	PSC	599	PSCI	5903
PHYS	499	PHYS	3830	PHYS	693	PHYS	7740	PSC	656	PSCI	7141	PSC	699	PSCI	6903
PHYS	414	PHYS	4140	PHYS	685	PHYS	7770	PSC	599	PSCI	7901	PSC	700	PSCI	6953
PHYS	341	PHYS	4230	PHYS	695	PHYS	7810	PSC	699	PSCI	8901	PSC	521	PSCI	7013
PHYS	446	PHYS	4340	PHYS	696	PHYS	7820	PSC	800	PSCI	8991	PSC	523	PSCI	7023
PHYS	491	PHYS	4410	PHYS	697	PHYS	7830	PSC	201	PSCI	2012	PSC	525	PSCI	7033
PHYS	492	PHYS	4420	PHYS	950	PHYS	7840	PSC	202	PSCI	2022	PSC	526	PSCI	7043
PHYS	495	PHYS	4430	PHYS	951	PHYS	7850	PSC	211	PSCI	2112	PSC	527	PSCI	7053
PHYS	496	PHYS	4440	PHYS	952	PHYS	7860	PSC	212	PSCI	2122	PSC	529	PSCI	7073
PHYS	451	PHYS	4510	PHYS	800	PHYS	8990	PSC	222	PSCI	2222	PSC	572	PSCI	7083
PHYS	455	PHYS	4530					PSC	270	PSCI	2702	PSC	574	PSCI	7093
PHYS	461	PHYS	4610					PSC	410	PSCI	4002	PSC	699	PSCI	8903
PHYS	462	PHYS	4620					PSC	411	PSCI	4012	PSC	800	PSCI	8993
PHYS	497	PHYS	4810					PSC	412	PSCI	4022	PSC	240	PSCI	2404
PHYS	498	PHYS	4820					PSC	413	PSCI	4032	PSC	439	PSCI	4004
PHYS	499	PHYS	4830					PSC	415	PSCI	4042	PSC	441	PSCI	4024
PHYS	940	PHYS	4840					PSC	416	PSCI	4052	PSC	442	PSCI	4034
PHYS	941	PHYS	4850					PSC	417	PSCI	4062	PSC	443	PSCI	4044
PHYS	942	PHYS	4860					PSC	418	PSCI	4072	PSC	445	PSCI	4054
PHYS	501	PHYS	5010					PSC	419	PSCI	4082	PSC	490	PSCI	4064
PHYS	503	PHYS	5030					PSC	460	PSCI	4092	PSC	494	PSCI	4074
PHYS	504	PHYS	5040					PSC	461	PSCI	4102	PSC	496	PSCI	4084
PHYS	505	PHYS	5050					PSC	463	PSCI	4112	PSC	438	PSCI	4224
PHYS	514	PHYS	5140					PSC	467	PSCI	4122	PSC	497	PSCI	4284
PHYS	515	PHYS	5150					PSC	421	PSCI	4142	PSC	541	PSCI	5024
PHYS	517	PHYS	5170					PSC	422	PSCI	4152	PSC	543	PSCI	5044
PHYS	621	PHYS	5210					PSC	423	PSCI	4162	PSC	545	PSCI	5054
PHYS	625	PHYS	5250					PSC	425	PSCI	4172	PSC	642	PSCI	5084
PHYS	626	PHYS	5260					PSC	426	PSCI	4182	PSC	643	PSCI	5104
PHYS	595	PHYS	5430					PSC	428	PSCI	4192	PSC	599	PSCI	5904
PHYS	596	PHYS	5440					PSC	429	PSCI	4202	PSC	699	PSCI	6904
PHYS	585	PHYS	5770					PSC	470	PSCI	4212	PSC	700	PSCI	6954
PHYS	950	PHYS	5840					PSC	472	PSCI	4222	PSC	541	PSCI	7024
PHYS	951	PHYS	5850					PSC	473	PSCI	4232	PSC	543	PSCI	7044
PHYS	952	PHYS	5860					PSC	476	PSCI	4252	PSC	545	PSCI	7054
PHYS	596	PHYS	6610					PSC	479	PSCI	4262	PSC	642	PSCI	7084

**POLITICAL SCIENCE**







220 Course Number Translation Table / Theatre and Dance

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj. No.	Subj. No.	Subj. No.	Subj. No.	Subj. No.	Subj. No.	Subj. No.	Subj. No.	Subj. No.	Subj. No.	Subj. No.	Subj. No.
THTR 112	THTR 1021	THTR 492	THTR 4029	DNCE 314	DNCE 3015	WMST 409	WMST 4090				
THTR 410	THTR 4001	THTR 493	THTR 4039	DNCE 530	DNCE 5055	WMST 470	WMST 4700				
THTR 411	THTR 4011	THTR 494	THTR 4049	DNCE 413	DNCE 4016	WMST 471	WMST 4710				
THTR 412	THTR 4021	THTR 495	THTR 4059	DNCE 415	DNCE 4036	WMST 940	WMST 4840				
THTR 413	THTR 4031	THTR 496	THTR 4069	DNCE 513	DNCE 5016	WMST 492	WMST 4271				
THTR 414	THTR 4041	THTR 497	THTR 4079	DNCE 515	DNCE 5036	WMST 380	WMST 3012				
THTR 415	THTR 4051	THTR 950	THTR 4849	DNCE 620	DNCE 6056	WMST 326	WMST 3262				
THTR 416	THTR 4061	THTR 593	THTR 5039	DNCE 491	DNCE 4017	WMST 481	WMST 4012				
THTR 510	THTR 5001	THTR 594	THTR 5049	DNCE 492	DNCE 4027	WMST 427	WMST 4272				
THTR 511	THTR 5011	THTR 597	THTR 5079	DNCE 591	DNCE 5017	WMST 398	WMST 4063				
THTR 512	THTR 5021	THTR 960	THTR 5849	DNCE 592	DNCE 5027	WMST 401	WMST 4614				
THTR 513	THTR 5031	THTR 690	THTR 6009	DNCE 420	DNCE 4018	WMST 313	WMST 3135				
THTR 514	THTR 5041	THTR 970	THTR 6849	DNCE 494	DNCE 4038	WMST 205	WMST 1006				
THTR 515	THTR 5051	THTR 999	THTR 6949	DNCE 496	DNCE 4068	WMST 206	WMST 1016				
THTR 516	THTR 5061	THTR 700	THTR 6959	DNCE 594	DNCE 5038	WMST 204	WMST 2016				
THTR 517	THTR 5071	THTR 800	THTR 8999	DNCE 596	DNCE 5068	WMST 298	WMST 2616				
THTR 518	THTR 5081			DNCE 930	DNCE 2849	WMST 299	WMST 2626				
THTR 610	THTR 6001	<b>Dance</b>		DNCE 940	DNCE 3849	WMST 406	WMST 4016				
THTR 611	THTR 6011	DNCE 141	DNCE 1000	DNCE 950	DNCE 4849	WMST 456	WMST 4086				
THTR 612	THTR 6021	DNCE 142	DNCE 1010	DNCE 489	DNCE 4909	WMST 410	WMST 4619				
THTR 613	THTR 6031	DNCE 101	DNCE 1100	DNCE 479	DNCE 4919	WMST 477	WMST 4809				
THTR 619	THTR 6091	DNCE 102	DNCE 1110	DNCE 960	DNCE 5849						
THTR 230	THTR 2003	DNCE 103	DNCE 1120	DNCE 589	DNCE 5909						
THTR 231	THTR 2013	DNCE 104	DNCE 1130	DNCE 579	DNCE 5919						
THTR 232	THTR 2023	DNCE 151	DNCE 1160	DNCE 601	DNCE 6009						
THTR 233	THTR 2033	DNCE 131	DNCE 1200	DNCE 600	DNCE 6019						
THTR 330	THTR 3003	DNCE 132	DNCE 1220	DNCE 615	DNCE 6049						
THTR 331	THTR 3013	DNCE 143	DNCE 2040	DNCE 999	DNCE 6949						
THTR 332	THTR 3023	DNCE 144	DNCE 2050	DNCE 700	DNCE 6959						
THTR 333	THTR 3033	DNCE 133	DNCE 2240	DNCE 690	DNCE 6969						
THTR 430	THTR 4003	DNCE 134	DNCE 2250								
THTR 431	THTR 4013	DNCE 280	DNCE 2400	<b>UNIVERSITY WRITING PROGRAM</b>		<b>ACCOUNTING</b>					
THTR 432	THTR 4023	DNCE 105	DNCE 3160	A S 105	UWRP 1050	ACCT 200	ACCT 2000				
THTR 434	THTR 4043	DNCE 106	DNCE 3170	A S 115	UWRP 1150	ACCT 202	ACCT 2020				
THTR 435	THTR 4053	DNCE 107	DNCE 4180	A S 125	UWRP 1250	ACCT 231	ACCT 2310				
THTR 250	THTR 2005	DNCE 108	DNCE 4190	A S 910	UWRP 1840	ACCT 322	ACCT 3220				
THTR 251	THTR 2015	DNCE 191	DNCE 1001	A S 199	UWRP 1850	ACCT 323	ACCT 3230				
THTR 253	THTR 2035	DNCE 192	DNCE 1011	A S 205	UWRP 2050	ACCT 332	ACCT 3320				
THTR 260	THTR 2045	DNCE 181	DNCE 1101	A S 305	UWRP 3050	ACCT 424	ACCT 4240				
THTR 258	THTR 2085	DNCE 182	DNCE 1111	A S 315	UWRP 3150	ACCT 425	ACCT 4250				
THTR 259	THTR 2095	DNCE 193	DNCE 2021	A S 405	UWRP 4050	ACCT 433	ACCT 4330				
THTR 350	THTR 3005	DNCE 194	DNCE 2031	A S 415	UWRP 4150	ACCT 441	ACCT 4410				
THTR 351	THTR 3015	DNCE 183	DNCE 2121			ACCT 442	ACCT 4420				
THTR 352	THTR 3025	DNCE 184	DNCE 2131	<b>WOMEN STUDIES</b>		ACCT 454	ACCT 4540				
THTR 352	THTR 3035	DNCE 195	DNCE 3041	WMST 126	WMST 1260	ACCT 462	ACCT 4620				
THTR 356	THTR 3065	DNCE 186	DNCE 3051	WMST 200	WMST 2000	ACCT 480	ACCT 4800				
THTR 450	THTR 4005	DNCE 185	DNCE 3141	WMST 201	WMST 2010	B AD 490	ACCT 4810				
THTR 451	THTR 4015	DNCE 186	DNCE 3151	WMST 202	WMST 2080	B AD 495	ACCT 4820				
THTR 453	THTR 4035	DNCE 197	DNCE 4061	WMST 210	WMST 2100	B AD 930	ACCT 4900				
THTR 454	THTR 4045	DNCE 198	DNCE 4071	WMST 226	WMST 2260	B AD 501	ACCT 5010				
THTR 456	THTR 4065	DNCE 187	DNCE 4161	WMST 294	WMST 2290	ACCT 524	ACCT 5240				
THTR 457	THTR 4075	DNCE 188	DNCE 4171	WMST 230	WMST 2300	ACCT 525	ACCT 5250				
THTR 271	THTR 2017	DNCE 579	DNCE 5001	WMST 231	WMST 2310	ACCT 533	ACCT 5330				
THTR 272	THTR 2027	DNCE 510	DNCE 5101	WMST 270	WMST 2700	ACCT 541	ACCT 5410				
THTR 273	THTR 2037	DNCE 293	DNCE 2012	WMST 215	WMST 2910	ACCT 542	ACCT 5420				
THTR 471	THTR 4017	DNCE 598	DNCE 5052	WMST 300	WMST 3000	ACCT 554	ACCT 5540				
THTR 472	THTR 4027	DNCE 214	DNCE 2013	WMST 355	WMST 3550	ACCT 562	ACCT 5620				
THTR 473	THTR 4037	DNCE 290	DNCE 2033	WMST 370	WMST 3700	ACCT 580	ACCT 5800				
THTR 474	THTR 4047	DNCE 390	DNCE 3043	WMST 371	WMST 3710	B AD 620	ACCT 6200				
THTR 190	THTR 1009	DNCE 490	DNCE 4053	WMST 373	WMST 3730	ACCT 622	ACCT 6220				
THTR 930	THTR 2849	DNCE 590	DNCE 5053	WMST 373	WMST 3730	ACCT 625	ACCT 6250				
THTR 940	THTR 3849	DNCE 610	DNCE 6073	WMST 930	WMST 3840	ACCT 626	ACCT 6260				
THTR 490	THTR 4009	DNCE 380	DNCE 2014	WMST 399	WMST 3930	ACCT 627	ACCT 6270				
THTR 491	THTR 4019	DNCE 381	DNCE 3024	WMST 400	WMST 4000	ACCT 635	ACCT 6350				
				WMST 402	WMST 4020	ACCT 642	ACCT 6420				

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ACCT 200	ACCT 2000
ACCT 202	ACCT 2020
ACCT 231	ACCT 2310
ACCT 322	ACCT 3220
ACCT 323	ACCT 3230
ACCT 332	ACCT 3320
ACCT 424	ACCT 4240
ACCT 425	ACCT 4250
ACCT 433	ACCT 4330
ACCT 441	ACCT 4410
ACCT 442	ACCT 4420
ACCT 454	ACCT 4540
ACCT 462	ACCT 4620
ACCT 480	ACCT 4800
B AD 490	ACCT 4810
B AD 495	ACCT 4820
B AD 930	ACCT 4900
B AD 501	ACCT 5010
ACCT 524	ACCT 5240
ACCT 525	ACCT 5250
ACCT 533	ACCT 5330
ACCT 541	ACCT 5410
ACCT 542	ACCT 5420
ACCT 554	ACCT 5540
ACCT 562	ACCT 5620
ACCT 580	ACCT 5800
B AD 620	ACCT 6200
ACCT 622	ACCT 6220
ACCT 625	ACCT 6250
ACCT 626	ACCT 6260
ACCT 627	ACCT 6270
ACCT 635	ACCT 6350
ACCT 642	ACCT 6420

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course					
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.				
ACCT	643	ACCT	6430	INS	487	FNCE	4770	MK	350	MKTG	3500	PRMG	560	OPMG	5600				
ACCT	644	ACCT	6440	B AD	490	FNCE	4810	MK	490	MKTG	4100	M SC	601	OPMG	6010				
ACCT	645	ACCT	6450	B AD	495	FNCE	4820	MK	430	MKTG	4300	M SC	602	OPMG	6020				
ACCT	646	ACCT	6460	B AD	932	FNCE	4900	B AD	440	MKTG	4400	PRMG	640	OPMG	6400				
ACCT	647	ACCT	6470	B AD	505	FNCE	5050	B AD	442	MKTG	4420	B AD	695	OPMG	6820				
ACCT	649	ACCT	6490	B AD	508	FNCE	5080	MK	450	MKTG	4500	M SC	960	OPMG	6900				
ACCT	650	ACCT	6500	FIN	534	FNCE	5340	MK	460	MKTG	4600	PRMG	999	OPMG	6940				
ACCT	652	ACCT	6520	FIN	540	FNCE	5400	MK	485	MKTG	4650	M SC	700	OPMG	6950				
ACCT	662	ACCT	6620	FIN	553	FNCE	5530	MK	470	MKTG	4700	PRMG	700	OPMG	6950				
B AD	695	ACCT	6820	INS	584	FNCE	5740	MK	475	MKTG	4750	B AD	695	OPMG	8820				
ACCT	960	ACCT	6900	INS	587	FNCE	5770	MK	480	MKTG	4800	M SC	960	OPMG	8900				
ACCT	999	ACCT	6940	FIN	601	FNCE	6010	B AD	490	MKTG	4810	PRMG	960	OPMG	8900				
ACCT	700	ACCT	6950	FIN	602	FNCE	6020	B AD	495	MKTG	4820	M SC	800	OPMG	8990				
ACCT	730	ACCT	7300	B AD	610	FNCE	6100	B AD	935	MKTG	4900	<b>ORGANIZATION MANAGEMENT</b>							
ACCT	732	ACCT	7320	B AD	615	FNCE	6150	B AD	503	MKTG	5030	ORMG	330	ORMG	3300				
B AD	790	ACCT	7830	FIN	633	FNCE	6330	MK	590	MKTG	5100	ORMG	335	ORMG	3350				
B AD	695	ACCT	8820	FIN	655	FNCE	6550	MK	550	MKTG	5500	ORMG	437	ORMG	4320				
ACCT	960	ACCT	8900	B AD	695	FNCE	6820	MK	560	MKTG	5600	B AD	490	ORMG	4810				
ACCT	800	ACCT	8990	FIN	960	FNCE	6900	MK	585	MKTG	5650	B AD	495	ORMG	4820				
<b>BUSINESS ENVIRONMENT AND POLICY</b>				FIN	999	FNCE	6940	MK	570	MKTG	5700	B AD	938	ORMG	4900				
B AD	100	BPOL	1500	FIN	700	FNCE	6950	MK	575	MKTG	5750	B AD	504	ORMG	5040				
B AD	450	BPOL	4500	FIN	720	FNCE	7200	MK	600	MKTG	6000	B AD	640	ORMG	6300				
B AD	451	BPOL	4510	FIN	733	FNCE	7330	MK	604	MKTG	6040	ORMG	602	ORMG	6310				
B AD	452	BPOL	4520	FIN	755	FNCE	7550	MK	605	MKTG	6050	ORMG	636	ORMG	6320				
B AD	411	BPOL	4550	B AD	790	FNCE	7830	MK	610	MKTG	6100	ORMG	632	ORMG	6330				
B AD	650	BPOL	6500	B AD	695	FNCE	8820	B AD	695	MKTG	6820	ORMG	633	ORMG	6340				
B AD	755	BPOL	7500	FIN	960	FNCE	8900	MK	960	MKTG	6900	ORMG	635	ORMG	6350				
B AD	756	BPOL	7530	FIN	800	FNCE	8990	MK	999	MKTG	6940	ORMG	637	ORMG	6360				
B AD	757	BPOL	7560	<b>INFORMATION SYSTEMS</b>				I S	200	INFS	2000	MK	700	MKTG	6950	B AD	695	ORMG	6820
B AD	960	BPOL	8900	I S	220	INFS	2200	MK	620	MKTG	7000	MK	620	MKTG	7000	ORMG	960	ORMG	6900
B AD	800	BPOL	8990	I S	221	INFS	2210	MK	710	MKTG	7100	MK	710	MKTG	7100	ORMG	999	ORMG	6940
<b>BUSINESS LAW</b>				I S	330	INFS	3300	MK	720	MKTG	7200	MK	720	MKTG	7200	ORMG	700	ORMG	6950
BLAW	300	BSLW	3000	I S	450	INFS	3500	MK	630	MKTG	7300	MK	630	MKTG	7300	ORMG	710	ORMG	7320
BLAW	412	BSLW	4120	I S	420	INFS	4200	MK	640	MKTG	7400	MK	640	MKTG	7400	ORMG	708	ORMG	7330
B AD	495	BSLW	4820	I S	365	INFS	4650	MK	650	MKTG	7500	B AD	790	MKTG	7830	B AD	790	ORMG	7830
B AD	506	BSLW	5060	I S	366	INFS	4660	B AD	695	MKTG	8820	B AD	695	MKTG	8820	B AD	695	ORMG	8820
BLAW	512	BSLW	5120	I S	470	INFS	4700	MK	960	MKTG	8900	ORMG	960	ORMG	8900	ORMG	960	ORMG	8900
BLAW	604	BSLW	6040	B AD	490	INFS	4810	MK	800	MKTG	8990	ORMG	800	ORMG	8990	<b>PERSONNEL-HUMAN RESOURCE MANAGEMENT</b>			
<b>ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT</b>				B AD	495	INFS	4820	<b>MINERALS LAND MANAGEMENT</b>				MLMG	495	MLMG	4600	PHR	438	PHRM	4400
B AD	470	SBME	4700	B AD	933	INFS	4900	MLMG	485	MLMG	4610	B AD	936	MLMG	4900	PHR	434	PHRM	4410
B AD	943	SBME	4900	I S	500	INFS	5000	<b>OPERATIONS MANAGEMENT</b>				Q M	201	OPMG	2010	PHR	439	PHRM	4420
B AD	670	SBME	6700	I S	520	INFS	5200	Q M	300	OPMG	3000	PHR	441	PHRM	4430	B AD	490	PHRM	4810
B AD	960	SBME	6900	I S	570	INFS	5700	Q M	430	OPMG	4300	B AD	495	PHRM	4820	B AD	495	PHRM	4820
<b>FINANCE</b>				I S	604	INFS	6040	PRMG	440	OPMG	4400	B AD	939	PHRM	4900	PHR	538	PHRM	5400
FIN	305	FNCE	3050	I S	645	INFS	6450	PRMG	444	OPMG	4440	PHR	534	PHRM	5410	PHR	539	PHRM	5420
FIN	321	FNCE	3210	I S	550	INFS	6500	PRMG	447	OPMG	4470	PHR	541	PHRM	5430	PHR	534	PHRM	5410
FIN	333	FNCE	3330	I S	665	INFS	6650	PRMG	460	OPMG	4600	PHR	638	PHRM	6400	PHR	634	PHRM	6410
FIN	355	FNCE	3550	I S	666	INFS	6660	B AD	490	OPMG	4810	B AD	695	PHRM	6820	PHR	960	PHRM	6900
FIN	401	FNCE	4010	B AD	695	INFS	6820	B AD	495	OPMG	4820	ORMG	709	PHRM	7400	<b>REAL ESTATE</b>			
FIN	402	FNCE	4020	M SC	960	INFS	6900	B AD	940	OPMG	4900	R ES	300	REAL	3000	R ES	401	REAL	4010
B AD	410	FNCE	4100	M SC	999	INFS	6940	B AD	502	OPMG	5020	R ES	430	REAL	4300	R ES	401	REAL	4010
B AD	433	FNCE	4330	M SC	700	INFS	6950	Q M	530	OPMG	5300					R ES	430	REAL	4300
FIN	434	FNCE	4340	B AD	695	INFS	8820	PRMG	540	OPMG	5400								
FIN	440	FNCE	4400	M SC	960	INFS	8900	PRMG	544	OPMG	5440								
FIN	441	FNCE	4410	M SC	800	INFS	8990	PRMG	547	OPMG	5470								
FIN	453	FNCE	4530	<b>MARKETING</b>				MK	300	MKTG	3000								
FIN	455	FNCE	4550	MK	310	MKTG	3100	MK	310	MKTG	3100								
INS	484	FNCE	4740	MK	320	MKTG	3200	MK	320	MKTG	3200								
				MK	330	MKTG	3300	MK	330	MKTG	3300								
				MK	340	MKTG	3400	MK	340	MKTG	3400								

Old 3-Digit Course Subj. No.		New 4-Digit Course Subj. No.		Old 3-Digit Course Subj. No.		New 4-Digit Course Subj. No.		Old 3-Digit Course Subj. No.		New 4-Digit Course Subj. No.		Old 3-Digit Course Subj. No.		New 4-Digit Course Subj. No.	
R ES	433	REAL	4330	EDUC	456	EDUC	4410	EDUC	525	EDUC	5255	EDUC	513	EDUC	6378
R ES	454	REAL	4540	EDUC	457	EDUC	4570	EDUC	526	EDUC	5265	EDUC	551	EDUC	6388
R ES	473	REAL	4730	EDUC	480	EDUC	4800	EDUC	527	EDUC	5275	EDUC	552	EDUC	6398
B AD	495	REAL	4820	EDUC	482	EDUC	4820	EDUC	766	EDUC	5285	EDUC	553	EDUC	6408
B AD	942	REAL	4900	EDUC	483	EDUC	4830	EDUC	532	EDUC	5325	EDUC	554	EDUC	6418
R ES	501	REAL	5010	EDUC	940	EDUC	4840	EDUC	534	EDUC	5345	EDUC	555	EDUC	6428
R ES	530	REAL	5300	EDUC	309	EDUC	3091	EDUC	535	EDUC	5355	EDUC	556	EDUC	6438
R ES	533	REAL	5330	EDUC	310	EDUC	3101	EDUC	536	EDUC	5365	EDUC	571	EDUC	6448
R ES	554	REAL	5540	EDUC	311	EDUC	3111	EDUC	537	EDUC	5375	EDUC	647	EDUC	6458
R ES	573	REAL	5730	EDUC	416	EDUC	4161	EDUC	538	EDUC	5385	EDUC	762	EDUC	6468
B AD	695	REAL	6820	EDUC	418	EDUC	4181	EDUC	557	EDUC	5395	EDUC	763	EDUC	6478
B AD	960	REAL	6900	EDUC	419	EDUC	4191	EDUC	543	EDUC	5405	EDUC	764	EDUC	6488
<b>TOURISM AND RECREATION</b>				EDUC	420	EDUC	4201	EDUC	544	EDUC	5415	EDUC	562	EDUC	6498
REC	201	TREC	2010	EDUC	421	EDUC	4211	EDUC	545	EDUC	5425	EDUC	563	EDUC	6508
REC	212	TREC	2120	EDUC	422	EDUC	4221	EDUC	546	EDUC	5435	EDUC	564	EDUC	6518
REC	310	TREC	3100	EDUC	450	EDUC	4501	EDUC	547	EDUC	5445	EDUC	597	EDUC	6528
REC	317	TREC	3170	EDUC	460	EDUC	4601	EDUC	548	EDUC	5455	EDUC	954	EDUC	6888
REC	320	TREC	3200	EDUC	470	EDUC	4691	EDUC	565	EDUC	5465	EDUC	759	EDUC	6918
REC	330	TREC	3300	EDUC	470	EDUC	4701	EDUC	566	EDUC	5475	EDUC	754	EDUC	6928
REC	340	TREC	3400	EDUC	410	EDUC	4102	EDUC	567	EDUC	5485	EDUC	605	EDUC	8318
REC	347	TREC	3470	EDUC	411	EDUC	4112	EDUC	569	EDUC	5495	EDUC	606	EDUC	8328
REC	400	TREC	4000	EDUC	412	EDUC	4122	EDUC	570	EDUC	5505	EDUC	678	EDUC	8338
REC	401	TREC	4010	EDUC	423	EDUC	4232	EDUC	572	EDUC	5515	EDUC	675	EDUC	8348
REC	403	TREC	4030	EDUC	432	EDUC	4322	EDUC	573	EDUC	5525	EDUC	674	EDUC	8358
REC	405	TREC	4050	EDUC	434	EDUC	4342	EDUC	574	EDUC	5535	EDUC	673	EDUC	8368
REC	407	TREC	4070	EDUC	435	EDUC	4352	EDUC	575	EDUC	5545	EDUC	679	EDUC	8378
REC	410	TREC	4100	EDUC	436	EDUC	4362	EDUC	760	EDUC	5555	EDUC	649	EDUC	8388
REC	420	TREC	4200	EDUC	437	EDUC	4372	EDUC	761	EDUC	5565	EDUC	650	EDUC	8398
REC	430	TREC	4300	EDUC	438	EDUC	4382	EDUC	595	EDUC	5575	EDUC	651	EDUC	8408
REC	434	TREC	4340	EDUC	441	EDUC	4412	EDUC	596	EDUC	5585	EDUC	617	EDUC	8418
REC	440	TREC	4400	EDUC	442	EDUC	4422	EDUC	952	EDUC	6855	EDUC	631	EDUC	8428
B AD	490	TREC	4810	EDUC	471	EDUC	4712	EDUC	757	EDUC	6915	EDUC	667	EDUC	8438
B AD	495	TREC	4820	EDUC	472	EDUC	4722	EDUC	752	EDUC	6925	EDUC	668	EDUC	8448
REC	941	TREC	4900	EDUC	473	EDUC	4732	EDUC	629	EDUC	7005	EDUC	669	EDUC	8458
REC	418	TREC	4930	EDUC	330	EDUC	3303	EDUC	630	EDUC	7015	EDUC	670	EDUC	8468
REC	944	TREC	4901	EDUC	446	EDUC	4463	EDUC	676	EDUC	7105	EDUC	671	EDUC	8478
REC	448	TREC	4931	EDUC	540	EDUC	6804	EDUC	963	EDUC	8855	EDUC	672	EDUC	8488
<b>TRANSPORTATION AND DISTRIBUTION MANAGEMENT</b>				EDUC	950	EDUC	6844	EDUC	982	EDUC	8935	EDUC	785	EDUC	8498
B AD	443	TRMG	4430	EDUC	999	EDUC	6944	EDUC	502	EDUC	5706	EDUC	786	EDUC	8508
TRMG	450	TRMG	4500	EDUC	700	EDUC	6954	EDUC	503	EDUC	5716	EDUC	787	EDUC	8518
TRMG	451	TRMG	4510	EDUC	619	EDUC	8804	EDUC	504	EDUC	5726	EDUC	623	EDUC	8528
TRMG	452	TRMG	4520	EDUC	960	EDUC	8844	EDUC	594	EDUC	5736	EDUC	624	EDUC	8538
TRMG	456	TRMG	4560	EDUC	801	EDUC	8984	EDUC	756	EDUC	6916	EDUC	625	EDUC	8548
TRMG	457	TRMG	4570	EDUC	811	EDUC	8984	EDUC	751	EDUC	6926	EDUC	662	EDUC	8558
TRMG	458	TRMG	4580	EDUC	800	EDUC	8994	EDUC	600	EDUC	7316	EDUC	965	EDUC	8888
B AD	495	TRMG	4820	EDUC	810	EDUC	8994	EDUC	601	EDUC	7326	EDUC	984	EDUC	8938
B AD	944	TRMG	4900	EDUC	500	EDUC	5005	EDUC	603	EDUC	7336	EDUC	953	EDUC	6899
TRMG	550	TRMG	5500	EDUC	577	EDUC	5015	EDUC	604	EDUC	7346	EDUC	758	EDUC	6919
TRMG	551	TRMG	5510	EDUC	582	EDUC	5025	EDUC	654	EDUC	7356	EDUC	753	EDUC	6929
TRMG	552	TRMG	5520	EDUC	584	EDUC	5035	EDUC	602	EDUC	7366	EDUC	964	EDUC	8899
TRMG	556	TRMG	5560	EDUC	549	EDUC	5045	EDUC	607	EDUC	7376	EDUC	983	EDUC	8939
TRMG	557	TRMG	5570	EDUC	628	EDUC	5055	EDUC	608	EDUC	7386	<b>College of Engineering and Applied Science</b>			
TRMG	558	TRMG	5580	EDUC	506	EDUC	5105	EDUC	609	EDUC	7396	<b>AEROSPACE ENGINEERING SCIENCES</b>			
TRMG	650	TRMG	6500	EDUC	508	EDUC	5115	EDUC	610	EDUC	7406	AERO	195	ASEN	1910
B AD	695	TRMG	6820	EDUC	514	EDUC	5125	EDUC	655	EDUC	7416	AERO	203	ASEN	2010
TRMG	960	TRMG	6900	EDUC	516	EDUC	5165	EDUC	962	EDUC	8866	AERO	204	ASEN	2020
<b>School of Education</b>				EDUC	517	EDUC	5175	EDUC	981	EDUC	8936	AERO	295	ASEN	2910
EDUC	201	EDUC	2010	EDUC	518	EDUC	5185	EDUC	682	EDUC	8087				
				EDUC	519	EDUC	5195	EDUC	501	EDUC	6318				
				EDUC	520	EDUC	5205	EDUC	511	EDUC	6328				
				EDUC	521	EDUC	5215	EDUC	512	EDUC	6338				
				EDUC	522	EDUC	5225	EDUC	581	EDUC	6348				
				EDUC	523	EDUC	5235	EDUC	580	EDUC	6358				
				EDUC	524	EDUC	5245	EDUC	579	EDUC	6368				

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
AERO	303	ASEN	3010	AERO	800	ASEN	8993	AERO	800	ASEN	8997
AERO	395	ASEN	3910	AERO	299	ASEN	2914	AERO	380	ASEN	3018
AERO	406	ASEN	4010	AERO	341	ASEN	3014	AERO	489	ASEN	4038
AERO	400	ASEN	4900	AERO	342	ASEN	3024	AERO	400	ASEN	4908
AERO	505	ASEN	5050	AERO	399	ASEN	3914	AERO	581	ASEN	5018
AERO	501	ASEN	5100	AERO	400	ASEN	4904	AERO	582	ASEN	5028
AERO	500	ASEN	5900	AERO	541	ASEN	5014	AERO	589	ASEN	5038
AERO	595	ASEN	5910	AERO	542	ASEN	5024	AERO	583	ASEN	5068
AERO	606	ASEN	6060	AERO	500	ASEN	5904	AERO	500	ASEN	5908
AERO	608	ASEN	6080	AERO	599	ASEN	5914	AERO	600	ASEN	6908
AERO	600	ASEN	6900	AERO	600	ASEN	6904	AERO	700	ASEN	6958
AERO	700	ASEN	6950	AERO	700	ASEN	6954	AERO	700	ASEN	6968
AERO	700	ASEN	6960	AERO	700	ASEN	6964	AERO	800	ASEN	8998
AERO	695	ASEN	7910	AERO	699	ASEN	7914	AERO	447	ASEN	4019
AERO	800	ASEN	8990	AERO	800	ASEN	8994	AERO	400	ASEN	4909
AERO	296	ASEN	2911	AERO	352	ASEN	3015	AERO	547	ASEN	5019
AERO	311	ASEN	3011	AERO	417	ASEN	4015	AERO	548	ASEN	5029
AERO	312	ASEN	3021	AERO	422	ASEN	4025	AERO	500	ASEN	5909
AERO	396	ASEN	3911	AERO	456	ASEN	4035	AERO	600	ASEN	6909
AERO	400	ASEN	4901	AERO	458	ASEN	4045	AERO	700	ASEN	6959
AERO	511	ASEN	5011	AERO	455	ASEN	4055	AERO	700	ASEN	6969
AERO	512	ASEN	5021	AERO	400	ASEN	4905	AERO	800	ASEN	8999
AERO	513	ASEN	5031	AERO	556	ASEN	5025				
AERO	514	ASEN	5041	AERO	556	ASEN	5045				
AERO	517	ASEN	5051	AERO	555	ASEN	5055	<b>ARCHITECTURAL</b>			
AERO	518	ASEN	5061	AERO	553	ASEN	5065	<b>ENGINEERING</b>			
AERO	565	ASEN	5071	AERO	500	ASEN	5905	AR E	201	AREN	2010
AERO	566	ASEN	5081	AERO	600	ASEN	6905	AR E	202	AREN	2020
AERO	500	ASEN	5901	AERO	700	ASEN	6955	AR E	301	AREN	3010
AERO	596	ASEN	5911	AERO	700	ASEN	6965	AR E	302	AREN	3020
AERO	613	ASEN	6031	AERO	800	ASEN	8995	AR E	303	AREN	3030
AERO	609	ASEN	6101	AERO	130	ASEN	1016	AR E	354	AREN	3540
AERO	600	ASEN	6901	AERO	132	ASEN	1026	AR E	363	AREN	3630
AERO	700	ASEN	6951	AERO	151	ASEN	1036	AR E	401	AREN	4010
AERO	700	ASEN	6961	AERO	363	ASEN	3016	AR E	405	AREN	4050
AERO	696	ASEN	7911	AERO	461	ASEN	4846	AR E	406	AREN	4060
AERO	800	ASEN	8991	AERO	462	ASEN	4856	AR E	455	AREN	4550
AERO	222	ASEN	2022	AERO	400	ASEN	4906	AR E	456	AREN	4560
AERO	297	ASEN	2912	AERO	495	ASEN	4916	AR E	457	AREN	4570
AERO	323	ASEN	3012	AERO	494	ASEN	4946	AR E	459	AREN	4590
AERO	324	ASEN	3022	AERO	498	ASEN	4986	AR E	400	AREN	4840
AERO	397	ASEN	3912	AERO	498	ASEN	4986	AR E	403	AREN	4035
AERO	400	ASEN	4902	AERO	563	ASEN	5016	AR E	404	AREN	4045
AERO	500	ASEN	5902	AERO	592	ASEN	5886	AR E	431	AREN	4315
AERO	597	ASEN	5912	AERO	591	ASEN	5896	AR E	130	AREN	1306
AERO	600	ASEN	6902	AERO	500	ASEN	5906	AR E	240	AREN	2406
AERO	700	ASEN	6952	AERO	590	ASEN	5906	AR E	441	AREN	4416
AERO	700	ASEN	6962	AERO	593	ASEN	5936	AR E	446	AREN	4466
AERO	697	ASEN	7912	AERO	594	ASEN	5946	AR E	102	AREN	1027
AERO	800	ASEN	8992	AERO	598	ASEN	5986	AR E	920	AREN	4849
AERO	232	ASEN	2013	AERO	600	ASEN	6906	AR E	930	AREN	4859
AERO	298	ASEN	2913	AERO	700	ASEN	6956	AR E	940	AREN	4869
AERO	398	ASEN	3913	AERO	700	ASEN	6966	AR E	941	AREN	4879
AERO	413	ASEN	4013	AERO	800	ASEN	8996	AR E	942	AREN	4889
AERO	430	ASEN	4023	AERO	478	ASEN	4017	AR E	943	AREN	4899
AERO	478	ASEN	4083	AERO	400	ASEN	4907	AR E	944	AREN	4909
AERO	400	ASEN	4903	AERO	578	ASEN	5017	<b>CHEMICAL</b>			
AERO	535	ASEN	5013	AERO	525	ASEN	5117	<b>ENGINEERING</b>			
AERO	500	ASEN	5903	AERO	527	ASEN	5127	CH E	130	CHEN	1300
AERO	598	ASEN	5913	AERO	572	ASEN	5207	CH E	920	CHEN	1840
AERO	600	ASEN	6903	AERO	573	ASEN	5217	CH E	920	CHEN	1850
AERO	700	ASEN	6953	AERO	500	ASEN	5907	CH E	920	CHEN	1860
AERO	700	ASEN	6963	AERO	600	ASEN	6907	CH E	920	CHEN	1870
AERO	698	ASEN	7913	AERO	700	ASEN	6957	CH E	920	CHEN	1880
				AERO	700	ASEN	6967	CH E	920	CHEN	1890
								CH E	920	CHEN	1900
								CH E	201	CHEN	2010
								CH E	210	CHEN	2100
								CH E	212	CHEN	2120
								CH E	920	CHEN	2840
								CH E	920	CHEN	2850
								CH E	920	CHEN	2860
								CH E	920	CHEN	2870
								CH E	920	CHEN	2880
								CH E	920	CHEN	2890
								CH E	920	CHEN	2900
								CH E	320	CHEN	3200
								CH E	321	CHEN	3210
								CH E	322	CHEN	3220
								CH E	370	CHEN	3700
								CH E	940	CHEN	3840
								CH E	940	CHEN	3850
								CH E	940	CHEN	3860
								CH E	940	CHEN	3870
								CH E	940	CHEN	3880
								CH E	940	CHEN	3890
								CH E	940	CHEN	3900
								CH E	403	CHEN	4030
								CH E	432	CHEN	4320
								CH E	433	CHEN	4330
								CH E	444	CHEN	4440
								CH E	452	CHEN	4520
								CH E	457	CHEN	4570
								CH E	458	CHEN	4580
								CH E	466	CHEN	4660
								CH E	471	CHEN	4710
								CH E	480	CHEN	4800
								CH E	481	CHEN	4810
								CH E	490	CHEN	4830
								CH E	940	CHEN	4840
								CH E	940	CHEN	4850
								CH E	940	CHEN	4860
								CH E	940	CHEN	4870
								CH E	940	CHEN	4880
								CH E	940	CHEN	4890
								CH E	940	CHEN	4900
								CH E	501	CHEN	5010
								CH E	590	CHEN	5090
								CH E	521	CHEN	5210
								CH E	522	CHEN	5220
								CH E	528	CHEN	5280
								CH E	536	CHEN	5360
								CH E	537	CHEN	5370
								CH E	538	CHEN	5380
								CH E	539	CHEN	5390
								CH E	542	CHEN	5420
								CH E	557	CHEN	5570
								CH E	558	CHEN	5580
								CH E	566	CHEN	5660
								CH E	569	CHEN	5690
								CH E	570	CHEN	5700
								CH E	571	CHEN	5710
								CH E	574	CHEN	5740
								CH E	575	CHEN	5750
								CH E	576	CHEN	5760
								CH E	580	CHEN	5800
								CH E	581	CHEN	5810
								CH E	950	CHEN	5840
								CH E	627	CHEN	6270

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
CH E	628	CHEN	6280	C E	562	CVEN	5622	C E	555	CVEN	7555	C E	962	CVEN	6869
CH E	639	CHEN	6390	C E	563	CVEN	5632	C E	556	CVEN	7565	C E	963	CVEN	6879
CH E	640	CHEN	6400	C E	564	CVEN	5642	C E	800	CVEN	8995	C E	964	CVEN	6889
CH E	657	CHEN	6570	C E	565	CVEN	5652	C E	130	CVEN	1306	C E	965	CVEN	6899
CH E	999	CHEN	6940	C E	566	CVEN	5662	C E	324	CVEN	3246	C E	966	CVEN	6909
CH E	700	CHEN	6950	C E	568	CVEN	5682	C E	523	CVEN	5236	C E	999	CVEN	6949
CH E	960	CHEN	7840	C E	569	CVEN	5692	C E	524	CVEN	5246	C E	700	CVEN	6959
CH E	800	CHEN	8990	C E	595	CVEN	5832	C E	525	CVEN	5256	C E	696	CVEN	8929
CH E	491	CHEN	4831	C E	700	CVEN	6902	C E	526	CVEN	5266	C E	697	CVEN	8929
CH E	492	CHEN	4832	C E	999	CVEN	6942	C E	528	CVEN	5286	C E	695	CVEN	8929
CH E	493	CHEN	4833	C E	700	CVEN	6952	C E	529	CVEN	5296	C E	698	CVEN	8929
CH E	494	CHEN	4834	C E	800	CVEN	8992	C E	595	CVEN	5836	C E	699	CVEN	8929
CH E	694	CHEN	6834	C E	331	CVEN	3313	C E	999	CVEN	6946	C E	800	CVEN	8999
CH E	495	CHEN	4835	C E	332	CVEN	3323	C E	700	CVEN	6956				
CH E	695	CHEN	6835	C E	433	CVEN	4333	C E	800	CVEN	8996	<b>COMPUTER SCIENCE</b>			
CH E	496	CHEN	4836	C E	434	CVEN	4343	C E	340	CVEN	3207	C S	100	CSCI	1000
CH E	497	CHEN	4837	C E	533	CVEN	5333	C E	391	CVEN	3217	C S	120	CSCI	1200
CH E	498	CHEN	4838	C E	534	CVEN	5343	C E	498	CVEN	4087	C S	121	CSCI	1210
CH E	499	CHEN	4839	C E	535	CVEN	5353	C E	497	CVEN	4147	C S	130	CSCI	1300
				C E	593	CVEN	5363	C E	453	CVEN	4537	C S	115	CSCI	1700
				C E	537	CVEN	5373	C E	591	CVEN	5367	C S	225	CSCI	2250
				C E	539	CVEN	5393	C E	553	CVEN	5537	C S	131	CSCI	2310
				C E	595	CVEN	5833	C E	595	CVEN	5837	C S	232	CSCI	2320
				C E	999	CVEN	6943	C E	999	CVEN	6947	C S	921	CSCI	2890
				C E	700	CVEN	6953	C E	700	CVEN	6957	C S	920	CSCI	2900
				C E	635	CVEN	7353	C E	800	CVEN	8997	C S	941	CSCI	4890
				C E	800	CVEN	8993	C E	389	CVEN	3698	C S	940	CSCI	4900
				C E	344	CVEN	3414	C E	380	CVEN	3708	C S	950	CSCI	5900
				C E	345	CVEN	3424	C E	381	CVEN	3718	C S	999	CSCI	6940
				C E	315	CVEN	3454	C E	318	CVEN	3728	C S	700	CSCI	6950
				C E	440	CVEN	4404	C E	580	CVEN	5708	C S	951	CSCI	7900
				C E	442	CVEN	4424	C E	582	CVEN	5728	C S	800	CSCI	8990
				C E	444	CVEN	4444	C E	583	CVEN	5738	ECE	555	CSCI	5551
				C E	446	CVEN	4464	C E	584	CVEN	5748	C S	558	CSCI	5582
				C E	447	CVEN	4474	C E	586	CVEN	5768	C S	659	CSCI	6592
				C E	592	CVEN	5374	C E	590	CVEN	5808	C S	326	CSCI	3263
				C E	540	CVEN	5404	C E	595	CVEN	5838	C S	375	CSCI	3753
				C E	541	CVEN	5414	C E	999	CVEN	6948	C S	459	CSCI	4593
				C E	542	CVEN	5424	C E	700	CVEN	6958	C S	583	CSCI	5323
				C E	543	CVEN	5434	C E	581	CVEN	7718	ECE	551	CSCI	5513
				C E	544	CVEN	5444	C E	585	CVEN	7758	C S	551	CSCI	5513
				C E	545	CVEN	5454	C E	587	CVEN	7778	C S	557	CSCI	5573
				C E	546	CVEN	5464	C E	588	CVEN	7788	ECE	559	CSCI	5593
				C E	547	CVEN	5474	C E	589	CVEN	7798	C S	612	CSCI	7123
				C E	548	CVEN	5484	C E	680	CVEN	7928	C S	614	CSCI	7143
				C E	549	CVEN	5494	C E	800	CVEN	8998	C S	140	CSCI	1404
				C E	595	CVEN	5834	C E	923	CVEN	4849	C S	123	CSCI	1734
				C E	999	CVEN	6944	C E	930	CVEN	4859	C S	220	CSCI	2204
				C E	700	CVEN	6954	C E	930	CVEN	4869	C S	221	CSCI	2214
				C E	800	CVEN	8994	C E	940	CVEN	4879	C S	343	CSCI	3434
				C E	350	CVEN	3505	C E	494	CVEN	4889	C S	344	CSCI	3444
				C E	351	CVEN	3515	C E	494	CVEN	4899	C S	514	CSCI	5414
				C E	451	CVEN	4525	C E	495	CVEN	4909	C S	546	CSCI	5444
				C E	454	CVEN	4545	C E	499	CVEN	4919	C S	545	CSCI	5454
				C E	455	CVEN	4555	C E	595	CVEN	5839	C S	565	CSCI	5654
				C E	456	CVEN	4565	C E	950	CVEN	5849	C S	531	CSCI	5714
				C E	551	CVEN	5525	C E	951	CVEN	5859	C S	615	CSCI	7154
				C E	557	CVEN	5575	C E	952	CVEN	5869	C S	255	CSCI	2555
				C E	558	CVEN	5585	C E	953	CVEN	5879	C S	324	CSCI	3245
				C E	595	CVEN	5835	C E	954	CVEN	5889	C S	455	CSCI	4555
				C E	552	CVEN	6525	C E	955	CVEN	5899	C S	553	CSCI	5535
				C E	999	CVEN	6945	C E	956	CVEN	5909	C S	556	CSCI	5565
				C E	700	CVEN	6955	C E	960	CVEN	6849	C S	613	CSCI	7135
				C E	554	CVEN	7545	C E	961	CVEN	6859	C S	365	CSCI	3656

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
C S	466	CSCI	3666	ECE	592	ECEN	5920	ECE	470	ECEN	4703	ECE	571	ECEN	5717
ECE	554	CSCI	5546	ECE	593	ECEN	5930	ECE	940	ECEN	4843	ECE	572	ECEN	5727
C S	560	CSCI	5606	ECE	594	ECEN	5940	ECE	550	ECEN	5503	ECE	574	ECEN	5747
C S	562	CSCI	5626	ECE	595	ECEN	5950	ECE	551	ECEN	5513	ECE	575	ECEN	5757
C S	563	CSCI	5636	ECE	596	ECEN	5960	ECE	553	ECEN	5533	ECE	576	ECEN	5767
C S	564	CSCI	5646	ECE	597	ECEN	5970	ECE	554	ECEN	5543	ECE	577	ECEN	5777
C S	569	CSCI	6676	ECE	598	ECEN	5980	ECE	555	ECEN	5553	ECE	578	ECEN	5787
C S	617	CSCI	7176	ECE	599	ECEN	5990	ECE	556	ECEN	5563	ECE	579	ECEN	5797
C S	328	CSCI	3287	ECE	999	ECEN	6940	ECE	557	ECEN	5573	ECE	950	ECEN	5847
C S	581	CSCI	5817	ECE	700	ECEN	6950	ECE	558	ECEN	5583	ECE	960	ECEN	7847
C S	771	CSCI	7717	ECE	700	ECEN	6960	ECE	559	ECEN	5593	ECE	910	ECEN	1848
C S	420	CSCI	4208	ECE	700	ECEN	6970	ECE	950	ECEN	5843	ECE	920	ECEN	2848
C S	421	CSCI	4218	ECE	621	ECEN	7210	ECE	960	ECEN	7843	ECE	930	ECEN	3848
C S	430	CSCI	4308	ECE	960	ECEN	7840	ECE	910	ECEN	1844	ECE	413	ECEN	4138
C S	431	CSCI	4318	ECE	961	ECEN	7840	ECE	920	ECEN	2844	ECE	422	ECEN	4228
ECE	550	CSCI	4588	ECE	690	ECEN	7900	ECE	930	ECEN	3844	ECE	445	ECEN	4458
C S	582	CSCI	5828	ECE	691	ECEN	7910	ECE	463	ECEN	4634	ECE	454	ECEN	4548
C S	584	CSCI	5918	ECE	692	ECEN	7920	ECE	940	ECEN	4844	ECE	461	ECEN	4618
<b>ELECTRICAL AND COMPUTER ENGINEERING</b>				ECE	693	ECEN	7930	ECE	510	ECEN	5104	ECE	940	ECEN	4848
ECE	130	ECEN	1300	ECE	694	ECEN	7940	ECE	511	ECEN	5114	ECE	541	ECEN	5418
ECE	133	ECEN	1330	ECE	695	ECEN	7950	ECE	513	ECEN	5134	ECE	543	ECEN	5438
ECE	134	ECEN	1340	ECE	696	ECEN	7960	ECE	514	ECEN	5144	ECE	544	ECEN	5448
ECE	910	ECEN	1840	ECE	697	ECEN	7970	ECE	525	ECEN	5254	ECE	545	ECEN	5458
ECE	215	ECEN	2150	ECE	698	ECEN	7980	ECE	526	ECEN	5264	ECE	546	ECEN	5468
ECE	216	ECEN	2160	ECE	699	ECEN	7990	ECE	527	ECEN	5274	ECE	950	ECEN	5848
ECE	222	ECEN	2220	ECE	800	ECEN	8990	ECE	950	ECEN	5844	ECE	641	ECEN	7418
ECE	223	ECEN	2230	ECE	910	ECEN	1841	ECE	960	ECEN	7844	ECE	642	ECEN	7428
ECE	255	ECEN	2550	ECE	920	ECEN	2841	ECE	910	ECEN	1845	ECE	643	ECEN	7438
ECE	256	ECEN	2560	ECE	930	ECEN	3841	ECE	920	ECEN	2845	ECE	645	ECEN	7458
ECE	257	ECEN	2570	ECE	481	ECEN	4811	ECE	930	ECEN	3845	ECE	960	ECEN	7848
ECE	920	ECEN	2840	ECE	482	ECEN	4821	ECE	404	ECEN	4045	ECE	910	ECEN	1849
ECE	302	ECEN	3020	ECE	483	ECEN	4831	ECE	434	ECEN	4345	ECE	920	ECEN	2849
ECE	303	ECEN	3030	ECE	940	ECEN	4841	ECE	437	ECEN	4375	ECE	930	ECEN	3849
ECE	313	ECEN	3130	ECE	580	ECEN	5801	ECE	940	ECEN	4845	ECE	481	ECEN	4019
ECE	314	ECEN	3140	ECE	581	ECEN	5811	ECE	503	ECEN	5035	ECE	485	ECEN	4019
ECE	317	ECEN	3170	ECE	582	ECEN	5821	ECE	504	ECEN	5045	ECE	486	ECEN	4029
ECE	323	ECEN	3230	ECE	583	ECEN	5831	ECE	505	ECEN	5055	ECE	940	ECEN	4849
ECE	331	ECEN	3310	ECE	950	ECEN	5841	ECE	506	ECEN	5065	ECE	585	ECEN	5019
ECE	332	ECEN	3320	ECE	960	ECEN	7841	ECE	507	ECEN	5075	ECE	586	ECEN	5029
ECE	343	ECEN	3430	ECE	910	ECEN	1842	ECE	508	ECEN	5085	ECE	587	ECEN	5039
ECE	353	ECEN	3530	ECE	920	ECEN	2842	ECE	950	ECEN	5845	ECE	588	ECEN	5039
ECE	381	ECEN	3810	ECE	930	ECEN	3842	ECE	601	ECEN	7015	ECE	950	ECEN	5849
ECE	930	ECEN	3840	ECE	424	ECEN	4242	ECE	602	ECEN	7025	ECE	960	ECEN	7849
ECE	440	ECEN	4400	ECE	465	ECEN	4652	ECE	960	ECEN	7845	<b>ENGINEERING MANAGEMENT</b>			
ECE	940	ECEN	4840	ECE	940	ECEN	4842	ECE	910	ECEN	1846	ENM	501	EMEN	5010
ECE	941	ECEN	4840	ECE	561	ECEN	5612	ECE	920	ECEN	2846	ENM	502	EMEN	5020
ECE	490	ECEN	4900	ECE	562	ECEN	5622	ECE	930	ECEN	3846	ENM	503	EMEN	5030
ECE	491	ECEN	4910	ECE	563	ECEN	5632	ECE	940	ECEN	4846	ENM	504	EMEN	5040
ECE	492	ECEN	4920	ECE	564	ECEN	5642	ECE	515	ECEN	5156	<b>GENERAL ENGINEERING</b>			
ECE	493	ECEN	4930	ECE	565	ECEN	5652	ECE	567	ECEN	5166	ENGR	109	GEEN	1090
ECE	494	ECEN	4940	ECE	566	ECEN	5662	ECE	560	ECEN	5606	ENGR	110	GEEN	1100
ECE	495	ECEN	4950	ECE	567	ECEN	5672	ECE	568	ECEN	5686	ENGR	171	GEEN	1710
ECE	496	ECEN	4960	ECE	568	ECEN	5682	ECE	569	ECEN	5696	ENGR	172	GEEN	1720
ECE	497	ECEN	4970	ECE	569	ECEN	5692	ECE	950	ECEN	5846	ENGR	301	GEEN	3010
ECE	498	ECEN	4980	ECE	950	ECEN	5842	ECE	960	ECEN	7846	ENGR	505	GEEN	5050
ECE	499	ECEN	4990	ECE	663	ECEN	7632	ECE	910	ECEN	1847	ENGR	101	GEEN	1017
ECE	590	ECEN	5000	ECE	960	ECEN	7842	ECE	920	ECEN	2847	<b>MECHANICAL ENGINEERING</b>			
ECE	521	ECEN	5210	ECE	910	ECEN	1843	ECE	930	ECEN	3847	M E	130	MCEN	1020
ECE	950	ECEN	5840	ECE	920	ECEN	2843	ECE	416	ECEN	4167	M E	371	MCEN	3020
ECE	951	ECEN	5840	ECE	930	ECEN	3843	ECE	451	ECEN	4517				
ECE	591	ECEN	5910	ECE	455	ECEN	4553	ECE	452	ECEN	4527				
				ECE	457	ECEN	4573	ECE	453	ECEN	4537				
				ECE	459	ECEN	4593	ECE	940	ECEN	4847				
				ECE	460	ECEN	4603	ECE	570	ECEN	5707				





Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.				
ENVD 475	ENVD 4336	JOUR 528	JOUR 5282	LAW 666	LAW 6103	<b>College of Music</b>							
ENVD 475	ENVD 4346	JOUR 529	JOUR 5292	LAW 635	LAW 6353								
ENVD 475	ENVD 4356	JOUR 550	JOUR 5502	LAW 787	LAW 7003					MUS 108	MUSC 1080		
ENVD 497	ENVD 4796	JOUR 560	JOUR 5602	LAW 709	LAW 7303					MUS 183	MUSC 1830		
ENVD 575	ENVD 5346	JOUR 570	JOUR 5702	LAW 778	LAW 7433					MUS 184	MUSC 1840		
ENVD 940	ENVD 3909	JOUR 580	JOUR 5802	LAW 770	LAW 7603					MUS 185	MUSC 1850		
ENVD 945	ENVD 3919	JOUR 581	JOUR 5812	LAW 727	LAW 9613					MUS 275	MUSC 2750		
ENVD 943	ENVD 4909	JOUR 340	JOUR 3403	LAW 706	LAW 9713					MUS 276	MUSC 2760		
ENVD 946	ENVD 4919	JOUR 345	JOUR 3453	LAW 561	LAW 5624					MUS 277	MUSC 2770		
<b>School of Journalism and Mass Communication</b>				JOUR 346	JOUR 3463					LAW 606	LAW 6004	MUS 308	MUSC 3080
				JOUR 497	JOUR 3913					LAW 698	LAW 6104	MUS 364	MUSC 3640
				JOUR 440	JOUR 4403					LAW 735	LAW 7024	MUS 365	MUSC 3650
				JOUR 445	JOUR 4453					LAW 732	LAW 7154	MUS 382	MUSC 3820
				JOUR 540	JOUR 5403					LAW 729	LAW 9254	MUS 383	MUSC 3830
				JOUR 545	JOUR 5453					LAW 540	LAW 5425	MUS 475	MUSC 4750
				JOUR 360	JOUR 3604					LAW 541	LAW 5435	MUS 489	MUSC 4890
				JOUR 361	JOUR 3614					LAW 661	LAW 6005	MUS 831	MUSC 8970
				JOUR 364	JOUR 3644					LAW 651	LAW 6045	MUS 100	MUSC 1001
				JOUR 367	JOUR 3674					LAW 736	LAW 7015	MUS 101	MUSC 1011
				JOUR 461	JOUR 4614					LAW 752	LAW 7045	MUS 102	MUSC 1021
				JOUR 462	JOUR 4624	LAW 753	LAW 7055	MUS 103	MUSC 1031				
				JOUR 463	JOUR 4634	LAW 702	LAW 7065	MUS 109	MUSC 1091				
				JOUR 464	JOUR 4644	LAW 710	LAW 7105	MUS 200	MUSC 2001				
				JOUR 467	JOUR 4674	LAW 700	LAW 7205	MUS 202	MUSC 2021				
JOUR 562	JOUR 5624	LAW 760	LAW 7255	MUS 207	MUSC 2071								
JOUR 563	JOUR 5634	LAW 724	LAW 7705	MUS 305	MUSC 3051								
JOUR 564	JOUR 5644	LAW 737	LAW 7725	MUS 307	MUSC 3071								
<b>School of Law</b>				LAW 739	LAW 9005	MUS 942	MUSC 3841						
				LAW 713	LAW 9015	MUS 400	MUSC 4001						
				LAW 751	LAW 9045	MUS 401	MUSC 4011						
				LAW 719	LAW 9415	MUS 402	MUSC 4021						
				LAW 775	LAW 9425	MUS 403	MUSC 4031						
				LAW 785	LAW 9525	MUS 404	MUSC 4041						
				LAW 776	LAW 9715	MUS 406	MUSC 4061						
				LAW 520	LAW 5226	MUS 407	MUSC 4071						
				LAW 791	LAW 7106	MUS 408	MUSC 4081						
				LAW 795	LAW 7406	MUS 501	MUSC 5011						
				LAW 771	LAW 7846	MUS 502	MUSC 5021						
				LAW 771	LAW 7856	MUS 503	MUSC 5031						
				LAW 792	LAW 7896	MUS 504	MUSC 5041						
				LAW 794	LAW 7906	MUS 505	MUSC 5051						
				LAW 660	LAW 6007	MUS 506	MUSC 5061						
LAW 669	LAW 6107	MUS 507	MUSC 5071										
LAW 668	LAW 6157	MUS 508	MUSC 5081										
LAW 715	LAW 7207	MUS 509	MUSC 5091										
LAW 718	LAW 7217	MUS 550	MUSC 5501										
LAW 768	LAW 7307	MUS 952	MUSC 5841										
LAW 662	LAW 6118	MUS 707	MUSC 6951										
LAW 664	LAW 6308	MUS 705	MUSC 6951										
LAW 705	LAW 7058	MUS 709	MUSC 6951										
LAW 722	LAW 7218	MUS 962	MUSC 7841										
LAW 731	LAW 9318	MUS 827	MUSC 8971										
LAW 707	LAW 9408	MUS 180	MUSC 1802										
LAW 741	LAW 9418	MUS 380	MUSC 3802										
LAW 685	LAW 6009	MUS 381	MUSC 3812										
LAW 687	LAW 6019	MUS 940	MUSC 3842										
LAW 686	LAW 6029	MUS 471	MUSC 4712										
LAW 688	LAW 6039	MUS 474	MUSC 4742										
LAW 762	LAW 7109	MUS 476	MUSC 4762										
LAW 793	LAW 7159	MUS 477	MUSC 4772										
LAW 780	LAW 7209	MUS 479	MUSC 4792										
LAW 796	LAW 7409	MUS 481	MUSC 4812										
LAW 790	LAW 7509	MUS 482	MUSC 4822										
		MUS 483	MUSC 4832										

228 Course Number Translation Table / Music

Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.
MUS 484	MUSC 4842	MUS 317	MUSC 3174	MUS 958	MUSC 5846	PMUS 163	PMUS 1617
MUS 485	MUSC 4852	MUS 318	MUSC 3184	MUS 956	MUSC 5846	PMUS 164	PMUS 1627
MUS 487	MUSC 4872	MUS 348	MUSC 3484	MUS 955	MUSC 5846	PMUS 165	PMUS 1637
<del>MUS 488</del>	<del>MUSC 4882</del>	<del>MUS 343</del>	<del>MUSC 3444</del>	MUS 966	MUSC 7846	PMUS 166	PMUS 1647
MUS 571	MUSC 5712	MUS 443	MUSC 4434	MUS 968	MUSC 7846	PMUS 167	PMUS 1657
MUS 574	MUSC 5742	MUS 444	MUSC 4444	MUS 965	MUSC 7846	PMUS 168	PMUS 1667
MUS 576	MUSC 5762	MUS 445	MUSC 4454	MUS 833	MUSC 8976	PMUS 169	PMUS 1677
MUS 577	MUSC 5772	MUS 446	MUSC 4464	MUS 947	MUSC 3847	PMUS 170	PMUS 1687
MUS 579	MUSC 5792	MUS 447	MUSC 4474	MUS 398	MUSC 3987	PMUS 171	PMUS 1697
MUS 580	MUSC 5802	MUS 515	MUSC 5154	MUS 490	MUSC 4107	PMUS 172	PMUS 1707
MUS 581	MUSC 5812	MUS 540	MUSC 5404	MUS 495	MUSC 4907	PMUS 152	PMUS 1717
MUS 582	MUSC 5822	MUS 543	MUSC 5434	MUS 957	MUSC 5847	PMUS 250	PMUS 2507
MUS 583	MUSC 5832	MUS 544	MUSC 5444	MUS 967	MUSC 7847	PMUS 251	PMUS 2517
MUS 950	MUSC 5842	MUS 545	MUSC 5454	MUS 800	MUSC 8977	PMUS 254	PMUS 2527
MUS 584	MUSC 5842	MUS 546	MUSC 5464	MUS 948	MUSC 3848	PMUS 255	PMUS 2537
MUS 585	MUSC 5852	MUS 547	MUSC 5474	MUS 570	MUSC 5708	PMUS 256	PMUS 2547
MUS 587	MUSC 5872	MUS 548	MUSC 5484	MUS 958	MUSC 5848	PMUS 257	PMUS 2557
MUS 588	MUSC 5882	MUS 953	MUSC 5844	MUS 519	MUSC 6198	PMUS 258	PMUS 2567
MUS 589	MUSC 5892	MUS 963	MUSC 7844	MUS 999	MUSC 6948	PMUS 259	PMUS 2577
MUS 706	MUSC 6952	MUS 830	MUSC 8974	MUS 713	MUSC 7138	PMUS 260	PMUS 2587
MUS 708	MUSC 6952	MUS 226	MUSC 2265	<del>MUS 968</del>	<del>MUSC 7848</del>	PMUS 261	PMUS 2597
MUS 782	MUSC 7822	MUS 232	MUSC 2325	MUS 800	MUSC 8108	PMUS 262	PMUS 2607
MUS 783	MUSC 7832	MUS 236	MUSC 2365	MUS 810	MUSC 8108	PMUS 263	PMUS 2617
MUS 960	MUSC 7842	MUS 334	MUSC 3345	MUS 691	MUSC 7928	PMUS 264	PMUS 2627
MUS 828	MUSC 8972	MUS 335	MUSC 3355	MUS 949	MUSC 3849	PMUS 265	PMUS 2637
MUS 210	MUSC 2103	MUS 944	MUSC 3845	MUS 959	MUSC 5849	PMUS 266	PMUS 2647
MUS 310	MUSC 3103	MUS 425	MUSC 4255	MUS 969	MUSC 7849	PMUS 267	PMUS 2657
MUS 311	MUSC 3113	MUS 426	MUSC 4265			PMUS 268	PMUS 2667
<del>MUS 312</del>	<del>MUSC 3123</del>	<del>MUS 427</del>	<del>MUSC 4275</del>	<b>Performance Music</b>			
MUS 313	MUSC 3133	MUS 428	MUSC 4285	PMUS 111	PMUS 1110	PMUS 269	PMUS 2677
MUS 314	MUSC 3143	MUS 429	MUSC 4295	PMUS 118	PMUS 1180	PMUS 270	PMUS 2687
MUS 315	MUSC 3153	MUS 432	MUSC 4325	PMUS 120	PMUS 1200	PMUS 271	PMUS 2697
MUS 316	MUSC 3163	MUS 434	MUSC 4345	PMUS 218	PMUS 2180	PMUS 272	PMUS 2707
MUS 319	MUSC 3193	MUS 436	MUSC 4365	PMUS 102	PMUS 1021	PMUS 252	PMUS 2717
MUS 320	MUSC 3203	MUS 523	MUSC 5235	PMUS 113	PMUS 1131	PMUS 350	PMUS 3507
MUS 322	MUSC 3223	MUS 525	MUSC 5255	PMUS 117	PMUS 1171	PMUS 351	PMUS 3517
MUS 941	MUSC 3843	MUS 526	MUSC 5265	PMUS 119	PMUS 1191	PMUS 354	PMUS 3527
MUS 410	MUSC 4103	MUS 527	MUSC 5275	MUS 703	PMUS 6951	PMUS 355	PMUS 3537
MUS 412	MUSC 4123	MUS 528	MUSC 5285	MUS 701	PMUS 6951	PMUS 356	PMUS 3547
MUS 413	MUSC 4133	MUS 529	MUSC 5295	MUS 821	PMUS 8971	PMUS 357	PMUS 3557
MUS 415	MUSC 4153	MUS 530	MUSC 5305	MUS 704	PMUS 6952	PMUS 358	PMUS 3567
MUS 419	MUSC 4193	MUS 532	MUSC 5325	MUS 702	PMUS 6952	PMUS 359	PMUS 3577
MUS 510	MUSC 5103	MUS 533	MUSC 5335	MUS 822	PMUS 8972	PMUS 360	PMUS 3587
MUS 512	MUSC 5123	MUS 534	MUSC 5345	MUS 823	PMUS 8973	PMUS 361	PMUS 3597
MUS 514	MUSC 5143	MUS 535	MUSC 5355	PMUS 416	PMUS 4164	PMUS 362	PMUS 3607
MUS 518	MUSC 5183	MUS 536	MUSC 5365	<del>MUS 824</del>	<del>PMUS 8974</del>	PMUS 363	PMUS 3617
MUS 520	MUSC 5203	MUS 954	MUSC 5845	PMUS 110	PMUS 1105	PMUS 364	PMUS 3627
MUS 951	MUSC 5843	MUS 634	MUSC 6345	PMUS 210	PMUS 2105	PMUS 365	PMUS 3637
MUS 611	MUSC 6113	MUS 635	MUSC 6355	MUS 825	PMUS 8975	PMUS 366	PMUS 3647
MUS 613	MUSC 6133	MUS 636	MUSC 6365	PMUS 127	PMUS 1276	PMUS 367	PMUS 3657
MUS 614	MUSC 6143	MUS 637	MUSC 6375	PMUS 144	PMUS 1446	PMUS 368	PMUS 3667
MUS 615	MUSC 6153	MUS 638	MUSC 6385	PMUS 344	PMUS 3446	PMUS 369	PMUS 3677
MUS 617	MUSC 6173	MUS 964	MUSC 7845	MUS 826	PMUS 8976	PMUS 370	PMUS 3687
<del>MUS 618</del>	<del>MUSC 6183</del>	<del>MUS 832</del>	<del>MUSC 8975</del>	PMUS 150	PMUS 1507	PMUS 371	PMUS 3697
MUS 619	MUSC 6193	MUS 317	MUSC 3176	PMUS 151	PMUS 1517	PMUS 372	PMUS 3707
MUS 710	MUSC 7103	MUS 318	MUSC 3186	PMUS 154	PMUS 1527	PMUS 352	PMUS 3717
MUS 711	MUSC 7113	MUS 946	MUSC 3846	PMUS 155	PMUS 1537	PMUS 450	PMUS 4507
MUS 712	MUSC 7123	MUS 948	MUSC 3846	PMUS 156	PMUS 1547	PMUS 451	PMUS 4517
MUS 782	MUSC 7823	MUS 945	MUSC 3856	PMUS 157	PMUS 1557	PMUS 454	PMUS 4527
MUS 783	MUSC 7833	MUS 466	MUSC 4666	PMUS 158	PMUS 1567	PMUS 455	PMUS 4537
MUS 961	MUSC 7843	MUS 513	MUSC 5136	PMUS 159	PMUS 1577	PMUS 456	PMUS 4547
MUS 829	MUSC 8973	MUS 552	MUSC 5526	PMUS 160	PMUS 1587	PMUS 457	PMUS 4557
MUS 144	MUSC 1444	MUS 553	MUSC 5536	PMUS 161	PMUS 1597	PMUS 458	PMUS 4567
MUS 145	MUSC 1454	MUS 566	MUSC 5666	PMUS 162	PMUS 1607	PMUS 459	PMUS 4577
						PMUS 460	PMUS 4587

Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course		Old 3-Digit Course		New 4-Digit Course	
Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.	Subj.	No.
PMUS	461	PMUS	4597	PMUS	139	PMUS	1398	BIPH	949	BIPH	4840	PHCH	805	PHCH	8990
PMUS	462	PMUS	4607	PMUS	140	PMUS	1408	BIPH	554	BIPH	5540	PHCH	806	PHCH	8990
PMUS	463	PMUS	4617	PMUS	141	PMUS	1418	BIPH	999	BIPH	6940	PHCH	807	PHCH	8990
PMUS	464	PMUS	4627	PMUS	142	PMUS	1428	BIPH	700	BIPH	6950	PHCH	808	PHCH	8990
PMUS	465	PMUS	4637	PMUS	143	PMUS	1438	BIPH	590	BIPH	7390	PHCH	809	PHCH	8990
PMUS	466	PMUS	4647	PMUS	131	PMUS	1458	BIPH	959	BIPH	7840	PHCH	810	PHCH	8990
PMUS	467	PMUS	4657	PMUS	131	PMUS	1468	BIPH	800	BIPH	8990	PHCH	572	PHCH	7472
PMUS	468	PMUS	4667	PMUS	131	PMUS	1478	BIPH	801	BIPH	8990	PHCH	562	PHCH	7562
PMUS	469	PMUS	4677	PMUS	131	PMUS	1488	BIPH	802	BIPH	8990	PHCH	573	PHCH	7473
PMUS	470	PMUS	4687	PMUS	131	PMUS	1498	BIPH	803	BIPH	8990	PHCH	654	PHCH	7654
PMUS	471	PMUS	4697	PMUS	328	PMUS	3288	BIPH	804	BIPH	8990	PHCH	565	PHCH	7565
PMUS	472	PMUS	4707	PMUS	329	PMUS	3298	BIPH	805	BIPH	8990	PHCH	566	PHCH	7566
PMUS	452	PMUS	4717	PMUS	330	PMUS	3308	BIPH	806	BIPH	8990	PHCH	568	PHCH	7568
PMUS	553	PMUS	4727	PMUS	327	PMUS	3318	BIPH	807	BIPH	8990	<b>PHARMACOLOGY</b>			
PMUS	550	PMUS	5507	PMUS	332	PMUS	3328	BIPH	808	BIPH	8990	PHCL	452	PCOL	4520
PMUS	551	PMUS	5517	PMUS	333	PMUS	3338	BIPH	809	BIPH	8990	PHCL	453	PCOL	4530
PMUS	554	PMUS	5527	PMUS	334	PMUS	3348	BIPH	810	BIPH	8990	PHCL	474	PCOL	4740
PMUS	555	PMUS	5537	PMUS	336	PMUS	3368	BIPH	391	BIPH	3901	PHCL	949	PCOL	4840
PMUS	556	PMUS	5547	PMUS	337	PMUS	3378	BIPH	591	BIPH	7391	PHCL	999	PCOL	6940
PMUS	559	PMUS	5577	PMUS	338	PMUS	3388	<b>CLINICAL PHARMACY</b>				PHCL	700	PCOL	6950
PMUS	560	PMUS	5587	PMUS	339	PMUS	3398	CNPH	421	CNLP	4210	PHCL	560	PCOL	7560
PMUS	561	PMUS	5597	PMUS	340	PMUS	3408	CNPH	422	CNLP	4220	PHCL	959	PCOL	7840
PMUS	562	PMUS	5607	PMUS	341	PMUS	3418	CNPH	423	CNLP	4230	PHCL	800	PCOL	8990
PMUS	563	PMUS	5617	PMUS	342	PMUS	3428	CNPH	424	CNLP	4240	PHCL	801	PCOL	8990
PMUS	564	PMUS	5627	PMUS	343	PMUS	3438	CNPH	425	CNLP	4250	PHCL	802	PCOL	8990
PMUS	565	PMUS	5637	PMUS	331	PMUS	3458	CNPH	446	CNLP	4460	PHCL	803	PCOL	8990
PMUS	566	PMUS	5647	PMUS	331	PMUS	3468	CNPH	447	CNLP	4470	PHCL	804	PCOL	8990
PMUS	567	PMUS	5657	PMUS	331	PMUS	3478	CNPH	449	CNLP	4490	PHCL	805	PCOL	8990
PMUS	568	PMUS	5667	PMUS	331	PMUS	3488	CNPH	949	CNLP	4840	PHCL	806	PCOL	8990
PMUS	569	PMUS	5677	PMUS	331	PMUS	3498	CNPH	426	CNLP	4910	PHCL	807	PCOL	8990
PMUS	570	PMUS	5687	PMUS	413	PMUS	4138	CNPH	430	CNLP	4930	PHCL	808	PCOL	8990
PMUS	571	PMUS	5697	PMUS	414	PMUS	4148	CNPH	427	CNLP	4911	PHCL	809	PCOL	8990
PMUS	572	PMUS	5707	PMUS	415	PMUS	4158	CNPH	431	CNLP	4931	PHCL	810	PCOL	8990
PMUS	552	PMUS	5717	PMUS	513	PMUS	5138	CNPH	428	CNLP	4912	PHCL	552	PCOL	7452
PMUS	653	PMUS	5727	PMUS	514	PMUS	5148	CNPH	432	CNLP	4932	PHCL	553	PCOL	7453
PMUS	650	PMUS	6507	PMUS	515	PMUS	5158	CNPH	429	CNLP	4913	PHCL	654	PCOL	7654
PMUS	651	PMUS	6517	PMUS	529	PMUS	5298	CNPH	435	CNLP	4933	PHCL	557	PCOL	7557
PMUS	654	PMUS	6527	PMUS	530	PMUS	5308	CNPH	433	CNLP	4914	PHCL	558	PCOL	7558
PMUS	655	PMUS	6537	PMUS	527	PMUS	5318	CNPH	438	CNLP	4934	<b>PHARMACY ADMINISTRATION</b>			
PMUS	656	PMUS	6547	PMUS	532	PMUS	5328	CNPH	434	CNLP	4915	PHAD	381	PHAD	3810
PMUS	659	PMUS	6577	PMUS	533	PMUS	5338	CNPH	439	CNLP	4935	PHAD	383	PHAD	3830
PMUS	660	PMUS	6587	PMUS	536	PMUS	5368	CNPH	436	CNLP	4916	PHAD	949	PHAD	4840
PMUS	661	PMUS	6597	PMUS	537	PMUS	5378	CNPH	442	CNLP	4936	PHAD	486	PHAD	4860
PMUS	662	PMUS	6607	PMUS	538	PMUS	5388	CNPH	437	CNLP	4917	PHAD	487	PHAD	4870
PMUS	663	PMUS	6617	PMUS	540	PMUS	5408	CNPH	443	CNLP	4937	PHAD	999	PHAD	6940
PMUS	664	PMUS	6627	PMUS	541	PMUS	5418	CNPH	440	CNLP	4918	PHAD	700	PHAD	6950
PMUS	665	PMUS	6637	PMUS	543	PMUS	5438	CNPH	441	CNLP	4919	PHAD	959	PHAD	7840
PMUS	666	PMUS	6647	PMUS	531	PMUS	5478	CNPH	549	CNLP	7449	PHAD	800	PHAD	8990
PMUS	667	PMUS	6657	PMUS	531	PMUS	5488	<b>PHARMACEUTICAL CHEMISTRY</b>				PHAD	801	PHAD	8990
PMUS	668	PMUS	6667	MUS	801	PMUS	8978	PHCH	370	PHCH	3700	PHAD	802	PHAD	8990
PMUS	669	PMUS	6677	MUS	399	PMUS	3919	PHCH	375	PHCH	3750	PHAD	803	PHAD	8990
PMUS	670	PMUS	6687	MUS	499	PMUS	4919	PHCH	472	PHCH	4720	PHAD	804	PHAD	8990
PMUS	671	PMUS	6697	MUS	802	PMUS	8979	PHCH	473	PHCH	4730	PHAD	805	PHAD	8990
PMUS	672	PMUS	6707	<b>Convocations</b>				PHCH	949	PHCH	4840	PHAD	806	PHAD	8990
PMUS	652	PMUS	6717	MUS	199	CONV	1999	PHCH	999	PHCH	6940	PHAD	807	PHAD	8990
PMUS	128	PMUS	1288	MUS	299	CONV	2999	PHCH	700	PHCH	6950	PHAD	808	PHAD	8990
PMUS	129	PMUS	1298	<b>School of Pharmacy</b>				PHCH	540	PHCH	7540	PHAD	809	PHAD	8990
PMUS	130	PMUS	1308	<b>BIOPHARMACY</b>				PHCH	540	PHCH	7540	PHAD	810	PHAD	8990
PMUS	132	PMUS	1328	BIPH	308	BIPH	3080	PHCH	959	PHCH	7840	PHAD	810	PHAD	8990
PMUS	133	PMUS	1338	BIPH	390	BIPH	3900	PHCH	801	PHCH	8990	PHAD	581	PHAD	7581
PMUS	134	PMUS	1348	BIPH	450	BIPH	4500	PHCH	802	PHCH	8990	PHAD	582	PHAD	7582
PMUS	136	PMUS	1368					PHCH	803	PHCH	8990	PHAD	583	PHAD	7583
PMUS	137	PMUS	1378					PHCH	804	PHCH	8990	PHAD	584	PHAD	7584
PMUS	138	PMUS	1388												

230 Course Number Translation Table / Pharmacy-Pharmaceutics

Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.	Old 3-Digit Course Subj. No.	New 4-Digit Course Subj. No.
<b>PHARMACY-PHARMACEUTICS</b>				PHAR 802	PHAR 8990	AIR 102	AIRR 1020
PHAR 201	PHAR 2010	PHAR 803	PHAR 8990	AIR 201	AIRR 2010	M S 402	MILR 4082
PHAR 202	PHAR 2020	PHAR 804	PHAR 8990	AIR 202	AIRR 2020	<b>NAVAL SCIENCE</b>	
PHAR 304	PHAR 3040	PHAR 805	PHAR 8990	AIR 301	AIRR 3010	N S 101	NAVR 1010
PHAR 305	PHAR 3050	PHAR 806	PHAR 8990	AIR 302	AIRR 3020	N S 102	NAVR 1020
PHAR 306	PHAR 3060	PHAR 807	PHAR 8990	AIR 401	AIRR 4010	N S 201	NAVR 2010
PHAR 410	PHAR 4100	PHAR 808	PHAR 8990	AIR 402	AIRR 4020	N S 202	NAVR 2020
PHAR 411	PHAR 4110	PHAR 809	PHAR 8990	<b>MILITARY SCIENCE (U.S. Army)</b>			
PHAR 412	PHAR 4120	PHAR 810	PHAR 8990	M S 101	MILR 1011	N S 301	NAVR 3010
PHAR 416	PHAR 4160	PHAR 512	PHAR 7512	M S 102	MILR 1021	N S 302	NAVR 3020
PHAR 949	PHAR 4840	PHAR 654	PHAR 7654	M S 201	MILR 2031	N S 401	NAVR 4010
PHAR 999	PHAR 6940	PHAR 518	PHAR 7518	M S 202	MILR 2041	N S 402	NAVR 4020
PHAR 700	PHAR 6950	<b>ROTC</b>		M S 301	MILR 3052	N S 310	NAVR 3101
PHAR 959	PHAR 7840	<b>AIR FORCE</b>		M S 302	MILR 3062	N S 410	NAVR 4101
PHAR 800	PHAR 8990	AIR 101	AIRR 1010	M S 401	MILR 4072		
PHAR 801	PHAR 8990						



# Course Descriptions

Following are descriptions of courses offered in the colleges and schools on the Boulder Campus. *This listing does not constitute a guarantee or contract that any particular course will be offered during a given year.*

For degree requirements, students should refer to the departmental listings in the appropriate college or school information section of this *Catalog*. These requirements are subject to change, and students should check with their department for up-to-date information.

For current information on times, days, and instructors, students should consult the *Schedule of Courses* issued at the beginning of each semester.

Courses numbered in the 1000s and 2000s are intended for lower-division students and those in the 3000s and 4000s for upper-division students. Courses numbered in the 5000s are primarily for graduate students but in some cases may be open to qualified undergraduates. Normally, courses at the 6000, 7000, and 8000 level are open to graduate students only; see college and school sections for special provisions.

The value of each course in semester hour credits is carried as part of the identifying course prefix and department number. For example, in ANTH. 1030-3, "ANTH. 1030" is the identifying department number and "-3" indicates semester hours of credit. Abbreviations used in the course descriptions are as follows:

Coreq.—Corequisite	Prereq.—Prerequisite
Lab—Laboratory	Rec.—Recitation
Lect.—Lecture	

## College of Arts and Sciences

### AMERICAN STUDIES

**AMST 2000-3. Themes in American Culture: 1600-1900.** Enables students to explore various themes in pre-1900 American culture. These themes, which vary each year, are examined in their social context.

**AMST 2010-3. Themes in American Culture: 1865-Present.** Enables students to explore various themes in post-1865 American culture. These themes, which vary each year, are examined in their social context.

**AMST 3840. Independent Study.**

**AMST 3960-3. American Studies: Junior Seminar.** Students examine the major conceptions of American Studies as a method of researching and organizing historical information. Special attention is given to the ideas and works of individuals that have had the greatest influence on the shaping of the discipline. Prereq., AMST 2000 or 2010.

**AMST 4840-3. Independent Study.**

**AMST 4950-3. Seminar in American Studies.**

**AMST 4960-3. Seminar in American Studies.**

## ANTHROPOLOGY

**ANTH 1030-3. Principles of Anthropology 1.**<sup>1</sup>Evolution of humanity and culture from the beginnings through the early metal ages. Covers human evolution, race, prehistory, and the rise of early civilizations.

**ANTH 1040-3. Principles of Anthropology 2.**<sup>1</sup> Survey of the world's major culture areas; culture and its major components, such as subsistence, social organization, religion, and language.

**ANTH 2010-3. Introduction to Physical Anthropology 1.** Detailed consideration of human biology, human's place in the animal kingdom, and fossil evidence for human evolution. Students may not receive credit for both ANTH 2010 and 2050.

**ANTH 2020-3. Introduction to Physical Anthropology 2.** Continuation of ANTH 2010. Quantitative analysis, genetics, and race are emphasized. Students may not receive credit for both ANTH 2020 and 2060. Prereq., ANTH 2010.

**ANTH 2030-1. Laboratory in Physical Anthropology 1.** A lab in human osteology and the musculoskeletal system with an emphasis on comparative primate morphology and adaptation. Coreq., ANTH 2010.

**ANTH 2040-1. Laboratory in Physical Anthropology 2.** Lab work consists of problems in quantitative analysis; serological procedures, pedigree analysis, and general problems in human genetics. Coreq., ANTH 2020.

**ANTH 2050-3. Honors—Human Origins 1.** Understanding how the following two major bodies of evidence for human evolution are used by physical anthropologists in search of human origins: humankind's close physical and behavioral similarity to other living species, particularly the living primates, and

the fossil record for human evolution. Students may not receive credit for both ANTH 2010 and 2050.

**ANTH 2060-3. Honors—Human Origins 2.** This course surveys evidence for the continuing evolution of *Homo Sapiens*. Emphasis on how physical anthropologists utilize data and concepts from medicine, genetics, demography, and ecology to understand the evolution of human biological diversity and adaptation. Students may not receive credit for both ANTH 2020 and 2060. Prereq., ANTH 2050.

**ANTH 2100-3. Frontiers of Cultural Anthropology.** Covers current theories in cultural anthropology and discusses the nature of field work. Major schools of thought and actual field studies are explored. Prereq., ANTH 1040.

**ANTH 2200-3. Introduction to Archaeology.** History, basic concepts, techniques, and theoretical construction of archaeological field and laboratory investigations are discussed.

**ANTH 2210-2. Laboratory Course in Archaeological Methods.** Study of analytical methods in archaeological research including those employed both in the field and in the laboratory. Instruction deals with practical exercises illustrating many of the theoretical principles covered in ANTH 2200. Coreq., ANTH 2200.

**ANTH 2220-3. Origins of Agriculture.** Analysis of the cultural processes involved with human adjustment to an agricultural-based lifestyle in both the Old and New Worlds, and the importance in terms of the subsequent growth of modern societies.

**ANTH 2230-3. Humans in the Pleistocene.** Review of evidence pertaining to human early cultural development. Specific concerns are the interaction of human physical evolution with the development of culture and human interaction with the environment.

**ANTH 2240-3. Urban Revolution.** The archaeological evidence available and the theories and methods by which urban civilizations arose in the Old and New Worlds.

**ANTH 2260-3. Old World Archaeology.** Prehistory and protohistory of Eurasia and Africa, emphasizing growth of culture and spread of civilization.

**ANTH 2270-3. New World Archaeology.** Prehistory of North, Middle, and South America, emphasizing peopling of the New World, earliest American Indian cultures, and later regional developments.

**ANTH 2800-3. Nature of Language.** Survey of the languages of the world. Study of theories of the origin of language, its relationship

<sup>1</sup> Also available through correspondence study.



to other forms of communication, and to systems of writing.

**ANTH 2840 (1-3). Independent Study.** For lower-division undergraduate students.

**ANTH 3000-3. Primate Behavior.** Survey of naturalistic primate behavior. Social behavior, behavioral ecology, and evolution emphasized as they lead to an understanding of human behavior. Prereq., ANTH 2010-2020 or EPOB 1210-1220.

**ANTH 3020-3. Seminar: Physical Anthropology.** Intended to offer the student an opportunity to probe more deeply the topics presented in ANTH 2010-2020. Prereq., ANTH 2010-2020 and instructor consent.

**ANTH 3030-3. Seminar: Archaeology.** The study of theoretical and methodological advances in anthropological archaeology. Prereq., ANTH 2200 and instructor consent.

**Cultures of the World (ANTH 3100 through 3180):** Each course covers the peoples and cultural systems within the areas indicated, including the ways of life of the indigenous populations, their relations with each other and to other peoples, and effects of culture change in recent times.

**ANTH 3100-3. Africa: Peoples and Societies in Change.**

**ANTH 3110-3. Ethnography of Mexico and Central America.**

**ANTH 3120-3. Peoples of Latin America.**

**ANTH 3130-3. North American Indians: Traditional Cultures.** A comprehensive survey of the native cultures of America north of Mexico, including a review of their natural environments, prehistory, languages, and major institutions for the various culture areas.

**ANTH 3140-3. Ethnography of China, Japan, and Korea.**

**ANTH 3150-3. Culture and Society in South Asia.**

**ANTH 3160-3. Peoples of the South Pacific.**

**ANTH 3170-3. America: An Anthropological Perspective.** Historical and contemporary aspects of American life are considered from an anthropological perspective. Includes such topics as slavery, immigration to the United States, the development of cities, American popular culture, and American character.

**ANTH 3180-3. Peoples and Cultures of Northern and Central Eurasia.**

**ANTH 3300-3. Elements of Religion.** The universal components of religion, as inferred from religions of the world, primitive and civilized.

**ANTH 3800-3. Languages and People.** Investigation of the roles which languages play in the building of new nations, in the spread of world religions, in migration, and in the diffusion of writing systems and other customs throughout the world.

**ANTH 4000/5000-3. Quantitative Methods in Anthropology.** A survey of the ways of deriving meaning from anthropological data by numerical means, including but not confined to basic statistical procedures.

**ANTH 4010/5010-3. Computer Applications in Anthropology.** Emphasizes use of computers, microcomputers, and main-frame computers for the storage, retrieval, organization, and analysis of anthropological data. Introduces students to computer modeling or simulation of anthropological processes, from human biological evolution to cultural evolution. Prereqs., ANTH 4000/5000 and 12 hours of other Anthropology course work.

**ANTH 4020/5020-3. Explorations in Anthropology: The Hindu Caste System.** Special topics in cultural, linguistic, and physical anthropology, as well as archaeology. Prereq., 15 hours of Anthropology course work.

**ANTH 4030/5030-6. Comparative Primate Anatomy.** Anatomical correlates are investigated through lecture and laboratory dissection of nonhuman primates. Emphasis in readings, lecture, and dissection is placed upon form, function, and ecology of living primate species. Prereq., ANTH 2010 or permission of instructor.

**ANTH 4060/5060-3. Nutrition and Anthropology.** The nutritional requirements of humans and how they have been met by different populations, taking into account difference in soils, climate, natural resources, technology, and cultural practices. Prereqs., ANTH 2010-2020 or EPOB 1210-1220 or NASC 1230 or 1240.

**ANTH 4080/5080-3. Anthropological Genetics.** A consideration of the data and theory of human genetics. Emphasis is placed upon analytical techniques relating to a genetic analysis of the individual, family, and populations. Prereqs., ANTH 2010-2020 or EPOB 1210-1220.

**ANTH 4100/5100-3. Human Races.** The biological variability of humans as shown in geographic races and individual differences; the ways in which races may be formed, maintained, and mixed; survey of the living peoples of the world. Prereqs., ANTH 2010-2020 or EPOB 1210-1220.

**ANTH 4110/5110-3. Human Paleontology.** A detailed consideration of the fossil evidence for human evolution. Subjects covered are a history of discovery of important fossils and interpretations, descriptive information about the fossils, and data and theory from Pleistocene studies relating to ecology. Prereqs., ANTH 2010-2020 or EPOB 1210-1220.

**ANTH 4120/5120-3. Advanced Physical Anthropology.** An introduction to population genetics and its application to understanding problems of process in human evolution and the formation of races in humans. Prereqs., ANTH 2010-2020 or EPOB 1210-1220.

**ANTH 4140/5140-3. Human Growth and Development.** Individual and population differences in human body size, shape, composition, and function are considered. Emphasis is on how these differences arise as a result of the growth process and in relation to genetic variation and environmental influences. Prereqs., ANTH 2010-2020 or EPOB 1210-1220 or NASC 1230 or 1240.

**ANTH 4150/5150-3. Human Ecology 1.** A study of demographic and ecological variables as they relate to humans. Aspects of

natural selection, overpopulation, and environmental deterioration are considered. Prereqs., ANTH 2010-2020 or EPOB 1210-1220.

**ANTH 4200/5200-3. North American Archaeology.** Prehistoric and protohistoric cultures and areas of North America, excluding the American Southwest.

**ANTH 4210/5210-3. Southwestern Archaeology.** Prehistoric cultures of the American Southwest, their origins, characteristics, and relationships.

**ANTH 4220/5220-3. Archaeology of Mexico and Central America.** Prehistoric and protohistoric cultures and areas of Mexico and Central America, including the Aztecs and Mayas.

**ANTH 4230/5230-3. Settlement Archaeology.** Study of the manner in which primitive humans adapt their residences to the physical environment and social needs. Consideration of prehistoric settlement data as well as inferences to be derived: population, community organization, architecture, and land use.

**ANTH 4240/5240-3. Archaeology of South America.** Prehistoric and protohistoric cultures of South America, their origins, characteristics, and relationships, including the high civilization of the Andean area.

**ANTH 4270/5270-3. Plains Archaeology.** Prehistoric and protohistoric cultures of the North American Plains are examined in five subregions. The origins, characteristics, and structural elements of these cultures are discussed in detail. Prereq., ANTH 1030 or 2200 or 2270.

**ANTH 4280/5280-3. Comparative Prehistoric Frontiers of Mesoamerica: the Southwest and Central America.** A comparison of the northern and southern frontiers of Mesoamerica. Comparative geographical settings, data bases, cultural historical processes, and generalized theoretical concepts are all incorporated. Prereq., ANTH 4210/5210 or 4220/5220.

**ANTH 4330/5330-3. Environmental Archaeology.** A survey of the method of cultural ecology as it can be applied to archaeological investigations.

**ANTH 4340/5340-3. Archaeological Method and Theory.** A review of the methods of cultural theories employed in investigating and explaining the archaeological record. Prereq., ANTH 2200.

**ANTH 4350/5350 (2-6). Archaeological Field and Laboratory Research.** Students participate in archaeological field research and conduct laboratory analysis of archaeological materials and data. Prereq., instructor consent.

**ANTH 4360/5360 (3-6). Archaeological Ruins Stabilization.** Practical and administrative aspects of ruins stabilization. Includes "on-the-job" training in this specialty and review of the policies and legal bases which govern ruins stabilization. Prereq., instructor consent.

**ANTH 4380/5380-3. Lithic Analysis and Replication.** A diversity of approaches to the analysis of ancient stone tools is used,

including fracture mechanics, lithic technology, materials, heat treatment, and functional analysis. Percussion and pressure flaking experiments are performed. Prereq., ANTH 1030 or 2200.

**ANTH 4500/5500-3. Cross-Cultural Aspects of Socioeconomic Development.** Examines the goals of international agencies which support development in underdeveloped countries. Anthropological perspective is provided for such issues as urban planning, health care and delivery, population control, rural development, and land reform.

**ANTH 4510/5510-3. Applied Cultural Anthropology.** Analysis of problems of cultural change due to contacts between people of different cultures.

**ANTH 4520/5520-3. Symbolic Anthropology.** An exploration of anthropological approaches to the study of symbolic systems, including patterns of belief, ritual, art, and myth. Theoretical issues involve the nature of symbols, the impact of modes of communication, and the interpretation of meaning cross-culturally. Prereq., ANTH 1040.

**ANTH 4530/5530-3. History of Anthropology.** History of the growth of anthropology from the earliest times to the mid-twentieth century, including various schools of thought, outstanding contributors, and their works.

**ANTH 4540/5540-3. Culture, Mind, and Experience.** A sampling of contemporary work in the field of psychological anthropology, including culture and personality, culture and cognition, altered states of consciousness, cultural models of diagnosis and cure, the ethnography of experience, and psychological dimensions of social change.

**ANTH 4550/5550-3. Culture Dynamics.** A study of culture change with emphasis on the role of individual motivation in promoting or inhibiting such change. Survey of the literature and analysis of selected case material, including problems of directed change.

**ANTH 4560/5560-3. North American Indian Acculturation.** A comprehensive survey of changes in the native cultures of America north of Mexico caused by the occupation of the continent by Old World populations, including a review of processes of contact, environmental changes, changes in major institutions, the nature of federal/state administration, the reservation system, and contemporary developments.

**ANTH 4570/5570-3. Maritime Peoples.** Archaeological studies of maritime peoples are considered first, followed by detailed study of contemporary maritime peoples, emphasizing fishermen and fishing communities. A consideration of contemporary issues involving humanity's present and future use of the seas concludes the course.

**ANTH 4580/5580-3. Power: The Anthropology of Politics.** Covers the nature and distribution of power in state and stateless societies, the evolution of political stratification, the political economy of colonialism, and selected aspects of power in modern society.

**ANTH 4590/5590-3. Urban Anthropology.** A comparative study of urban life.

**ANTH 4600/5600-3. Human Ecology 2.** A descriptive and analytical study of change in demographic and ecological variables within one or more specific cultures undergoing rapid assimilation. Aspects of breeding isolates, population structures, settlement patterns, and family and community institutions are compared.

**ANTH 4610/5610-3. Medical Anthropology.** Cultural factors determine states of health and illness in both Western and non-Western societies. The transition from traditional to modern status creates new problems including population growth, aging, changing patterns of morbidity, morality and health care, and new socioeconomic consequences. Prereq., ANTH 1040.

**ANTH 4710-3. Departmental Honors in Anthropology 1.** Course work is built around a theme of research design as a means of integrating previous training in the field of anthropology, as well as providing an opportunity to perform creative scientific investigations.

**ANTH 4720-3. Departmental Honors in Anthropology 2.** Continuation of ANTH 4710.

**ANTH 4760/5760-3. Ethnography of Southeast Asia and Indonesia.**

**ANTH 4800/5800-3. Languages of Primitive People.** The methods used to record and analyze the languages of nonliterate societies. Students work with languages recorded by native speakers of non-Western languages from around the world.

**ANTH 4810/5810-3. Language and Culture.** Focuses on the relationship of language to human behavior. The typological classification of languages; the study of linguistic universals, and the evolutionary implications of such studies are also examined.

**ANTH 4820-3. Anthropology of Nonverbal Communication.** Studies biological origins and cultural variations in nonverbal behavior. Biological signs are compared with those of nonhuman primates. Culture-specific symbols are investigated cross-culturally with a view to relating them to evolution and to verbal behavior. Prereq., junior standing and at least 6 hours upper-division social science credit.

**ANTH 4840 (1-3). Independent Study.** For upper-division undergraduate students.

**ANTH 4850 (1-3). Independent Study.** For upper-division undergraduate students.

**ANTH 4910 (1-3). Teaching Anthropology.** Practicum by special arrangement only in which students learn to teach anthropology by serving as recitation leaders or tutors in introductory courses or as small group leaders in advanced courses. Prereq., instructor consent.

**ANTH 5130-3. Advanced Osteology.** Detailed study of the human skeleton with special attention to health and demographic conditions in prehistoric cultures and the evaluation of physical characteristics and genetic relationships of prehistoric populations. Prereqs., ANTH 2010-2020.

**ANTH 5190-3. Conservation Archaeology.** Philosophy and legislation involved with

conservation (contract) archaeology. Contract negotiations and budgetary involvements of government agencies and universities. Analysis of environmental impact statements for archaeological projects.

**ANTH 5390-3. Research Methods in Archaeology 1.** Methods and theory of archaeology, emphasizing the interpretation of materials and data and the relationships of archaeology to other disciplines.

**ANTH 5400-3. Research Methods in Archaeology 2.**

**ANTH 5780-3. The Anthropology of Language Acquisition.** Consideration of various cultural and psycholinguistic factors that may determine group behavior or personality.

**ANTH 5830-3. Biocultural Foundations of Language.** An investigation of species-specific language behavior as it relates to the hominoid fossil record, primate communication, and physiology. Evidence is drawn from archaeological data and from cultural anthropology.

**ANTH 5840 (1-3). Guided Study.** A concentrated study of a topic of anthropological concern.

**ANTH 6940-0. Candidate for Degree.**

**ANTH 6950 (1-6). Master's Thesis.**

**ANTH 7000-3. Seminar: Current Research Topics.**

**ANTH 7010-3. Seminar: Ethnological Theory.**

**ANTH 7020-3. Seminar: Physical Anthropology.**

**ANTH 7030-3. Seminar: Archaeology.**

**ANTH 7040-3. Seminar: Anthropological Linguistics.**

**ANTH 7130-3. Interdisciplinary Seminar.** A consideration of interdisciplinary problems that involve anthropology and related fields such as history, the behavioral disciplines, and the natural sciences.

**ANTH 7140-3. Seminar: Archaeology of Selected Areas.** Consideration of the archaeology of a specified area, either geographical or topical. Areas selected in accordance with current research interests.

**ANTH 7150-3. Seminar: Physical Anthropology of Selected Areas.** A detailed consideration of the morphological and genetic range of variability of major continental divisions of humankind.

**ANTH 7300-3. Seminar in Research Methods in Cultural Anthropology.**

**ANTH 7840 (1-3). Independent Research.** Original research aimed at developing a solution to an originally conceived research problem.

**ANTH 8990-30. Doctor's Dissertation.** All doctoral students must register for no fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## Cross Listings

**ANTH 4269/5269-3. Biblical Archaeology.** (CLAS 4269/5269.) Old Testament history in the light of archaeological investigation; the Old Testament in the framework of the literature of the ancient Near East.

**ANTH 4419/5419-3. Archaeology of Ancient Near East.** (CLAS 4419/5419.) Emphasis is placed on the similarity and differences between the archaeological material of the nations of the Middle East and the archaeological influences which were exchanged between such nations.

**ANTH 4429/5429-3. Archaeology of Ancient Egypt.** (CLAS 4429/5429.) The archaeology of ancient Egypt in the light of recent excavations; the link between the history and archaeology of the nations of the Bible in the North and Egypt, Nubia, Ethiopia, and Yemen in the South.

**ANTH 4789/5789-3. Egyptian Hieroglyphics 1.** (CLAS 4789/5789.) A study of the culture of the ancient Middle East to shed light on the history of its languages. Reading and translating hieroglyphics into modern languages.

**ANTH 4799/5799-3. Egyptian Hieroglyphics 2.** (CLAS 4799/5799.) Reading and translating hieroglyphics into modern languages.

## ARTS AND SCIENCES

### Colloquia

**ARSC 1303 to 1743-variable. Arts and Sciences Freshman Colloquium.** Designed for entering freshmen to explore in a small group environment a range of contemporary social, scientific, or humanistic issues. The emphasis is on the development of critical thinking and oral skills.

### Special Curricula

**ARSC 2274-3. Peer Counseling.** An overview of the field of paraprofessional counseling, this course introduces students to counseling theory and techniques. Students will study the philosophy of a liberal arts education as well as the policies and requirements of the College of Arts and Sciences. Graded on a Pass/Fail basis.

### Theses

**ARSC 4909 (2-6). Senior Thesis for Individually Structured Major.**

**ARSC 4949-variable. Senior Thesis.**

## ASIAN STUDIES

**ASIA 1010-3. Asian Humanities: South Asia.** An interdisciplinary introduction to the literature, art, religion, and philosophy of traditional and present-day South Asia.

**ASIA 1020-3. Asian Humanities: East Asia.** An interdisciplinary introduction to the literature, art, religion, and philosophy of traditional and present-day China and Japan.

**ASIA 1840/2840/3840/4840-variable credit. Independent Study.**

**ASIA 4830-3. Senior Project in Asian Studies.** An individually supervised research paper or creative project in Asian Studies. Required of, and open only to, seniors majoring in Asian Studies.

## ASTROPHYSICAL, PLANETARY, AND ATMOSPHERIC SCIENCES

**APAS 1110-3. General Astronomy.** Principles of modern astronomy for nonscience majors, summarizing our present knowledge about the Earth, moon, planets, Sun, and the origin of life. APAS 1110 and 1120 may be taken in either order. In both courses there is considerable use of the Fiske Planetarium, but only limited use of telescopes. Students desiring more extensive laboratory and observing experience should also register for APAS 1210.

**APAS 1120-3. General Astronomy.** Principles of modern astronomy for nonscience majors summarizing our present knowledge about the Sun, stars, neutron stars, black holes, interstellar gas, galaxies, quasars, and the structure and origins of the universe. APAS 1110 and 1120 can be taken in either order. Students desiring more extensive laboratory and observing experience should also register for APAS 1220.

**APAS 1150-3. Dynamic Earth 3—Meteorology and Oceanography.** Composition and structure of the atmosphere and the oceans; ocean-current systems, waves, and tides; air-sea interaction; weather phenomena; and human impact on the ocean and atmosphere.

**APAS 1210-1. General Astronomy Laboratory.** Optional lab for APAS 1110. Centered around the solar laboratory, but involving other telescope, laboratory, and planetarium experience emphasizing the solar system. One three-hour period per week. Prereq. or coreq., APAS 1110.

**APAS 1220-1. General Astronomy Laboratory.** Optional lab for APAS 1120 involving observatory, planetarium, and laboratory experience, emphasizing Sun, stars, and galaxies. One scheduled hour per week plus additional day- and night-time hours to be arranged. Prereq. or coreq., APAS 1120.

**APAS 2840-variable credit. Independent Study.** Instructor consent required.

**APAS 3210-3. Topics in Solar-System Astronomy.** Topics in modern solar-system astronomy are pursued. Topics may vary but often include nature and evolution of the Sun, life in the universe, origin and nature of the planets, and space science. Nonmathematical. Prereq., APAS 1110.

**APAS 3220-3. Topics in Stars and Galaxies.** Topics in modern astronomy outside the solar system are pursued. Topics may vary but often include stars, black holes, galaxies, quasars, and cosmology. Nonmathematical (simple algebra only) but physical concepts introduced. Prereq., APAS 1120.

**APAS 3500, 3510, 3520-variable credit. Special Topics in Astrophysical, Planetary, and Atmospheric Sciences.** Special topics intended to acquaint undergraduate students

with topics of current interest and research in astrophysics and planetary and atmospheric sciences.

**APAS 3710-3. The Earth's Atmosphere and Oceans.** The physical structure and processes occurring in the atmosphere and oceans; radiation and cloud physics; atmospheric winds and ocean currents; general circulation; gulf and jet streams; and the formation of severe storms.

**APAS 3720-3. Planets and their Atmospheres.** The physics and chemistry of the atmospheres of Mars, Venus, Jupiter, Saturn, and Titan. The evolution of the atmospheres of Earth, Venus, and Mars. The escape of gases from the Galilean satellites, Titan, and Mars. Orbital characteristics of planets, moons, and comets. Recent results of space exploration.

**APAS 3730-3. Astrophysics.** The structure and evolution of the Sun and stars; stellar winds, interstellar matter, and galaxies; origin and propagation of various types of radiation, generation of energy, and production of the elements in the stars; cosmic electrodynamic processes.

**APAS 3740-3. Cosmology and Relativity.** Special and general relativity as applied to astrophysics, cosmological models, observational cosmology, experimental relativity, and the early universe.

**APAS 3750-3. Planets, Moons, and Rings.** An approach to the physics of planets which emphasizes their surfaces, satellites, and rings. Topics covered include formation and evolution of planetary surfaces, history of the terrestrial planets, and dynamics of planetary rings. Both APAS 3720 and APAS 3750 may be taken for credit in any order. Prereqs., MATH 1300 or 1350, and PHYS 1120.

**APAS 4210-3. Photochemistry of the Earth's Upper Atmosphere.** Presents the theory of the photochemistry of the Earth's stratosphere and upper atmosphere. Spacecraft observations of ozone are described, particularly the natural variations that occur. Human influence on the chemistry of the atmosphere is also included. The theory of the photochemistry of the early atmosphere is the final part of the course.

**APAS 4220-3. Photochemistry of Planetary Atmospheres.** The photochemistry of the atmospheres of Mars and Venus and how they compare to the photochemistry of the Earth's atmosphere. The photochemistry of Jupiter, Saturn, and their moons is also a part of the course, as is the photochemistry of comets and the 1986 observations of Halley's comet.

**APAS 4400-3. Introduction to Controlled Fusion.** Overview of research in controlled thermonuclear fusion for power uses. Discussion of world energy problems; elementary plasma physics relevant to fusion reactors; confinement schemes (toroidal devices, magnetic mirrors, magnetic pinches, laser-plasma systems); nuclear reactions; Lawson criterion for reactor feasibility; and heating methods. Prereq. or coreq., PHYS 3310 or 3320.

**APAS 4840-variable credit. Independent Study.** Instructor consent required.

**APAS 5050-3. Atmospheric Physics and Dynamics.** Atmospheric thermodynamics, hydrostatics, cloud and radiative processes, and chemical cycles. Elementary dynamics with applications to the Earth and planetary atmospheres.

**APAS 5110-3. Internal Processes in Gases.** Thermal, mechanical, quantum, and radiative processes in gases and plasmas, with emphasis on spectroscopy, atomic and molecular physics, and statistical mechanics applicable to planetary and stellar atmospheres, interstellar matter, and other cosmic phenomena.

**APAS 5140-4. Experimental Plasma Physics.** (PHYS 4140/5140.) Lecture and lab. Fundamentals of plasma physics are demonstrated in student hands-on experiments. Gas-discharge physics and the statics and dynamics of plasmas are explored.

**APAS 5150-3. Introductory Plasma Physics.** (PHYS 5150.) Includes basic phenomena of ionized gases, static and dynamic shielding, linear waves, instabilities, particles in fields, collisional phenomena, fluid equations, collisionless Boltzmann equations, Landau damping, scattering and absorption of radiation in plasmas, elementary nonlinear processes, WKB wave theory, controlled thermonuclear fusion concepts, astrophysical applications, and experimental plasma physics (laboratory).

**APAS 5220-3. Nonlinear Dynamics.** (PHYS 5220.) Conservative systems: canonical perturbation theory, adiabatic invariants, surface of section, overlap criterion, orbit stability, quasilinear diffusion, renormalization analysis of transition to chaos. Bifurcation theory: center manifolds, normal forms, singularity theory. Dissipative systems: strange attractors, renormalization analysis of period doubling, intermittency. Prereq., PHYS 5210 or consent of instructor.

**APAS 5250-3. Planetary Aeronomy.** Basic physics of the processes that occur in the upper atmosphere between 80 km and several earth radii. Photodissociation, diffusion, and thermal conductivity of the thermosphere. The structure and composition of the D, E, and F regions of the ionosphere. Escape of gases from the exosphere.

**APAS 5300-3. Introduction to Magnetospheres.** (ASEN 5217.) Introduction to solar and stellar winds, planetary and stellar magnetospheres. Guiding center theory for particle motion, magnetospheric topology, convection, radiation belts, magnetic storms and substorms, and auroras.

**APAS 5400-3. Introduction to Fluid Dynamics.** Governing equations of fluid motion relevant to terrestrial, planetary, and stellar atmospheres and gas-dynamical phenomena; scale analysis; effects of rotation, buoyancy, viscosity, and compressibility. Topics include boundary layers, linear and nonlinear gravity waves, and shocks.

**APAS 5410-3. Fluid Instabilities and Waves.** Linear and nonlinear analyses of small-scale waves and instabilities in stratified fluids, with effects of rotation. Internal gravity and acoustic waves with terrestrial, planetary, and astrophysical applications.

Thermal and double-diffusive convection, homogeneous and stratified shear flow instabilities. These topics are examined from the onset of small amplitude disturbances to their nonlinear development and equilibration. Prereq., APAS 5400.

**APAS 5540-3. Mathematical Methods.** An applied mathematics course designed to provide the necessary analytical background for courses in plasma physics, fluid dynamics, electromagnetism, and radiation transfer. Subjects to be covered: integration techniques, linear and nonlinear differential equations, WKB and Fourier transform methods, adiabatic invariants, partial differential equations, integral equations, and integrodifferential equations. Illustrative examples are drawn from above areas of physics.

**APAS 5560-3. Radiative Processes in Planetary Atmospheres.** Application of radiative transfer theory to problems in planetary atmospheres, with primary emphasis on the Earth's atmosphere; principles of atomic and molecular spectroscopy; infrared band representation; absorption and emission of atmospheric gases; radiation flux and flux divergence computations; radiative transfer and fluid motions; additional applications such as inversion methods and climate models. Prereq., APAS 5110.

**APAS 5700-3. Stellar Structure and Evolution.** Basic stellar astronomy: stellar classifications, kinematics, populations and distributions, H-R diagrams. Principles of stellar structure, including energy generation and energy transport by radiation and convection. Stellar evolution theory.

**APAS 5710-3. High Energy and Interstellar Astrophysics.** Structure, dynamics, and ecology of interstellar medium; high-energy particle and radiation interactions with gas in stars, galaxies, quasars, and compact X-ray sources; star formation; thermal and non-thermal processes.

**APAS 5720-3. Galaxies and Cosmology.** Galaxies: classification, structure, content, dynamics; quasars and active galaxies; clusters of galaxies; extragalactic X-ray sources; intergalactic matter. Cosmology and cosmogony: cosmic distance scale, Hubble's law, source counts, physics of the early universe, chemical evolution of galaxies.

**APAS 5730-3. Stellar Atmospheres and Radiative Transfer.** Stellar atmospheres: basic stellar atmospheres, spectral line formation, interpretation of stellar spectra, model atmospheres. Solar physics: the Sun as a star, solar cycle, chromospheric and coronal structure, energy balance, magnetic field, solar wind. Prereq., APAS 5110.

**APAS 5920-variable credit. Reading and Research in Astrophysical, Planetary, and Atmospheric Sciences.** Instructor consent required.

**APAS 6000-1. Seminar in Astrophysics.** Studies current research and research literature on an astrophysical topic. Students and faculty give presentations. Subjects vary each semester. May be repeated to a maximum of four credit hours to meet candidacy requirements. Prereq., graduate standing or instructor consent.

**APAS 6610-3. Earth and Planetary Physics 1.** (GEOL/PHYS 6610.) Mechanics of deformable materials, with applications to earthquake processes. Introduction to seismic wave theory. Inversion of seismic data for the structure, composition, and state of the interior of the Earth.

**APAS 6620-3. Earth and Planetary Physics 2.** (GEOL/PHYS 6620.) Space and surface geodetic techniques as well as potential theory are covered. Other topics are the definition and geophysical interpretation of the geoid and of surface gravity anomalies; isostasy; post-glacial rebound; tides and the rotation of the Earth.

**APAS 6630-3. Earth and Planetary Physics 3.** (GEOL/PHYS 6630.) The solar system: theories of its origin, meteorites. Distribution of radioactive materials; age dating. Heat flow through continents and the ocean floor; internal temperature distribution in the Earth, mantle convection. Origin of the oceans and atmosphere.

**APAS 6650-variable credit. Seminar in Geophysics.** (GEOL/PHYS 6650.) Advanced seminar studies in geophysical subjects for graduate students.

**APAS 6940 (1-3). Master's Degree Candidate.**

**APAS 6950 (4-6). Master's Thesis.**

**APAS 7150-3. Magnetohydrodynamics.** Development of MHD equations, approximations, MHD flows, waves and shocks, double adiabatic theory, stability theory, boundary layers, convection, and turbulence. Astrophysical applications (varies somewhat according to instructor). Prereqs., APAS 5150 and 5400.

**APAS 7160-3. Intermediate Plasma Physics.** (PHYS 7160.) Continuation of APAS 5150. Topics vary yearly but include nonlinear effects such as wave coupling, quasilinear relaxation, particle trapping, nonlinear Landau damping, collisionless shocks, solitons; nonneutral plasmas; kinetic theory of waves in a magnetized plasma; anisotropy; inhomogeneity; radiation ponderomotive force, parametric instabilities, stimulated scattering; plasma optics; kinetic theory and fluctuation phenomena.

**APAS 7170-3. Advanced Plasma Physics.** (PHYS 7170.) Continuation of APAS 7160. Radiative transfer of plasma waves, advanced kinetic theory of plasmas, spontaneous emission, transport phenomena, fluctuation-dissipation theorems, modulational instability, wave trapping and collapse, turbulence, special topics.

**APAS 7200-3. Dynamics and Photochemistry of the Upper Atmosphere.** Planetary wave propagation, equatorial waves, gravity waves; stratospheric warmings, quasi-biennial oscillation, thermal tides; chemical distributions, long-lived source molecules, photochemical and radiative processes; diabatic circulations, wave transport, motion tracers; remote-sensing techniques. Prereqs., APAS 5050 and 7420.

**APAS 7240-3. Physics of Planetary Airglows.** Theory of the physical processes that lead to the excitation of the airglows.

Ground- and space-based observational techniques used to measure the nightglow, twilightglow, and dayglow. The determination of the structure and composition of planetary atmospheres from airglow measurements. Prereqs., APAS 5110, 5250; PHYS 6550.

**APAS 7300-3. Advanced Magnetospheric Physics.** Current research problems in the physics of the solar and stellar winds, terrestrial, planetary, and stellar magnetospheres, auroras, and space plasmas.

**APAS 7420-3. Geophysical and Astrophysical Fluid Dynamics.** Large-scale dynamics of stratified rotating atmospheres. Quasigeostrophic flow, baroclinic and barotropic instabilities, Rossby wave propagation, wave-mean flow interactions, global circulations, transport processes in planetary atmospheres, and stellar envelopes. Prereqs., APAS 5400 and 5410.

**APAS 7430-3. Fluid Turbulence and Non-linear Processes.** Deterministic models and transition to chaos in fluids. Statistical descriptions of small- and large-scale turbulence in planetary and stellar atmospheres. Dimensionality and intermittency. Mathematical and physical closure models. Prereqs., APAS 5400 and either APAS 5410 or 7420.

**APAS 7500, 7510, 7520, 7530, 7540, 7550-variable credit. Special Topics in Astrophysical, Planetary, and Atmospheric Sciences.** Intended to acquaint students with current research in astrophysical, planetary, and atmospheric sciences. (Topics vary each semester.)

**APAS 7920-variable credit. Reading and Research in Astrophysical, Planetary, and Atmospheric Sciences.** Instructor consent required.

**APAS 8990-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## Cross Listings

**APAS 3191-3. Topics in Meteorology.** (GEOG 3191.) Topics vary from year to year and may include weather-map analysis and prediction, weather modification, severe storms, air quality, and regional weather.

**APAS 3201-3. Topics in Climatology.** (GEOG 3201.) Topics vary from year to year and may include climatic change, snow and ice, mountain weather and climate, and applied climatology.

**APAS 5951-3. Seminar: Climatic Change.** (GEOG/GEOL 5951.) A cross-disciplinary survey of the evidence for and theories of climatic change.

**APAS 5961-3. Theories of Climate and Climate Variability.** (GEOG 5961.) A critical review of the current theories of climatic variability based on analysis of the different physical processes affecting climate.

## BIBLIOGRAPHY

**BIBL 3010-2. Methods of Library Research.** Development of library research methods for the undergraduate to achieve proficiency in the use of libraries.

**BIBL 3900 (1-3). Independent Library Research.** In-depth library research project. For upper-division students. Arranged with consent of instructor.

**BIBL 4900 (1-3). Independent Library Research.** In-depth library research project. For upper-division students. Arranged with consent of instructor.

## BIOLOGICAL SCIENCES

There are four two-semester introductory biology courses offered at CU-Boulder. A student may receive credit for only one sequence. The Department of Environmental, Population, and Organismic (EPO) Biology offers two sequences: (1) EPOB 1210 and 1220 are lecture-only courses designed to accommodate both science and nonscience majors. The accompanying labs (EPOB 1230 and 1240) are designed for and required of majors. (2) EPOB 1410 and 1420 are designed specifically for educationally disadvantaged students.

The Department of Molecular, Cellular, and Developmental (MCD) Biology offers one sequence, MCDB 1050-1060, designed for science and nonscience majors who have the recommended prerequisites. There is a two-semester sequence, NASC 1230-1240, which is designed exclusively for non-science majors.

Students who receive scores of 4 or 5 on the AP biology test or who score in the 66th percentile or higher on the CLEP test in biology receive 6 hours credit and are exempt from EPOB 1210-1220. Students who wish to receive credit for MCDB 1050-1060 should consult with their departmental advisor. Students who transfer credit in biology must also consult their departmental advisor.

### Biology—Environmental, Population, and Organismic

**EPOB 1210-3. General Biology 1.** Lect. A concentrated introduction to molecular, cellular, genetic, and evolutionary biology. Emphasis is on fundamental principles, concepts, facts, and questions which receive more detailed consideration later in the core curriculum. Open to nonmajors.

**EPOB 1220-3. General Biology 2.** Lect. A concentrated introduction to organisms, homeostasis, development, behavior, and ecology. Emphasis is on fundamental principles, concepts, facts, and questions which receive more detailed consideration later in the core curriculum. Open to nonmajors. Prereq., EPOB 1210.

**EPOB 1230-1. General Biology Laboratory 1.** One 2-hour lab per week. Consists of experiments and exercises to provide an extension of basic concepts and scientific approaches presented in the general biology

lecture course. Prereq. or coreq., EPOB 1210. Open to nonmajors.

**EPOB 1240-1. General Biology Laboratory 2.** One 2-hour lab per week. Focuses upon diversity, physiology, and ecology of whole organisms. Provides direct experience with experimental procedures, identification of organisms, and report preparation. Prereq. or coreq., EPOB 1220. Open to nonmajors.

**EPOB 1300, 1310, 1320. Topics in Biological Sciences.** Designed to cover special topics in biology for freshmen or nonmajors. May serve as a general introduction to scientific methods and principles in biology, as well as address issues of current interest in biology. Does not count toward major in EPOB.

**EPOB 1410-4. Introduction to Biology 1.** Three lect., two rec. per week. An introductory survey for students educationally disadvantaged in biology and other sciences (i.e., students with inadequate or no high school science courses). Includes molecular, cellular, developmental, and organismic biology. Emphasis placed on fundamental principles, concepts, facts, and questions. Prereq., instructor consent.

**EPOB 1420-4. Introduction to Biology 2.** Three lect., two rec. per week. Continuation of introductory survey provided in EPOB 1410. For students educationally disadvantaged in biology and other sciences. Includes introduction to organisms, homeostasis, behavior, ecology, and evolutionary biology. Emphasis on fundamental principles, concepts, facts, and questions. Prereq., EPOB 1410.

**EPOB 1840 (1-3). Independent Study (Freshman).**

**EPOB 1870 (1-3). Independent Research (Freshman).**

**EPOB 2840 (1-3). Independent Study (Sophomore).**

**EPOB 2870 (1-3). Independent Study (Sophomore).**

**EPOB 3020-3. Principles of Ecology.** Lect. Principles relating to ecosystem structure and function; properties and interactions of populations; adaptations and environmental influences; organization and development of terrestrial and aquatic ecosystems. Prereqs., EPOB 1210 and 1220, or MCDB 1060, or NASC 1230 and 1240. Open to nonmajors.

**EPOB 3030-3. Introduction to Biological Statistics.** Lect. and discussion. Introduction to statistical methods for the design and analysis of biological research. Includes such topics as development and testing of hypotheses, field research vs. the controlled experiment, and when to use parametric vs. distribution-free statistics. Prereqs., EPOB 1210 and 1220, or MCDB 1060 and MATH 1110.

**EPOB 3160-3. Paleocology.** Lect. History of modern biotic communities; background of climatic history as setting for contemporary studies of evolution, genetics, and ecology; the myth of stable tropical biotas; ecotonal instability in North America; extinction of large mammals; why environmental planning ignores historical perspective. Field trips required. Prereqs., EPOB 1210 and 1220, or MCDB 1060, or instructor consent.

**EPOB 3170-3. Arctic and Alpine Ecology.**

Lect. Deals with the biology of arctic and alpine environments, the limiting physical factors (such as geomorphology and climatic history), and the human interaction with cold stressed environments, especially the arctic. Field trips are required. Prereqs., EPOB 1210 and 1220, or MCDB 1060 or GEOL 1010 or 1992, or instructor consent.

**EPOB 3180-3. Global Ecology.** (NASC 3180.)

Lect. Involves the study of ecological principles and problems at the biosphere level. Presents a worldwide approach to populations, biotic resources, ecologic interactions, land use, deforestation, desertification, species extinctions, pollution, environmental quality and restoration, and environmental ethics. Prereqs., EPOB 1210 and 1220, or MCDB 1060, or NASC 1230 and 1240. Open to nonmajors.

**EPOB 3200-3. Genetics.** Lect. and rec.

Study of Mendel's laws, gene action, linkage, chromosomal aberrations, mutation, genetic fine structure, chemical basis of heredity, quantitative and population genetics. For emphasis on molecular, biochemical, and developmental genetics, MCDB 3400 is recommended. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 3240-4. Animal Behavior.** Lect.

Topics include basic concepts and history, methods of study, neurobiology and behavior, the development of behavior, predator-prey relationships, communication, aggression and dominance, mating systems, and parental care. Where possible, life-history strategies, the evolution of behavior, and behavioral ecology are stressed. Prereqs., EPOB 1210 and 1220, or PSYC 1001, or ANTH 2020.

**EPOB 3250-3. Introduction to Evolution.**

Lect. Designed to introduce both science and nonscience majors to modern concepts of organic evolution. Traces the historical development of evolutionary thought, which is central to modern life science, and surveys the kinds of substantiating evidence. Prereqs., EPOB 1210 and 1220, or instructor consent. Open to nonmajors.

**EPOB 3400-4. Microbiology.** Lect. and lab. A

survey of distinguishing characteristics of microorganisms based on structural-functional relationships, taxonomy, growth, physical-chemical agents of control including antibiotics, metabolism, and genetics. Students receive an introduction to applied microbiology with emphasis on infectious diseases, basic concepts of immunology, and microbial ecology. Prereqs., EPOB 1210 and 1220 and CHEM 1071, 1131, or 1171. Organic chemistry advised.

**EPOB 3420-5. Introduction to Human Anatomy.** Lect. and lab.

An introduction to the basics of human anatomy. Students may not receive credit for both EPOB 3420 and PHED 2790. Prereqs., EPOB 1210 and 1220, or MCDB 1060, or instructor consent.

**EPOB 3430-5. Human Physiology.** Lect., lab

and rec. An introduction to human physiology primarily for students in pharmacy and allied health programs. May be counted towards EPOB major. Students may not receive credit for both EPOB 3430 and PHED

2800. Prereqs., EPOB 1210-1240 or MCDB 1060 and CHEM 1071, 1131, or 1171.

**EPOB 3450-3. The Biology of Human**

**Reproduction.** Lect. Anatomy and physiology of human reproduction, including sex determination, embryology, puberty, menstrual cycle, pregnancy, lactation, menopause, sexual behavior, sexual abnormalities, and contraception. Prereqs., EPOB 1210 and 1220, or MCDB 1060. Open to nonmajors.

**EPOB 3500-4. Plant Kingdom.** Lect. and lab.

A survey of plant types with an emphasis on the diagnostic features of plants in general and major taxa in specific. Emphasis is placed on the identity, morphology, anatomy, reproduction, ecology, geography, evolution, fossil record, and economic use of taxon. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 3510-4. Plant Anatomy and Develop-**

**ment.** Lect. and lab. An introduction to the structures of seed plants, especially angiosperms, and the developmental history of these structures. Cell types are learned, and their location and function in plant tissues and organs are studied. The laboratory provides an opportunity to examine plant tissues and to prepare tissues for examination by the light microscope. The role of plant structures in the living plant is stressed. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 3520-4. Flowering Plant Systematics.**

Lect. and lab. Introduction to orders and families of angiosperms and consideration of evolutionary relationships. Synopsis of current research areas in modern biosystematics placed in an historical framework. Field and laboratory identification of higher plants with introduction to local and regional flora. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 3530-4. Essentials of Plant Physi-**

**ology.** Lect. and lab. Water relations, photosynthesis, respiration, germination, growth, and movements of plants. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 3630-3. Parasitology.** Lect. and lab. A

survey of animal parasites, including life histories; emphasis on parasites of humans. Prereqs., EPOB 1210 and 1220, or MCDB 1060, or instructor consent.

**EPOB 3650-3. Embryology.** Lect.

Lectures emphasize the experimental analysis of embryonic development in animals. Topics covered include gametogenesis, fertilization, cleavage, gastrulation, cytodifferentiation, morphogenesis, and organogenesis. Students may not receive credit for both EPOB 3650 and MCDB 4650. Prereqs., EPOB 1210 and 1220, or MCDB 1060; coreq., EPOB 3660.

**EPOB 3660-2. Developmental Biology Labo-**

**ratory.** Lab for EPOB 3650 and MCDB 4650. Studies of live eggs and embryos from sea urchins, nematodes, fruit flies, frogs, chickens, and mice, plus cultured cells, sponges, and slime molds, provide experience with experimental design and interpretation of data. Prepared slides illustrate details of descriptive embryology. Coreq., EPOB 3650 or MCDB 4650.

**EPOB 3700-5. Comparative Animal Physi-**

**ology.** Lect., lab, and rec. Introduction to principles of animal physiology and responses to environmental change. Prereqs., EPOB 1210 and 1220, or MCDB 1060 and CHEM 1071, 1131, or 1171, or instructor consent.

**EPOB 3720-5. Principles of Comparative**

**Vertebrate Anatomy.** Lect. and lab. An introduction to the major components of the vertebrate body and how they are organized into a whole organism, emphasizing function, evolution, and diversity of these basic features. Laboratories involve dissection of representative groups and demonstrations. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 3840 (1-3). Independent Study (Junior).****EPOB 3870 (1-3). Independent Research (Junior).**

**EPOB 3930 (1-6). Internship.** Provides an academically-supervised opportunity for upper-division students to work in public or private organizations. Projects are usually related to the students' career goals. Each project has an academic as well as a work component. Instructor consent required.

**EPOB 4000/5000-3. Teaching of Modern**

**High School Biology.** Lect. and lab. The context in which modern biology should be taught to either high school or college and university students. Recommended for biological science education majors. Prereqs., EPOB 1210 and 1220, or MCDB 1060, and junior standing.

**EPOB 4010-2. Teaching Biology.**

Offers students a one-time opportunity to assist in teaching of specific laboratory section in EPO Biology under direct faculty supervision. Students must make arrangements with the faculty person responsible for the course in which they plan to assist. No student can receive independent study credit through this program.

**EPOB 4020/5020-3. Stream Biology.** Lect.

Geological, physical, chemical, and biological study of flowing water with special reference to streams and rivers as ecosystems. A laboratory course is offered (see EPOB 4150, 4160, 4170/5150, 5160, 5170). Prereq., EPOB 3020 or instructor consent.

**EPOB 4030/5030-3. Limnology.** Lect.

Ecology of inland waters, including a detailed consideration of physical, chemical, and biological properties of freshwater ecosystems: origins and major characteristics of lakes and streams, survey of chemical and nutrient cycles in freshwater habitats, and survey of biotic composition of freshwater environments. Important themes in modern freshwater ecology are considered, including energy flow, trophic structure, eutrophication, and management of freshwater ecosystems. Prereq., EPOB 3020 or instructor consent.

**EPOB 4040-3. Wildlife Impact Assessment.**

Lect. Topics include prediction, detection, evaluation, communication, and mitigation of effects of human activities on wildlife populations and habitats. Many of the concepts and methods apply more broadly to environmental impact assessment. Prereq., EPOB 3020 or instructor consent.



**EPOB 4050-2, 4060-2. Biological Seminar.** Designed primarily for seniors seeking honors in EPO Biology. Separate sections may be available for other seniors, especially those interested in graduate studies. Sample topics include history of biological concepts, impact of biology on modern thought, and biology and the crises of the modern world. Prereq., instructor consent.

**EPOB 4070/5070-3. Geographical Ecology.** Lect. Discussion of the ecological and faunistic distribution of animals on a world basis. How the number and kinds of species vary from region to region and how we can account for this variation. Patterns of distribution of animals in terms of historical geological, evolutionary, and ecological processes that have caused them. Emphasis is placed on ecological aspects. Prereq., EPOB 3020 or instructor consent.

**EPOB 4080/5080-3. Physiological Plant Adaptation.** Lect. Examines adaptive aspects of plant structure and function in natural environments. Some subjects considered are cost-income approach to resource allocation, leaf energy budgets and the adaptive significance of leaf size and shape, environmental and biological control of photosynthesis, and adaptive aspects of plant water relations. (For concurrent laboratory see EPOB 5090.) Prereqs., EPOB 3020 and either 3500 or 3530, or instructor consent.

**EPOB 4100, 4110, 4120, 4130, 4140/5100, 5110, 5120, 5130, 5140 (2-4). Advanced Ecology.** Specific aspects of ecology. Emphases are specialties of faculty. One or more courses are offered most semesters. Topics which have been taught include dynamics of mountain ecosystems, tundra ecology, ethnecology, population dynamics, tropical and insular biology, ecology of fishes, quantitative plant ecology, and arctic and alpine environments. Prereqs., EPOB 1210 and 1220, or MCDB 1060 and EPOB 3020.

**EPOB 4150, 4160, 4170/5150, 5160, 5170 (1-2). Techniques in Ecology.** Courses emphasize application of modern ecological techniques, such as stream biology, aquatic biology, environmental measurement and control, and techniques in geoecology.

**EPOB 4190/5190-3. Introduction to Neurobiology.** (MCDB 4190/5190). Lect. An introduction to the cellular structure and physiology of neurons, followed by a consideration of integrative mechanisms. Topics include the action potential, synaptic transmission development, sensory systems, motor systems, and the neural basis of behavior. Prereq., EPOB 3700, or MCDB 3120, or PSYC 4052, or instructor consent.

**EPOB 4200/5200-3. Developmental Neurobiology.** Lect. An intensive survey of mechanisms involved in the development of neurons and neural circuits in both vertebrates and invertebrates. Prereq., EPOB 3650 or instructor consent.

**EPOB 4220-3. Eukaryotic Genetics Laboratory.** See MCDB 4320.

**EPOB 4240, 4250/5240, 5250 (1-4). Advanced Topics in Animal Behavior.** Lect. Special areas of ethology such as sociobiology, animal communication. Prereqs., EPOB 3240 and instructor consent.

**EPOB 4260/5260-4. Evolutionary Ecology of Plants.** Lect. Ecology and evolution of plant populations: population dynamics, geographic variation, adaptive strategies, and plant-animal coevolution. Prereqs., EPOB 3020, 3200, and 3250, or instructor consent.

**EPOB 4270/5270-3. Population Genetics and Evolution.** Lect. Focus is on the evolutionary mechanisms influencing levels of genetic variation within populations and the differentiation of populations. Examples are from natural populations, laboratory experiments, and simulation studies. Special topics include overdominance, sexual selection, and mechanisms of speciation. Prereq., EPOB 3200 or instructor consent.

**EPOB 4280, 4290/5280, 5290 (2-4). Advanced Topics in Evolution.** Specialized aspects of organic evolution. Courses offered include origin and dispersal of flowering plants, reproductive biology of flowering plants, evolution, and speciation.

**EPOB 4300, 4310/5300, 5310 (2-4). Advanced Genetics.** Courses deal with specialized topics in genetics. Prereq., EPOB 3200.

**EPOB 4320, 4330/5320, 5330 (1-2). Techniques in Genetics.** Courses involve specific procedures and their applications in solving genetic research problems.

**EPOB 4340/5340-3. Evolutionary Morphology of Vertebrates.** Lect. An advanced course in vertebrate structure and evolution, with emphasis on current controversies and methods in the study of morphology. Material is drawn from a number of fields including comparative anatomy, paleontology, biomechanics, and developmental biology. Prereq., EPOB 3720 or instructor consent.

**EPOB 4350/5350 (2-4). Biological Field Studies.** Courses stress broad areas of biology and employ field approaches. Instructor consent required.

**EPOB 4360/5360-3. Microbial Ecology.** Lect. and lab. Microbial approaches and solutions to environmental problem areas in which microorganisms play favorable or unfavorable roles: in biodeterioration control in soil, water and waste management, current pollution problems, resource recovery, energy production, ecological control of pests, and biotechnology. Prereqs., EPOB 1210 and 1220, or MCDB 1060. Open to nonmajors.

**EPOB 4370, 4380/5370, 5380 (2-4). Advanced Microbiology.** Courses deal with specialized topics related to microbiology such as microbial ecology, microbial physiology, and applied microbiology. Prereq., EPOB 3400 or 4360.

**EPOB 4390/5390 (1-2). Advanced Microbiology Laboratory.** Special techniques related to specific areas of microbial research: microbial ecology laboratory, microbial physiology laboratory.

**EPOB 4400/5400-3. Comparative Biology of Locomotion.** Lect. Investigates the physiological consequences of natural animal activities. Covers topics such as metabolic energy production, skeletal muscle function, the metabolism of flying birds and insects,

aquatic locomotion, and terrestrial locomotion including migration energetics and exercise adaptations in lower vertebrates and humans. A blend of physiology, metabolism, and behavior. Prereq., EPOB 3430 or 3700, or instructor consent.

**EPOB 4410/5410-4. Biometry.** Lect. and lab. A demanding, problems-oriented methods course in statistical inference procedures, assumptions, limitations, and applications with emphasis on techniques appropriate to realistic biological problems. Includes data file management using interactive computing techniques. Prereqs., EPOB 1210 and 1220, or MCDB 1060 and MATH 1110, and senior status.

**EPOB 4420/5420-3. Environmental Animal Physiology.** Lect. A broad consideration of biochemical, physiological, morphological, and behavioral adaptations of animals to various environments and strategies for allocation of energetic expenditures in relation to environmental demands. Prereq., EPOB 3430 or 3700 or instructor consent.

**EPOB 4440-3. Mammalian Endocrinology.** Lect. An introduction into the mammalian endocrine system, this course provides a thorough analysis and integration of chemical communication by hormones, paracrines, and semiochemicals.

**EPOB 4460, 4470/5460, 5470 (2-4). Advanced Animal Physiology.** Specialized areas of physiology including invertebrate physiology, cell physiology, vertebrate reproduction, and others. Prereq., EPOB 3430 or 3700.

**EPOB 4480, 4490/5480, 5490 (1-2). Techniques in Animal Physiology.** Laboratory courses dealing with special techniques employed in various aspects of physiological research. Examples: techniques in endocrinology, instrumentation, vertebrate physiology laboratory. Instructor consent required.

**EPOB 4510/5510-4. Plant Ecology.** Lect., lab, and field work. Discussion of the ecosystem concept. Survey of the characteristics of Colorado ecosystems in detail and of North America in general; adaptation; ecological classification of plants. Prereq., EPOB 3020.

**EPOB 4520-3. Plants of Colorado.** Lect., lab, and field trips. A systematic survey of Colorado plants including algae, fungi, lichens, mosses, gymnosperms, and flowering plants. Plant collections are required. Prereqs., EPOB 1210 and 1220, or MCDB 1060. Open to nonmajors.

**EPOB 4530-4. Morphology of Nonvascular Plants.** Lect. and lab. Algae, fungi, and bryophytes. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 4540-4. Morphology of Vascular Plants.** Lect. and lab. Tracheophytes. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 4550, 4560/5550, 5560 (2-4). Advanced Botany.** Special areas of botany including courses in algology, mycology, lichenology, palynology, evolution and ecology of domesticated plants, advanced classification of flowering plants, plants of Colorado, developmental plant anatomy, and Cenozoic paleobotany. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 4570, 4580/5570, 5580 (2-4).**

**Advanced Plant Physiology.** Functional aspects of botany including advanced general plant physiology, ecological plant physiology, plant growth and development in sterile culture. Prereq., EPOB 3530 or 4080 or instructor consent.

**EPOB 4630/5630 (2-4). Field Techniques in Environmental Science.**

A field and laboratory course in assessing the abiotic and biotic environment. Emphasis is on field techniques in climatology, surveying soils, hydrology, geomorphology, plant and animal ecology, and environmental law. Evaluation by written module reports and maps. Instructor consent required.

**EPOB 4640/5640 (2-4). Plant Field Studies.**

Field-oriented courses offered at irregular intervals or during summer sessions. Examples: field botany, plants of Colorado. Instructor consent required.

**EPOB 4650/5650-5. Invertebrate Zoology.**

Lect. and lab. Morphology, physiology, ecology, and phylogeny of invertebrates. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 4660/5660-4. Insect Biology.**

Lect. and lab. An introduction to evolution, ecology, physiology, and behavior of insects. Emphasis on how insects have solved problems, such as maintaining water balance or finding food, that are shared by all animals but for which there may be unique solutions among the insects. Agricultural and human health problems relative to entomology are discussed. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 4670, 4680/5670, 5680 (2-4).**

**Advanced Invertebrate Biology.** Courses dealing with specific taxa and/or special aspects of invertebrate biology. Topics offered include insect taxonomy, aquatic invertebrate zoology, biology of social insects, benthic and Aufuchs ecology. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 4690/5690 (1-2). Advanced Invertebrate Biology Laboratory.** Laboratory courses dealing with special taxa and/or special aspects of invertebrate biology. Instructor consent required.

**EPOB 4700/5700-5. Vertebrate Histology.**

Lect. and lab. Analysis of vertebrate histology and preparation of vertebrate tissues for light microscopic examination. Especially useful to students of vertebrate anatomy, development, and physiology. Prereq., EPOB 3650, 3700, or 3785, or instructor consent.

**EPOB 4740/5740-3. Biology of Amphibians and Reptiles.**

Lect. Comparative morphology, taxonomy, ecology, and geographic distribution of amphibians and reptiles. Prereq., EPOB 1210 and 1220, or MCDB 1060.

**EPOB 4750/5750-3. Ornithology.**

Lect., lab, and field trips. Origin, evolution, ecology, physical and behavioral characteristics, and taxonomy of orders and families of birds of North America; field work with local species emphasizing avian ecology. Prereq., EPOB 3020 or instructor consent.

**EPOB 4760/5760-4. Mammalogy.** Discussion, lab, and field studies. Origin, evolution and adaptation, geographic distribution, ecology, and taxonomy of mammals; field

and laboratory study of Colorado species. Prereq., EPOB 3020 or instructor consent.

**EPOB 4770, 4780/5770, 5780 (2-4).**

**Advanced Vertebrate Biology.** Special aspects of vertebrate biology such as ichthyology, experimental embryology, biology of freshwater fishes, and vertebrate natural history.

**EPOB 4790, 4800/5790, 5800 (1-2).**

**Advanced Vertebrate Biology Laboratory.** Laboratory courses dealing with special taxa and/or special aspects of vertebrate biology. Instructor consent required.

**EPOB 4810, 4820/5810, 5820 (2-4). Animal Field Studies.**

Field-oriented courses in animal biology. Courses are typically taught at locations other than the Boulder Campus. Instructor consent required.

**EPOB 4840 (1-3). Independent Study (Senior).****EPOB 4870 (1-3). Independent Research (Senior).**

**EPOB 5090-1. Techniques in Plant Ecophysiology.** Laboratory course taken concurrently with EPOB 5080. Lab exercises include modern techniques in plant ecophysiology such as infrared gas analysis, pressure chamber analyses, thermocouple psychrometry, and leaf porometry. Coreq., EPOB 5080.

**EPOB 5180-3. Biophysical Ecology.** The first half of the course examines aspects of solar radiation, thermal radiation, sensible heat transfer through conduction and convection, wind, and latent heat transfer through evaporation. During the second half, these concepts are used to discuss biological microenvironments, plant and animal energy budgets, and plant and animal adaptation to microenvironments. Prereqs., EPOB 3020 and PHYS 3020, or instructor consent.

**EPOB 5440-3. Vertebrate Endocrinology.**

Lect. Evolutionary analysis of the chemical control and integration of physiology and behavior. Instructor consent required.

**EPOB 5830-5. Neuroscience Research Lab.**

(MCDB 5800, PSYC 5800, ASEN 5080.) An intensive study of methods and techniques in neuroscience research for advanced graduate students. Methods are drawn from electrophysiology, neurohistology, computer neural modeling, neurochemistry, neuropharmacology, and psychophysics. Faculty and topics vary from term to term. Instructor consent required.

**EPOB 5840/7840 (1-3). Independent Study (Graduate).**

**EPOB 6000-1. Seminar: Introduction to Biological Research.** In-depth discussions on areas of biological research represented in EPO Biology. Required of all first-year graduate students in EPO Biology.

**EPOB 6100 through 6190/7100 through 7190-2. Seminar in Environmental Biology.**

Open only to graduate students. Instructor consent required.

**EPOB 6200 through 6290/7200 through 7290-2. Seminar in Population Biology.**

Open only to graduate students. Instructor consent required.

**EPOB 6300 through 6390/7300 through 7390-2. Seminar in Organismic Biology.**

Open only to graduate students. Instructor consent required.

**EPOB 6840/8840 (1-3). Independent Research in Environmental Biology.**

Instructor consent required.

**EPOB 6860/8860 (1-3). Independent Research in Population Biology.**

Instructor consent required.

**EPOB 6880/8880 (1-3). Independent Research in Organismic Biology.**

Instructor consent required.

**EPOB 6940 (1-3). Master's Degree Candidate.** Instructor consent required.

**EPOB 6950. Master's Thesis.** Instructor consent required.

**EPOB 8990. Doctor's Dissertation.** Instructor consent required.

**Biology—Molecular, Cellular, and Developmental**

**MCDB 1010-3. Molecular Biology for Non-Scientists.** Introduces nonmajors to modern molecular biology. Topics covered include gene cloning, biotechnology, oncogenes, AIDS virus, cancer, monoclonal antibodies, gene replacement therapy, screening for inherited diseases, and recombinant vaccines. No background in biology is required.

**MCDB 1050-4, 1060-4. Introduction to Molecular, Cellular, and Developmental Biology.** Three lect., one 2-hour lab per week. Designed to prepare nonmajors, MCDB majors, and other science majors for upper-division MCDB courses. Nonscience majors who seek to understand modern biology and its implications for the future of humankind are encouraged to enroll as long as they have had high school chemistry and algebra. Topics include structure of biological macromolecules and molecular associations; structure and function of cells; sources of energy and materials for life; reproduction; molecular and Mendelian genetics; growth, development, and death; multicellularity; organismal physiology; communities of organisms; and origin and evolution of life. Lab sections stress carrying out actual experiments, and provide time for questions and discussion of lecture material. MCDB 1050 is prereq. for 1060.

**MCDB 2840 (1-6). Independent Study (Sophomore).**

**MCDB 3120-3. Cell Biology.** Lect. Introduction to modern cell biology, with an emphasis on the molecular basis of cellular organization and function. Topics include cellular membrane systems, intracellular organelles, photosynthesis, the cytoskeleton, extracellular matrix, and the functional organization of genetic material. Recommended for students planning careers in health sciences. MCDB 3140 must be taken concurrently by MCDB and distributed studies majors. Prereq., MCDB 1060 or EPOB 1220 or instructor consent.

**MCDB 3140-2. Cell Biology Laboratory.** One 3½ hour lab per week. Provides hands-

on experience with modern cell biology laboratory techniques. Topics covered include light and electron microscopy, cell surface antigens, biochemical analysis of fractionated liver cells, and photosynthesis. Coreq., MCDB 3120.

**MCDB 3150-3. Biology of the Cancer Cell.** Cellular basis of cancer. Includes kinds of cancer and range of occurrence among animals and humans; cell reproduction; loss of control of cell reproduction in cancer; chemicals, viruses, and radiation as causes of cancer; environmental causes of cancer; cancer and diet; cancer epidemiology; genetic basis of cancer; and prevention of cancer. Prereq., MCDB 1050 or instructor consent.

**MCDB 3200-3. Histophysiology: The Structure and Function of Vertebrate Organ Systems.** The structure and function of the four basic types of vertebrate tissues are discussed, and how the arrangement of these tissues in the major organs contributes to the functioning of these organs is explained. The correlation between microscopic anatomy and organ function is stressed. Recommended for students preparing for careers in the health sciences. MCDB 3210 is optional laboratory for this course. Prereq., MCDB 1060 or EPOB 1220 or instructor consent.

**MCDB 3210-1. Histophysiology Laboratory.** Students learn to identify and analyze the structure of vertebrate tissues and organs by means of the light microscope. Correlation with electron microscope images are stressed. An optional laboratory to accompany MCDB 3200. Coreq., MCDB 3200.

**MCDB 3330-3. Evolution, Creationism, and Origins of Life.** An intensive lecture/discussion course on the theory of evolution, its historic and scientific development, the conflict between evolution and creationism, and current ideas on the origins and evolution of life on earth. Does not count as an MCDB major's elective. Prereqs., recommended but not required, any of the following: HIST 4521 or 4314; PHIL 1400, 3400, or 3420; MCDB 1060; EPOB 1220, 1420, or 3250.

**MCDB 3350-3. Fertility, Sterility, and Early Mammalian Development.** Describes the production of germ cells, ovulation, fertilization, reproductive cycles, the nervous and hormonal controls of reproduction, the development of the embryo through implantation in the uterus, methods of contraception, and the causes and treatments of sterility. Prereq., MCDB 1060 or EPOB 1220 or instructor consent.

**MCDB 3400-4. Molecular Genetics.** Major emphasis is on understanding genetic phenomena at the DNA level. Topics covered range from bacterial and viral genetics through Mendelian and human genetics. Particular attention is given to techniques used for genetic mapping in prokaryotes and eukaryotes, the relationship between chromosomes and genetic maps, RNA and protein syntheses and how these processes can be altered to control gene expression, recombinant DNA procedures, transposable elements, replication, mutation and repair of DNA, and genetic studies of mammalian cells in tissue culture. Prereqs., CHEM 1031, 1071, and MCDB 1060, or instructor consent.

**MCDB 4010-variable credit. Teaching MCD Biology.** Practice teaching in college-level courses in MCD Biology. Students experience laboratory teaching; participate in holding discussion sections, review sessions, and office hours; and carry out special projects. Does not count as an MCDB major's elective. Instructor consent required. May not be repeated.

**MCDB 4110-variable credit. Special Topics.** Presentations of special topics in molecular, and/or cellular, and/or developmental biology, usually given by visiting faculty, alone or in conjunction with MCDB faculty.

**MCDB 4140/5140-3. Introduction to Plant Molecular and Cellular Biology.** Introduction to some of the main frontiers in experimental plant research with applications in modern biotechnology, including photosynthetic mechanisms, hormonal control of growth, photomorphogenesis, stress responses (heat, water, salt), host-pathogen systems (bacteria, fungi, viruses, viroids), plant defense mechanisms, beneficial interactions ( $N_2$  fixation), plant cell tissue culture, and genetic engineering of plants. Prereqs., MCDB 3120 and 3400, or instructor consent.

**MCDB 4190/5190-3. Introduction to Neurobiology.** (EPOB 4190/5190.) An introduction to the cellular structure and physiology of neurons, followed by a consideration of integrative mechanisms. Topics include the action potential, synaptic transmission, development, sensory systems, motor systems, and the neural basis of behavior. Prereq., one-upper division course in physiology or cell biology, or instructor consent.

**MCDB 4200/5200-2. Topics in Plant Cell Biology, Ultrastructure, and Morphogenesis.** Instructor and, in some cases, students present lectures, seminars, and papers on selected contemporary problems in morphogenesis, sexuality, physiology, and cell division among higher and lower plants. Instructor consent for nonbiology majors.

**MCDB 4220/5220-3. The Plant Cell—Diversity of Form and Function.** Structure and ultrastructure of a wide variety of plant cells including algae and lower plants examined and compared. The correlation of structure with possible function is emphasized; the variation and diversity in both form and role of cell organelles and the cells themselves demonstrated. Instructor consent for nonbiology majors.

**MCDB 4320-3. Eukaryotic Genetics Laboratory.** (EPOB 4320.) Focuses on laboratory experiments in classical population and molecular genetics to elucidate the principles of these areas. Students perform research projects with a number of organisms. Prereq., MCDB 3400 or instructor consent.

**MCDB 4400-3. Seminar: Recombinant DNA and Cloning.** A small, intensive course, in seminar format, accompanied by a few lectures. Every student reads, speaks, and comments on original scientific literature in the field of genetic engineering. Goal is articulate, independent, critical understanding of a section of biology. Prereqs., excellent understanding of material in MCDB 1050 and 3400.

**MCDB 4410-3. Human Biochemical Genetics.** The human organism as a genetic system: effect of mutation on protein structure and function; biochemical basis of human genetic disease; immunogenetics; polymorphic gene loci; gene mapping; impact of human genetics on medicine and society. Prereq., MCDB 3400.

**MCDB 4440/5440-3. Cell Growth and Reproduction.** Lect. The passage of eukaryotic cells through the cell cycle is examined in depth. Emphasis is given to extracellular requirements for cellular multiplication and to intracellular mechanisms and regulatory signals involved in cellular growth and reproduction. Topics covered include genetics and physiology of the cell cycle in yeast, growth requirements of cultured vertebrate cells, cellular growth factors, quiescence, initiation of the cell cycle, biochemical and physiological events associated with the cell cycle, cellular senescence, immortalization of cells, malignancy and oncogene function in normal and malignant cells. Prereqs., MCDB 3120, 3400; coreq., CHEM 4711.

**MCDB 4470/5470-3. Regulation of Gene Expression in Development.** Molecular biology of cell differentiation in development with special emphasis on mammalian systems. Part I focuses on biological systems, *in vivo* and in cell culture, with discussions on major cell differentiation systems, cell fusion, and hybridoma technology. Part II examines molecular mechanisms of gene expression, with discussions on actively pursued systems and coordinate regulations. Prereqs., CHEM 4711 and MCDB 3400, or instructor consent.

**MCDB 4500/5500-4. Workshop in Electron Microscopy.** Laboratory course that allows the student to obtain experience in the preparation of specimens for electron microscopy, instruction in the operation of the transmission electron microscope, and limited experience with the use of the scanning electron microscope. Instruction in photographic techniques and experience in interpretation of micrographs are also included. Prereqs. for MCDB 4500, MCDB 3120 and instructor consent; for MCDB 5500, graduate standing or instructor consent.

**MCDB 4510/5510-variable credit. Advanced Workshop in Electron Microscopy.** Allows students to undertake research projects in which electron microscopy is the primary technique. Students are able to exploit and extend their mastery of techniques acquired by previous training in electron microscopy. Prereq., instructor consent.

**MCDB 4650-3. Developmental Biology.** Analysis of development with emphasis on cellular and molecular mechanisms. Topics covered include descriptive embryology, control of gene expression in eukaryotic cells, mechanisms of differentiation, and morphogenesis and developmental genetics. Prereqs. or coreqs., MCDB 3120, 3400, or instructor consent; coreq., MCDB 4660.

**MCDB 4660-2. Developmental Biology Laboratory.** Lab for MCDB 4650 and EPOB 3650. Studies of live eggs and embryos from sea urchins, nematodes, fruit flies, frogs, chickens, and mice, plus cultured cells, sponges, and slime molds, provide experience with

experimental design and interpretation of data. Prepared slides illustrate details of descriptive embryology. Concurrent enrollment in EPOB 3650 or MCDB 4650 required.

**MCDB 4680/5680-3. Mechanisms of Aging.** Study of aging as a developmental process with emphasis on the cellular and molecular mechanisms involved. Prereqs., MCDB 3120 and 3400; coreq., MCDB 4650 or EPOB 3650.

**MCDB 4720/5720-3. Molecular Biology of Cellular Membranes and Organelles.** Examines the functional, biosynthetic, and metabolic interrelationships between cellular organelles. Topics include organelle biochemistry, intracellular energy flow, organelle biogenesis and turnover, and cellular evolution. Prereqs., MCDB 3120 and CHEM 4711.

**MCDB 4750-2. Animal Virology.** Basic course encompassing the structure, replication, and interactions with the host of both lytic and transforming animal viruses. The diversity of naturally occurring genomic structures and the resulting strategies of infection are emphasized. Prereqs., MCDB 3400 and CHEM 4711, or instructor consent.

**MCDB 4840 (1-6). Undergraduate Independent Study (Junior/Senior level).** Instructor consent required.

**MCDB 4850-2. Advanced Topics in Early Mammalian Development.** An intensive seminar course focusing on current topics in the molecular and cellular biology of early mammalian development. In addition to lectures, the course involves student presentations on current research and research literature in early mammalian embryogenesis. Emphasis is placed on discussions of genomic and extragenomic forces that influence and direct development during the pre- and postfertilization period. Prereq., MCDB 1320, EPOB 3650, or instructor consent.

**MCDB 4970/5970-2. Seminar on Physical Methods in Biology.** (PHYS 4970/5970.) An introduction to the basic mechanism and applications of physical methods, both established and recently developed, that are currently used at the forefront of research in cellular and molecular biology (e.g., synchrotron radiation, electron and X-ray crystallography, new forms of ultramicroscopy, video-enhanced light microscopy, NMR imaging, fluorescence). Includes lectures, presentations, and occasional demonstrations. Prereqs., MCDB 1060, EPOB 1220, and PHYS 3020 or PHYS 1120, or instructor consent.

**MCDB 5050-4, 5060-3, 5070-4, 5080-3. Core Courses in Molecular, Cellular, and Developmental Biology 1-4.** Classes meet 6-8 hours per week throughout fall and spring semesters. The four courses are tightly integrated to provide an advanced overview of life processes at the molecular, cellular, and developmental level, as well as an introduction to current research in these areas of biology. Emphasis is placed on correlating information derived from pro- and eukaryotic cells. The courses are divided into segments, team-taught by two to four faculty. Topics include structural and functional organization of bacterial, animal, and plant cells; energy metabolism; enzymes; structure,

function, and assembly of membranes, microtubules, microfilaments; photosynthesis; chromosomes; genes as units of molecular memory; DNA replication, recombination, transcription; mutation and genetic mapping; translation and posttranslational control; host-virus interactions; evolution of patterns of gene expression; hormones; morphogenesis of complex viruses and subcellular structures; inheritance of cytoplasmic and cortical structures; developmental fields in morphogenesis and regeneration; cell lineage patterns in development; cytoplasmic determinants versus morphogenetic gradients. A detailed outline of each course can be obtained from the department. Prereq., instructor consent.

**MCDB 5130-3. Advanced Topics in Electron Microscopy.** Three lectures per week with occasional demonstrations or lab sessions. Basic mechanisms beyond introductory stage and recent developments of current interest in advanced biological research. Elements of electron optics, image optimization, image formation and recording, resolution, radiation damage, various modes of ultramicroscopy (including CTEM, SEM, STEM, HVEM), stereoscopy of cells and tissues, image processing, specimen quantitation, microanalysis, autoradiography, applications to molecular biology, elements of electron diffraction. Specimen preparation treated only incidentally. Some familiarity with electron microscopy desirable. Prereq., MCDB 1060 or EPOB 1220, or MCDB 4500 or 5500, or PHYS 3020 or 1120, or instructor consent.

**MCDB 5300-2. Yeast Molecular Biology and Genetics.** Seminar presentations on selected topics in the biology of molecular genetics, and biochemistry of yeast. Older literature and current research papers are covered. May be repeated.

**MCDB 5750-3. Animal Virology.** Same as MCDB 4750, with one additional meeting per week for the purpose of further discussion and a critical review of the literature.

**MCDB 5780-2. Cell Membranes and Photosynthesis.** Discussions and reports on research advances in biological membranes, particularly photosynthetic membranes; plant cell secretion and assembly of plant cell walls. May be repeated. Instructor consent required.

**MCDB 5820-2. Seminar on Nematode Development.** Presentations on current research and research literature in nematode physiology and development, with emphasis on molecular, cellular, and genetic aspects. May be repeated. Instructor consent required.

**MCDB 5830-1. Seminar on Genetics and Biology of *Drosophila* and *C. elegans*.** Presentations on selected topics in *Drosophila* and nematode development, molecular biology, and developmental genetics. Covers both classic literature and current research papers. May be repeated. Prereq., instructor consent.

**MCDB 6000-3. Introduction to Laboratory Methods.** An introduction to methodology and techniques used in biological research. Designed as a tutorial between a few students and one faculty member. Students are expected to read original research papers,

discuss the findings, and to plan and execute experiments in selected areas. Open only to first-semester graduate students.

**MCDB 6440 (1-3). Special Topics in MCD Biology.** Various topics not normally covered in the curriculum; offered intermittently, often by visiting professors or upon student demand.

**MCDB 6940-0. Master's Degree Candidate.**

**MCDB 6950 (1-6). Master's Thesis.** Students seeking a master's degree should consult a departmental advisor. Plan I or Plan II is offered.

**MCDB 7050-1. Genetics Seminar.** A series of seminars that critically review both current and past research that uses formal genetics as a tool. Each member of the class presents a seminar based on work in the literature. Discussion of the presented work is encouraged. May be repeated. Prereq., graduate standing.

**MCDB 7790 (1-3). Graduate Seminar.**

**MCDB 7840 (1-6). Graduate Independent Study.** Graduate level. Instructor consent required.

**MCDB 7910-2. Seminar Practicum.** Designed for graduate students to practice oral presentation of their own research, fielding questions and responding to critique.

**MCDB 8990-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## BLACK STUDIES

**BLST 1840 (1-3). Independent Study.** Arranged with consent of instructor.

**BLST 2000-3. Introduction to Black Studies.** An overview of Black Studies as a field of investigation, its origins, and history.

**BLST 2030-3. Behavioral Analysis 1.** A psychology course which deals with the interrelationships between Black individuals and their social environment. Social influences upon motivation, perception, and behavior. Development and change of attitudes and opinions in the ghetto.

**BLST 2040-3. Behavioral Analysis 2.** Continuation of BLST 2030. Psychological analysis of small groups, social stratification, and mass phenomena, e.g., riots.

**BLST 2200-3. Black Social Movements.** Examination of selected case studies of Black collective behavior in a historical context. Emphasis on an in-depth investigation of the continuing Black struggle for social/democratic rights.

**BLST 2210-3. Black Social and Political Thought.** General introductory course designed to acquaint the student with historical and contemporary thinking, writings, and speeches of Black people.

**BLST 2350, 2360, 2370-1. Mini Courses in Black Studies.** Three five-week courses in Black Studies, each bearing 1 hour of credit. Topics vary in accordance with student/

faculty interest and availability. One, two, or three of the courses may be taken.

**BLST 2400-2. Afro-American Dance 1.** An exploration of various Caribbean and African dance forms, both traditional and choreographed works. Other cultural arts including some rituals, musical accompaniment, singing and chanting, and descriptive background data of a particular dance are studied to accompany and enhance the dance as a total cultural experience.

**BLST 2410-2. Afro-American Dance 2.** A continuation of BLST 2400, but may be taken separately by permission of instructor. Emphasizes the growth of American Black dance from the roots of African dance. Technique, movement exploration, and improvisation includes plantation dance, Afro-American heritage dances, blues, and jazz.

**BLST 2600-3. Introduction to African Literature.** Survey of African literature from its beginnings to the present: the oral tradition, the pioneer writers, market literature, the Negritude movement, and some major contemporary writers like Achebe, Laye, Ngugi, and Soyinka. Also, some theoretical questions concerning second-language literatures.

**BLST 3000-3. Race, Class, and Gender.** An examination of the uses of race, sex, and class as instruments of domination in Western society.

**BLST 3020-3. Selected Topics in Black Studies.** Intensive examination of a particular topic, theme, issue, or problem concerning the Black presence, as chosen by the instructor. Sample offerings could include the Black family institution.

**BLST 3840 (1-3). Undergraduate Independent Study.**

**BLST 4000-3. Seminar in Afro-American, African, and Caribbean Literature.** Seeks to explore the nature of the literary impulse in African, Afro-American, and Caribbean literature.

**BLST 4500-3. Research Methods in Black Studies 1.** Preparation for empirical inquiry in Black Studies. Emphasis on philosophy of science concerns and skill acquisition. Students submit a rigorous, executable research design for the investigation of a specific problem, topic, or issue germane to Black people.

**BLST 4510-3. Research Practicum in Black Studies.** Research apprenticeship with emphasis on skill development. Students execute in library, field, or laboratory the research design developed in BLST 4500.

**BLST 4650-3. Contemporary Issues in Black Studies.** A variable topic that allows intensive coverage of a subject, theme, or issue in Black Studies.

**BLST 4710-3. The Black Female: A Feminist Analysis.** (WMST 4710.) Examines from a black feminist framework the impact on black women of experiences with racism and sexism in select historical and contemporary contexts. Issues addressed include self-esteem, socialization patterns, interpersonal relationships, and mental health. Prereqs., junior or senior standing plus two of the following: BLST 2030, 3000; WMST 2700, 4700.

**BLST 4800-3. The African Novel.** In addition to a detailed study of works by distinguished African novelists, examines such areas as the indigenous and foreign antecedents of African fiction and possibilities of the novel as a reflector of changing moods and attitudes.

**BLST 4840 (1-3). Independent Study.** Arranged with consent of instructor.

**BLST 4950-3. Senior Seminar.** An independent project summarizing the work done in Black Studies. A public presentation of the work executed is a requirement.

## African-American Literature

**BLST 2722-3. Survey of African-American Literature 1.** Chronological study of African-American literature beginning with the eighteenth century. Covers the Harlem Renaissance, the Depression writers, and writers from the 1940s to the present.

**BLST 2732-3. Survey of African-American Literature 2.** Continuation of BLST 2722.

**BLST 4692-3. Contemporary African-American Literature 1.** An advanced in-depth study of the works of prominent African-American novelists and poets of the traditional school, e.g., Wright, Gaines, Ellison, and Morrison. Their works are studied in terms of their literary, intellectual, and political values.

**BLST 4702-3. Contemporary African-American Literature 2.** A nontraditional and experimental examination of the literature of the Black arts movement of the 1960s and 1970s. Students examine the works of such authors as Baraka (LeRoi Jones), Don L. Lee, William Melvin Kelly, and Ishmael Reed.

## CHEMISTRY

**CHEM 1001-3. Preparatory Chemistry.** Lect. and rec. For students with no high school chemistry or a very limited chemistry background; designed especially to prepare students for entrance to CHEM 1111. Students whose academic plans require CHEM 1051-1071 should not take this course. CHEM 1001 does not count toward fulfillment of the natural science requirement. Prereq., one year of high school algebra or concurrent registration in MATH 1010 or 1100.

**CHEM 1011-3. Chemistry for the Non-Scientist 1.** Two lectures and one two-hour participatory experience in chemistry each week. Chemistry as a science including its relationships to energy, radiation, nuclear properties, synthetic chemicals, and the environment. Special projects.

**CHEM 1031-3. Chemistry for the Non-Scientist 2.** Two lectures and one two-hour participatory experience in chemistry each week. Chemistry and chemical materials in living systems and in medicine, in the home, for food, nutrition, and agriculture, in space, and in war. Special projects; science policy; the limits of science. Prereq., CHEM 1011, 1051, or 1111.

**CHEM 1051-4. Introduction to Chemistry.** Lect., rec., and lab. First course in principles of chemistry. CHEM 1051-1071 satisfies part of the natural science requirement of the

College of Arts and Sciences and meets the chemistry requirement for nursing and physical therapy. Prereq., high school algebra.

**CHEM 1071-4. Introduction to Organic and Biochemistry.** Lect., rec., and lab. Essential topics in organic and biochemistry. CHEM 1051-1071 or 1111-1131 completes the chemistry requirement for nursing, physical therapy, and physical education students. Prereq., CHEM 1051, 1111, or 1151. CHEM 1071 does not replace CHEM 1131 or 1171 as a prereq. for CHEM 3311 or 3351.

**CHEM 1111-5. General Chemistry 1.** Lect., rec., and lab. An introductory college-level chemistry course for students who have taken high school chemistry and whose academic plans require advanced work in chemistry or who wish to satisfy the natural science requirement at a more advanced level than CHEM 1051-1071. Prereqs., one year of high school chemistry or satisfactory performance in CHEM 1001; high school algebra.

**CHEM 1131-5. General Chemistry 2.** Lect., rec., and lab. Continuation of CHEM 1111. For students who intend to take advanced chemistry courses. Subject areas include acids and bases, solubility and complex ion equilibria, transition metal chemistry, chemical kinetics, electrochemistry, and nuclear chemistry. Prereq., CHEM 1111 or equivalent, with a grade of C or higher.

**CHEM 1151-6. Honors General Chemistry 1.** Lect., rec., and lab. The principles of chemistry and their applications are covered in a comprehensive manner (honors level) in this low-enrollment freshman course. Lectures include topics not covered in CHEM 1111-1131. The laboratory experience is more extensive; therefore, the CHEM 1151-1171 sequence is highly recommended for well-prepared students who intend to major in chemistry, chemical engineering, physics, molecular biology, or related areas. Prereq., one year each of high school chemistry and physics. Four years of high school math and/or a high score on the SAT or ACT mathematics examination is recommended.

**CHEM 1171-6. Honors General Chemistry 2.** Lect., rec., and lab. Continuation of CHEM 1151.

**CHEM 3311-3. Organic Chemistry 1.** Lect. For biochemistry option and nonchemistry majors. Topics include structure and reactions of alkanes, alkenes, alkynes, alkyl halides, and aromatic molecules; nomenclature of organic compounds; stereochemistry; reaction mechanisms and dynamics. Prereqs., CHEM 1131, 1171, or equivalent with a grade of C or higher; coreq., CHEM 3321.

**CHEM 3321-1. Laboratory in Organic Chemistry 1.** Lab. For biochemistry option and nonchemistry majors. Instruction in the experimental techniques of modern organic chemistry with emphasis on chemical separations and reactions of alkanes, alkenes, and aromatic compounds. Stereochemical modeling and the identification of organic unknowns by spectroscopic and chemical methods are also introduced. Coreq., CHEM 3311.

**CHEM 3331-3. Organic Chemistry 2.** Lect. For biochemistry option and nonchemistry

majors. Topics include structure and reactions of alkyl halides, alcohols, ethers, carboxylic acids, aldehydes, ketones, and amines; introduction to the chemistry of heterocycles, carbohydrates, and amino acids; nomenclature of organic compounds; synthesis; and reaction mechanisms. Prereqs., CHEM 3311 and 3321 with grades of C or higher; coreq., CHEM 3341.

**CHEM 3341-1. Laboratory in Organic Chemistry 2.** Lab. For biochemistry option and nonchemistry majors. Instruction in the experimental techniques of modern organic chemistry with emphasis on reactions involving alcohols, ketones, carboxylic acids, and their derivatives. Multistep syntheses are also introduced. Coreq., CHEM 3331.

**CHEM 3351-3. Organic Chemistry 1 for Chemistry Majors.** Lect. Required course for chemistry majors. Topics include structure and reactions of alkanes, alkenes, alkynes, alcohols, ethers, aldehydes, ketones, and alkyl halides; nomenclature of organic compounds; stereochemistry; reaction mechanisms. Prereq., CHEM 1131 or 1171 with a grade of C or higher; coreq., CHEM 3361.

**CHEM 3361-2. Laboratory in Organic Chemistry 1 for Chemistry Majors.** Required course for chemistry majors. Instruction in the experimental techniques of modern organic chemistry with emphasis on chemical separations and reactions of alkanes, alkenes, alcohols, ketones, and alkyl halides. Stereochemical modeling and the identification of organic unknowns are also explored. Coreq., CHEM 3351.

**CHEM 3371-3. Organic Chemistry 2 for Chemistry Majors.** Lect. Required course for chemistry majors. Topics include structure and reactions of carboxylic acids and derivatives, aromatic compounds, and amines; introduction to the chemistry of heterocycles, carbohydrates, and amino acids; nomenclature of organic compounds; reaction mechanisms. Prereqs., CHEM 3351 and 3361 with grades of C or higher; coreq., CHEM 3381.

**CHEM 3381-2. Laboratory in Organic Chemistry 2 for Chemistry Majors.** Lab. Required course for chemistry majors. Instruction in the experimental techniques of modern organic chemistry with emphasis on reactions involving alcohols, ketones, carboxylic acids, aromatic compounds, and their derivatives. Multistep syntheses are also introduced. Prereqs., CHEM 3361 or 3321 and 3341 with grades of C or higher; coreq., CHEM 3371.

**CHEM 4011-3. Modern Inorganic Chemistry.** Lect. An introduction to modern inorganic chemistry for undergraduates. Includes atomic structure, chemical periodicity, structure and bonding in molecules and crystals, reaction mechanisms, chemistry of selected main group and transition elements, and emphasis on catalyst, materials, bioinorganic, and organometallic systems. Prereq., CHEM 4411 or 4511.

**CHEM 4181-4. Instrumental Analysis.** Lect. and lab. The theory and practice of instrumental methods of chemical analysis is covered, including atomic and molecular spectroscopy, gas and liquid chromatography,

mass spectrometry, and electrochemistry. Lab provides an opportunity for hands-on experience with common analytical methods. Prereq., CHEM 4411 or 4511.

**CHEM 4401-1. Scientific Glassblowing.** Lab. An introductory course in scientific glassblowing which allows the student an opportunity to develop sufficient skills in glass manipulation to design, fabricate, and repair glass apparatus.

**CHEM 4411-3. Physical Chemistry.** Thermodynamics and related topics with emphasis on macromolecules and biological applications. Includes thermodynamics, chemical and physical equilibria, solution chemistry, transport properties, and multiple-site binding phenomena. Alternative to CHEM 4511, designed for biochemistry option and biology majors. Students may not take both CHEM 4411 and 4511. Prereqs., one semester physics, MATH 2400, and organic chemistry; coreq., second semester physics.

**CHEM 4511-3. Physical Chemistry.** Lect. Applications of thermodynamics to chemistry. Includes study of the laws of thermodynamics, thermochemistry, solutions, chemical equilibria, and phase equilibria. Prereqs., CHEM 3311 or 3351, one semester of physics, and MATH 2400; coreq., second-semester physics.

**CHEM 4531-3. Physical Chemistry.** Lect. Introduction to quantum chemistry with applications to molecular spectroscopy, the nature of chemical bonding, the electronic structure of conjugated hydrocarbons, and magnetic resonance spectroscopy. Prereqs., CHEM 3311 or 3351, one year of physics, and MATH 2400. CHEM 4511 and 4531 may be taken in any order.

**CHEM 4541-2. Physical Chemistry Laboratory.** One lect. and one 3-hour lab per week. Instruction in the experimental techniques of modern physical chemistry with emphasis on experiments illustrating the fundamental principles of chemical thermodynamics, quantum chemistry, statistical mechanics, and chemical kinetics. Prereq., CHEM 4411 or 4511 or equivalent course in thermodynamics.

**CHEM 4551-3. Physical Chemistry.** Lect. Statistical mechanics, kinetic theory, chemical kinetics, and other topics in physical chemistry. Prereq., CHEM 4411 or 4511 or ENGR 3010 or equivalent course.

**CHEM 4561-3. Experimental Physical Chemistry.** One lect. and two 3-hour labs per week. Instruction in the experimental techniques of modern physical chemistry with emphasis on experiments illustrating the fundamental principles of chemical thermodynamics, quantum chemistry, statistical mechanics, and chemical kinetics. For Chemistry majors. Prereq., CHEM 4411 or 4511 or equivalent course in thermodynamics; coreq., CHEM 4531 or 4511.

**CHEM 4611-3. Survey of Biochemistry.** Covers proteins and enzymes, intermediary metabolism, lipids, amino acids, biochemistry of nucleotides and protein biosynthesis. Designed for pharmacy students and science majors. Does not serve as a prerequisite for CHEM 4731. Biochemistry majors must take

CHEM 4711-4731. Prereq., one year of organic chemistry or instructor consent.

**CHEM 4711-3. General Biochemistry.** Lect. Topics include structure, conformation, and properties of proteins; enzymes: mechanisms and kinetics; intermediary metabolism; Krebs cycle, carbohydrates; energetics and metabolic control; electron transport and oxidative phosphorylation. Prereq., one year of organic chemistry.

**CHEM 4731-3. General Biochemistry.** Lect. Continuation of CHEM 4711. Metabolism of lipids, amino acids, and nucleic acids; photosynthesis; biosynthesis and function of macromolecules including DNA, RNA, and proteins; biochemistry of subcellular systems; and special topics. Prereq., CHEM 4711.

**CHEM 4761-4. Biochemistry Laboratory.** Introduction to modern biochemical techniques. Topics include enzymology, spectrophotometry, electrophoresis, affinity chromatography, radioisotopes, membrane structure, immunochemistry, and nucleic acid chemistry. Prereq., CHEM 4711; coreq., CHEM 4731 or MCDB 3400.

**CHEM 4901 (1-3). Independent Study in Chemistry.** For undergraduate study. May be repeated; no limit on total credit. Consent of instructor required.

**CHEM 5011-3. Advanced Inorganic Chemistry 1.** Lect. Inorganic chemistry based on principles of bonding, structure, reaction mechanisms, and modern synthetic methods. Chemistry and general properties of representative and transition elements and their compounds. Prereqs., CHEM 4531 and graduate standing or CHEM 4011.

**CHEM 5061-3. Advanced Inorganic Chemistry 2.** Lect. A study of modern coordination chemistry. Includes a description of the bonding and properties of coordination compounds in terms of the ligand field and molecular orbital theories.

**CHEM 5111-1. Instructional Methods in Chemistry.** Lecture, discussion, and practicum in teaching strategies for undergraduate chemistry courses. Includes applications of Piaget's theories to instruction in chemistry, application of Bloom's taxonomy to questioning skills, ways to tutor, reinforcement theory, and writing instructional objectives, exam, and quiz questions. Required of all chemistry teaching assistants. Does not count toward a graduate degree.

**CHEM 5161-3. Analytical Spectroscopy.** Lect. Special topics in spectrochemical analysis, including atomic and molecular spectroscopy, laser analytical methods, electron spectroscopy, surface analytical methods, and their applications to environmental, atmospheric, and bioanalytical problems. Prereq., undergraduate physical chemistry or instructor consent.

**CHEM 5171-3. Electroanalytical Chemistry.** Lect. A background for understanding electrochemical systems is established through a review of the relevant thermodynamic, kinetic, and electronic principles. Classical and modern electrochemical methods of analysis are compared. Several special topics



are discussed in depth. Prereq., undergraduate physical chemistry or instructor consent.

**CHEM 5181-2. Chromatography and Analytical Separations.** Lect. Analytical separation processes, with special reference to theory and practice of liquid and gas chromatography. Prereq., undergraduate physical chemistry or instructor consent.

**CHEM 5311-3. Advanced Organic Chemistry 1.** Lect. Survey of synthetic transformations emphasizing important functional group manipulations, reactions of carbanions, and synthetic applications of pericyclic reactions. Prereq., CHEM 4511 and one year of organic chemistry.

**CHEM 5321-3. Advanced Organic Chemistry 2.** Lect. Modern concepts of physical-organic chemistry and their use in interpreting data in terms of mechanisms of organic reactions and reactivities of organic compounds. Prereqs., one year of organic chemistry and one year of physical chemistry.

**CHEM 5331-3. Advanced Organic Chemistry 3.** Lect. Advanced spectroscopic techniques for structure determination in organic chemistry. Emphasis in  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectroscopy. Prereqs., one year of organic chemistry and one year of physical chemistry.

**CHEM 5441-3. Physical Chemistry.** Lect. Thermodynamics and related topics with emphasis on macromolecules and biological applications are studied, including equilibria, solution chemistry, transport properties, and multiple-site binding phenomena. Intended for biology graduate students and not open to students in Chemistry or other physical sciences.

**CHEM 5511-3. Survey of Thermodynamics and Statistical Mechanics.** A survey of the basic laws of phenomenological equilibrium thermodynamics and their applications to problems in chemistry. An outline of the concepts of statistical mechanics with special emphasis on the properties of perfect gases, crystals, and liquid models. Prereq., undergraduate physical chemistry.

**CHEM 5521-3. Survey of Chemical Kinetics and Quantum Mechanics.** An introduction to chemical kinetics, including the phenomenological discussion of rate laws, an outline of the theories of rate constants and a survey of experimental techniques. An introduction to quantum mechanics with applications to problems in chemistry. Prereq., undergraduate physical chemistry.

**CHEM 5531-3. Statistical Mechanics.** Lect. Fundamental concepts of quantum and classical statistical mechanics. Applications to properties of gases, liquids, solids, spin and polymer systems. Reaction, fluctuation, nucleation, and relaxation phenomena. Prereq., undergraduate physical chemistry.

**CHEM 5541-3. Chemical Dynamics.** Lect. Discussion of mechanism and rate of chemical reactions from a fundamental point of view. The nature of collision is discussed and the concepts of cross section and rate constant developed. Theories of elementary bimolecular and decay processes are critically examined.

**CHEM 5551-3. Mathematical Methods of Chemistry.** Lect. A variety of mathematical techniques important in physical chemistry are developed and applied. Topics include complex analysis, ordinary and partial differential equations, integral transforms, and some numerical analysis. Prereq., undergraduate physical chemistry.

**CHEM 5561-3. Physical Chemistry of Macromolecules.** Lect. Structure and conformation of macromolecules; interaction between macromolecules; binding and cooperative phenomena; transport in solution; light scattering; spectroscopic probes of structure and motion. Prereq., one semester of physical chemistry.

**CHEM 5571-3. Surface Chemistry.** Lect. Covers the basic principles of surface chemistry and the fundamentals of electron spectroscopic techniques used for surface analysis. Discussions include the nature of gas-solid interactions, the surface chemical bond, thermodynamics of surfaces, and kinetics of catalyzed surface reactions. Prereq., undergraduate physical chemistry.

**CHEM 5581-3. Introductory Quantum Chemistry.** Lect. Basic principles and techniques of quantum mechanics with applications to questions of chemical interest. Quantum dynamics of atoms, molecules, and spin; electronic structure of atoms and molecules. Prereq., CHEM 4531.

**CHEM 5591-3. Advanced Molecular Spectroscopy.** Rotational, vibrational, and electronic spectra of molecules, and their interpretation in terms of the quantum theory of molecular structure. Prereq., CHEM 5521 or equivalent course in quantum mechanics.

**CHEM 5711-3. General Biochemistry.** Same lectures as CHEM 4711. Course work includes library studies and preparation of special reports. Not open to undergraduates. Prereq., one year of organic chemistry.

**CHEM 5731-3. General Biochemistry.** Lect. Same lectures as CHEM 4731. Course work includes library studies and report preparations. Not open to undergraduates. Prereq., CHEM 4711 or 5711.

**CHEM 5771-3. Advanced General Biochemistry 2.** Lect. In-depth analysis of several of the following subjects: proteins, enzymes, metabolic regulation, bioenergetics, photosynthesis, lipids, nitrogen metabolism, transcription, protein biosynthesis, topics in molecular biochemistry. Prereq., CHEM 4731 or comprehensive biochemistry.

**CHEM 5781-3. Advanced General Biochemistry 3.** Lect. In-depth analysis of selected topics listed under CHEM 5771. For the same academic year different topics are covered in CHEM 5771 and 5781. Prereq., CHEM 4731 or comprehensive biochemistry.

**CHEM 6011-3. Reactions in Solution, Equilibrium and Kinetics.** Prereq., instructor consent.

**CHEM 6021 (1-3). Special Topics in Inorganic Chemistry.** Lect. Subjects of current interest in inorganic chemistry. Primarily used for graduate-level presentations of special topics by visiting and resident faculty. Variable class schedule.

**CHEM 6101-1. Seminar: Analytical Chemistry.** Student, faculty, and guest presentations and discussions of current research in analytical chemistry. Required of all analytical chemistry graduate students. Credit is deferred until presentation of satisfactory seminar.

**CHEM 6111 (1-3). Special Topics in Analytical Chemistry.** Lect. Subjects of current interest in analytical chemistry. Used for graduate-level presentations of special topics by visiting and resident faculty. Variable class schedule. Prereq., graduate standing.

**CHEM 6201-1. Seminar: Organic Chemistry.** Discussions principally concerned with recent literature in organic chemistry.

**CHEM 6211 (1-3). Special Topics in Physical Organic Chemistry.** Devoted to various topics of current interest in physical organic chemistry. Subjects covered in recent years include photochemistry, carbene chemistry, molecular orbital methods, and gas phase ion chemistry.

**CHEM 6311-3. Organic Synthesis.** Selected topics in synthetic organic chemistry, encompassing both methodology and the total synthesis of complex molecules. Prereq., CHEM 5311.

**CHEM 6411 (1-3). Advanced Topics in Physical Chemistry.** Prereq., instructor consent.

**CHEM 6511-3. Advanced Quantum Mechanics.** Topics in time-dependent quantum mechanics: tunneling, energy transfer, curve crossing, and photochemical processes. Prereq., CHEM 5581 or instructor consent.

**CHEM 6601-1. Biochemistry Seminar.** Required of all biochemistry graduate students. Credit is deferred until presentation of satisfactory seminar. Prereq., instructor consent.

**CHEM 6711, 6731 (3-6). Advanced Topics in Biochemistry.** A detailed study of the current literature relative to one main topic is undertaken each semester. Topics covered on a rotating basis include enzyme kinetics and mechanisms; lipids and lipoproteins; chemistry and enzymology of nucleic acids; biochemistry of nucleic acids in eukaryotic cells; and protein chemistry. Presentations include faculty lectures and student reports. Credit for one semester is 3 hours. The course(s) may be taken for a maximum of 12 hours credit. Prereqs., one year of biochemistry courses and consent of instructor.

**CHEM 6801-0. Departmental Research Seminar.** Lectures by visiting scientists and occasionally by staff members and graduate students on topics of current research. Meets once a week and is required for all graduate students in Chemistry.

**CHEM 6901 (1-6). Special Topics in Chemistry.** May be repeated; no limit on total credit. Prereq., instructor consent.

**CHEM 6941-0. Master's Candidate.**

**CHEM 6951 (4-6). Master's Thesis.**

**CHEM 7001-2. Seminar: Inorganic Solution Chemistry.** Informal talks and discussion of current research in areas of solution chemistry: soluble-solvent interactions, metal ion ligation, oxidation reduction reactions, and

bioinorganic systems. Prereqs., graduate standing and instructor consent.

**CHEM 7011-2. Seminar: Synthetic Chemistry of Nonmetal Compounds.** Informal talks and discussion of current research in areas of synthetic and structural nonmetal inorganic chemistry. Prereqs., graduate standing and instructor consent.

**CHEM 7021-2. Seminar: Structural Inorganic Chemistry.** Current research in the area of structural inorganic chemistry. Concerns topics related to the electronic and molecular structure of transition metal complexes. Prereq., instructor consent.

**CHEM 7031-2. Seminar: Synthetic Chemistry of Transition Metal Compounds.** Involves the study of organometallic and coordination compounds with special emphasis on methods of synthesis, characterization techniques, and reactivity studies. Studies are directed toward the synthesis and mechanistic understanding of homogeneous catalysts. Prereq., instructor consent.

**CHEM 7041-1. Seminar: Homogeneous Metal Catalysis.** Topics include the elucidation of catalytic reaction mechanisms, understanding metal-substrate binding and activation, and molecular modeling or reaction pathways. Prereq., instructor consent.

**CHEM 7101-2. Seminar: Chromatography and Trace Analysis.** Student and faculty discussions and reports on research advances in chromatography, trace analysis, and environmental chemistry. Prereq., instructor consent.

**CHEM 7111-2. Electrochemistry Seminar.** Student and faculty discussions and reports on research advances in electrochemistry. Prereq., instructor consent.

**CHEM 7121-2. Analytical Spectroscopy and Kinetic Measurements Seminar.** Student and faculty discussions and reports on research advances in analytical spectroscopy and reaction rate measurements. Prereq., instructor consent.

**CHEM 7131-1. Seminar: Molecular Spectroscopy in Chemical Analysis.** Discussion and presentation of current research in analytical spectroscopy including absorption, fluorescence, and ionization methods. Prereq., instructor consent.

**CHEM 7201-2. Seminar: Ground-State and Excited-State Organic Reactions.** Discussions of certain organic reactions and their mechanisms involving both ground-state and electronically excited-state intermediates. Coreq., CHEM 4901, 6901, 6951, or 8991.

**CHEM 7211-2. Seminar: Physical Organic Chemistry.** Current research and literature in physical organic chemistry with emphasis on gas phase ion molecule reactions. Prereqs., CHEM 5321, one year of physical chemistry, and instructor consent.

**CHEM 7221-1. Seminar: Photochemistry and Free Radical Chemistry.** Current research in the areas of organic free radical chemistry, photochemistry, and related topics are presented and discussed. Prereq., instructor consent.

**CHEM 7231-1. Seminar: Reactive Intermediates.** An application of contemporary ideas of chemical physics to organic molecules. Special attention to the structures and bonding in organic ions and radicals. Prereq., organic and physical chemistry.

**CHEM 7241-1. Seminar: Synthetic Organic Chemistry.** A series of seminars on directed total synthesis. Modern synthetic methodology and applications to total synthesis of natural products are emphasized. Prereq., instructor consent.

**CHEM 7251-1. Seminar: Topics in Synthetic Chemistry.** Discussions of selected topics of current interest, including the total synthesis of complex molecules, development of new synthetic methodology, organosilicon chemistry, chemistry of small-ring molecules, mechanistic problems, and organometallic chemistry. Prereq., instructor consent.

**CHEM 7261-1. Seminar: Organometallic Chemistry.** Specialized aspects of the synthesis of organometallic reagents and their utility in organic synthesis. Emphasis is placed on current research results being obtained both at the University of Colorado and from other research groups. Prereq., CHEM 3311.

**CHEM 7271-1. Seminar: Picosecond Dynamics of Reactions.** Topics include the development and application of picosecond laser spectroscopy to organic and organometallic reactions. Emphasis is placed on the relationship between current theoretical developments and experiments. Prereq., instructor consent.

**CHEM 7281-1. Seminar: Organotransition Metal Chemistry.** Topics include the development of synthetic routes to new organotransition metal compounds and critical evaluations of the mechanisms of the reactions observed for these materials. Parallels to developments in the field of surface catalysis are drawn. Prereq., instructor consent.

**CHEM 7401-1. Seminar: Biophysical Chemistry.** Involves discussion of various biochemical molecules, such as DNA, RNA, and proteins, from the viewpoint of their physical properties. Possible topics include the application of thermodynamic, kinetic, and spectroscopic theory and experiment to the study of biophysical systems. Prereq., CHEM 4411, 4511, or instructor consent.

**CHEM 7411-1. Seminar: Molecular Spectroscopy.** Current research topics in molecular spectroscopy and the properties of molecules in excited electronic states. Prereq., instructor consent.

**CHEM 7421-2. Seminar: Negative Ion Chemistry.** Chemistry of negative ions; experimental methods and designs; laser spectroscopy of ions; theoretical methods; reactive dynamics of ions in the gas phase. Prereq., graduate standing.

**CHEM 7431-1. Seminar: Topics in Theoretical Chemical Physics.** Seminars presented on a variety of topics in theoretical chemical physics. Molecular collisions and unimolecular dynamics predominantly featured. Prereq., instructor consent.

**CHEM 7441-2. Research Seminar: Theoretical Chemistry.** Study of the theoretical

description of molecular dynamics as related to rate processes. Focus is on chemical reactions in liquids, absorption-desorption on surfaces, nucleation reactions, and energy flow in molecules. Prereq., graduate standing.

**CHEM 7451-2. Seminar: Reaction Dynamics.** Study of experiments and theory in modern reaction dynamics, energy transfer, and photodissociation; experimental techniques, critique of recently published literature, and current work. Prereq., CHEM 4511, 4531, 4541, or equivalent.

**CHEM 7461-2. Seminar: Atmospheric Chemistry.** Discussion of current problems and activities in atmospheric chemistry research. Journal articles, conferences, guest workers, and research group progress reports provide resource material. Prereq., instructor consent.

**CHEM 7471-1. Seminar: Surface Chemistry.** Topics in surface chemistry are discussed, including chemisorption and reactions on metal surfaces, catalysis, and electron spectroscopy for surface analysis. Discussions focus on current research and recent literature. Prereq., instructor consent.

**CHEM 7481-2. Seminar: Molecular Spectroscopy and Photochemistry.** Consists of discussion and presentation of current research in spectroscopy and photochemistry of organic as well as organometallic systems. State of the art techniques available for the theoretical and experimental characterization of excited states are reviewed. Prereq., instructor consent.

**CHEM 7491-1. Seminar: Molecular Vibrational Dynamics.** Topics pertaining to vibrational dynamics of small molecules are discussed, with particular emphasis upon IR laser spectroscopy, van der Waals clusters, vibrationally induced dipole moments, and predissociation. Discussion of current research and recently published literature. Prereq., instructor consent.

**CHEM 7501-1. Seminar: Theoretical Molecular Dynamics.** A variety of topics in theoretical chemical physics, with an emphasis on dynamics of molecules in dissipative environments or in radiation fields. Prereq., instructor consent.

**CHEM 7601-2. Seminar: Nucleic Acid Chemistry.** Topics in various aspects of current research; emphasis on student readings and presentations. Prereq., instructor consent.

**CHEM 7611-1. Seminar: Structures and Dynamics of Biopolymers in Solution.** Discussion of experimental and theoretical approaches for probing structures and dynamics of proteins, peptides, and nucleic acids; computations in molecular dynamics simulation, modeling, and geometry. Prereq., instructor consent.

**CHEM 7621-1. Seminar: Regulation of Transcription.** Topics in transcriptional regulation are discussed, with emphasis on eukaryotic RNA polymerases and auxiliary proteins. Discussion of current research and recently published literature. Prereq., instructor consent.

**CHEM 7631-1. Seminar: Eukaryotic Gene Expression.** Discussion of current research, both published and unpublished; student and faculty presentations; occasional guest speakers. Prereq., instructor consent.

**CHEM 7641-2. Seminar: RNA Structure and Function.** Topics include the synthesis and characterization of RNA, RNAs structure and function relationships, and the role of RNA in biological reactions. Prereq., instructor consent.

**CHEM 7651-2. Seminar: Biochemistry.** Topics in various aspects of current biochemical research; emphasis on student reading and presentations. Prereq., instructor consent.

**CHEM 7661-1. Seminar: Bioorganic Chemistry.** Lectures and class discussion on metabolism, use of isotopes, nutritional biochemistry, and enzyme chemistry. Prereq., instructor consent.

**CHEM 7671-1. Seminar: Protein and Enzyme Chemistry.** Discussion and presentation of topics in protein chemistry and enzymology. Prereq., instructor consent.

**CHEM 7681-2. Seminar: Structural Biochemistry.** An advanced course covering current theory and techniques of protein crystallography and closely related fields in biophysical chemistry, and a critical examination of current literature in biophysical chemistry. Prereq., instructor consent.

**CHEM 7691-1. Seminar: Protein—Folding Structure and Dynamics.** Current literature is discussed regarding the folding and assembly of proteins, the structural features and principles underlying folded proteins, and the biological roles of these motions. Prereq., instructor consent.

**CHEM 8991-30. Doctor's Dissertation.** All doctoral students must register for 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## CHICANO STUDIES

### Humanities

**CHST 1031-3. Chicano Fine Arts and Humanities.** Provides a foundation for study of Chicano literature, music, the plastic arts, theatre, and film. Also introduces aesthetic and critical concepts and their applications in Chicano Studies.

**CHST 4351-3. The Mexican Revolution.** The Mexican Revolution studied through a multiperspective approach (films, literature, photographs, historical documents, and chronicles) that allows the student to conceptualize a complex event that changed the history and future of Mexico and the United States. Prereq., CHST 1031 or 1044.

**CHST 4681-3. Special Topics.**

### Culture

**CHST 4002-3. Mexican-American Culture of the Southwest.** (SPAN 4000/5000.) A lecture course on Mexican-American culture conducted by experts in such fields as geography, anthropology, history, fine arts,

comparative literature, political science, and sociology.

### Society

**CHST 1273-3. The Contemporary Mexican American.** Special attention is given to the following areas of Mexican American life: family life cycle, migration, economic change, discrimination (race and sex), and political status. Prereq., CHST 1015 or sophomore standing.

**CHST 2213-3. Barrio Issues.** Surveys a range of public issues relating to Mexican Americans in contemporary society. Describes and analyzes such topics as education, discrimination, health care, housing, and employment. Prereq., CHST 1015 or 1273.

**CHST 3023-3. Field Experience.** Acquaints students with major ethnographic studies in ethnic communities and teaches such qualitative methods as participant observation and depth interviews. Students are required to do a field study. Prereq., CHST 1015 or 1273.

**CHST 3153-3. Folklore, Mysticism, and Power.** Concerned with cultural and literary conceptions of folklore, mysticism, and social power, giving special attention to the varieties of folkloric expressions of mysticism and power in ancient, colonial, and contemporary Mexican and Chicano societies. Prereq., CHST 1015 or 2517 or 2527.

**CHST 4303-3. The Chicano and the United States Social Systems.** Special attention is given to the ways U.S. institutions (i.e., legal, economic, educational, governmental and social agencies) affect Chicanos. The following concepts are discussed: internal colonialism, institutional racism, assimilation and acculturation, and identity. Prereq., one of the following: CHST 1015, 1273, 2517, 2527, or 2213.

### Literature

**CHST 1044-3. Introduction to Chicano Literature.** Examines contemporary Mexican-American literature from its early concern with political protest to its present expression of a variety of subjects, themes, and styles.

**CHST 3814-3. Chicano Poetry.** Beginning with an examination of indigenous pre-Columbian roots and later Mexican influences, the course moves to an exploration of contemporary Chicano poetry. Recommended, CHST 1031 or 1044.

**CHST 3824-3. Chicano Prose Fiction.** Covers the most important Chicano writers of prose fiction of the past three decades. The progression of Chicano fiction from naturalism, realism, and romanticism to post-modernism is considered. Recommended, CHST 1044.

### Interdisciplinary

**CHST 1015-3. Introduction to Chicano Studies.** Examines how social science theory and methodology produce stereotypes. The analysis and description of social problems

are also investigated to learn how Chicanos create culture.

**CHST 3135-3. Study of Chicanas.** (WMST 3135.) Through an interdisciplinary study of history, sociology, literary images, and film portrayals, this course provides insight into the present socioeconomic condition of Mexican-American women and the concept of *femenismo*. Prereq., CHST 1015 or 2517 or 2527.

**CHST 3905-variable credit. Independent Study in Chicano Studies.** Consent of instructor required.

**CHST 4905-variable credit. Independent Study in Chicano Studies.** Consent of instructor required.

### History

**CHST 2517-3. Chicano History to 1848.** (HIST 2517.) An introduction to the historical developments of Chicano society and thought from the pre-Columbian period to 1848.

**CHST 2527-3. Chicano History 1848 to Present.** (HIST 2527.) An introduction to the historical development of Chicano society and thought from 1848 to the present.

**CHST 4277-3. Intellectual History and Social Theory in Chicano Studies.** Surveys the various intellectual traditions that influence the nature of contemporary social thought and theory in Chicano Studies. The approach is that of sociology of knowledge.

**CHST 4607-3. History of the Chicano in the American Labor Movement.** Presents an historical and topical analysis of the American labor movement, particularly its ethnic, sexual, racial, and skill divisions. The objective is to analyze the historical development of the American working class, specifically its culture, ideology, ethnicity, and union involvement with focus on Chicanos.

## CLASSICS

### General Classics

#### NO GREEK OR LATIN REQUIRED

**CLAS 1010-3. The Study of Words.** A study of English words of Latin and Greek origin, focusing on etymological meaning by analysis of component parts (prefixes, bases, suffixes) and on the ways in which words have changed and developed semantically.

**CLAS 1100-3. Greek Mythology.** The Greek myths are examined as documents of early human imagination, the source of Greek culture, and part of the fabric of the Western cultural tradition. Of particular interest to students of literature and the arts, psychology, anthropology, and history.

**CLAS 1110-3. Masterpieces of Greek Literature in Translation.** Survey of Greek authors whose works have most influenced Western thought: Homer, Aeschylus, Sophocles, Euripides, Aristophanes, and Plato.

**CLAS 1120-3. Masterpieces of Roman Literature in Translation.** Surveys the ideas and culture of the Romans through a study of representative literature: comedy, tragedy,

history, philosophy, oratory, the novel, lyric, epic, and didactic poetry.

**CLAS 2020-3. Science in the Ancient World.** The coherent development of scientific modes of thought, theory, and research from mythological origins (e.g., Hesiod's poetry) through the pre-Socratic philosophers and culminating in the theories and researches of Plato and Aristotle. Scientific thought of the Roman Empire is also covered. Students read original sources in translation.

**CLAS 2100-3. Women in Antiquity.** (WMST 2100.) The evidence of art, archaeology, and literature is examined from a contemporary point of view in a study of the status of women in Greek and Roman antiquity. Focus is on women's roles in works of art and literature, attitudes expressed toward them, and their daily lives.

**CLAS 2840 (1-3). Independent Study.**

**CLAS 3300-3. Visiting Scholar's Course.** Topic to be announced.

**CLAS 3330-3. Ancient Athletics.** An examination of the role of athletics and recreation in Classical Greece, Rome, and the Roman Empire (especially Constantinople) with special emphasis upon religious and political significance (e.g., of the Olympic Games) and the philosophical speculations on athletics by Plato, Aristotle, and others.

**CLAS 3610-3. From Paganism to Christianity.** (Greco-Roman Paganism and the Rise of Christianity.) (PHIL 3610.) Treats the history of Greek and Roman religion from its Bronze Age origins through the rise of Christianity. Recommended prereq., CLAS 1100.

**CLAS 4110/5110-3. Ancient Epic.** Students read in English such major epics of antiquity as *Gilgamesh*, *Iliad*, *Odyssey*, *Argonautica*, and *Aeneid*. Topics discussed may include the nature of ancient epic, its relation to the novel, and its legacy.

**CLAS 4120/5120-3. Greek and Roman Tragedy.** An intensive study of selected tragedies of Aeschylus, Sophocles, Euripides, and Seneca in English translation.

**CLAS 4130/5130-3. Greek and Roman Comedy and Satire.** A study of Aristophanes, Plautus, Terence, and Roman satire in English translation.

**CLAS 4160/5160-3. Myth in the Arts.** See HUMN 4160.

**CLAS 4500/5500-3. Open Topics.** Especially tailored to the needs of present and future teachers of classics, this course covers specialized topics in classical humanities to be specified in the *Schedule of Courses*.

**CLAS 4820/5820-3. Latin Backgrounds to English Literature: Selected Readings.** Key readings from selected Latin authors influential in English literature are studied using a bilingual text; emphasis is placed on structure, word placement, diction, and meter in order to cast light on the debts of their successors. Prereqs., CLAS 5804-5814 or instructor consent.

**CLAS 4840 (1-3). Independent Study.**

**CLAS 5800-3. Philosophy of Plato.** (PHIL 5080.)

**CLAS 5810-3. Philosophy of Aristotle.** (PHIL 5081.)

**CLAS 6840 (1-3). Graduate Independent Study.**

**CLAS 6940-3. Master's Degree Candidate.**

## Ancient History

**CLAS 1051-3. The World of the Ancient Greeks.** See HIST 1051.

**CLAS 1061-3. The Rise and Fall of Ancient Rome.** See HIST 1061.

**CLAS 4021/5021-3. Athens and Greek Democracy.** (HIST 4021.) A study of Greek history from 800 B.C. (the rise of the city-state) to 323 B.C. (the death of Alexander the Great). The major emphasis is on the development of democracy in Athens. The reading is in the primary sources.

**CLAS 4031/5031-3. Alexander and the Hellenistic World.** (HIST 4031.) Focuses first on the careers of Philip of Macedon and his son Alexander and second on the Hellenistic Age, especially its culture, from Alexander's death (323 B.C.) to the defeat of Cleopatra and Antony by Octavian in 31 B.C.

**CLAS 4051/5051-3. Greek Constitutional History.** A study primarily of Athenian constitutional and legal history with some consideration given to other Greek states.

**CLAS 4071/5071-3. History of the Byzantine Empire.** See HIST 4071.

**CLAS 4081/5081-3. The Roman Republic.** (HIST 4081.) A study of the Roman Republic from its foundation in 753 B.C. to its conclusion with the career of Augustus. The major emphasis is upon the development of Roman Republican government. The reading is in the primary sources.

**CLAS 4091/5091-3. The Roman Empire.** See HIST 4091.

**CLAS 4761/5761-3. Rome, the Law-Giver.** A study of the constitutional and legal history of ancient Rome with emphasis upon basic legal concepts and comparisons with American law.

**CLAS 6011-3. Readings in Ancient History.** See HIST 6011. Prereq., graduate standing.

## Classical Philology

**CLAS 6012-1. Proseminar: Introduction to Research Methods in Classical Studies.**

**CLAS 6092-3. Graduate Seminar.** Author or topic to be specified in *Schedule of Courses*. May be repeated.

**CLAS 6102-3. Graduate Seminar.** Author or topic to be specified in *Schedule of Courses*. May be repeated.

**CLAS 6952 (4-6). Master's Thesis.**

**CLAS 8992-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## Greek

**CLAS 1013-5. Beginning Classical Greek 1.**

**CLAS 1023-5. Beginning Classical Greek 2.** Continuation of CLAS 1013. Prereq., CLAS 1013 or instructor consent.

**CLAS 3113-3. Intermediate Classical Greek 1.** Readings in Plato.

**CLAS 3123-3. Intermediate Classical Greek 2.** The reading of two Attic dramas, generally one Euripidean and one Sophoclean. The major emphasis is upon learning to read the dramas with ease and comprehension. Grammar and syntax receive a good deal of attention.

**CLAS 4213/5213-3. Lyric Poetry.** Prereqs., CLAS 3113 and 3123, or equivalent.

**CLAS 4403/5403-3. Attic Orators.** Prereqs., CLAS 3113 and 3123, or equivalent.

**CLAS 4503/5503-3. Herodotus.** Prereq., CLAS 3113 and 3123, or equivalent.

**CLAS 4653-3. Koine and New Testament.** Prereqs., CLAS 3113 and 3123, or equivalent.

**CLAS 4843 (1-3). Independent Study.**

**CLAS 5003-3. Graduate Reading.** Author or topic to be specified in *Schedule of Courses* (e.g., Homer, Hesiod, Pindar, Aeschylus, Sophocles, Euripides, Thucydides, Greek Comedy, Plato, Aristotle, Menander). May be repeated.

**CLAS 5803-3. Accelerated Classical Greek 1.** For advanced undergraduates and graduate students. Grammar survey, intensive reading. No previous knowledge of Greek required.

**CLAS 5813-3. Accelerated Classical Greek 2.** Continuation of CLAS 5803. For advanced undergraduates and graduate students. Successful completion of CLAS 5813 meets the Graduate School foreign language requirement. Prereq., CLAS 5803.

**CLAS 6923-3. Graduate Reading.** For Master's candidates. May be repeated.

**CLAS 7843 (1-3). Graduate Independent Study.**

**CLAS 7923 (1-3). Advanced Graduate Reading: Greek Drama.** Materials to be taken from graduate reading list. May be repeated.

## Latin

**CLAS 1014-5. Beginning Latin 1.**

**CLAS 1024-5. Beginning Latin 2.** Continuation of CLAS 1014. Prereq., CLAS 1014 or instructor consent.

**CLAS 1034-5. Latin Review.** For students who have had two years of high school Latin.

**CLAS 2114-3. Intermediate Latin.** Devoted to Cicero (Catinarians, etc.) with a required component in grammar review. Prereq., CLAS 1024 or two years of high school Latin. Students with two or three years of high school Latin will be placed in accordance with their level of proficiency.

**CLAS 2124-3. Intermediate Latin.** The course of study is Vergil.

**CLAS 3114-3. Cicero's Pro Caelio and Catullus' Lesbia Poems.** Prereq., CLAS 2114 or three years of high school Latin.

**CLAS 3124-3. Tacitus (either Agricola or Nero passages) and Pliny (letters re provincial administration and Christians).** Prereq., CLAS 2114 or three years of high school Latin.

**CLAS 3214-3. Livy (Early Rome) and Caesar (Selections).** Prereq., CLAS 2114 or three years of high school Latin.

**CLAS 3224-3. Ovid.** Prereq., CLAS 2114 or three years of high school Latin.

**CLAS 4024/5024-3. Latin Prose Composition.** Prereq., completion of one 3000-level sequence.

**CLAS 4034-3. Advanced Latin Prose Composition.**

**CLAS 4244/5244-3. Roman Elegy.** The poetry of Propertius, Tibullus, Ovid: structure, unity, traditional influences, originality. Prereq., completion of one 3000-level sequence.

**CLAS 4254/5254-3. Horace's Odes and Epodes.** Prereq., completion of one 3000-level sequence.

**CLAS 4324/5324-3. Lucretius.** The philosophical background to Lucretius' *De Rerum Natura*; tradition and originality in Lucretius' thought and poetry. Prereq., completion of one 3000-level sequence.

**CLAS 4554/5554-3. Tacitus.** Prereq., completion of one 3000-level sequence.

**CLAS 4614/5614-3. Cicero's Philosophical Essays.** Prereq., completion of one 3000-level sequence.

**CLAS 4824/5824-3. Latin Teaching Methods: Open Topics.** Covers specialized topics in Latin pedagogy to be specified in the *Schedule of Courses*. Prereq., proficiency test in the translation of Caesar, Cicero, Vergil, and Ovid.

**CLAS 4844 (1-3). Independent Study.**

**CLAS 5004-3. Graduate Reading.** Author or topic to be specified in *Schedule of Courses* (e.g., Roman Comedy, Catullus, Cicero's Forensic Oratory, Sallust, Satire: Horace, Juvenal; Vergil, Livy, Seneca's Tragedies, Tacitus). May be repeated.

**CLAS 5804-3. Accelerated Latin 1.** For advanced undergraduates and graduate students. Grammar survey, intensive reading. No previous knowledge of Latin required.

**CLAS 5814-3. Accelerated Latin 2.** Continuation of CLAS 5804. For advanced undergraduates and graduate students. Reading of advanced texts: Caesar, Cicero, Ovid. Successful completion of CLAS 5814 meets the Graduate School foreign language requirement. Prereq., CLAS 5804.

**CLAS 6924-3. Graduate Reading.** For Master's candidates. May be repeated.

**CLAS 7844 (1-3). Graduate Independent Study.**

**CLAS 7924 (1-3). Advanced Graduate Reading.** Materials to be taken from graduate reading list. May be repeated.

## Honors

**CLAS 1105-3. Honors—Greek Mythology.**

**CLAS 1115-3. Honors—Greek Literature in Translation.**

**CLAS 1125-3. Honors—Masterpieces of Roman Literature in Translation.**

## Art and Archaeology

**CLAS 4009/5009-3. Art of the Ancient Near East.** See FINE 4009/5009.

**CLAS 4019/5019-3. Art of Ancient Egypt.** See FINE 4019/5019.

**CLAS 4039/5039-3. Byzantine Art.** See FINE 4039/5039.

**CLAS 4049/5049-3. Pre-Classical Art and Archaeology.** (FINE 4049/5049.) Greece and Crete from the Neolithic period to the end of the Mycenaean world.

**CLAS 4059/5059-3. Classical Art and Archaeology.** (FINE 4059/5059.) Greek art and archaeology from the end of the Mycenaean world through the Hellenistic era.

**CLAS 4079/5079-3. Roman Art and Archaeology.** (FINE 4079/5079.) Covers a millennium of development in Roman art and architecture, from the foundation of Rome (753 B.C.) to Constantine (A.D. 311-337). The geographical scope includes far-flung imperial provinces as well as the Italian homeland.

**CLAS 4269/5269-3. Biblical Archaeology.** See ANTH 4269/5269.

**CLAS 4419/5419-3. Archaeology of Ancient Near East.** See ANTH 4419/5419.

**CLAS 4429/5429-3. Archaeology of Ancient Egypt.** See ANTH 4429/5429.

**CLAS 4789/5789-3. Egyptian Hieroglyphics 1.** See ANTH 4789/5789.

**CLAS 4799/5799-2. Egyptian Hieroglyphics 2.** See ANTH 4799/5799.

**CLAS 5069-3. Prehistoric Greek Art and Archaeology.** (FINE 5069.) Topics selected from architecture, pottery, frescoes, and minor arts of the third millennium B.C. Prereq., CLAS 4049 or instructor consent.

**CLAS 5089-3. Classical Greek Art.** (FINE 5089.) Topics selected from architecture, vase painting, and sculpture. Prereq., CLAS 4059 or FINE 4059 or instructor consent.

**CLAS 5099-3. Archaic Greek Art.** (FINE 5099.) Concentrates on the architecture, sculpture, pottery, and minor arts of the period circa 700-500 B.C. Regional characteristics and development are stressed. Prereq., CLAS 4059 or FINE 4059 or instructor consent.

**CLAS 5159-3. Hellenistic Art and Archaeology.** Topics of emphasis are architecture, domestic decoration, sculpture, terra-cottas, jewelry and coins of the period following the death of Alexander the Great until the Roman conquest of Greece. Prereq., CLAS 4059 or FINE 4059 or instructor consent.

**CLAS 6149-3. Seminar in Archaeology of Selected Areas.** (ANTH 7140.) Areas to be

selected in terms of current research interests. Prereq., instructor consent.

## COMMUNICATION

**COMM 1020-3. Introduction to Communication.** Presents an introduction to concepts and related skills that define communication in a variety of face-to-face contexts. Topics include models of communication, meaning, content/relationships, formal gathering, intimacy, and group problems. Optional for majors; open to nonmajors.

**COMM 1240-3. Introduction to Organizational Communication.** Provides a communicatively-based definition of formal organization and deals with individual-organizational relationships by means of the concepts of identification and commitment. Motivation, authority, power, control, and ethics are treated from the rhetorical perspective.

**COMM 2030-3. Interpersonal Communication.** Emphasizes personal aspects of communication. Choice making, choice attribution, risk taking, personal knowledge, creativity, and alternative kinds of interpersonal relationships are central topics. Increased self-awareness, understanding of interpersonal relationships, and improvement of interpersonal skills are dominant goals. Required for majors. Prereq., COMM 1020.

**COMM 2150-3. Small Group Communication.** An introduction to the processes of communication in groups with an emphasis on group decision making in organizational settings. Required for majors. Prereq., COMM 1020.

**COMM 2200-3. Public Speaking.** Covers the theory and skills of speaking in various public settings. Treats fundamental principles from rhetorical and communication theory and applies them to oral presentations. Optional for majors.

**COMM 2500-3. Information Theory: Background of Contemporary Developments.** Students develop a basic, nontechnical understanding of information theory—the mathematical theory of communication—as background for contemporary developments in computers and information systems. Optional for majors; open to nonmajors. Prereq., MATH 1010.

**COMM 3200-3. Principles and Practices of Argumentation.** Focuses on principles of argument, the process of critical decision making, the uses and limitations of logic and evidence. Contemporary issues (personal, social, political, or philosophical) are analyzed and debated. Required for majors.

**COMM 3350-3. Laboratory in Interpersonal Communication.** Explores the use of creative drama and experiential learning techniques to develop a better understanding and greater skill in intra/interpersonal communication. Optional for majors. Prereq., COMM 2030.

**COMM 4000-3. Special Topics.** Special interest areas of communication research and practice are analyzed in depth. The course format is lecture, discussion, investigative

analysis, and practical applications. (Six-hour limit in major.)

**COMM 4030/5030-3. Advanced Interpersonal Communication.** Reviews perspectives of interpersonal communication and the key variables and research studies that emerge from each perspective. Special attention is paid to the humanistic or dialogic view of interpersonal communication. Assignments include readings, discussion, and experiential methods. Graduate students are assigned additional work of a more theoretical nature. Junior standing or above required. Prereqs., two of the following: COMM 2030, 2150, 3200.

**COMM 4200/5200-3. Persuasion.** The study of all the dimensions of communication with an emphasis on oral performance. Attitudes, values, beliefs, ethics, notions of credibility, criticism of effects, and elements of oral presentation are analyzed. Advanced-level registration involves the examination and synthesis of current theory, research findings, and societal applications of both. Advanced students are expected to meet writing standards appropriate for thesis projects. Junior standing or above required. Prereqs., COMM 2030, 2150, and 3200.

**COMM 4210/5210-3. Psychology of Communication.** Emphasizes applications to communication of selected areas of psychological theory and research. Topics treated may include person perception, interpersonal attraction, learning, symbolic interaction, attitude change, language and meaning, and information theory. Advanced-level registration involves extended reading and analysis. Written efforts at this level are critiqued by standards appropriate to thesis writing. Junior standing or above required. Prereqs., COMM 2030, 2150, and 3200.

**COMM 4230/5230-3. Nonverbal Dimensions of Communication.** Focuses on how people communicate in everyday life without words and with signals which accompany words. Special topics of analysis include proxemics (spatial relations), kinesics (body movement), facial expression, eye contact, vocal qualities, touch, personal adornment, and environmental cues. Advanced-level registration involves the examination and synthesis of current theory, research findings, and applications of both. Junior standing or above required. Prereqs., COMM 2030, 2150, and 3200.

**COMM 4240/5240-3. Organizational Communication.** Focuses on relationships among such variables as information processing, network analysis, leadership, morale, productivity, decision making and conflict, and general message construction and delivery. The course format is lecture, discussion, and case studies. Advanced-level registration involves the examination and synthesis of current special theories, research findings, and applications of both. Advanced students are expected to meet writing standards appropriate for thesis projects. Junior standing or above required. Prereqs., COMM 2030, 2150, and 3200.

**COMM 4260/5260-3. Communication and Conflict.** Conflict management is studied from a communication perspective on the intrapersonal, interpersonal, and small group

levels. Attention is given to managing conflict in informal settings and to the productive management of conflict. Assignments include field observations, analysis of actual conflicts, and experiences in intervention methods. Advanced registration involves reading primary theoretical works in conflict, reading and critiquing recent research in communication and conflict, and writing a major paper. Junior standing or above required. Prereqs., COMM 2030, 2150, and 3200.

**COMM 4270/5270-3. Intercultural Communication.** The processes, problems, and potentials unique to communication across cultural boundaries are studied. Special topics include comparative studies of communication philosophies and customs in selected countries. Advanced-level registration involves the examination and synthesis of current theory, research findings, and applications of both. Junior standing or above required. Prereqs., COMM 2030, 2150, and 3200.

**COMM 4500-3. Human Communication Theory.** Acquaints the advanced student with general, thematic, and contextual theories of human communication. Attention is given to criteria for evaluating theories, and each student designs a theory of human communication based on metatheoretical guidelines. Prereqs. for majors: COMM 2030, 2150, 3200, and at least three 4000-level courses; for nonmajors, upper-division standing and instructor consent.

**COMM 4840 through 4900 (1-6). Undergraduate Independent Study.** Six-hour limit in major. NOTE: the 6-hour limit in the major applies to independent study *and* internship credit.

**COMM 4930 (1-6). Senior Internship.** For senior majors only. Studies are pursued in communication-related work experience projects. These internships generally require 45-75 hours on the job per credit hour and evidence (journal, paper, employer evaluation) of significant learning. Prereqs., major status, senior standing, 21 hours of Communication courses, and instructor consent. NOTE: The 6-hour limit in the major applies to independent study *and* internship credit.

**COMM 6940-0. Master's Degree Candidate.**

**COMM 8990-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## COMMUNICATION DISORDERS AND SPEECH SCIENCE

### Didactic: All-department

**CDSS 1000-3. Communication and Learning in Children.** Provides insight into developing effective communication and learning environments for children. Experience with and observation of children are provided.

Designed for students planning a career in human services.

**CDSS 2000-3. Introduction to Communication Disorders.** Survey of communication disorders including hearing impairments, learning disabilities, and speech-language disorders, as well as an introduction to basic speech and hearing science.

**CDSS 2500-3. Voice and Diction.** Elementary course for the improvement of the speaking voice. Group and individual laboratory practice.

**CDSS 3120-4. Anatomy and Physiology of the Speech and Hearing Mechanisms.** A study of structures and functions of those portions of the human body important to the reception of sound and the production of speech. Prereq., EPOB 3420.

**CDSS 4010/5010-3. Computer Applications in Communication Science.** Students survey small computer applications in understanding human verbal communication behavior. Selected topics include acoustical, aerodynamic, and perceptual aspects of interactive and synthetic speech with ample hands-on demonstrations of computer applications.

**CDSS 4560-3. Language Development.** (LING/PSYC 4560.) The development of language in childhood and into adult life, with emphasis on the role of environment and biological endowment in learning to communicate with words, sentences, and narratives. Prereqs., PSYC 1001 and LING 2000.

**CDSS 5000-2. Research Methods in Communication Disorders and Speech Science.** Intended to familiarize students with basic methodologies and research designs employed in the field. Focuses on critical reading of research papers and design of experiments. At least one research project is conducted and written as part of the course requirements.

**CDSS 5020-3. Computer Applications in CDSS.** Familiarizes students with basic concepts of computers and how they are applied in the field. Emphasis is placed on analysis of typical CDSS problems, their computer-based solutions, and skills to utilize programs.

**CDSS 5120-3. Neural Bases of Communication Disorders.** Neuroanatomical and neurophysiological bases for normal and disordered communication.

**CDSS 5200-3. Psycholinguistics and Language Behavior.** Presents an introduction to psycholinguistic theories that relate to language comprehension and construction strategies. Psycholinguistic theories are also related to sociolinguistics and cognition that are relevant to the language disordered.

**CDSS 6000 (1-3). Problems in Communication Disorders and Speech Science.** Current issues related to theory and management of communication disorders are presented.

**CDSS 6940 (1-3). Candidate for Degree.**

**CDSS 6950 (1-4). Master's Thesis.**

**CDSS 7830 (1-4). Seminar: Departmental Research.**

**CDSS 8990-30. Doctor's Dissertation.** All doctoral students must register for not fewer



than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## Didactic: Speech-Language Pathology

**CDSS 4502-4. Speech Disorders 1.** Survey of the following disorders: stuttering, articulation, and language and learning disabilities. Prereqs., CDSS 3006, 3106, and 3120, or instructor consent.

**CDSS 4512-4. Speech Disorders 2.** Survey of the following disorders: cleft palate, motor speech, aphasia, and voice. Prereqs., CDSS 3066, 3106, and 3120, or instructor consent.

**CDSS 5202-2. Seminar: Child Language Acquisition.** Advanced study of normal, first-language acquisition. Emphasis on the areas of developmental pragmatics, semantics, syntax morphophonemics, phonology, and cognitive development. Special topics of interest to speech-language pathologists and audiologists are addressed. Class discussion and student presentations are expected. Prereq., CDSS 4560 or instructor consent.

**CDSS 5232-3. Language Disorders of Children.** Language disorders are viewed from infancy through adolescence. A comparison is made of the cognitive, social, and linguistic development of the language-learning disabled, the mentally retarded, the emotionally disturbed, the autistic, the hearing impaired, and the environmentally deprived. Prereq., CDSS 5200 or instructor consent.

**CDSS 5262-3. Neurogenic Communication Disorders.** Focus on the role of the speech-language pathologist in the assessment and treatment of individuals with aphasia, related language disorders, and motor speech disorders.

**CDSS 5302-2. Phonological Development and Disorders.** Provides an overview of normal aspects of phonological acquisition—perception and production. Factors related to articulation disorders are presented. Traditional assessment procedures, phonological process analysis strategies, and critical examination of remediation approaches are the focus.

**CDSS 5332-3. Cleft Palate and Voice Disorders.** Anatomical and physiological bases for normal and disordered velopharyngeal and laryngeal function. Evaluation and treatment of the speech of individuals with cleft lip and palate and laryngeal-based voice disorders. Prereq., CDSS 6106.

**CDSS 5362-2. Stuttering: Therapy and Research.** Primary emphasis is the evaluation and treatment of children and adults who stutter. Various stuttering intervention approaches are discussed and evaluated. Discussion is also devoted to counseling parents of young children who stutter. Familiarity with research is a secondary emphasis.

**CDSS 5402-3. Speech-Language-Learning Appraisal.** Students are taught the appraisal process and techniques and learn about test construction. Measures of social maturity, intelligence, hearing, speech, oral language,

reading, writing, spelling, and mathematics are discussed.

**CDSS 5602-2. Methods of Language-Learning Disorders Intervention.** Intervention methods and materials appropriate for children from infancy through adolescence with oral language, reading, and writing disorders.

## Didactic: Audiology

**CDSS 2304-3. American Sign Language 1.** Designed to teach a basic sign vocabulary and an introduction to the grammatical structures of American Sign Languages (ASL) and the culture of deaf people, this course emphasizes receptive skills. Classes are taught using ASL, without depending on spoken English.

**CDSS 2314-3. American Sign Language 2.** Continuation of CDSS 2304, more complex receptive and expressive grammatical structures and a larger sign vocabulary are developed. Classes continue to be taught using ASL, without depending on spoken English.

**CDSS 4704-3. Audiology 1.** Basic principles and techniques of pure tone audiometry, hearing conservation programs in the schools and industry, and pathologies of the auditory system. Required projects in screening and pure tone audiometry. Prereq. or coreq., CDSS 3006 or 3120.

**CDSS 4714-3. Audiology 2.** Basic principles and techniques of clinical masking, speech audiometry, immittance audiometry, and introduction to rehabilitation of the hearing impaired. Required projects. Prereq., CDSS 4704.

**CDSS 5524-2. Conservation of Hearing in Schools and Industry.** Principles of identification audiometry in both the pediatric and adult populations; prevention of hearing loss in the educational and industrial settings. Prereq., CDSS 4714; coreq., CDSS 5928.

**CDSS 5544-3. Seminar: Assessment of Hearing 1.** Lect. and lab. The first in a two-course sequence in advanced hearing measurement including both behavioral and electrophysiologic assessment procedures.

**CDSS 5554-3. Seminar: Assessment of Hearing 2.** The second in the two-course sequence.

**CDSS 5574-2. Medical Backgrounds for Clinical Audiology.** Advanced study of hearing disorders and audiologic practice in the medical setting.

**CDSS 5614-3. Residual Hearing and Amplification.** Study of the physical components of hearing aids; hearing aid performance and clinical evaluation of hearing aids; hearing aid use in the education and rehabilitation of the hearing impaired.

**CDSS 5644-3. Communication Skills of the Hearing Impaired.** A study of the process and teaching of speech reading, the basic features of auditory training, and the development of speech and language skills for the hearing impaired.

**CDSS 5674-3. Social and Vocational Adjustment of the Hearing Impaired.** Study of the personal, social, and vocational adjustment of the hearing impaired, together with a

review of the agencies and organizations which serve them.

**CDSS 5684-3. Advanced Hearing Science.** Study of the instrumentation used by audiologists for signal generation, signal shaping, and measurement and calibration. Also examines microcomputer applications in audiology.

## Didactic: Speech-Hearing Science

**CDSS 3006-3. Introduction to Speech and Hearing Sciences.** A study of basic processes of speech production, transmission, and perception.

**CDSS 3106-3. General Phonetics.** Introduction to principles of speech production, transmission, and reception. Classification of speech sounds and development of an understanding and a limited skill in transcription using International Phonetic Alphabet.

**CDSS 6106-2. Experimental Phonetics 1.** A demonstration and lab course in the applications of instrumentation to problems in acoustic and physiological phonetics; measurement and analysis of linguistically significant acoustic parameters of speech. Lab experiments and at least one experimental research paper are part of the course requirements.

**CDSS 7106-2. Experimental Phonetics 2.** A comprehensive survey of topics in physiological and articulatory phonetics with emphasis on motor control of speech production and its theoretical and methodological issues. Lab experiences and research reports on a selected topic are part of the course requirements.

**CDSS 7206-2. Speech Perception.** A survey of research findings and laboratory experience on topics in speech perception including intelligibility of speech, perceptual cues of segmental and suprasegmental linguistic features, dichotic listening and hemispheric specialization, and speech synthesis.

## Practica

**CDSS 4918-1. Observation and Cotherapy.** Supervised observation and cotherapy with individuals exhibiting speech, language, and hearing problems.

**CDSS 4938 (1-6). Internship: Speech-Language Intervention (Child Language Center).** Provides supervised experience in the management of speech-language disorders in preschool age children from Boulder County who are enrolled in the Communication Disorders Clinic's preschool program. Prereqs., PSYC 2643 or EDUC 4463, and CDSS 4560, or instructor consent.

**CDSS 5878 (1-3). Practicum I: Speech-Language-Learning Appraisal.** Supervised clinical experience on campus in the appraisal of speech, language, and learning disorders after training at the observational level.

**CDSS 5888 (1-3). Practicum I: Voice Evaluation.** Supervised clinical experience on

campus in the evaluation of voice disorders and cleft palate.

**CDSS 5898 (1-4). Practicum 1: Speech-Language-Learning Intervention.** On-campus supervised clinical practice in the management of speech-language disorders in children and adults.

**CDSS 5908 (1-4). Practicum 1: Speech-Language-Learning Intervention (Child Language Center).** Supervised experience in the management of speech-language disorders in preschool age children who are enrolled in the Communication Disorders Clinic's preschool program.

**CDSS 5918 (1-3). Practicum 1: Audiology Appraisal.** Supervised clinical experience on campus in the appraisal of hearing of children and adults.

**CDSS 5928 (1-3). Practicum 1: Conservation of Hearing.** Supervised clinical experience off campus in the organization and administration of hearing conservation programs in schools and/or industry.

**CDSS 5938 (1-3). Practicum 1: Audiology Intervention.** Supervised clinical on- and/or off-campus experience in the management of hearing disorders of children and adults.

**CDSS 6918-7. Practicum 2: Speech-Language-Learning Internship.** Off-campus experience in a clinical or hospital setting which provides in-depth practice with speech-language handicapped individuals.

**CDSS 6928-7. Practicum 2: Public School Internship.** Off-campus supervised experience providing extended and in-depth practice with speech-language handicapped school children.

**CDSS 6938 (4-8). Practicum 2: Audiology Internship.** An off-campus experience in a school, hospital, or clinic setting which provides in-depth appraisal and/or rehabilitation practice with hearing-impaired individuals.

**CDSS 7918-2. Practicum 3: Clinical Supervision.**

**CDSS 7928-2. Practicum 3: Clinical Administration.**

**CDSS 8918-2. Practicum 3: Classroom Instruction.**

**CDSS 8928-2. Practicum 3: Research Coordination.**

### Independent Study

**CDSS 4849 (1-4). Independent Study for Undergraduates.**

**CDSS 5849 (1-4). Independent Study: Speech-Language Pathology, M.A.**

**CDSS 5859 (1-4). Independent Study: Language-Learning Disabilities, M.A.**

**CDSS 5869 (1-4). Independent Study: Audiology, M.A.**

**CDSS 5879 (1-4). Independent Study: Speech Science, M.A.**

**CDSS 7849 (1-4). Independent Study: Speech-Language Pathology, Ph.D.**

**CDSS 7859 (1-4). Independent Study: Language-Learning Disabilities, Ph.D.**

**CDSS 7869 (1-4). Independent Study: Audiology, Ph.D.**

**CDSS 7879 (1-4). Independent Study: Speech Science, Ph.D.**

## COMPARATIVE LITERATURE

The following course titles represent broad areas and general topics which, together, constitute a program of inquiry in the discipline of Comparative Literature. In any given semester, selected courses will be listed with specific topic and instructor in the *Schedule of Courses*. Please contact the Comparative Literature office for more detailed plans of upcoming semesters.

**COML 5000 (1-3). Proseminar in Comparative Literature.**

**COML 5350 (1-3). Studies in the Novel.**

**COML 5360 (1-3). Studies in Drama.**

**COML 5370 (1-3). Studies in Poetry.**

**COML 5410 (1-3). Classical Literature.**

**COML 5420 (1-3). Medieval Lyric Literature.**

**COML 5430 (1-3). Renaissance Literature.**

**COML 5440 (1-3). Baroque Literature.**

**COML 5450 (1-3). Literature of the Enlightenment (English, French, German).**

**COML 5460 (1-3). Nineteenth and Early Twentieth-Century Literature.**

**COML 5470 (1-3). Modern Literature.**

**COML 5480 (1-3). Contemporary Literature.**

**COML 5610 (1-3). Introduction to Literary Theory.**

**COML 5620 (1-3). Aesthetics.**

**COML 5630 (1-3). History of Literary Criticism.**

**COML 5640 (1-3). International Literary Relations.**

**COML 5650 (1-3). Influence and Literary Fortune.**

**COML 5660 (1-3). Themes, Motifs, and Characters.**

**COML 5790 (1-3). Literature and the Social Sciences.**

**COML 5820 (1-3). Philosophy and Literature.**

**COML 5830 (1-3). Literature and History.**

**COML 5840 (1-3). Independent Study.**

**COML 6010 (1-3). Seminar: Major Figures.**

**COML 6020 (1-3). Seminar: Period.**

**COML 6030 (1-3). Seminar: Genre.**

**COML 6040 (1-3). Seminar: A Selected Topic.**

**COML 6840 through 6890 (1-3). Independent Study.**

**COML 6940 (1-3). Candidate for Degree.**

**COML 6950-4. Master's Thesis.**

**COML 6970 (1-3). Colloquium in Comparative Literature.**

**COML 8990-30. Doctor's Dissertation.**

## ECONOMICS

### Theory and History of Economic Thought

**ECON 2010-4. Principles of Microeconomics.** The operation of the price system as a major organizer of the economy. Elementary theory, problems, and public policy of competition, monopoly, distribution of income, and international economic relations.

**ECON 2020-4. Principles of Macroeconomics.** An overview of the economy, examining the flow of income and GNP, the factors determining the level of employment, income, money, credit, and prices.

**ECON 3070-3. Intermediate Microeconomic Theory.** Production, price, and distribution theory. Study of value and distribution theories under conditions of varying market structures, with special reference to the contributions of modern economic theorists. ECON 3070 and 3080 may be taken in any order; there is no recommended sequence. Prereqs., MATH 1070 and 1080, and ECON 2010.

**ECON 3080-3. Intermediate Macroeconomic Theory.** National income and employment theory. Primary emphasis placed on determination of the levels of employment and prices. Within the framework of a general equilibrium macroeconomic model, theories of consumption, investment, and money are considered. The problems of unemployment and inflation are analyzed and appropriate monetary and fiscal policies considered. ECON 3070 and 3080 may be taken in any order; there is no recommended sequence. Prereqs., MATH 1070 and 1080, and ECON 2020.

**ECON 6070-3. Applied Microeconomic Theory.** Develops competence in techniques of applied micro/macro theory for those going directly into policy and problem-solving jobs. Topics include estimating demand, cost, and production functions; operational models of production; processes from industry/agriculture; capital theory with resource applications; and benefit-cost analysis. Prereqs., ECON 3070 and 4808.

**ECON 6080-3. Applied Macroeconomic Theory.** Develops students' competence in techniques of applied macro theory. Topics include theoretical and empirical work on consumption, investment, money demand and supply, and open economy macroeconomics models. Also covers different expectations models, the policy ineffectiveness proposition, and policy credibility. Prereqs., ECON 3080 and 4808.

**ECON 7000-3. History of Economic Thought.** Advances the student's appreciation of the historical and philosophical background of current economic concepts. Students read in the original texts of certain great economic writers from the industrial revolution to the 1920s. Secondary sources

are used in some instances. Prereqs., ECON 3070 and 3080.

**ECON 7010-3. Microeconomic Theory 1.** Recent and contemporary literature on fundamentals of economic theory. Consideration of value theory with particular emphasis on methodology, theory of demand, theory of the firm, theory of distribution, and general equilibrium theory. Prereqs., ECON 3070 and 3080.

**ECON 7020-3. Macroeconomic Theory 1.** Considers the theory of aggregative analysis and accompanying policy implications. A general equilibrium model is constructed and applied to the problems of unemployment, inflation, and growth. Particular emphasis is given to theories of consumption, investment, and the supply of and demand for money. Prereqs., ECON 3070 and 3080.

**ECON 7030-3. Microeconomic Theory 2.** Continuation of ECON 7010. Prereq., ECON 7010.

**ECON 7040-3. Macroeconomic Theory 2.** Continuation of ECON 7020. Prereq., ECON 7020.

**ECON 8000-3. Alternative Economic Paradigms.** Explores nontraditional economic paradigms and considers how these approaches compare with the dominant neo-classical view. Emphasis is placed on the paradigms associated with the Austrian and Cambridge schools. Prereqs., ECON 7000, 7010, and 7020.

## Money, Banking, and Public Finance

**ECON 4111/5111-3. Money and Banking.** Survey of major monetary and financial institutions such as commercial banks, the Federal Reserve System, and savings institutions, and the structure of debt from the standpoint of how their operation affects the money supply and its circulation. Prereqs. for ECON 4111, ECON 2010 and 2020; prereq. for ECON 5111, ECON 3080.

**ECON 4211/5211-3. Seminar: Public Finance.** Taxation and public expenditures. Topics covered include the economic rationale for government action, the economic theory of government behavior, and the effects of government policies on the allocation of resources and the distribution of income. Prereq., ECON 3070.

**ECON 8111-3. Seminar: Monetary Political Economy.** International monetary and financial institutions with a focus on international policy coordination and political business cycles. Prereqs., ECON 4111 or 5111, and 6080 or 7020.

**ECON 8121-3. Seminar: Monetary Theory 1.** Major contributions to monetary and banking theory up to the present day. Prereq., ECON 6080 and 7020.

**ECON 8131-3. Contemporary Monetary Theory and Policy.** Continuation of ECON 8121. Modern-day monetary thinking and policy. Prereq., ECON 8121.

**ECON 8211-3. Seminar: Public Finance 1.** Advanced study of theory and practice of

public expenditures and taxation. Focus is on taxation, including a detailed examination of the economic effects of taxation on resource allocation, production, and distribution. Prereq., ECON 6070 and 7010.

**ECON 8221-3. Seminar: Public Expenditures.** Continuation of ECON 8211 with emphasis on government expenditures. Specific topics include welfare economics, theories of public good provision, determinants of expenditure growth, and benefit-cost analysis. Either course may be taken independently for credit. Prereq., ECON 8211.

## Urban Regional Economics

**ECON 4252/5252-3. Urban Economics.** Analysis of the level, distribution, stability, and growth of income and employment in urban regions. The topics of urban poverty, housing, land use, transportation, and local public services are examined, with special reference to economic efficiency and social progress. Prereq., ECON 3070.

**ECON 5292-3. Migration, Urbanization, and Development.** (GEOG 5292.) Historical and current patterns of national settlement system development are examined. Focuses on a quantitative analysis of problems associated with population growth and decline, urbanization, and economic structural change in more developed and less developed countries.

**ECON 8252-3. Seminar: Urban and Regional Economics 1.** Covers basic theories in spatial location of economic activity and land use and survey techniques developed to analyze, measure, and predict regional and urban structure and growth, such as economic base studies, regional social accounts, and input-output analysis. Prereq., ECON 4252 or 5252.

**ECON 8262-3. Topics in Urban and Regional Economics.** Investigates various theoretical topics in urban and regional economics and focuses on policy issues. Course format involves student research and presentations throughout. Prereq., ECON 8252.

## International Trade and Finance

**ECON 3403-3. International Economics and Policy.** Examines national and supranational policies that affect the international economy, with attention to trade barriers, economic nationalism and regionalism, international political economy, exchange market intervention, and international transmission of economic perturbations. Open to nonmajors only. Prereqs., ECON 2010 and 2020.

**ECON 3433-3. International Conflict in the Nuclear Age.** International conflicts concerning debt, development, and the U.S./U.S.S.R. are analyzed, using ideas from game theory, social choice theory, and information-communication theory. Competing views of socialism versus free market economics are considered as are alternative economic paradigms and reform proposals. Students use University terminals to engage in classroom

telecommunications dialogue. Prereqs., ECON 2010, 2020, and instructor consent.

**ECON 4413/5413-3. International Trade.** Theories of interregional and international trade, private and public trade, world population and resources, tariffs and commercial policy, and international economic organization. Prereq., ECON 3070 and 3080.

**ECON 4423/5423. International Finance.** Foreign exchange, theories of adjustment disequilibria in the international balance of payments, international investment, and international monetary and banking organizations. Prereq., ECON 3080.

**ECON 8413-3. Seminar: International Trade Theory.** Contemporary and classical literature on theories of international trade. Prereqs., ECON 3070 and 3080.

**ECON 8423-3. Seminar: International Finance.** Foreign exchange markets, past and current international monetary mechanisms, and the processes of adjustment. Plans for international monetary reform. International monetary and banking institutions. Prereqs., ECON 3070 and 3080.

**ECON 8433-3. Seminar: Topics in Money and International Economics.** Foundational issues in monetary theory and an integration with international economics. Topics include alternative monetary arrangements, international monetary history, theory of multiple monies, and the interaction between real and monetary phenomena. Prereq., ECON 8423 or 8121.

## Economic History and Economic Development

**Note:** The prereqs. for the following 4000-level courses are ECON 2010 and 2020; for the following 5000-level courses, the prereqs. are ECON 3070 and 3080.

**ECON 1524-3. Economic History of the United States.** A survey of the economic aspects of U.S. history from the colonial period to the present.

**ECON 4494/5494-3. Comparative Economic History of Developing Areas 1.** History of trade, commercial policies, banking, and finance throughout colonial and precolonial periods until the present date. Special attention to the effects of colonialism and other relationships with industrialized countries on economic development. Focuses on East, South, and Southeast Asia.

**ECON 4504/5504-3. Comparative Economic History of Developing Areas 2.** A companion course to ECON 4494/5494. Covers the history of trade, commercial policies, banking, and finance throughout colonial and precolonial periods until the present date. Focuses on the Middle East, Africa, and Latin America.

**ECON 4514/5514-3. Economic History of Europe.** Evolution of industrial society with emphasis on its growth and development from colonial times to the present.

**ECON 4524/5524-3. Economic History of the United States.** American economic organizations and institutions and their development from colonial times to the present.

**ECON 4714/5714-3. Comparative Economic Systems.** Critical study of socialism, capitalism, communism, utopianism, syndicalism, cooperatives, and other functioning and proposed economic systems.

**ECON 4774/5774-3. Economic Development: Theory and Problems.** Theoretical and empirical analysis of problems of economic development in both underdeveloped and advanced countries.

**ECON 4784/5784-3. Policies of Economic Development.** Current conditions and policies of national and international economic development with emphasis on accelerating and maintaining economic and social growth.

**ECON 4794/5794-3. Economic Development of Latin America.** Current problems of economic development in Latin America.

**ECON 8764-3. History of Economic Development.** (HIST 8764.) Covers in historical perspective the causes of economic development, why some areas develop faster than others, and why development occurs more rapidly in some eras than others. Students prepare papers on topics to be selected. Prereq., graduate standing.

**ECON 8774-3. Economic Planning and Development.** Deals with the role of planning in economic development with particular reference to investigation of planning problems in Southeast Asia and the Middle East. Prereqs., ECON 3070 and 3080.

**ECON 8784-3. Economic Development: Problems.** Seminar in theory and practice of economic development. Topics include international poverty and inequality, dualistic development, employment mobilizing and allocating resources, human-resource development, sectoral development, and planning and policy making. Prereqs., ECON 3070 and 3080.

**ECON 8794-3. The Economics of Energy and Development.** A general survey seminar covering the economics dominating the field of energy, investigating alternative sources with the economic ramifications of each, and the economics of the logistical and ecological problems involved. Related to the role of energy in economic growth of both developed and developing countries and the issues of scarcity, conservation, and imports. Prereqs., ECON 3070 and 3080.

## Natural Resources and Environment/Agricultural Economics

**ECON 3535-3. Natural Resource Economics.** Economic analysis is integrated with life science aspects of natural resource systems to develop social policies for national use of natural resources. The economist's approach to natural resources policy analysis is studied, then applied to energy, forestry, fisheries, mineral, and water systems. For nonmajors. Students may not receive credit for both ECON 3535 and 4535. Prereq., ECON 2020.

**ECON 3545-3. Environmental Economics.** Understanding the causes of excessive environmental pollution and the tools for controlling it through economic analysis; values

of preservation; distribution of costs and benefits from environmental protection programs. For nonmajors. Students may not receive credit for both ECON 3545 and 4545. Prereq., ECON 2020.

**ECON 4535-3. Natural Resource Economics.** An analysis of problems associated with socially optimal use of renewable and non-renewable natural resources over time. Problems of common property resources, irreversible forms of development, and preservation of natural areas. Students may not receive credit for both ECON 3535 and 4535. Prereqs., ECON 3070 and 4808.

**ECON 4545-3. Environmental Economics.** Effects of economic growth on the environment; application of economic theory of external diseconomies, cost-benefit analysis, program budgeting, and welfare economics to problems of the physical environment. Students may not receive credit for both ECON 3545 and 4545. Prereqs., ECON 3070 and 4808.

**ECON 4565/5565-3. Agricultural and Rural Economics.** Analysis of the rural sector and related problems and policies; economics of agriculture, agribusiness, and rural-urban relations; role of agriculture in economic development. Prereqs. for ECON 4565, ECON 2010 and 2020; for ECON 5565, ECON 3070 and 3080.

**ECON 8535-3. Seminar: Natural Resources.** An analysis of problems associated with socially optimal use of renewable and nonrenewable natural resources over time. Problems of common property resources, irreversible forms of development, and preservation of natural areas. Prereqs., ECON 3070, 3080, and 4808.

**ECON 8545-3. Seminar: Environmental Economics.** Theory of externalities: alternative policies for environmental management, taxes, subsidies, standards, pollution rights; industry models, regional models; macroimpacts of environmental policies; transboundary problems; preservation/development. Prereqs., ECON 4808 and 6070.

**ECON 8555-3. Seminar: Water Resources Development and Management.** An examination of the economic principles governing water planning and development. Application of benefit-cost analysis and optimization techniques of design of water systems. Relationship to national planning and growth. Prereqs., ECON 3070, MATH 1070, and MATH 1080 or equivalent.

**ECON 8565-3. Economics of Agriculture and Agribusiness.** Analysis of agricultural supply and marketing processes and their interrelations with farming enterprises in industrial and developing economies; the management of farm and farm-related enterprises; commodity markets; government and agriculture. Prereqs., ECON 3070 and 3080.

**ECON 8585-3. Seminar: Agriculture and Economic Development.** Farm and rural sector development theories and policies; subsistence and industrial agricultural systems; agribusiness; technology, farm size, land tenure, and international trade in farm products. Prereqs., ECON 3070 and 3080.

## Labor and Human Resources

**ECON 4616/5616-3. Labor Economics.** Determination of wages, hours, and working conditions in the American economy. Includes economic effects of trade unionism and other social institutions that have been developed to promote equality of bargaining power between labor, management, and the public. Prereqs. for ECON 4616, ECON 2010 and 2020; for ECON 5616, ECON 3070 and 3080.

**ECON 8666-3. Economic Demography.** Investigates the economic determinants and consequences of demographic behavior in developing and developed countries. Issues covered include fertility and female labor supply interactions, the demographic transition, the effect of population growth on income distribution, family investments in children, and intergenerational mobility. Prereqs., ECON 3070 and 3080.

**ECON 8676-3. Seminar: Labor Economics 1.** Economic analysis of wage determination and labor market operation. Detailed study of the supply of and demand for labor under competitive and noncompetitive conditions; concentration on level and structure of wage rates, bargaining theory, discrimination, unions, labor mobility and migration, unemployment, and inflation. Prereqs., ECON 3070 and 3080.

**ECON 8686-3. Seminar: Labor Economics 2.** Focuses on three interrelated special topics in labor economics: 1) dynamic theories of labor supply, employment, and unemployment; 2) labor supply in a household framework; 3) labor market activity and income distribution. In each area both the theoretical models and empirical tests of these models are extensively explored. Prereqs., ECON 3070 and 3080.

## Industrial Organization

**ECON 4697/5697-3. Government and Business in the Economy.** An analysis of the roles of business and government in the economy in the light of the performance of a theoretical free-market system, departures of real economies from the free-market model, and the economic goals of society. Prereqs. for ECON 4697, ECON 2010 and 2020; for ECON 5697, ECON 3070 and 3080.

**ECON 4767/5767-3. Economics of the Public Service Industries.** Public policy issues in the regulated industries: transportation, communications, electricity, and gas. Prereqs. for ECON 4767, ECON 2010 and 2020; for ECON 5767, ECON 3070 and 3080.

**ECON 8757-3. Seminar: Industrial Organization and Control.** The large firm in relation to its rivals, suppliers, and customers (theory and industry studies); social control of business through antitrust and other government regulation. Prereqs., ECON 3070 and 3080.

## Quantitative Economics

**ECON 3818-4. Introduction to Statistics with Computer Applications.** Introduction to statistical methods and their applications

in quantitative economic analysis. Prereqs., ECON 2010, 2020, MATH 1070, and MATH 1080.

**ECON 4808/5808-3. Introduction to Mathematical Economics.** Introduction to the use of mathematics in economics. Topics include vectors and matrices, differential calculus, and optimization theory, with economic applications. Prereqs., ECON 2010 and 2020, MATH 1070 and 1080.

**ECON 4818-3. Introduction to Econometrics.** Designed to give undergraduate Economics majors an introduction to econometric theory and practice. The multiple regression model and problems encountered in its application are developed in lecture and individual applied projects. Prereq., ECON 3818.

**ECON 4838/5838-3. Microcomputer Applications in Economics.** The main objective is innovative uses of personal computers (Zenith PCs) in economic analysis and model building techniques. Students acquaint themselves with the nature and properties of economic models by trial and error through individualized, computer-generated exercises. Topics include input-output analysis, linear programming, nonlinear approximation, and simulation. Prereqs., ECON 4808 or MATH 1300, and ECON 3070.

**ECON 6818-3. Econometric Methods and Application.** Designed to give master's-level Economics students an introduction to econometric theory and practice. The multiple regression model and problems encountered in its application are developed in lecture and individual applied projects. Prereq., ECON 3818.

**ECON 6828-3. Applied Time Series Analysis (Box-Jenkins) and Forecasting.** Introduces first-year graduate students to time series approach of model building and forecasting. Basic topics covered are Box-Jenkins Autoregressive Moving Average (ARIMA), Transfer Function and Vector Autoregressive (VAR) models, and the evaluation of forecasts from such models. Emphasis placed on applied computer assignments and on individual applied projects. Prereq., ECON 4808 or 5808.

**ECON 7808-3. Seminar: Quantitative Methods in Economics.** Offers more advanced essential tools in quantitative methods to prepare students to take theory and econometrics courses. Topics include multivariable calculus, implicit function theorem, optimization, quadratic form, vector differentiation, and differential equations. Prereq., ECON 5808.

**ECON 7818-3. Seminar: Intermediate Econometrics.** Application of statistical inference to economic research. Principal topics are probability theory, statistical inference, and regression analysis. Prereq., ECON 7808.

**ECON 8808-3. Seminar: Mathematical Economics 1.** Mathematical foundations of theories of consumption, production, and general equilibrium. Topics in demand and production theories, linear, nonlinear programming, input-output analysis, and welfare economics. Prereq., ECON 5808.

**ECON 8818-3. Seminar: Mathematical Economics 2.** Mathematical exposition of contemporary macro- and microdynamics. Neoclassical and linear models. Topics in efficient and optimal growth, growth and fluctuations, stabilization and control policies. Prereq., ECON 5808.

**ECON 8828-3. Seminar: Econometrics 1.** Theory, construction, and testing of single-equation models, including generalized least squares, limited dependent variable models, and nonlinear estimation. Prereq., ECON 7818.

**ECON 8838-3. Seminar: Econometrics 2.** Advanced topics in econometrics and mathematical economics, including simultaneous equations models, dynamic models and time series analysis. Prereq., ECON 7818.

## Independent Study and Other Courses

**ECON 4309-3. Economics Honors Seminar.** Open only to qualified seniors. For information consult the department's director of honors.

**ECON 4319-3. Economic Education 1.** Seminar for qualified undergraduate economics majors interested in being teaching assistants for ECON 2010. Students hold one or two 50-minute recitations per week for an introductory microeconomics class and attend a weekly seminar with the other undergraduate TAs. Prereqs., ECON 3070, 3080, and consent of the department.

**ECON 4329-3. Economic Education 2.** Seminar for qualified undergraduate economics majors interested in being teaching assistants for ECON 2020. Students hold one or two 50-minute recitations per week for an introductory macroeconomics class and attend a weekly seminar with the other undergraduate TAs. Prereqs., ECON 3070, 3080, and consent of the department.

**ECON 4909-variable credit. Independent Study.** Consent of instructor and department required. Prereqs., ECON 2010 and 2020.

**ECON 6339 (1-3). Teaching Economics.** Explores a variety of topics applicable to the study and teaching of economics. The main emphasis is on themes, topics, and strategies most appropriate to motivate students' interest in economics. Courses offered through the Colorado Council for Economic Education. Not an option for Economics majors or Economics graduate students.

**ECON 6359-3. Calculus for Economists.** Partial derivatives and their applications to economics; optimization, both unconstrained and constrained; matrices and determinants. Course is offered through the Economics Institute.

**ECON 6369-3. Econometrics.** The single equation regression model with two or more variables, least squares estimators and their properties, problems in single equation regression estimation, and the simultaneous equation model. Course is offered through the Economics Institute.

**ECON 6379-3. Advanced Intermediate Microeconomic Theory.** Production and cost theory, theory of monopoly, monopolistic

competition and oligopoly, distribution theory, and general equilibrium and welfare economics. Course is offered through the Economics Institute.

**ECON 6389-3. Advanced Intermediate Macroeconomic Theory.** A brief review of intermediate theory and advanced theory of modern inflation. Course is offered through the Economics Institute. ECON 6359 may be taken concurrently.

**ECON 6909-variable credit. Independent Study.** Consent of instructor and department required.

**ECON 6949 (1-3). Master's Candidate.**

**ECON 6959 (1-4). Master's Thesis.**

**ECON 8359-2. Mathematics for Economists: Special Topics.** Development of selected topics and applications in mathematics for economists and especially linear algebra and/or differential equations. Course is offered through the Economics Institute. Not an option for Economics majors or Economics graduate students.

**ECON 8369-2. Statistics for Economists: Special Topics.** Development of selected topics in statistics and their applications to economic research. Course is offered through the Economics Institute. Not an option for Economics majors or Economics graduate students.

**ECON 8379-2. Microeconomic Theory: Special Topics.** Development of selected topics in microeconomic theory and their applications to economic policy. Research paper required of all participants. Course is offered through the Economics Institute. Not an option for Economics majors or Economics graduate students.

**ECON 8389-2. Macroeconomic Theory: Special Topics.** Development of selected topics in macroeconomic theory and their applications to economic policy. Research paper required of all participants. Course is offered through the Economics Institute. Not an option for Economics majors or Economics graduate students.

**ECON 8909-variable credit. Independent Study.** Consent of instructor and department required.

**ECON 8999-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## ENGLISH College List

**ENGL 1200-3. Introduction to Fiction.** Reading and analysis of short stories and novels.

**ENGL 1260-3. Introduction to Women's Literature.** (WMST 1260.) An introduction to the study of literature by women in England and America. Both poetry and fiction are read, and varying historical periods are covered. Designed to acquaint the student with the contribution of women writers to the

English literary tradition and to investigate the nature of this contribution.

**ENGL 1300-3. Introduction to Drama.** Reading and analysis of plays.

**ENGL 1400-3. Introduction to Poetry.** Reading and analysis of poetry.

**ENGL 1500-3. Introduction to British Writers.** Introduces students to a range of major works of British literature, including at least one play of Shakespeare, a pre-twentieth-century English novel, and works by Chaucer and/or Milton.

**ENGL 1600-3. Introduction to American Writers.** Introduces students to a range of representative major works of American literature, with emphasis on works written before the twentieth century.

**ENGL 1700-3. Introduction to Shakespeare.** Introduces students to Shakespeare's major works—the histories, comedies, and tragedies—and may include the nondramatic poetry as well.

**ENGL 2260-3. Images of Women in Literature.** (WMST 2260.) A survey of images of women in English literature from the Middle Ages to the present.

**ENGL 2530-3. Modern and Contemporary Literature.** Close study of significant twentieth-century poetry, drama, and prose works. The readings range from the 1920s to the present.

**ENGL 2600-3. Introduction to World Literature 1.** Close study of literary classics of Western civilization: the *Odyssey* or *Iliad*, Greek drama, and several books of the Bible. Not open to students who have credit in HUMN 1010-1020.

**ENGL 2610-3. Introduction to World Literature 2.** Close study of literary classics of Western civilization: major Roman and medieval texts. Not open to students who have credit in HUMN 1010-1020.

## Undergraduate Creative Writing

**ENGL 1191-3. Introduction to Creative Writing.** An introduction to the techniques of fiction and poetry. Student work is scrutinized by the instructor and discussed in a workshop atmosphere by other students.

**ENGL 2021-3. Introductory Poetry Workshop.** An introductory course in poetry writing. Prereq., permission of the instructor after submitting a manuscript (five to seven poems). May be taken up to three times for credit.

**ENGL 2051-3. Introductory Fiction Workshop.** An introductory course in fiction writing. Prereq., permission of the instructor after submitting a manuscript (one short story). May be taken up to three times for credit.

**ENGL 3021-3. Intermediate Poetry Workshop.** An intermediate course in poetry writing. Prereq., consent of instructor based on submission of manuscript (five to seven poems). May be taken up to three times for credit.

**ENGL 3051-3. Intermediate Fiction Workshop.** An intermediate course in fiction writing. Prereq., consent of instructor based on submission of manuscript (one short story). May be taken up to three times for credit.

**ENGL 4021-3. Advanced Poetry Workshop.** An advanced course in poetry writing. Prereq., consent of instructor based on submission of manuscript (five to seven poems). May be taken up to three times for credit.

**ENGL 4051-3. Advanced Fiction Workshop.** An advanced course in fiction writing. Prereq., consent of instructor based on submission of manuscript (one short story). May be taken up to three times for credit.

**ENGL 4081-3. Playwriting: Short Form.**

**ENGL 4091-3. Playwriting: Long Form.**

## Undergraduate Literature and Language

**ENGL 2002-3. Writing About Literature.** Practical criticism of novels, poems, and plays, with emphasis on written work. Introduction to and practice in using various critical approaches to works of literature.

**ENGL 2212-3. Science Fiction.** Readings in classical and popular science fiction.

**ENGL 2712-3. Native American Literature.** Surveys traditional and contemporary North American Native American literature, from traditional oral forms to contemporary genre literature of novel, short story, and poetry.

**ENGL 2722-3. Survey of Afro-American Literature 1.** Chronological study of Afro-American literature from the seventeenth century to the Harlem Renaissance.

**ENGL 2732-3. Survey of Afro-American Literature 2.** Chronological study of Afro-American literature from the Depression writers to the present.

**ENGL 2742, 2752, 2762, 2772-3. Studies in Language.** Intensive study of special topics in the English language, especially designed for freshmen and sophomores.

**ENGL 2782, 2792, 2802, 2812-3. Studies in Literature.** A study of a special literary topic or major author, especially designed for freshmen and sophomores.

**ENGL 3152-3. Report Writing.** Instruction and practice in various forms of reports, papers, and articles. Style and editing are emphasized.

**ENGL 3222-3. Folklore 1.** Emphasizes formal study of folk traditions—including tales, songs, games, customs, beliefs, and crafts—within a theoretical framework, using examples from several cultures.

**ENGL 3262-3. Women Writers.** (WMST 3262.) An introduction to literature by British and American women.

**ENGL 3302-3. Backgrounds of English and American Literature.** The literary, philological, and religious traditions of the Greco-Roman and Judeo-Christian worlds: close analysis of major texts in translation. Comparison of ancient and modern texts is made where feasible.

**ENGL 3312-3. The Bible as Literature.** Survey of the literary achievements of the Judeo-Christian tradition as represented by the Bible.

**ENGL 3502-3. Survey of British Literature 1.** Chronological study of the greater figures and forces in English literature from *Beowulf* to 1660.

**ENGL 3512-3. Survey of British Literature 2.** Continuation of ENGL 3502.

**ENGL 3542-3. Chaucer: Troilus and the Early Poems.** A close reading of Chaucer's work before *The Canterbury Tales*, with special emphasis on *Troilus and Criseyde* and its sources.

**ENGL 3552-3. Chaucer: The Canterbury Tales.** A short introduction to Middle English precedes study of the poetry.

**ENGL 3562-3. Shakespeare.** Shakespeare's works through 1600.

**ENGL 3572-3. Shakespeare.** Shakespeare's works after 1600.

**ENGL 3582-3. Milton.** Milton's poetry and selected prose.

**ENGL 3652-3. Survey of American Literature 1.** Chronological survey of the literature from Bradford to Whitman.

**ENGL 3662-3. Survey of American Literature 2.** Chronological survey of the literature from Whitman to Faulkner. Continuation of ENGL 3652.

**ENGL 3682-3. Twentieth-Century American Literature.** Reading course in American novelists, poets, and dramatists of the twentieth century. Primarily for nonmajors.

**ENGL 3702, 3712, 3722-3. New Directions in English Studies.** New directions courses are concerned with developments in the study of literature that have significantly influenced our conception of the theoretical bases for study and expanded our understanding of appropriate subject matter. Such courses may include, but are not limited to, topics in women's literature and feminist criticism, Marxist criticism, the various schools of psychological criticism, structuralism, semiotics, deconstruction, ethnopoetics, film studies, and applications of linguistic theories to literary criticism.

**ENGL 3732, 3742, 3752-3. Studies in Language.** Intensive study of special topics in the English language, especially designed for juniors and seniors.

**ENGL 3762, 3772, 3782-3. Studies in Literature.** A study of a special literary topic or major author, especially designed for juniors and seniors.

**ENGL 3802-3. Computer Applications in Language and Literature.** Surveys the major successful applications of computer technology to the analysis of literary texts. Actual analysis of selected texts, in the context of a consideration of the most appropriate theories of language and literature and the proper structuring of literary data bases, is the major component of the course.

**ENGL 3912-3. Computer Practicum.** Provides direct experience in using the computer as a tool of literary study: to analyze, to edit, to make a concordance of a limited



number of literary texts. Emphasis is on the use of machine analyses to formulate and test critical perspectives about the texts. Several critical papers are required.

**ENGL 4002-3. Literature and Psychology.** Critical application of basic concepts of psychology to world literature.

**ENGL 4012-3. Literature and Psychopathology.** Students study major psychological disorders as they are given dramatic and descriptive treatment by literary artists in poems, plays, short stories, and novels. Although the emphasis is primarily descriptive, some attention is paid to contemporary views of etiology.

**ENGL 4102-3. The English Language.** Outlines the history of the language, including a brief survey of sound changes affecting modern English, of history of grammatical forms, and of the vocabulary. Elementary knowledge of English grammar is assumed.

**ENGL 4192-3. Advanced Shakespeare.** For advanced students only. Close readings of works spanning Shakespeare's career.

**ENGL 4202-3. Development of the English Novel 1.** From the beginnings to 1830.

**ENGL 4212-3. Development of the English Novel 2.** Continuation of ENGL 4202.

**ENGL 4222-3. Modern British and Irish Novel.** A study of major figures and trends in the twentieth century.

**ENGL 4232-3. American Novel 1.** From the beginnings to 1900.

**ENGL 4242-3. American Novel 2.** From 1900 to the present.

**ENGL 4252-3. Modern Novel.** A close study of masterpieces by such novelists as Proust, Joyce, Woolf, Lawrence, Mann, Kafka, and Faulkner.

**ENGL 4262-3. Contemporary Novel.** A study of the major novelists and developments in the genre, with emphasis on novels written since 1945.

**ENGL 4272-3. Topics in Women's Literature.** (WMST 4272.) An advanced course focusing on areas of research interest in the study of women's literature, such as selected themes or critical issues. Students are expected to contribute original research to the topic under consideration.

**ENGL 4282-3. Folklore 2.** Upper-level studies of folk groups, events, texts, and contexts as they reflect traditional "knowing"—folk perceptions and teachings about the structure and purpose of the universe.

**ENGL 4302-3. Development of British Drama 1.** From beginning to the closing of the theatres in 1642.

**ENGL 4312-3. Development of British Drama 2.** From 1660 to the present.

**ENGL 4322-3. Elizabethan and Jacobean Drama.** Representative non-Shakespearean plays of the period.

**ENGL 4332-3. Restoration and Eighteenth-Century Drama.** Representative plays of the period (1660-1800), with consideration of authors, texts, performance practice, and context.

**ENGL 4342-3. Modern British and Irish Drama.** A survey of the English-Irish theatre since 1900.

**ENGL 4352-3. American Drama.** Famous American plays from O'Neill to the present.

**ENGL 4362-3. Modern Drama.** Continental, British, and American drama since Ibsen.

**ENGL 4452-3. Modern American Poetry.** A study of major figures and trends in twentieth-century American poetry up to 1945.

**ENGL 4462-3. Modern Poetry.** A selection of the works of British and American poets from 1900 to the present.

**ENGL 4502-3. Medieval Literature 1.** An intensive study of the major literary works of the Middle Ages on the continent.

**ENGL 4512-3. Medieval Literature 2.** An intensive study of the major literary works of the Middle Ages in Britain.

**ENGL 4522-3. The Renaissance in England: 1500-1600.** Selected prose and nondramatic poetry from Skelton and More through Shakespeare and his contemporaries.

**ENGL 4532-3. The Renaissance in England: 1600-1700.** Selected prose and poetry by Donne, Jonson, Bacon, and their successors.

**ENGL 4542-3. The Age of Satire: 1660-1740.** Dryden, Defoe, Swift, Pope, Addison and Steele, and their contemporaries.

**ENGL 4552-3. The Age of Sense and Sensibility: 1740-1800.** Gray, Johnson, Goldsmith, Boswell, Cowper, Burns, Blake, and their contemporaries.

**ENGL 4562-3. The Early Romantics.** Major emphasis on Blake, Coleridge, and Wordsworth.

**ENGL 4572-3. The Later Romantics.** Major emphasis on Keats, Shelley, and Byron.

**ENGL 4602-3. The Early Victorians.** Main currents of Victorian thought in prose and poetry, 1830-1860.

**ENGL 4612-3. The Later Victorians.** Continuation of ENGL 4602, covering 1860-1900.

**ENGL 4652-3. Studies in American Literature to 1900.** An extensive study of particular periods and movements in American literature.

**ENGL 4662-3. Studies in American Literature after 1900.** An extensive study of particular periods and movements in American literature.

**ENGL 4672/5674-3. Anglo-Saxon.** An introduction to Anglo-Saxon (Old English) language and literature. Emphasis is placed on rapidly acquiring a reading knowledge of the language. Prose readings are followed by highlights of the shorter poetry (*Wanderer*, *Seafarer*, *Battle of Maldon*, etc.).

**ENGL 4682/5684-3. Beowulf.** Students read and analyze *Beowulf* in the original language, with some attention to additional background readings.

**ENGL 4692-3. Contemporary Afro-American Literature 1.** An advanced in-depth study of the works of prominent Afro-American novelists and poets.

**ENGL 4702-3. Contemporary Afro-American Literature 2.** An advanced in-depth

study of the works of prominent Afro-American novelists and poets.

**ENGL 4722, 4732, 4742, 4752, 4762-3. Seminar: Topics in English.** Study of such topics as satire, comedy, tragedy, American humor, and the Mexican-American in American literature. Especially designed for senior English majors.

**ENGL 4772, 4782, 4792, 4802-3. Seminar: Major Authors.** Intensive study of the works of one major British or American author. Especially designed for senior English majors.

## Graduate Creative Writing

**ENGL 5213, 5223 (1-3). Poetry Workshop.** Designed to give students practical criticism of their poetry and to develop a sense of critical standards. Admission by submission of manuscript and/or consent of instructor.

**ENGL 5233, 5243 (1-3). Fiction Workshop.** Designed to give students practical criticism of their fiction and to develop a sense of critical standards. Admission by submission of manuscript and/or consent of instructor.

**ENGL 5253-3. Nonfiction Workshop.** Class meetings are spent in discussion and practical criticism of student work and in discussion of relevant works of nonfiction. Admission by submission of a manuscript and consent of the instructor.

**ENGL 5263-3. Publishing Workshop.** Provides practical experience in the editorial, design, and business procedures of the publishing industry.

**ENGL 5273-3. Recent Poetry.** Covers poetry, mainly American, written since World War II.

**ENGL 5293-3. Recent Fiction.** Covers fiction, mainly American, written since World War II.

**ENGL 5303-3. Poetics.** An advanced poetics course primarily (though not exclusively) for creative writing students. Instruction in the use of a variety of forms from different eras and traditions in fiction and poetry.

## Graduate Literature and Language

**ENGL 5004 through 5094-3. Studies in Major Authors.** Individual British, American, and significant Continental authors. (Author for any given semester is specified in the *Schedule of Courses*.)

**ENGL 5104 through 5194-3. Studies in Special Topics.** Special topics in British and American language and literature.

**ENGL 5204-3. Studies in the Novel.** In-depth analyses of novels that are significant in mainstream traditions or that display major departures.

**ENGL 5324-3. Studies in Drama.** Major dramatic writers.

**ENGL 5374-3. Dramatic Structure: Comedy.** Representative comedy from Aristophanes to the present. Structure and principles of comedy.

**ENGL 5384-3. Dramatic Structure: Tragedy.** Representative tragedy from Classical

Greece to the present. Structure and principles of tragedy.

**ENGL 5504-3. Medieval Literature.** Selections representative of the life and thought of the Middle Ages up to 1500.

**ENGL 5524-3. Renaissance and Seventeenth-Century Literature.**

**ENGL 5544-3. Restoration and Eighteenth-Century Literature.** Explores the poetry, novel, and nonfiction prose of the period, with rotating emphases on genres and topics.

**ENGL 5554-3. Studies in the Nineteenth Century.** Covers principal movements and developments.

**ENGL 5604-3. Studies in British and Irish Literature of the Early Twentieth Century.** An intensive study of a few representative authors.

**ENGL 5654-3. Readings in American Literature.** Extensive reading in the history of American literature as the basis for a graduate major or minor in the field.

**ENGL 5664-3. Twentieth-Century American Literature.**

**ENGL 5674/4672-3. Anglo-Saxon.** See ENGL 4672.

**ENGL 5684/4682-3. Beowulf: Advanced Anglo-Saxon.** See ENGL 4682.

**ENGL 5704-3. Chaucer.** Intensive study of the *Canterbury Tales* and other works by Chaucer.

**ENGL 5724-3. Rhetoric and the Teaching of Composition.** Analysis of rhetorical theory with emphasis on practical applications in the classroom. Pedagogical alternatives and evaluation of teaching.

**ENGL 5734-3. Computer Applications in the Humanities.** Use of the computer as a tool in research and instruction: style and content analysis, authorship and influence studies, text collation and edition; creativity; analysis of nontextual data; bibliographies and information banks. Programming not required.

**ENGL 7004 through 7094-3. Studies in Major Authors.** Intensive study of the works of one major British, American, or significant Continental author. (Author for a given semester is specified in the *Schedule of Courses*.)

**ENGL 7104 through 7194-3. Special Topics.** Intensive study of specialized topics in English, American, and Continental literature. (Topic for a given semester is specified in the *Schedule of Courses*.)

**ENGL 7474-3. Problems in Literary Criticism.**

**ENGL 7484-3. Problems in Literary Theory.**

## Independent Study

**ENGL 1845-variable credit. Independent Study, Lower Division.** Creative Writing.

**ENGL 1855-variable credit. Independent Study, Lower Division.** Literature/Language.

**ENGL 3935 (1-6). Internship.** Provides an academically supervised opportunity for

upper-division students to work in public or private organizations on projects related to students' career goals and to relate classroom theory to practice. Prereqs., junior standing and Dean's and instructor consent.

**ENGL 4835-3. Honors Thesis.**

**ENGL 4845-variable credit. Independent Study, Upper Division.** Creative Writing.

**ENGL 4855-variable credit. Independent Study, Upper Division.** Literature/Language.

**ENGL 5845-variable credit. Independent Study, Graduate Level 1.** Independent investigation of topics of specific interest to individual students. Students wishing to enroll in Independent Study must petition the Director of Graduate Studies prior to the beginning of the semester.

**ENGL 5855-variable credit. Tutorials in Medieval Studies.**

**ENGL 5865-variable credit. Tutorials in Renaissance Studies.**

**ENGL 5875-variable credit. Tutorials in Restoration and Eighteenth-Century Studies.**

**ENGL 5885-variable credit. Tutorials in Romantic Studies.**

**ENGL 5895-variable credit. Tutorials in Victorian Studies.**

**ENGL 5905-variable credit. Tutorials in Modern Studies.**

**ENGL 6845-variable credit. Tutorials in American Studies.**

**ENGL 6855-variable credit. Tutorials in Author Studies.**

**ENGL 6865-variable credit. Tutorials in Creative Writing.**

**ENGL 6945-3. Master's Degree Candidate.**

**ENGL 6955 (3-6). Master's Thesis.**

**ENGL 7845-variable credit. Independent Study, Graduate Level 2.**

**ENGL 7855-variable credit. Advanced Medieval Studies.**

**ENGL 7865-variable credit. Advanced Renaissance Studies.**

**ENGL 7875-variable credit. Advanced Restoration and Eighteenth-Century Studies.**

**ENGL 7885-variable credit. Advanced Romantic Studies.**

**ENGL 7895-variable credit. Advanced Victorian Studies.**

**ENGL 7905-variable credit. Advanced Modern Studies.**

**ENGL 8845-variable credit. Advanced American Studies.**

**ENGL 8855-variable credit. Advanced Studies in Authors.**

**ENGL 8995-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## FILM STUDIES

### Production

#### FILM 2000-3. Beginning Filmmaking.

Offered to instruct students in making Super 8 films. Instruction covers use of cameras and editing equipment, basic editing and splicing techniques, and analysis of pertinent films. The emphasis may be on making personal experimental films or on making narrative sound films, according to the instructor. There is no lab fee for filmmaking courses, but students are expected to purchase materials and rent the necessary equipment. The Film Studies Program maintains an equipment pool with modest registration and rental fees for students needing equipment.

**FILM 2400-3. Advanced Super 8 Filmmaking.** Instruction in shooting and editing Super 8 sound, as well as lab techniques. Students are required to make completed films, i.e., projects that involve a semester of preparation, shooting, reshooting, editing, and final prints. Prereq., FILM 2000 or instructor consent.

**FILM 2500-3. Beginning/Intermediate Filmmaking.** This course, usually taught by a distinguished visiting filmmaker, covers basic camera, editing and splicing techniques for Super 8 film. 16mm skills are also taught for the more advanced students. Equipment is available at the Film Studies Department for a modest rental fee. May be repeated for credit.

**FILM 3500-3. Intermediate Filmmaking, 16mm.** A film production class in 16mm (with emphasis on personal experimental films) and in film studies (with a documentary and/or narrative orientation). The class will cover the following: 16mm camera operation, splicing, editing, sound transfer and recording, and dealing with the lab. Each student is expected to make a film by the end of the semester. Students should expect to spend a few hundred dollars on equipment rental, film stock, and lab costs. Course may be repeated for credit with department consent.<sup>1</sup> Prereq., FILM 2000 or instructor consent.

#### FILM 3900 (1-3). Independent Study.

#### FILM 4500-3. Advanced Filmmaking.

Advanced training in 16mm camera operation, splicing, editing, sound transfer and recording, and conforming. Students are required to edit on the Steenbeck flatbed and produce a film that contains synch sound shot in double system. Course may be repeated for credit with department consent.<sup>1</sup> Prereqs., FILM 2000 and 3500.

#### FILM 4930 (1-6). Film Studies Internship.

Provides an academically supervised opportunity for advanced-level students to work in public or private organizations on film projects. Relates classroom theory to practice. Students follow a written work plan and submit a final report. Prereqs., FILM 2000 with concurrent registration in FILM 3500 and instructor consent.

<sup>1</sup>Courses which may be used for partial fulfillment of a college requirement only once.

## History

**FILM 2711-3. Japanese History Through Cinema.** See HIST 2718.

**FILM 3051-4. Film History 1.** (HUMN 3051.) An intensive introduction to film history and theory, from 1895 to 1935. Topics covered include the beginnings of still and motion picture photography, the growth of narrative and structural complexity from Lumiere to Gance, the influence of Griffith, American silent comedy, Soviet theories of montage, German expressionist and street films, an overview of experimental and animated films, the transition to sound, and the beginning of film theory. Lectures, discussions, and research papers supplement complete screenings of such films as *The Birth of a Nation*, *The Gold Rush*, *Greed*, *Bonaparte and the Revolution*, *Un Chien Andalou*, *The Man With a Movie Camera*, *Vampyr*, and *The Road to Glory*. It is recommended that students take FILM 1502 before FILM 3051.

**FILM 3061-4. Film History 2.** (HUMN 3061.) Starts with the late 1930s and early 1940s films of Renoir and Welles and follows the historical growth and the evolution of film aesthetics to the present. Italian Neorealist, French New Wave, and recent experimental films are studied, as well as the films of major auteur figures such as Bergman, Kurosawa, Fellini, Hitchcock, Bunuel, Antonioni, and Coppola. It is recommended that students take FILM 3051 first or obtain instructor consent.

**FILM 3901 (1-3). Independent Study.**

## Genre and Movements

**FILM 1502-3. Introduction to Film Studies.** An introduction to the critical study of film, exploring basic theoretical concerns while presenting a survey of important film genres, both narrative and non-narrative. Lectures are presented by various faculty members. A considerable amount of writing is required.

**FILM 2002-3. Recent International Cinema.** Designed to familiarize students with current trends and major directors in international cinema. Students attend specific films offered in the International Film Series and both read and write about these films.

**FILM 3002-3. Major Film Movements.** An historical-aesthetic survey dealing with the various national cinemas, to be taught in conjunction with the appropriate language department. Typical offerings are The French Film, The German Film, The Russian Film, and so on. Occasionally the course may offer a more detailed approach to a more restricted subject, i.e., French New Wave, German Expressionist Cinema, Italian Neorealism. Course may be repeated for credit with department consent.<sup>1</sup>

**FILM 3012-3. Documentary Film.** A historical survey of the genre, from the silent film era to contemporary examples. May include autobiographical diary and propaganda films.

**FILM 3902 (1-3). Independent Study.**

## Topics

**FILM 2003-3. Film Topics.** Varying topics on important individuals, historical developments, groupings of films, film directors, national cinemas, critical and theoretical issues in film. May be repeated for credit as topics change.

**FILM 3003-3. Major Film Directors.** Focuses on the work of a single director or a group of related directors. Course content varies from semester to semester. Consult the *Schedule of Courses* for specific topics. Course may be repeated for credit with department consent.<sup>1</sup>

**FILM 4003-3. Film and Fiction.** See HUMN 4003.

## Intensive and Small

**FILM 4004-3. Film Theory.** See HUMN 4004.

**FILM 4604-3. Colloquium in Film Aesthetics.** A seminar for the serious round table discussion and critique of film as a possible art form, with emphasis upon the development of an appropriate verbal and written language for description of film. Occasionally cross-listed with FREN 4600.

## FINE ARTS

### Studio

#### INTEGRATED MEDIA ARTS

**FINE 3900 (1-3). Undergraduate Independent Study—Video.**

**FINE 4130/5130-3. Integrated Media.** An interdisciplinary course encouraging experimentation with media and integration of traditional areas of drawing, painting, sculpture, and photography. Areas to be covered include two- and three-dimensional collage/ assemblage, correspondence art, artist's books, site-specific, performance, and audio and video art.

**FINE 4140/5140-3. Video.** Explores time-based media, an art form which deals with the experience, perception, and implication of time as integral to its form and content in its sequential aspects as well as its immediacy. Uses video as a narrative or documentary tool, in relation to the various expressions of performance work, including work designated as conceptual art, body art, video performance, and correspondence art.

**FINE 5840 (1-3). Graduate Independent Study—Video.**

#### PHOTOGRAPHY

**FINE 1161-2. Basic Photography 1.** An introduction to techniques and concepts of photography as art. Emphasis is on photography as a means to formal and expressive ends. Students must have an adjustable camera. For nonart majors.

**FINE 1171-3. Basic Photography 1.** An introduction to techniques and concepts of

photography as art. Emphasis is on photography as a means to formal and expressive ends. Students must have an adjustable camera. For Fine Arts majors.

**FINE 2191-3. Intermediate Photography 1.** Exploration of relating more sophisticated technical and conceptual skills to the creative process. May be repeated once. Prereq., FINE 1161 or 1171.

**FINE 3191-3. Intermediate Photography 2.** Continued exploration of the possibility of individual photographic expression. Students are encouraged to discover and develop a personal position in relation to the medium. May be repeated once. Prereq., FINE 2191 or equivalent.

**FINE 3841 (1-3). Undergraduate Independent Study—Photography.**

**FINE 4151/5151-3. Large Format Photography.** Introduces the student already skilled in black and white photography as an expressive art form to aesthetic and technical issues particular to large format photography. The zone system of exposure and development is explored in depth as well as advanced creative printing controls. Students develop a body of work using a large format camera.

**FINE 4161-3. Advanced Photography.** Exploration of advanced techniques and concepts of photography as art. Emphasis on photography as a means to formal and expressive ends. May be repeated. Prereq., FINE 3191 or equivalent.

**FINE 4171-3. New Directions in Photography.** An investigation of the use of the photographic image in new, antique, or non-standard ways including nonsilver, photoculature, various color processes, photolanguage, photoinstallations, electronic media, performance, filmmaking, electrostatic art (copy machine), photobooks, photocollage, and audio/visual art. May be repeated twice. *Note:* Course content changes each semester. Prereq., FINE 2191 or equivalent.

**FINE 4181-3. Advanced Photography.** See FINE 4171. Prereq., FINE 2191 or equivalent.

**FINE 5161-3. Graduate Photography.**

**FINE 5171-3. Graduate New Directions in Photography.**

**FINE 5181-3. Graduate Photography.**

**FINE 5901 (1-3). Graduate Independent Study—Photography.**

#### PAINTING/DRAWING/WATERMEDIA

**FINE 1002-2. Basic Drawing.** An introductory course including pictorial design, life drawing, still life, and landscape, using varied drawing techniques and media. May not be repeated.

**FINE 1012-3. Basic Drawing.** Required for B.F.A. majors; recommended for other Fine Arts majors instead of FINE 1002. May not be repeated.

**FINE 1202-2. Basic Painting.** General introduction to painting. Color, pictorial space, still life, landscape, figure, and abstract painting. May not be repeated.

<sup>1</sup>Courses which may be repeated may be used for partial fulfillment of a college requirement only once.

**FINE 1212-3. Basic Painting.** Required for B.F.A. majors; recommended for other Fine Arts majors instead of FINE 1202. May not be repeated.

**FINE 2002-3. Drawing.** Problems in drawing. Exploration of possibilities in pictorial design, the human figure, and composition. May be repeated once. Prereq., FINE 1002 or 1012.

**FINE 2202-3. Painting.** Emphasis is on composition, color, and use of materials in expressing the student's ideas. Prereq., FINE 1202 or FINE 1212.

**FINE 2212-3. Color.** A basic introduction to the relative effects of color as used by the artist. Emphasis is on the practice of color relations including basic characteristics, mixtures, illusions, optical mixture, color intervals and color quantity. May not be repeated.

**FINE 2232-3. Life Painting.** Oil painting from the model, landscape, and still life, concentrating on direct observation. Class must share expenses for models, materials, and transportation. Prereq., FINE 2202.

**FINE 3002-3. Drawing and Anatomy.** Emphasis on the human figure as a vehicle for creative drawing. Course involves lecture, studio work, and outside preparation. May be repeated once. Prereq., FINE 2002.

**FINE 3202-3. Intermediate Painting.** Continuation of FINE 2202. May be repeated once. Prereq., FINE 2202.

**FINE 3222-3. Aspects of Painting.** A lecture course providing insights into the art of painting. Contemporary painting, as well as that of the past, is examined and discussed in depth.

**FINE 3302-3. Watermedia Painting 1.** Introduction to transparent and opaque water color media emphasizing problems of motivation, creative expression, and techniques involving varied subject matter. May not be repeated. Prereq., FINE 1202 or 1212.

**FINE 3312-3. Watermedia Painting 2.** Transparent and opaque water media experience emphasizing problems of motivation, expression and techniques involving varied subject matter. May not be repeated. Prereq., FINE 3302.

**FINE 3842 (1-3). Undergraduate Independent Study—Painting.**

**FINE 3852 (1-3). Undergraduate Independent Study—Drawing.**

**FINE 4002-3. Advanced Drawing.** A creative approach to advanced problems in drawing. May be repeated. Prereq., FINE 2002.

**FINE 4202-3. Advanced Painting.** Expressive pictorial problems involving varied subject matter and painting media with an emphasis on individual development. May be repeated. Prereq., FINE 3202.

**FINE 4302-3. Advanced Watermedia Painting.** Advanced painting problems using transparent and opaque water color media, with an emphasis on individual development. May be repeated. Prereq., FINE 3302 or 3312.

**FINE 5002-3. Graduate Drawing.**

**FINE 5202-3. Graduate Painting.**

**FINE 5302-3. Graduate Watermedia Painting.**

**FINE 5842 (1-3). Graduate Independent Study—Drawing.**

**FINE 5852 (1-3). Graduate Independent Study—Painting.**

## PRINTMAKING

**FINE 2403-3. Beginning Intaglio and Relief.** Introduction to intaglio and relief printing and printing media. May not be repeated.

**FINE 2413-3. Beginning Lithography.** An introduction to the techniques, including metal plate lithography. May not be repeated.

**FINE 2423-3. Beginning Screen Printing.** Exploration in silkscreen techniques. Emphasis on creativity and experimentation with contemporary screen printing processes. May not be repeated.

**FINE 2443-3. Beginning Papermaking.** Papermaking is the study of plant fibers and cellulose structure relating to the making of paper pulp as an art medium. Emphasis is placed on the creative use of the paper pulp as related to two- and three-dimensional form. May not be repeated.

**FINE 3403-3. Intermediate Intaglio and Relief.** Continued study and experimentation in intaglio and relief processes in both black and white, color, and possible photo imagery. May be repeated once. Prereq., one other printmaking course.

**FINE 3413-3. Intermediate Lithography.** A continuation of stone and metal plate lithography with an emphasis on individual creative development and further development in color printing processes. May be repeated once. Prereq., one other printmaking course.

**FINE 3423-3. Intermediate Screen Printing.** Refinement of basic techniques with the emphasis on individual development. May be repeated once. Prereq., one other printmaking course.

**FINE 3443-3. Intermediate Papermaking.** Continuation of FINE 2443, with more emphasis on individual creative growth and improvement of one's technical ability. May be repeated once.

**FINE 3843 (1-3). Undergraduate Independent Study—Printmaking.**

**FINE 4403-3. Advanced Intaglio and Relief.** May be repeated. Prereq., FINE 3403.

**FINE 4413-3. Advanced Lithography.** May be repeated. Prereq., FINE 3413.

**FINE 4423-3. Advanced Screen Printing.** Introduction to advanced screen printing technology, with emphasis on individual creativity and the ability to resolve problems of two-dimensional form. May be repeated. Prereq., FINE 3423.

**FINE 4443-3. Advanced Papermaking.** Continuation of FINE 3443, but with more emphasis on individual creative growth and additional improvement of one's technical ability. May be repeated. Prereq., FINE 3443.

**FINE 5403-3. Graduate Intaglio and Relief.**

**FINE 5413-3. Graduate Lithography.**

**FINE 5423-3. Graduate Screen Printing.**

**FINE 5443-3. Graduate Papermaking.**

**FINE 5843 (1-3). Graduate Independent Study—Printmaking.**

## SCULPTURE/JEWELRY

**FINE 1504-2. Basic Sculpture.** Orientation course involving three-dimensional form and application. Expressive problems based on nonobjective form relationships in various sculptural materials. May not be repeated.

**FINE 1514-3. Basic Sculpture.** Required for B.F.A. majors; recommended for other Fine Arts majors instead of FINE 1504. May not be repeated.

**FINE 2504-3. Materials and Techniques.** The exploration of a variety of materials, methods, and techniques and their application with reference to contemporary sculpture, i.e., moldmaking, welding, casting, vacuforming, photo techniques, and wood-working. May not be repeated. Prereq., FINE 1504 or 1514.

**FINE 2514-3. Welding and Metal Casting.** Technical and aesthetic studies in welding and casting metal as an expressive idea. May not be repeated. Prereq., FINE 1504 or 1514.

**FINE 3504-3. Experiments in Sculpture 1.** A further exploration of materials, methods, and techniques done through a series of assignments with an emphasis on individual ideas and their relationship to contemporary aesthetics. May not be repeated. Prereq., FINE 2504 or 2514.

**FINE 3514-3. Experiments in Sculpture 2.** A further exploration of individual concepts and ideas and their relationship to contemporary issues and aesthetics. A series of assignments are worked out with the instructor based on individual interest. May not be repeated. Prereq., FINE 3504.

**FINE 3774-3. Jewelry Design.** Creation of jewelry with metals and non-metals. Emphasis on individual design decisions. May not be repeated.

**FINE 3844 (1-3). Undergraduate Independent Study—Sculpture.**

**FINE 4504-3. Advanced Sculpture.** Individual studies in selected media. May be repeated. Prereq., FINE 3504 or 3514.

**FINE 5504-3. Graduate Sculpture.**

**FINE 5514-3. Graduate Sculpture.**

## CERAMICS

**FINE 1875-2. Introductory Ceramic Survey.** Encompasses broad and fundamental uses of clay. Basic instruction and demonstration of throwing, handbuilding, and primitive clay forming methods. Investigates utility, function, and ceramics in the fine arts context. Slide presentations explore historical and contemporary attitudes involving ceramics.

**FINE 2085-3. First-Year Handbuilding.** An introductory course concentrating on the techniques of hand-built clay forms as they relate to function and nonfunction. Various

clay techniques, glazing, and firing procedures are explored. Emphasis is on ceramics in a fine arts context. May not be repeated.

**FINE 2095-3. First-Year Wheelthrowing.** An introductory course concentrating on techniques of wheel-thrown forms as they relate to function and nonfunction. Exploration of various glazing and firing methods. May not be repeated. Prereq., FINE 2085.

**FINE 3085-3. Intermediate Ceramics.** Deals with further exploration of techniques approached in FINE 2085 and 2095. Students are encouraged to develop personal concentration in relation to medium. May be repeated once. Prereqs., FINE 2085 and 2095.

**FINE 3845 (1-3). Undergraduate Independent Study—Ceramics.**

**FINE 4085-3. Advanced Ceramics.** Lecture, research, and experimentation in clay (wheel and hand construction techniques). May be repeated. Prereq., FINE 3085.

**FINE 4095-3. Ceramics Seminar.** Designed for students majoring in ceramics. May be repeated; not to exceed 9 hours credit. Prereq., FINE 4085.

**FINE 5075-3. Graduate Ceramics.**

**FINE 5085-3. Graduate Ceramics.**

**FINE 5095-3. Graduate Ceramics Seminar.**

## Art Teacher Certification

Studio majors desiring teaching certification are required to take FINE 3646, 3666, 3676, and 3686, and must consult the art certification advisors concerning the remainder of the program.

**FINE 3626-2. Teaching Art in the Elementary Classroom.** For students seeking certification for teaching at the elementary school level. Not for art majors; course does not count in the first 94 hours presented for the B.A. and B.F.A. degrees. Students may not receive credit in both FINE 3626 and FINE 3636. Prereq., junior standing.

**FINE 3636-2. Art for the Elementary Teacher.** For persons planning to teach at the elementary level. Theoretical and practical elementary art methods for the nonart major are covered. Through Continuing Education only.

**FINE 3646-3. Art in the Elementary Schools.** For art majors wishing to receive certification for teaching art in public elementary schools. Deals with the theoretical and practical problems of teaching art in the elementary school and provides an opportunity for in-school observations of elementary art instruction.

**FINE 3666-2. Art Materials Workshop.** Introduction to and exploration of materials available for use by the art educator in both two- and three-dimensional materials used with various age level groups.

**FINE 3676-2. Art Materials Workshop: Weaving.** Introduction to and exploration of fiber processes suitable for use in the public school.

**FINE 3686-2. Art in the Secondary Schools.** For art majors wishing to receive certification for teaching art in the public secondary

schools. Deals with the theoretical and practical problems of teaching art in the secondary school.

**FINE 4706-6. Teaching in Art.** Supervised teaching in art in grades kindergarten through 12. These hours do not count toward student hours in the major nor in the maximum departmental hours allowed. Must be taken concurrently with EDUC 4701/4712. The credit is Pass/Fail only. Prereq., admission to the teacher education program in art.

**FINE 5646 (1-3). Seminar in Art Education.** Subjects and instructors vary.

**FINE 5686 (2-5). Seminar in Current Issues in Art Education.** Provides students with a wide base for understanding art education purposes, trends, policies, and art education's potential as a viable discipline. Focuses on categories of general interest in art education.

**FINE 6956 (1-4). Master's Thesis (Art Education).**

## Seminars/Special Topics

**FINE 1047-3. Art Lecture.** Develops the student's awareness of art from a nonhistorical perspective. Topics covered include the technical aspects of painting and sculpture, origins and development of photography, theory of art values, and art criticism.

**FINE 2097, 3097, 4097, 5097 (2-3). Special Topics.** Introduces timely subjects in fine arts which cannot be offered on a regular basis. Information concerning the topics offered in any given semester will be available prior to preregistration from the Fine Arts Department. May be repeated.

**FINE 2107, 3107, 4107, 5107 (2-3). Special Topics.** See *Schedule of Courses*. May be repeated.

**FINE 3937 (1-6). Internship.** Provides the opportunity for upper-division students to work in public or private organizations on assignments relating to their career goals, allowing them to explore the relationship between theory and practice in their major.

**FINE 4087/5087-3. Selected Topics in Contemporary Art.** A selective study of significant areas of visual art of the last decade including major critical opinions. Prereq., twenty hours of Fine Arts courses.

**FINE 4117-2. B.F.A. Seminar.** For students intending to pursue graduate work and/or a professional career in art. Emphasis is on developing a critical overview of their work and interests, and how they relate to the problems of professional activity today. Prereq., B.F.A. candidate. *Pass/Fail only*.

**FINE 5117-2. Graduate Art Seminar.**

**FINE 6947-3. Master's Degree Candidate.**

**FINE 6957 (1-4). Master of Fine Arts Creative Thesis.**

## Visiting Artist Program

**FINE 4118/5118-3. Visiting Artist Program.** Artists of national and international reputation interacting with graduate and advanced undergraduate students discuss their studio

work at seminar meetings and at public lectures or events, providing continuous input of significant developments and a comprehensive view of contemporary issues in the arts. May be repeated once. Prereq., portfolio review for undergraduates.

## Art History

Double-level (4000/5000) courses are open to both advanced undergraduate and graduate students. An undergraduate student registers for the 4000 level; a graduate student for the 5000 level. A higher level of performance and extra work is expected of the graduate student. Seniors may take 5000-level courses only after consultation with the instructor.

**FINE 1709-3. Experiencing Art—Image, Artist, and Idea.** Provides a broad introduction to the understanding and appreciation of art from all time periods and all parts of the world. Particularly directed to nonmajors.

**FINE 2009-3. Art of Antiquity.** A survey of sculpture, painting, and architecture from the Paleolithic to the accession of Constantine. The geographic scope includes Mesopotamia, Anatolia, North Africa, and the lands of the eastern and western Mediterranean.

**FINE 2109-3. Art of the Middle Ages.** A survey of sculpture, painting, and architecture from 300 to 1500 A.D.—art of the Early Christian, Byzantine, Early Medieval, Romanesque, and Gothic periods.

**FINE 2209-3. Art of the Renaissance, the Baroque, and the Rococo.** A survey of sculpture, painting, and architecture from Giotto through the Rococo.

**FINE 2309-3. Art of the Nineteenth and Twentieth Centuries.** Survey of sculpture, painting, and architecture from the late eighteenth century to the present, beginning with Neoclassicism and Romanticism. Impressionism and all the other "isms" of the nineteenth and twentieth centuries are covered.

**FINE 2409-3. Introduction to Asian Art.** Designed for those having no previous experience in the study of Asian art. Traces the development of sculpture, painting, architecture, and the other visual arts of South Asia, the Far East, and Southeast Asia, especially as they are connected by the religious themes of Hinduism and Buddhism.

**FINE 3909 (1-3). Undergraduate Independent Study—Art History.**

**FINE 4009/5009-3. Art of the Ancient Near East.** (CLAS 4009/5009.) A survey of the architecture, sculpture, and painting of the eastern Mediterranean from their beginnings to the end of the Sassanian Empire to include the arts of Anatolia, Mesopotamia, and Persia.

**FINE 4019/5019-3. The Art of Ancient Egypt.** (CLAS 4019/5019.) A survey of the development of Egyptian architecture, sculpture, painting, and the minor arts from their beginnings until the establishment of Christianity.

**FINE 4029/5029-3. Art of Islam.** Art and architecture of the Islamic peoples from the death of Muhammad through the eighteenth century from Spain to India.

**FINE 4039/5039-3. Byzantine Art.** (CLAS 4039/5039.) Art of the East Christian Empire from the accession of Constantine to the conquest of Constantinople with a synopsis of developments from 1453 through the eighteenth century.

**FINE 4049/5049-3. Pre-Classical Art and Archaeology.** See CLAS 4049/5049.

**FINE 4059/5059-3. Classical Art and Archaeology.** See CLAS 4059/5059.

**FINE 4079/5079-3. Roman Art and Archaeology.** See CLAS 4079/5079.

**FINE 4109/5109-3. Early Christian and Early Medieval Art.** History of European art from Constantine to around the year 1000 with primary emphasis on western Christian, Hiberno-Saxon, Carolingian, Ottonian, and Anglo-Saxon art, but including barbarian and Byzantine contributions.

**FINE 4119/5119-3. Romanesque Art.** History of European art of the eleventh and twelfth centuries treating architecture, sculpture, fresco painting, and manuscript illumination.

**FINE 4129/5129-3. Gothic Art.** History of European art from the mid-twelfth to the sixteenth century treating architecture, sculpture, stained glass, and manuscript illumination with special emphasis on developments in France, England, and Germany.

**FINE 4139/5139-3. Italian Gothic Art.** Developments in Italian painting, sculpture, and architecture from about 1200 to 1400 A.D., including interactions with northern Europe and the so-called Proto-Renaissance.

**FINE 4209/5209-3. Italian Renaissance Art 1.** Italian art and architecture from 1400 to the death of Donatello (1466), with emphasis on the development of Renaissance art in Florence and central Italy.

**FINE 4219/5219-3. Italian Renaissance Art 2.** Italian art and architecture from about 1470 to 1520, including the diffusion of Renaissance ideas throughout Italy, and the development of the High Renaissance in central Italy and Rome.

**FINE 4229/5229-3. The Late Renaissance and Mannerism.** Italian painting, sculpture, and architecture from about 1520 to 1580, dealing with Mannerism and the expansion of late Renaissance art in Europe.

**FINE 4239/5239-3. Art and Architecture in Italy, 1580-1750.** Traces the development of Italian art from the last gasps of Mannerism through the barocchetto style of Tiepolo.

**FINE 4249/5249-3. Spanish and Netherlandish Painting in the Seventeenth Century.** A critical survey of Baroque painting in Spain, Flanders (modern Belgium), and the Dutch Republic. Despite obvious cultural differences among Holland, Catholic Flanders, and Spain, the common thread of Baroque vision is traced through the three cultures.

**FINE 4259/5259-3. Northern European Painting.** History of painting in the Netherlands, France, and Germany in the fifteenth and sixteenth centuries.

**FINE 4269/5269-3. Art in France, 1500-1750.** Examines the developing French style through the various foreign influences, the impact of classicism, and finally the efflorescence of that uniquely French expression, the Rococo, and its reflections in Germany and Austria.

**FINE 4309/5309-3. Neoclassicism and Romanticism: 1760 to 1840.** A survey of painting and sculpture in England and France from the last quarter of the eighteenth century through the first half of the nineteenth century.

**FINE 4319/5319-3. European Art from 1830 to 1886.** A survey of the major movements in painting in France and England from the Revolution of 1830 to the Impressionist crisis of 1886. Although the emphasis is on painting, major expressions in sculpture and architecture are also discussed.

**FINE 4329/5329-3. Modern Art 1.** An in-depth study of the fin de siècle, stressing Post-Impressionism, Art Nouveau, and Symbolism. The course closes with Fauvism in France and the expressionist movement in Germany.

**FINE 4339/5339-3. Modern Art 2.** Emphasizing the various "isms" of the twentieth century, the course begins with early Picasso and Cubism, including Analytic and Synthetic Cubism. Also studied are Italian Futurism, de Stijl and the Bauhaus, Dada, and Surrealism.

**FINE 4349/5349-3. Modern Architecture.** A survey of world contemporary architecture from its beginnings with Richardson and Wright to the present.

**FINE 4359/5359-3. Modern Sculpture 1870-1970.** An extensive examination of outstanding sculptors in Europe and America from Rodin to the present; American sculpture since World War II receives special emphasis.

**FINE 4409/5409-3. Art of Africa and Oceania.** Native arts of non-Western peoples of Africa and Oceania. Sculpture, architecture, and minor arts for both archaeological and ethnological cultures. Emphasis upon the function of art in society as well as aesthetic analysis.

**FINE 4419/5419-3. Pre-Columbian Art.** Architecture, sculpture and painting of the high cultures of Meso-American and Andean areas before the Spanish Conquest.

**FINE 4429/5429-3. Latin American Art Since 1492.** The arts of the colonies of Spain and Portugal in the Western Hemisphere from 1492 to the present.

**FINE 4439/5439-3. North American Indian Art.** Survey of art of North American Indian cultures, including Northwest Coast, Southwest, Southeast, Northeast, and Plains, covering architecture sculpture, and minor arts for both archaeological and ethnological cultures.

**FINE 4449/5449-3. Art of India and Southeast Asia.** A survey of the architecture,

sculpture, and painting of India and those areas of Southeast Asia influenced by India from the period of Mohenjo Daro and Harappa to recent times. The Himalayan region is treated, as is Tantric art in general.

**FINE 4459/5459-3. The Arts of Japan.** Appreciation and chronological development of the arts of Japan. Emphasis upon the arts of Shintoism and Buddhism as well as the particular Japanese aesthetic from prehistoric times to the present.

**FINE 4469/5469-3. The Arts of China.** Survey of Chinese painting, sculpture, architecture, and other arts from Neolithic to modern times.

**FINE 4509/5509-3. American Art Before the Civil War.** Examines painting, sculpture, architecture, and folk art in the new world. Considers cultural and artistic interaction between Indians, Hispanics, and Anglos in eastern and southwestern America, and the struggle to develop a uniquely American artistic identity before the Civil War.

**FINE 4519/5519-3. American Art 1860-1945.** Examines such American art as painting, sculpture, architecture, photography, parks, and fairs from the Gilded Age to WWII. Considers major art styles, women and minority artists, the development of art schools and museums, and cultural interaction between America and other countries.

**FINE 4529/5529-3. American Art 1945-1970.** Examines the "triumph of American painting," sculpture, architecture, and other arts after WWII and through the 1960s. Considers "mainstream" art (Abstract Expressionism, Pop, Minimalism) and "alternative" art (earthworks, feminist and minority expression, visionary architecture, funk sculpture) in New York and California.

**FINE 4539/5539-3. Contemporary Art: 1970 to the Present.** Examines contemporary art and theory in the transition from modern to post-modern expression. Discusses painting, sculpture, installations, performance, video, photography, and architecture with attention to historical context and criticism. Considers Neo-Expressionism, feminist, minority, political, and public art.

**FINE 4609/5609-3. Roots of the Italian Renaissance.** Begins with the art of the so-called proto-Renaissance in the later thirteenth and early fourteenth centuries, with visits to major monuments in Tuscany and the Veneto. Continues with Tuscan art and architecture until about 1440 in Florence. *Offered abroad only.*

**FINE 4619/5619-3. Quattrocento Art in Florence and Central Italy.** Commences with monuments of the so-called Second Renaissance Style about 1440 around Florence. Deals with the later Ghiberti and Donatello, the work of Leonbattista Alberti, and the painting of Castagno, Piero della Francesca, Botticelli, Filippino Lippi, and others, ending in the late Quattrocento. *Offered abroad only.*

**FINE 4629/5629-3. Monuments of the High Renaissance.** Begins with first stirring of the High Renaissance in Florentine art and architecture around 1480, continues to 1525 in Rome and Central Italy, and deals with monumental art and architecture in Venice



and the Veneto from about 1480 to 1580.  
*Offered abroad only.*

**FINE 4639/5639-3. Mannerist Painting and Sculpture.** An investigation of Mannerism in Italian art and architecture, beginning with "anti-classicism" in Tuscan painting around 1515, continuing with Mannerist art in Rome until 1527 and in Parma and Mantua until about 1540, and ending with art of the *bella maniera* in Florence. *Offered abroad only.*

**FINE 4649/5649-3. The Renaissance in Rome.** Works of art produced in Rome between circa 1450 and 1600 are studied by attending on-site lectures which deal with style and intellectual and social contexts, and by writing extensively about works of art. *Offered abroad only.*

**FINE 4659/5659-3. The Roman Baroque.** Traces the main stylistic trends, along with appropriate intellectual and social contexts, for Roman art of the seventeenth and eighteenth centuries. Classroom and on-site lectures as well as techniques appropriate to writing about the visual arts are emphasized. *Offered abroad only.*

**FINE 4669-5. Asian Arts in Context: Study Abroad.** Travel, readings, short analysis papers, oral reports, examinations, and seminar meetings plus lectures bring Asian arts to life as major Buddhist, Hindu and Islamic monuments are visited and discussed in ways that are possible only in the field. *Offered abroad only.*

**FINE 4709/5709-3. Perspectives on Art and Criticism.** An examination of some traditional and current ideas which have shaped, defined, or influenced the goals, practices, and evaluation of the visual arts. Lectures, readings, discussion. Open to fine arts majors or students with 9 or more hours in art.

**FINE 4719-3. History of Media Arts.** A survey of the development of technological media both as sources of information and as art. Photography and related media, film, video, holography, and electronic imaging systems are surveyed as art and as technologies, with emphasis on major artists, movements, exhibition, and other production in the nineteenth and twentieth centuries.

**FINE 4729-3. Readings: Issues in Contemporary Photography.** Includes reading some of the critical and theoretical discourse surrounding the practice of photography and related art forms. Work is made that is in dialogue with ideas raised in those readings. Prereq., FINE 2191 or 3191.

**FINE 4809/5809-3. Women Artists From the Middle Ages to the Present.** (WMST 4809.) A survey of women's art in the West with emphasis on painting and sculpture.

**FINE 4919-3. Undergraduate Seminar: Selected Topics in Art History.** A seminar course dealing with selected areas or problems within the history of art. Consult current *Schedule of Courses* for seminar topic.

**FINE 4929/5929-3. Special Topics in Art History.**

**FINE 5069-3. Prehistoric Greek Art and Archaeology.** (CLAS 5069.) Topics selected

from architecture, pottery, frescoes, and minor arts of the third millennium B.C.

**FINE 5089-3. Classical Greek Art.** See CLAS 5089. Prereq., CLAS 4059 or FINE 4059 or instructor consent.

**FINE 5099-3. Archaic Greek Art.** See CLAS 5099. Prereq., CLAS 4059 or FINE 4059 or instructor consent.

**FINE 5909 (1-3). Graduate Independent Study—Art History.**

**FINE 5919-3. Graduate Seminar: Selected Topics in Art History.** Subjects and instructors vary.

**FINE 5929-3. Graduate Seminar: Selected Topics in Art History.** Subjects and instructors vary.

**FINE 5969 (1-3). Graduate Project.**

**FINE 6909 (1-3). Graduate Independent Study—Art History.**

**FINE 6919-3. Seminar: Tools of Research.** Required for Master of Arts (Art History) candidates. Discussion of problems in art history and theory. Particular emphasis on defining problems for research study and systematically acquiring and presenting written evidence. Study of sources and bibliographical materials pertaining to art. Requirements in oral and written presentation in the seminar, including the preparation and use of visual aids.

**FINE 6949-3. Master's Candidate for Degree.**

**FINE 6959 (1-3). Master's Thesis (Art History).**

## FRENCH AND ITALIAN

### French

**FREN 1010-5. Beginning French 1.** For students with no previous knowledge of French.

**FREN 1020-4. Beginning French 2.** Students should have completed FREN 1010 with a C- or better or be placed in this course.

**FREN 1050-5. Beginning French Review.** Reserved for students with up to two years of high school French on the basis of foreign language placement code. Covers the material of FREN 1010 and 1020 in one accelerated semester.

**FREN 2110-4. Second-Year French Grammar Review and Reading 1.** Students should have completed FREN 1020 with a C- or better or 1050 or be placed in this course. Fulfills undergraduate language requirement.

**FREN 2120-3. Second-Year Grammar Review and Reading 2.** Students should have completed 2010, 2110 with a C- or better, or three semesters of college French at another university, or three years of high school French, or have been placed at this level. FREN 2120 fulfills the Graduate School language requirement for the Ph.D.

**FREN 2140-3. Oral Grammar Review and Civilization.** Students should have completed 2010, 2110, or three semesters of college French at another university, or three years of high school French, or have been placed at this level. FREN 2140 fulfills the

Graduate School language requirement for the Ph.D.

**FREN 2600-3. Introduction to French Film.** The history and evolution of French film from Lumière to today. Some scripts and a few modern French literary texts in translation are used as points of reference for the study of narrative structures in both literature and film. Handouts of technical terms and critical theory supplement these readings. Taught in English.

**FREN 3010-3. French Phonetics and Pronunciation.** Required for majors.

**FREN 3020-2. Oral Practice.** Not required for majors.

**FREN 3030-3. French for Business 1.** Students should have completed FREN 2120 or equivalent. Required for all Business French majors.

**FREN 3050-3. French Composition 1.** Should be taken before FREN 3060. Required for all majors.

**FREN 3060-3. French Composition 2.** Prereq., FREN 3050 or instructor consent. Required for all majors.

**FREN 3110-3. Main Currents of French Literature 1.** A survey of French literature from the Middle Ages through the eighteenth century. Required for majors.

**FREN 3120-3. Main Currents of French Literature 2.** A survey of nineteenth- and twentieth-century French literature. Required for majors.

All courses at the 4000 level or above are not open to freshmen or sophomores.

**FREN 4010-2. Advanced Composition 1.** Students should have passed FREN 3060 or consulted instructor.

**FREN 4020-2. Advanced Composition 2.** Students should have passed FREN 4010 or consulted instructor.

**FREN 4030-3. Advanced Oral Practice and Interpreting.** Students should have passed FREN 3020 or FREN 3030 or consulted instructor. May be repeated for credit. Required for all Business French majors.

**FREN 4060-3. French Phonology and Morphology.** No previous knowledge of linguistics is assumed.

**FREN 4070-3. Syntax of Modern French.** Students should have passed FREN 3010 or consulted instructor.

**FREN 4080-3. Introduction to Old French.**

**FREN 4090-3. Contrastive Analysis of French and English.** Students should have passed FREN 4070 or consulted instructor.

**FREN 4100-2. Translation.** Students should have passed FREN 4010 or consulted instructor.

Prereq. for all of the following courses is FREN 3110-3120, or consultation with instructor.

**FREN 4110, 4120 (2-3). French Special Topics.** Different topics are offered and, in a number of cases, cross-listed with other departments.

**FREN 4130-3. Medieval Lyric Literature.**  
See ITAL 4130.

**FREN 4170-3. Francophone Literature.**

**FREN 4200-3. Contemporary French Culture and Civilization.**

**FREN 4210-3. History of French Civilization.**

**FREN 4250-3. Medieval and Renaissance Readings.**

**FREN 4310-3. Seventeenth-Century French Tragedy and Poetry.**

**FREN 4320-3. Seventeenth-Century French Prose.**

**FREN 4330-3. Molière and Seventeenth-Century French Comedy.**

**FREN 4350-3. French Enlightenment.**

**FREN 4360-3. Survey of Eighteenth-Century French Literature.**

**FREN 4430-3. Survey of Nineteenth-Century French Literature.**

**FREN 4470-3. Twentieth-Century French Theatre and Poetry.**

**FREN 4480-3. Twentieth-Century French Novel.**

**FREN 4490-3. Women Novelists of the Twentieth Century in France.**

**FREN 4510-3. French Dramatic Theories.**

**FREN 4520-3. Renaissance French Poetry.**  
See ITAL 4520.

**FREN 4600-3. Topics in French Film.** Covers various topics in the French and some other Francophone cinemas (Belgian, Swiss, Quebecois) from 1895 to the present. The periods, schools, themes, and directors from Melies to Duras, and the critical approaches by which they are studied varies from year to year. Prereqs., junior standing and 6 hours in French literature or other literature or film studies.

**FREN 4750-3. Methods of Teaching French and Professional Orientation.** To be taken one semester prior to or concurrently with student teaching.

**FREN 4840 (1-3). Independent Study: Language.** Upon consultation only. Undergraduate level.

**FREN 4850 (1-3). Independent Study: Literature.** Upon consultation only. Undergraduate level.

**FREN 4960-6. High School French Teaching.** Part of the supervised student teaching in a secondary school required for state certification to teach French. These hours do not count toward student hours in the major nor in the maximum departmental hours allowed. The credit is Pass/Fail only. Prereq., FREN 4750; must be admitted to the secondary teaching education program and currently in EDUC 4712.

Prereq. for all of the following courses is graduate standing or instructor consent.

**FREN 5010-2. Advanced Phonetics.**

**FREN 5060-2. French Phonology and Morphology.**

**FREN 5070-2. Syntax of Modern French.**

**FREN 5080-2. Introduction to Old French.**

**FREN 5090-2. Contrastive Analysis of French and English.**

**FREN 5110,5120-2. French Special Topics.** Different topics are offered and, in a number of cases, cross-listed with other departments.

**FREN 5130-2. Medieval Lyric Literature.**

**FREN 5170-2. Francophone African Literature.**

**FREN 5200-2. Contemporary French Culture and Civilization.**

**FREN 5210-2. History of French Civilization.**

**FREN 5250-2. Medieval and Renaissance Readings.**

**FREN 5310-2. Seventeenth-Century French Tragedy and Poetry.**

**FREN 5320-2. Seventeenth-Century French Prose.**

**FREN 5330-2. Molière and Seventeenth-Century French Comedy.**

**FREN 5350-2. French Enlightenment.**

**FREN 5360-2. Eighteenth-Century French Literature.**

**FREN 5420-2. Nineteenth-Century French Literature.**

**FREN 5430-2. Topics in Nineteenth-Century French Prose.**

**FREN 5470-2. Twentieth-Century French Theatre and Poetry.**

**FREN 5480-2. Twentieth-Century French Novel.**

**FREN 5490-2. Women Novelists of the Twentieth Century in France.**

**FREN 5510-2. French Dramatic Theories.**

**FREN 5520-2. Italian and French Poetry of the Renaissance.**

**FREN 5570-2. French Literary Criticism.**

**FREN 5600-2. Seminar on French and Francophone Film.**

**FREN 5770-2. College Foreign Language Teaching.** Required for TAs and graduate part-time instructors.

**FREN 5860-2. French Creoles.**

**FREN 6840 (1-3). Independent Study.**

**FREN 6850 (1-3). Independent Study.** Upon consultation only. Graduate level.

**FREN 6940 (1-6). Master's Degree Candidate.**

**FREN 6950 (1-6). Master's Thesis.**

**FREN 7010-3. Problems in Critical Theory.**

**FREN 7030-3. History of the French Language to 1300: Grammar, Phonology, History.**

**FREN 7040-2. History of the French Language from 1300 to the Present Day: Morphology and History.**

**FREN 7050-2. Old Provençal.**

**FREN 7110-2. Stylistics of French.**

**FREN 7120-2. Seminar in French Literature.** For use of visiting lecturers and distinguished visiting professors.

**FREN 7130-2. Seminar in French Literature.**

**FREN 7140-2. Seminar: Special Topics.** To be team-taught by French faculty. Upon demand.

Consult *Schedule of Courses* for more information on seminar topics.

**FREN 7290-2. Seminar: Moyen Age.**

**FREN 7340-2. Seminar: Renaissance Literature.**

**FREN 7380-2. Seminar: 17<sup>e</sup> siècle.**

**FREN 7550-2. Seminar: 18<sup>e</sup> siècle.**

**FREN 7710-2. Seminar: 19<sup>e</sup> siècle.**

**FREN 7720-2. Seminar: 20<sup>e</sup> siècle.**

**FREN 7750-2. Seminar: Advanced Linguistics.**

**FREN 8990-30. Doctor's Dissertation.** All doctoral students must register for no fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## Italian

**ITAL 1010-5. Beginning Italian 1.** The four skills of listening, speaking, reading, and writing are progressively developed in a predominantly oral presentation. Language laboratory work expected.

**ITAL 1020-5. Beginning Italian 2.** Students should have passed ITAL 1010 with a grade of C- or better.

**ITAL 2110-3. Second-Year Italian Reading, Grammar and Composition 1.** Designed to provide a thorough grammar review and to improve reading abilities and writing skills. Students should have received a grade of C- or better in ITAL 1020. Taught in Italian.

**ITAL 2120-3. Second-Year Italian Reading, Grammar, and Composition 2.** Continuation of ITAL 2110. ITAL 2120 fulfills the Graduate School language requirement for the Ph.D.

**ITAL 2130-3. Italian Short Story.** Acquaints students with the short story as a literary genre through the study of its tradition and evolution in Italy from the Middle Ages to the nineteenth century. Taught in English.

**ITAL 3120-3. Readings in Italian Literature.** Study of selected masterpieces of the Middle Ages, the Age of Humanism, the Early and High Renaissance, and the Baroque periods. Students should have passed ITAL 2120 or have consent of instructor. Taught in Italian.

**ITAL 3130-3. Readings in Italian Literature.** Study of selected masterpieces from the eighteenth, nineteenth, and twentieth centuries, with special emphasis on contemporary literature. Students should have passed ITAL 2120 or have consent of instructor. Taught in Italian.

**ITAL 3210-3. Advanced Conversation and Composition 1.** Devoted to assigned translations and compositions with discussion of grammatical and stylistic problems encountered, and to conversation at an advanced

level. Students should have passed ITAL 2120 or have consent of instructor.

**ITAL 3220-3. Advanced Conversation and Composition 2.** Continuation of ITAL 3210. Consult instructor.

**ITAL 3600-3. Workshop in Italian Theatre.** Consult instructor.

**ITAL 4010-2. Problems in Translation, Advanced Grammar, and Stylistics 1.** Major emphasis concerns practice in translating varying types of prose from Italian into English and English into Italian. Consult instructor.

**ITAL 4020-2. Problems in Translation, Advanced Grammar, and Stylistics 2.** Consult instructor.

**ITAL 4110-3. Dante: *Inferno* and *Purgatorio*.** The first two canticles of the *Divine Comedy* are studied against the background of the culture, politics, and society of the High Middle Ages. Consult instructor.

**ITAL 4130-3. Medieval Lyric Literature.** (FREN 4130, COML 5420.) Examination of medieval concept of courtly love as both a cultural and literary phenomenon; its theoretical and stylistic evolution from the Provençal and Old-French Romance to Italian lyric. No knowledge of Italian necessary. Consult instructor.

**ITAL 4200-3. Italian Culture and Civilization from Origins through the Renaissance.** Taught in English.

**ITAL 4250-3. History of Italy: 1815 to Present.** A survey of the political, social, and intellectual history of Italy from 1815 to present. Taught in English.

**ITAL 4280-3. Italian Cinema: From Twentieth-Century Novel to Film.** Analyzes the transition of Italian twentieth-century novels to film with special focus on the changes and reinterpretation of the plot, characters, and themes. Course aims to broaden students' knowledge of Italian culture and to give some of the vocabulary and analytical perspectives for the two art forms. Taught in English; readings in Italian for Italian majors.

**ITAL 4510-3. The Culture of the Italian Renaissance.** An interdisciplinary course emphasizing the relationship between the fine arts, the civil history, and the literature of the Italian Renaissance, and its influence and repercussions in Western Europe. Taught in English.

**ITAL 4520-3. Italian and French Poetry of the Renaissance.** (FREN 4520.) Focuses on close reading of major poets of the Renaissance. Special attention is given to the cultural context of the poems, such as the influence of Petrarchism, the revival of Platonism, and the impact of the Counter-Reformation. Taught in English; readings in Italian for Italian majors.

**ITAL 4700-3. Dante: *Paradiso*, *La Vita Nuova*, and Minor Works.**

**ITAL 4710-3. Italian Literature of the Nineteenth Century.** Primary focus on the pre-Romantics, Italian Romanticism, Verismo, and Decadentismo literary and cultural movements, particularly in their European context. Taught in English; readings in Italian for Italian majors.

**ITAL 4720-3. Italian Literature of the Twentieth Century.** A study of the Italian novel, theatre, poetry, and short story in the period from World War I to the present. Taught in English; readings in Italian for Italian majors.

**ITAL 4840 (1-3). Independent Study.**

## GEOGRAPHY

**GEOG 3840 (1-3). Undergraduate Independent Study.** By special arrangement with faculty. Only for students presenting strong geography preparation.

**GEOG 3930-3. Internship.** Provides an academically supervised opportunity for advanced geography-environmental conservation majors to work in public and private organizations on projects related to students' career goals and to relate classroom theory to practice.

**GEOG 4160-3. Teaching Geography.** Practicum and/or tutorial, by special arrangement only, in the teaching of geography. Includes serving as small-group leaders or tutors in introductory courses or developing and/or testing curriculum materials.

**GEOG 4430-3. Seminar: Conservation Trends.** An advanced upper-division seminar to provide environmental conservation and geography majors an undergraduate format for interdisciplinary discussion and research into the current and future directions of conservation. Senior majors only.

**GEOG 5840 (1-3). Graduate Independent Study.** Independent research for masters students only.

**GEOG 5930-3. Advanced Internship.** Provides an academically supervised opportunity for graduate-level geography majors to work in public and private organizations on advanced projects related to geographic theory and to their career goals.

**GEOG 6160-3. Seminar: Geographic Education.** A survey and critique of ideas from education, psychology, philosophy, and geography related to teaching and learning, especially for graduate students in geography who plan careers in college teaching.

**GEOG 6170-3. Geography Teaching Materials.** Individual work under supervision; emphasizes the creation of materials for classroom use in geography.

**GEOG 6180-3. Seminar: Geographic Problems.** Application of research methods to selected problems. Instructor and topic vary. Course may be repeated under different topics with advisor's approval.

**GEOG 6190 (1-3). Experimental Teaching in Geography.** Advanced graduate students in geography experimenting with new course content or structures, instructional objectives, curriculum materials, evaluation devices, communication skills, and the like.

**GEOG 6940-3. Master's Degree Candidate.**

**GEOG 6950 (1-6). Master's Thesis.**

**GEOG 7840 (1-3). Graduate Independent Study.** Independent research for doctoral students only.

**GEOG 8990-30. Doctor's Dissertation.** All doctoral students must register for not fewer

than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## Physical Geography

**GEOG 1001-3 or 4. Environmental Systems—Climate and Vegetation.** A general introduction to the atmospheric environment of the Earth: the elements and controls of climate and their implications to hydrology, vegetation, and soils.

**GEOG 1011-3 or 4. Environmental Systems—Landforms and Soils.** An introductory survey primarily concerned with two essential aspects of the natural environment: landforms and soils. Major emphasis is directed to the genesis, distribution, and utility of surface features in a variety of learning situations, including lectures, labs, and field trips. GEOG 1011 carries only 2 credits if student has credit in GEOL 1010 or 1030.

**GEOG 3191-3. Topics in Meteorology.** (APAS 3191.) Topics vary from year to year and may include weather-map analysis and prediction, weather modification, severe storms, air quality, and regional weather.

**GEOG 3201-3. Topics in Climatology.** (APAS 3201.) Topics vary from year to year and may include climatic change, snow and ice, mountain weather and climate, and applied climatology.

**GEOG 3251-3. Mountain Geography.** A survey of mountain environments and their human use with illustrations from temperate and tropical mountain areas.

**GEOG 3321-3. Geocology of Alpine and Arctic Regions.** Comparisons and contrasts in natural sciences of alpine and arctic regions—biogeography, climatology, geomorphology. Examination of concept geocology as applied to cold-stressed environments. Includes one or two local field trips.

**GEOG 3351-3. Biogeography.** Survey and analysis of plant and animal distributions on a world scale from ecological and historical perspectives. Human impact on vegetation is emphasized.

**GEOG 3391-3. Conservation of Natural Resources.** An introduction to the nature, distribution, and conservation of natural resources with emphasis on forest, rangeland, and wildlife resources. Resource problems of the western United States are contrasted with those of tropical latitude countries.

**GEOG 4211-3. Physical Climatology—Principles.** Introduces the physical principles of flows of heat and moisture to and from the Earth's surface, the interaction and modeling of such flows, and their distribution in space and time.

**GEOG 4221-3. Physical Climatology—Applied.** Applications of the principles of physical climatology are examined in areas such as water balance, agriculture and forestry, and urban climatology.

**GEOG 4241-4. Principles of Geomorphology.** See GEOL 4241.

**GEOG 4291/5291-4. Mountain Geomorphology.** (GEOL 4291/5291.) Field course emphasizing study of landforms produced by weathering and soils, mass movement, and erosional processes under all climatic and altitudinal conditions. Offered during the summer at the Mountain Research Station.

**GEOG 4331/5331-4. Mountain Climatology.** Survey and analysis of the climatic characteristics of selected mountain environments, their study in the field; emphasis on Rocky Mountains. Offered during the summer at the Mountain Research Station.

**GEOG 4371/5371-3. Forest Geography: Principles and Dynamics.** Survey of the principles of forest geography and ecology. Both individual tree responses to environmental factors and species interactions within communities are included. Emphasizes forest dynamics and their relation to management problems.

**GEOG 4381/5381-1. Forest Geography Laboratory.** Techniques of describing, classifying, and analyzing changes in forest vegetation are applied in the field to a variety of local forest types.

**GEOG 4501/5501-3. Water Resources and Water Management of Western United States.** Interpretation and analysis of hydroclimatic data, surface, and groundwater. Water use is critically evaluated with emphasis on problems associated with geographic maldistribution, appropriations, irrigation, industry, pollution, and regional development.

**GEOG 4511-4. Surface Hydrology.** Examines hydrologic processes in the surface environment, with emphasis on the environment of the western United States. Greatest emphasis is placed on natural processes and their management to augment water resources. Students may not receive credit for this course and GEOL 4040/5040.

**GEOG 5161-3. History and Nature of Physical Geography.** Development of geographical ideas leading to contemporary methodological issues and reviews of selected research frontiers in physical geography. Most attention is given to activity in physical geography in North America since 1945.

**GEOG 5211-3. Seminar: Physical Climatology.** A research seminar concerned with problems of mass and energy exchange in the Earth-atmosphere system. Topics are selected from such areas as air quality, bioclimatology, hydrology, climate change, and the climates of urban, agricultural, and natural environments.

**GEOG 5221-3. Synoptic and Dynamic Climatology.** Global climates examined from the standpoint of synoptic and dynamic climatology.

**GEOG 5241-3. Topics in Physical Geography.** (Precise title specified in *Schedule of Courses*.) Recent research topics which vary from year to year. May be taken twice, as the topics vary.

**GEOG 5291-4. Mountain Geomorphology.** (GEOL 5291.) Field course emphasizing study of landforms produced by weathering and soils, mass movement, and erosional

processes under all climatic and altitudinal conditions.

**GEOG 5391-3. Seminar: Biogeography.** Detailed consideration of current research themes in biogeography. Intensive reading of current research literature and preparation of research papers. May be taken twice, as the topics vary.

**GEOG 5951-3. Seminar: Climatic Change.** (APAS/GEOL 5951.) A cross-disciplinary survey of the evidence for the theories of climatic change.

**GEOG 5961-3. Theories of Climate and Climate Variability.** (APAS 5961.) A critical review of the current theories of climatic variability based on analysis of the different physical processes affecting climate.

**GEOG 6211-3. Readings in Climatology.** Selected topics in current climatological literature are discussed in seminars. Specific themes vary but may include aspects of microclimatology, paleoclimatic reconstruction, and climatic applications of satellite data.

**GEOG 6301-4. The Arctic and Alpine Environments.** Concentration on multidisciplinary aspects of environmental processes and Quaternary history of the arctic/alpine region. Involves introduction of new and recent faculty research in the Canadian Arctic and in the alpine area of the Rocky Mountains. Local field trips.

## Human and Cultural Geography

**GEOG 1982-3. World Regional Geography.** Using the interrelated concepts of population, urbanization, trade resources, and development as an organizing framework, the world's regions are geographically analyzed and placed in global perspective.

**GEOG 1992-3. Introduction to Human Geography.** A systematic introduction to the broad field of human-environment relationships. Topics vary but may include growth and distribution of populations; locational analysis of economic activities; origin, development, and problems of urban communities; and spatial analysis of cultural, historical, and political phenomena.

**GEOG 2002-3. World Geographic Problems.** Set in several regions, problems include resource-use decision making, locational analysis. Third World poverty and community development, and political and economic urban land use conflict. Small student groups in role-playing simulations leading to human decisions causing geographic change.

**GEOG 3402-3. Natural Hazards.** The impact of extreme geophysical events on human society. Emphasis upon adaptations to extreme events and ways of reducing vulnerability and damage.

**GEOG 3412-3. Conservation Practice and Resource Management.** Inventory, policy, and management of natural resources. Emphasizes practical approaches to the conservation and management of soil, land, water, and air resources.

**GEOG 3422-3. Conservation Thought.** Historical survey of human consumption of earthly materials; environmental and global considerations of population growth, cultural attitude, and technological development; the diverse goals and philosophy of conservation movements in time and place.

**GEOG 3812-3. Latin America.** National and regional overview of culture, history, resources, population, socioeconomic change, and other contemporary geographic problems.

**GEOG 3862-3. Geography of Africa.** A study of physical and cultural regions of Africa; analytical comparison of natural and cultural regions; development of present nation-states.

**GEOG 4612/5612-3. Geography of American Cities.** An introduction to the geography of American cities. Includes demographic and ideological contexts of urban development, emergence of the city system, location theory and rent models, and urban-economic problems.

**GEOG 4622/5622-3. Urban Geography: Social.** An analysis of the social, behavioral, political, and demographic factors which influence the development and maintenance of communities in contemporary urban environments, with primary emphasis on U.S. cities.

**GEOG 4662/5662-3. Economic Geography.** Several theories of location of economic activity are presented: general theory of land use, agricultural location theory, plant location theory, central place theory, location of systems of cities, and geographical organization of industries. The aggregate geographical structure of regions is studied as the geography of three major markets: labor, product, and capital, including the banking system. The economic growth of regions and policies designed to influence regional growth and welfare.

**GEOG 4672/5672-3. Seminar: World Agriculture.** Analysis of the origins, evolution, and distribution of agricultural systems. Problems of agricultural modernization and development.

**GEOG 4712/5712-3. Political Geography.** A systematic study of the relations between geography and politics, especially as a background for better understanding of international affairs. Topics such as frontiers and boundaries, power analysis, electoral geography, resource utilization, and strategic concepts are included.

**GEOG 4722/5722-3. Historical Geography of Europe.** A study of how people have changed the landscape of Europe through time, including an analysis of the past geography of Europe at selected periods of time.

**GEOG 4732/5732-3. Population Geography.** Emphasis is on the spatial aspects of population characteristics including fertility, mortality, migration, distribution, and composition. Includes both theoretical and empirical considerations, and some field work and computer simulations.

**GEOG 4742-3. Environments and Peoples.** Diverse environments and peoples are

viewed in terms of their systemic relationships in order to understand human adaptability, human modification of environments, the environment as a medium of cultural communication, and the dynamics of human geographic change through space and time.

**GEOG 4752/5752-3. Seminar: Recreational Geography.** An inquiry into the spatial distribution and environmental conditions of recreation. Emphasis is on outdoor recreation in nonurban settings. The implications of recreational values to resource managers and land use decisions are included.

**GEOG 4822-3. Historical Geography of Eastern North America.** A study of how people have developed settlements and utilized and changed the landscape of North America east of the Mississippi River through time. Includes an analysis of the past geography of certain regions of eastern North America at selected periods of time.

**GEOG 4832-3. Historical Geography of Western North America.** A study of how people have developed settlements and utilized and changed the landscape of North America west of the Mississippi River through time. Includes an analysis of the past geography of certain regions of western North America at selected periods of time.

**GEOG 4872-3. Geography of Colorado.** Location, distribution, evaluation, and utilization of Colorado resources with emphasis on the major problems of resource development and use in the population explosion.

**GEOG 4882-3. Soviet Union.** A systematic and regional survey of features that characterize the physical, economic, and social geography of the U.S.S.R.

**GEOG 4892-3. Geography of Western Europe.** A regional survey of the cultural, economic, social, physical, and political geography of Europe west of the Rhine, emphasizing the distinctive character and problems of each major area.

**GEOG 4902-3. Geography of Central, Northern, and Southeastern Europe.** A regional survey of the cultural, economic, social, physical, and political geography of Europe east of the Rhine, emphasizing the distinctive character and problems of each major area.

**GEOG 5152-3. History and Nature of Human Geography.** Development of geographical ideas leading to contemporary methodological issues and reviews of selected research frontiers in human geography.

**GEOG 5292-3. Migration, Urbanization, and Development.** (ECON 5292.) Historical and current patterns of national settlement system development are examined. Focuses on a quantitative analysis of problems associated with population growth and decline, urbanization, and economic structural change in more developed and less developed countries.

**GEOG 5642-3. Seminar: Urban Geography.** A survey of current research topics in urban geography. Emphasis on definition of possible student thesis topics.

**GEOG 6402-3. Seminar: Comparative Environmental Studies.** A critical examination of

cross-cultural experience with adjustments to natural hazards and with political management of resource exploitation.

**GEOG 6712-3. Seminar: Political Geography.** Detailed consideration of the history and methodology of the field, including an analysis of selected systematic topics such as frontiers and boundaries, international rivers, conflicting claims to territory, and electoral geography.

**GEOG 6722-3. Seminar: Historical Geography.** Discussion of the scope and methodology of historical geography, including consideration of past and current trends, as well as future prospects. Seminar presentations on topics selected for their substantive importance.

**GEOG 6732-3. Formal Population Geography: Analysis and Forecasting.** Focuses on methods for describing, interpreting, and forecasting the spatial dynamics of human populations disaggregated by age and such state categories as different marital and labor force statuses.

**GEOG 6742-3. Seminar: Cultural Geography.** Exploration of various geographic topics emphasizing the concept of culture. Emergence of several points of view in the development of cultural geography.

### Techniques (Skills)

**GEOG 3053-4. Cartography 1.** An introduction to the science and art of cartography. Develops skills necessary to create maps and graphs of spatially distributed phenomena. The emphasis is on the use of maps as descriptive and analytical tools, but some attention is given to production and to computer-assisted cartography.

**GEOG 3063-3. Maps and Mapping.** An introduction to maps and their role in society. Includes the fundamentals of reading and using both reference and special purpose maps, as well as the influence of maps on attitudes toward and images of the geographic environment.

**GEOG 4013/5013-3. Introduction to Quantitative Methods in Human Geography.** Introduction to the techniques and applications of quantitative methods in human geography. Particular emphasis on applications in the spatial analysis of human settlement and the distribution of economic activities.

**GEOG 4023-3. Statistics for Earth Sciences.** See GEOL 4023.

**GEOG 4043/5043-3. Computer-Assisted Cartography.** Emphasizes application of geographic information. Attention is directed to mapping both physical and human phenomena. Students develop their own computer mapping programs.

**GEOG 4053-3. Cartography 2.** Advanced cartography with emphasis on independent research and projects. Field trips to leading map publishers and printers arranged.

**GEOG 4063/5063-3. Geographic Interpretation of Aerial Photographs.** The use of aerial and space photography in geographic research is emphasized. Includes properties and the systematic application of imagery in

the photographable portion of the spectrum for the evaluation of urban, transportation, landform, and vegetation features.

**GEOG 4093/5093-3. Remote Sensing of the Environment.** (GEOL 4093/5093.) Covers the acquisition and interpretation of environmental data by remote sensing. Theory and sensors are discussed, as are manual and computerized interpretation methods. The infrared and microwave portions of the spectrum are stressed.

**GEOG 4103/5103-3. Geographic Information Systems.** Deals with computerized systems for storage and analysis of spatial data. Data structures and problem solving using both statistical and cartographic techniques are considered. Lab assignments allow attention to information concerning both physical and human geographic features.

**GEOG 4173-3. Research Seminar.** Development of skills for research, with emphasis on primary and secondary sources, on methods of evaluating source materials, and on geographic writing.

**GEOG 4983/5983 (1-6). Field Problems.** Selected geographic problems are investigated through intensive, instructor-directed field work. The instructor and the problem(s) vary and are announced. May be repeated under different problems with departmental approval.

**GEOG 5183-3. Data Processing in the Earth Sciences.** See GEOL 5183.

## GEOLOGICAL SCIENCES

The following courses are not open to majors in Geological Sciences: GEOL 1030, 1040, 1130, and 1140.

**GEOL 1010-4. Introduction to Geology 1.** Introductory geology for majors and nonmajors. Three lect. and one lab or field trip per week. Study of the Earth, its materials, its characteristics, and its dynamic processes, and how it relates to people. GEOL 1010 carries only 2 credits if student has credit in GEOG 1010.

**GEOL 1020-4. Introduction to Geology 2.** Introductory geology for majors and nonmajors. Three lect. and one lab or field trip per week. Study of the evolutionary history of the Earth and life. Prereq., GEOL 1010 or equivalent.

**GEOL 1030-3. Our Geological Environment.** Lect. A course for nongeology majors that reviews the Earth's physical/chemical makeup, its dynamic processes, and its geological resources, with emphasis on how these affect our life on Earth.

**GEOL 1040-3. Geological Evolution of the Colorado Region.** Lect. A course for nongeology majors that traces the geological development of Colorado and nearby western states, cast within a broader framework of the Earth's geological evolution.

**GEOL 1050-3. The History of Life.** Evolution of life on planet Earth, beginning with the earliest origins and surveying the major steps that led to the rise of higher plants and animals. Modern ideas on the causes of periodic mass extinctions in both the marine and terrestrial realms. Emphasis on geologic

evidence for the pathways of evolution using examples from the ordinary to the bizarre.

**GEOL 1060-3. Global Change 1.** Addresses environmental change: how and why these changes occur in the Earth's interactive system. The climate machine, hydrologic cycle, the record of past environmental change, and future implications are covered. For nonscience majors.

**GEOL 1070-3. Global Change 2.** Continues discussion of changes in the Earth's interactive systems. Our changing oceans including biological and chemical cycles, land surface processes including resources and hazards, and the interplay of global change with humankind are covered. For nonscience majors.

**GEOL 1130-3. Dynamic Earth 1—Introduction.** The origin and evolution of Earth as a planet leads to its composition and heat budget. Alternate energy resources are considered. Basic concepts of the physics of the solid earth lead to a discussion of earthquakes—their causes and prediction.

**GEOL 1140-3. Dynamic Earth 2—The Solid Earth.** Study of large-scale earth processes including formation of igneous, sedimentary, and metamorphic rocks; glacial eras; continental drift and plate tectonics. Students who are especially interested in the solid Earth are encouraged to take GEOL 1130 before GEOL 1140.

**GEOL 1530-4. Geological Development of Colorado and the West.** Three lect. and one field trip or lab per week. An outline of the development, through time, of the geology of Colorado. Follow-up to GEOL 1010. Prereq., GEOL 1010.

**GEOL 3010-4. Introduction to Mineralogy.** Three lect. and one lab per week. Origin, occurrence, identification, classification, and uses of minerals. Applications of mineralogy to economic geology and petrology are emphasized. Prereqs., CHEM 1131 and MATH 1300.

**GEOL 3020-4. Petrology.** The field relations, petrography, petrology, chemistry, and origins of igneous and metamorphic rocks are studied by means of lectures, reading, and lab and field experience. Labs include instruction in the fundamentals of optical petrography and the study of rocks in thin section. Prereq., GEOL 3010.

**GEOL 3070-3. Oceanography.** Survey of ocean features and processes including ocean water, circulation, sediments, structure, faunas, floras, and history of the ocean basins. Prereqs., GEOL 1010 and 1020/1530, or GEOL 1010 and one semester of biology.

**GEOL 3120-4. Structural Geology 1.** Geometrical techniques for describing and illustrating geological structures. Major topics include graphic methods and geometry of fractures and folds. Prereqs., GEOL 1010 and 1020/1530.

**GEOL 3310-3. Introduction to Sedimentology.** An introduction to the origin, transport, and deposition of sedimentary particles. Emphasizes the physical properties of sediments, fundamentals of fluid flow and sediment transport, sedimentary structures,

and facies models. Prereqs., GEOL 3010 and 3020.

**GEOL 3400-4. Evolution of Continental Ecosystems.** An enquiry into the evolution of important ecosystems of the past and present. Biological and geological data for reconstructing ecosystems discussed in detail and applied to creating scenarios of past ecosystems. Vertebrates and their structure are emphasized.

**GEOL 3410-3. Paleobiology.** A survey of the morphology, ecology, and evolution of ancient animal and plant life and its interactions with the Earth. Fossils used to solve geological and biological problems. Prereq., GEOL 1020 or one year of introductory biology (with lab), or consent of instructor.

**GEOL 3420-3. Introductory Stratigraphy.** Studies of sedimentary rocks and the application of stratigraphic principles are used to interpret ancient environments and geologic history. Field techniques are emphasized. Prereq., GEOL 3310.

**GEOL 4040/5040-3. Geohydrology.** Surface and ground waters are examined as a dynamic system within a geological framework. Implications for human management of watercourses, water supplies, and water quality are considered.

**GEOL 4050/5050-3. Introduction to Seismology.** Causes and effects of earthquakes; earthquake prediction, seismic waves, record interpretation, parameters of seismic foci, and seismo-tectonics of the world are also covered.

**GEOL 4100/5100-3. X-ray Crystal Chemistry.** Topics in physics and chemistry of minerals are covered, particularly crystal structure control on chemical substitution and order-disorder phenomena. Laboratory covers methods of mineral identification and characterization by X-ray powder and single-crystal diffraction. Prereqs., GEOL 3010 and MATH 2300, or consent of instructor.

**GEOL 4110-4. Field Geology.** Methods of geologic mapping including plane table surveying and introduction to photogrammetry. Prereqs., GEOL 3120 and 3020.

**GEOL 4120/5120-4. Structural Geology 2.** Lect. and lab. Mechanics applied to the deformation of rocks. Stress, infinitesimal strain, behavior of elastic and brittle rocks, fault mechanics, mechanical effects of pore fluids, introduction to petrofabrics, and other topics. Prereq., GEOL 3120.

**GEOL 4130-4. Geophysics and Tectonics.** Students are introduced to fundamental geophysics including seismology, geomagnetism, gravity, radiometric dating, and heat flow. The theory of plate tectonics is reviewed and its geophysical and geological aspects are outlined. The tectonics of orogenic belts such as the North American Cordillera are studied and related to plate tectonic processes. Prereq., GEOL 3120.

**GEOL 4140-3. Techniques in Glacial Geology.** Designed to acquaint students with research techniques. Instruction includes analysis of remote sensing imagery and maps, investigation of seismic records, evaluation of sedimentological techniques and approaches, and statistical evaluation of the

data. Prereq., GEOL 4360 or 4241 or consent of instructor.

**GEOL 4200-3. Advanced Mineralogy.** Covers topics in the crystal chemistry of major rock-forming mineral groups, specifically reactions, transformations, deformations, and geothermometry and geobarometry based on inter- and intracrystalline element distributions in these major mineral groups. Prereq., GEOL 4100/5100.

**GEOL 4250/5250-4. Introduction to Ore Deposits.** A survey of processes of ore formations, with examples drawn from selected districts. Field trips to representative deposits. Prereq., GEOL 3010 or equivalent.

**GEOL 4350-3. Geology of Fold/Thrust Belts.** Includes the geology, tectonic setting, and structure of fold/thrust belts including relationships between thrusting and sedimentation, foreland basins, sea level change, techniques for constructing restored and balanced cross sections, and examination of type areas including North American Cordillera, Alps, and Himalayas. Prereqs., GEOL 3120 and 3310.

**GEOL 4360-3. Glacial Geology.** Introduction to glaciology, glacial influence on topography, crustal rebound, and sea level, and glacial chronology for northern North America. Prereqs., GEOL 1010 and consent of instructor.

**GEOL 4470-4. Paleontology of the Lower Vertebrates.** Evolution of the nonmammalian vertebrates with an emphasis on the evolutionary development of major vertebrate features. Prereqs., GEOL 3410, one year of biology, and one year of geology.

**GEOL 4480-4. Paleontology of the Higher Vertebrates.** Evolution of mammals and birds with an emphasis on the evolutionary history of modern and prominent fossil orders. Prereqs., GEOL 3410, one year of biology, one year of geology, or consent of instructor.

**GEOL 4530-3. Introduction to the Physics of the Solid Earth.** A survey of the structure, physical properties of the materials, the environmental conditions, and the processes in the Earth's interior. Methods of interpreting geophysical data to determine the state of the interior are emphasized. Prereqs., MATH 2400 and PHYS 2130.

**GEOL 4590-3. Carbonate Diagenesis and Geochemistry.** Postdepositional alteration of carbonate rocks is examined with emphasis on diagenetic environments and process-response models. Petrographic and geochemical evidence is stressed. Prereqs., GEOL 1030, 3010, 3020, and 3310.

**GEOL 4640-3. Glaciology.** Ice physics, snow, glaciers, floating ice, ice in the ground and in the solar system. Emphasis is on glaciers and ice sheets, including reconstruction of past glaciations and impacts of ice and snow on society.

**GEOL 4650-3. Carbonate Sedimentary Environments.** Recognition and interpretation of modern and ancient carbonate sedimentary environments are examined through the analysis of fauna, texture, sedimentary structures, and primary geochemistry. Emphasis on eustatic sea level and climatic controls.



Prereqs., CHEM 1111, 1131, GEOL 3310, 3410, and 3420.

**GEOL 4670-3. Isotope Geology.** An introduction to the principles of stable and radiogenic isotope systematics in inorganic and organic geochemistry. Emphasizes the application of isotope data to problems in igneous, metamorphic and sedimentary petrology, geobiochemistry, and petroleum genesis. Prereqs., CHEM 1131, MATH 1300, and GEOL 5210.

**GEOL 4700 (3-4). Special Geological Topics.** Studies in selected geological subjects of special current interest (for undergraduates). The initial offering is Petroleum Geology. Prereq. to be determined by topics, but always junior standing.

**GEOL 4840 through 4849 (1-3). Independent Study in Geology.** Time and credit to be arranged. For advanced undergraduates who have high scholastic standing. Open only upon consultation.

**GEOL 4940/5940-4. Introduction to Geophysical Prospecting.** Lect. and lab. Outlines the principles of geophysical prospecting for oil, other minerals, and water. Seismic, gravity, magnetic and electrical methods are discussed. Prereqs., PHYS 1120, MATH 2300, and GEOL 1010-1020.

**GEOL 4950-3. Natural Catastrophes and Geologic Hazards.** Survey of historic and prehistoric natural disasters, their cause and potential for recurrence. Meteorite impact, earthquakes, volcanic eruptions, tsunamis, landslides, floods, magnetic reversals, and major extinction events. Prereq., one year of science.

**GEOL 4960-3. Mineral Resources in World Affairs.** A nontechnical introduction to the geology, distribution, reserves, uses, and conservation of economic mineral materials. For nongeology majors.

**GEOL 4970-1. Mineral Resources in World Affairs Laboratory.** Laboratory and field trips for GEOL 4960. Provides experience with maps, rocks, and on-site inspection of mineral deposits.

**GEOL 4990-3. Honors Thesis.** A supervised project involving original research in any area of the geological sciences. The thesis is submitted to the Honors Program of the College of Arts and Sciences in late March and is orally defended. The candidate must have a GPA of 3.00 or better in geology and must be accepted by the Departmental Honors Committee.

**GEOL 5030-3. Rock and Mineral Analysis.** The theory and practice of analytical techniques used in determination of rock, mineral, and water chemistries for geological applications.

**GEOL 5040-3. Geohydrology.**  
See GEOL 4040.

**GEOL 5050-3. Introduction to Seismology.**  
See GEOL 4050.

**GEOL 5070-3. Advanced Sedimentology.** Study of fluid flow, particle transport, bedforms, and sedimentary structures. The principles and methods of interpreting vertical sequences of sedimentary structures are

emphasized. Prereq., GEOL 3310 or GEOL 3420 or equivalent.

**GEOL 5100-3. X-ray Crystal Chemistry.** See GEOL 4100.

**GEOL 5120-4. Structural Geology 2.** See GEOL 4120.

**GEOL 5140-3. Techniques in Glacial Geology.** See GEOL 4140.

**GEOL 5160-3. Interpretation of Geological Phase Diagrams.** Phase diagrams of mineral systems are explored in terms of the variables: temperature, composition, pressure, oxygen fugacity, and water fugacity. The viewpoint is experimental rather than theoretical, and the unifying theme is to discover how these diagrams can be related to igneous and metamorphic rocks. Prereq., consent of instructor.

**GEOL 5170-4. Optical Mineralogy.** Principles of optical mineralogy and applications to the identification of rock-forming minerals in thin section. Prereq., GEOL 3010.

**GEOL 5190-3. Continental Depositional Systems.** A study of modern and ancient continental depositional systems. Emphasis is placed on depositional processes and analysis of vertical sequences and lateral assemblages of facies. Prereq., GEOL 3310 or equivalent.

**GEOL 5200-3. Advanced Mineralogy.** See GEOL 4200.

**GEOL 5210-4. Advanced Igneous Petrology.** Systematic analysis of the petrology of igneous rocks. Emphasis is placed on integrating knowledge obtained from theory, experiment, and field studies. Prereq., GEOL 5170 or equivalent.

**GEOL 5230-4. Mineral Exploration.** An introduction to the application of genetic models of mineral deposits to their exploration and discovery. Development of strategies for regional, district, and mine exploration. Prereq., GEOL 3010 or consent of instructor.

**GEOL 5250-4. Introduction to Ore Deposits.** See GEOL 4250.

**GEOL 5260-4. Field and Laboratory Study of Mineral Deposits.** Field mapping and laboratory studies of ore deposits, with emphasis on petrology, wall-rock alteration, and ore mineralogy. Prereq., GEOL 4250/5250.

**GEOL 5270-4. Thermodynamics for Petrologists.** A systematic treatment of the thermodynamic fundamentals required in mineralogy and petrology, with emphasis on heterogeneous equilibria and data retrieval and evaluation. Thermodynamic properties of gases and supercritical fluids and minerals are covered in detail. Prereq., consent of instructor.

**GEOL 5280-4. Principles of Aqueous Geochemistry.** Composition and origin of natural waters. Principles relating to reactions between rock materials and water. Discussion of natural waters; ionic equilibria; computer methods. Prereq., CHEM 1131.

**GEOL 5300-3. Low-Temperature Geochemistry.** Discussion of geochemistry of sedimentary and near-surface environments. Stability diagrams, ion exchange, weathering,

geochemical prospecting, and topics in thermodynamics. Prereq., CHEM 1131 and GEOL 3010.

**GEOL 5310-3. Comparative Sedimentology.** Applies studies of modern and other geologically-young sediments to the interpretation of Paleozoic depositional systems in central Colorado. Emphasis is on the origin and diagenetic history of continental and near-shore marine deposits on the east and west flanks of the Ancestral Front Range. The lab includes several half-day field trips and a 2½-day weekend trip. A term paper is required. Prereqs., CHEM 1131, GEOL 3010, GEOL 3420, or equivalents.

**GEOL 5330-3. Planetary Chemistry.** Discussion of the chemistry of the solar system, especially the role of stable and radiogenic isotopes and trace elements in interpreting the formation and magmatic evolution of the planets. Prereqs., GEOL 3010 and 3020.

**GEOL 5340-2. Ore Microscopy.** Emphasizes reflected light microscopic methods for the identification of opaque minerals with emphasis on ore minerals and related sulfides. Prereq., GEOL 4250/5250.

**GEOL 5350-3. Geology of Fold/Thrust Belts.** See GEOL 4350.

**GEOL 5360-3. Glacial Geology.** See GEOL 4360.

**GEOL 5390-3. Rock and Paleomagnetism.** Study of the origin of magnetic properties of minerals, survey of principal means of rock magnetization and their use in geologic interpretations, and the use and reliability of paleomagnetism. Basic courses in physics, chemistry, math, and geology recommended.

**GEOL 5400-4. Quaternary Stratigraphy.** Summary of geologic and pedologic methods used to recognize, date, and correlate Quaternary deposits and interpret Quaternary history. Prereq., GEOL 4241/5241 or equivalent.

**GEOL 5410-3. Ancient Sedimentary Environments.** Analysis of sedimentary rock sequences, biostratigraphy, sedimentary environments, and stratigraphic synthesis. Prereq., GEOL 3420.

**GEOL 5420-3. Quaternary Dating Methods.** An in-depth survey of standard and experimental dating methods that provide absolute ages for events of the last 2 million years of Earth history. Includes theory and application of radiocarbon, uranium series, amino acid, thermoluminescence, fission track, potassium/argon, hydration, light stable isotopes, and other radioactive techniques.

**GEOL 5430-2. Soil Laboratory Methods.** Physical and chemical methods of research in soils. Analysis includes particle size, carbonate, organic matter, iron, aluminum, phosphorous, and clay mineralogy. Prereq., consent of instructor.

**GEOL 5440-4. Morphology and Genesis of Soils.** Effects of climate, vegetation, parent material, topography, and time on the development, classification, and chemistry of soils. Prereq., GEOL 4241/5241 or equivalent, CHEM 1111 or equivalent, or consent of instructor.

**GEOL 5450-4. Micropaleontology 1.** Classification, occurrence, and interpretation of Foraminifera. Prereqs., GEOL 3410 and 3420.

**GEOL 5460-4. Micropaleontology 2.** Classification, occurrence, and interpretation of microfossil groups other than Foraminifera. Prereqs., GEOL 3410 and 3420.

**GEOL 5470-4. Paleontology of the Lower Vertebrates.** See GEOL 4470.

**GEOL 5480-4. Paleontology of the Higher Vertebrates.** See GEOL 4480.

**GEOL 5490-3. Geochemistry of Hydrothermal Ore Deposits.** Laboratory studies, thermodynamic data, chemical data, fluid inclusions, stable isotopes, and field occurrences are all used to explain the composition, origin, and history of hydrothermal ore deposits. Prereq., GEOL 5250 or equivalent.

**GEOL 5500-4. Petroleum Geology.** Covers the theoretical and applied aspects of petroleum geology and geochemistry. Organic geochemistry, time-temperature models, migration, trapping mechanisms, log analysis, application of facies models in the subsurface, and reservoir geology are discussed. Prereqs., structure, stratigraphy/sedimentology, deposits, environment, physics, and chemistry.

**GEOL 5510-3. Current Problems in Paleobiology.** A series of short field and laboratory projects, utilizing modern research techniques, dealing with current controversies in paleobiology. Prereq., GEOL 3410, one year of biology, or consent of instructor.

**GEOL 5520-3. Marine Paleoecology.** Study of the functional morphology, population structure, niche structure, and ecological interactions of living and ancient marine organisms. Application of ancient ecosystem analysis to geological and environmental problem solving. GEOL 3410 or equivalent biology courses recommended.

**GEOL 5550-3. Paleobotany and Palynology.** Two-semester sequence. Concepts and methods of paleobotany focusing on palynology and its use in diverse fields of geologic, environmental, and biologic interpretation.

**GEOL 5560-3. Evolution.** Concepts, mechanisms, rates, and patterns of evolution as depicted by living and fossil organisms. Prereq., GEOL 3400, 3410, or introductory biology sequence.

**GEOL 5570 (1-3). Topical Seminar: Paleobiology and Paleoenvironments.** A seminar on current topics of exceptional interest built around a series of prominent invited speakers. (Co-listed with G.E. 502 at Colorado School of Mines.) Prereq., GEOL 3410, one year of biology, or consent of instructor.

**GEOL 5580-3. Biostratigraphy and Biogeography.** Concepts and methods of biostratigraphic zonation, correlation, and paleobiogeography in light of biologic, ecological, climatic, and physicochemical parameters. Prereq., GEOL 3410, one year of biology, or consent of instructor.

**GEOL 5590-3. Carbonate Diagenesis and Geochemistry.** See GEOL 4590. Prereq., graduate standing.

**GEOL 5610-2. Mammalian Micropaleontology.** Studies of mammalian microfossils.

Methods of analysis, collection, and use in stratigraphic problems such as correlation, paleoecology, and earth history. Prereq., consent of instructor.

**GEOL 5620-5. Field Problems in Vertebrate Paleontology.** Field techniques in study of fossil vertebrates and their host rocks. Four weeks field work, one week faunal analysis. GEOL 3420, 4100, 4470, and 4480 recommended.

**GEOL 5640-3. Glaciology.** See GEOL 4640.

**GEOL 5650-3. Carbonate Sedimentary Environments.** See GEOL 4650.

**GEOL 5670-3. Isotope Geology.** See GEOL 4670.

**GEOL 5680-3. Global Tectonics.** Geological and geophysical aspects of plate motions along accretionary, transforming, subducting, and collisional margins. Relationships of sedimentation, volcanism, metamorphism, and deformation to mountain building are studied in conjunction with examination of type areas. Prereqs., GEOL 4130 and 4530, or equivalents.

**GEOL 5690-3. Volcanology/Igneous Petrology.** A study of landforms, processes, and geologic features associated with igneous (particularly volcanic) activity. Also includes rock classification, petrography, and geochemical methods. Prereq., GEOL 5170.

**GEOL 5700 through 5790-variable credit. Geological Topics Seminar.** Seminar studies in geological subjects of special current interest are offered primarily for graduate students, as departmental staff and facilities permit.

**GEOL 5800-4. Structural Geology 3.** Displacement and strain theory, ductile deformation of rocks. Lab emphasizes practical techniques of finite strain measurement including computer methods. Prereq., GEOL 3120.

**GEOL 5840 through 5849-variable credit. Independent Study.** Graduate.

**GEOL 5850 through 5851-variable credit. Independent Study.** Graduate.

**GEOL 5940-4. Introduction to Geophysical Prospecting.** See GEOL 4940.

**GEOL 6270-3. Thermodynamics for Petrologists 2.** Advanced topics in thermodynamics, with emphasis on properties of electrolyte solutions at low and high temperature; thermodynamics of silicate melts; experimental methods for determining activity coefficients in gaseous, liquid, and crystalline solutions; and linear algebra techniques for manipulation of multicomponent rock compositions.

**GEOL 6310-3. Sedimentary Petrology 1.** Interpretation of the depositional and diagenetic history of sedimentary rocks as determined from thin-section studies. Prereq., GEOL 3310 or equivalent, and optical mineralogy.

**GEOL 6320-3. Sedimentary Petrology 2.** Interpretation of the depositional and diagenetic history of sedimentary rocks as determined from thin-section studies. Prereq., GEOL 3310 or equivalent.

**GEOL 6530-3. Seminar: Geomorphology and Quaternary Geology.** Recent research

topics. Precise title specified in *Schedule of Courses*. Prereq., consent of instructor.

**GEOL 6610-3. Earth and Planetary Physics 1.** (APAS/PHYS 6610.) Mechanics of deformable materials, with applications to earthquake processes. Introduction to seismic wave theory. Inversion of seismic data for the structure, composition, and state of the interior of the Earth.

**GEOL 6620-3. Earth and Planetary Physics 2.** (APAS/PHYS 6620.) Space and surface geodetic techniques, as well as potential theory are covered. Other topics are the definition and geophysical interpretation of the geoid and of surface gravity anomalies, isostasy; post-glacial rebound; tides and the rotation of the Earth.

**GEOL 6630-3. Earth and Planetary Physics 3.** (APAS/PHYS 6630.) The solar system: theories of its origin, meteorites. Distribution of radioactive materials; age dating. Heat flow through continents and the ocean floor; internal temperature distribution in the Earth, mantle convection. Origin of the oceans and atmosphere.

**GEOL 6650-variable credit. Seminar in Geophysics.** (APAS/PHYS 6650.) Advanced seminar studies in geophysical subjects for graduate students.

**GEOL 6660-3. Geophysical Instrumentation.** (PHYS 6660.) An introduction to the principles on which the design of instruments for various geophysical observations is based. Emphasis on seismographic and strain/tilt systems, with some discussion of gravimetric and magnetometric instruments.

**GEOL 6670-3. Rock Physics.** Magnetic, electrical, optical, thermal, and mechanical properties of rocks. Emphasizes basic concepts of solid-state physics and shows the use of these properties in helping to interpret the geologic records. Basic courses in physics, mathematics, and geology recommended.

**GEOL 6680-3. Dynamics of Continuous Media.** (MCEN 6183, PHYS 6680.) Theory of wave motion in continuous media, with emphasis on isotropic, elastic materials. Propagation, reflection, refraction, dispersion, and diffraction of body- and surface-waves in infinite and bounded systems, with applications to seismic waves.

**GEOL 6690-3. Advanced Seismology.** (PHYS 6690.) Wave propagation in the earth; inversion of seismological data to obtain earth structure. Matrix formulation of seismic wave transmission. Theory of seismic wave generation illustrating use of contour integration techniques.

**GEOL 6940-0. Master's Degree Candidate.**

**GEOL 6950 (0-6). Master's Thesis.**

**GEOL 6960-3. Plan II Master's Research.**

**GEOL 8990-variable credit. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

## Cross Listings

**GEOL 4241-4. Principles of Geomorphology.** (GEOG 4241.) Systematic study of weathering, mass-wasting, fluvial, wind, and marine processes and the landforms resulting therefrom. Prereqs., GEOL 1010 and 1020.

**GEOL 4291-4. Mountain Geomorphology.** (GEOG 4291.) Field course. Includes Front Range glacial geology and glaciology. Prereqs., GEOL 1010 and 1020, MATH 1100, and CHEM 1001.

**GEOL 5241-4. Principles of Geomorphology.** (GEOG 5241.) See GEOL/GEOG 4241.

**GEOL 5291-4. Mountain Geomorphology.** (GEOG 5291.) See GEOL/GEOG 4291.

**GEOL 5951-3. Seminar: Climatic Change.** (APAS/GEOG 5951.) A cross-disciplinary survey of the evidence for and theories of climatic change.

**GEOL 4023-3. Statistics for Earth Sciences.** (GEOG 4023.) Introduction to parametric and distribution-free statistics with emphasis on applications to earth science problems.

**GEOL 5183-3. Data Processing in the Earth Sciences.** (GEOG 5183.) Advanced statistical analysis, multivariate statistics, time series, classification models. Prereq., GEOL 4770 or consent of instructor.

**GEOL 4093-3. Remote Sensing of the Environment.** (GEOG 4093.) Covers the acquisition and interpretation of environmental data by remote sensing. Theory and sensors are discussed, as are manual and computerized interpretation methods. The infrared and microwave portions of the spectrum are stressed.

**GEOL 5093-3. Remote Sensing of the Environment.** (GEOG 5093.) See GEOL/GEOG 4093.

## GERMANIC LANGUAGES AND LITERATURES

### German

**GRMN 1010-4. Beginning German 1.** For students with no previous training in German.

**GRMN 1020-4. Beginning German 2.**

**GRMN 1900 (1-3). Independent Study.**

**GRMN 2010-4. Intermediate German.** A review and continuation of the basic skills begun in the first year: reading, writing, speaking, and oral comprehension. Satisfies Arts and Sciences language requirement.

**GRMN 2020-4. Intermediate German.** Satisfies Graduate School language requirement for the Ph.D.

**GRMN 2050-2. Intermediate German: Conversation.** For students who wish supplementary conversational practice on the third semester level. Does not satisfy the Arts and Sciences foreign language requirement. Students may take this course concurrently with GRMN 2010.

**GRMN 2060-4. Intermediate German: Communication Skills.** Satisfies Graduate School language requirement for the Ph.D.

**GRMN 2070-3. Intermediate Conversational German.** Intensive training in speaking and understanding spoken German. Does not satisfy the Arts and Sciences foreign language requirement.

**GRMN 2220-4. Scientific German.** Satisfies Graduate School language requirement for the Ph.D.

**GRMN 2900 (1-3). Independent Study.**

**GRMN 3010-3. Advanced Conversation and Grammar.** Required for German majors.

**GRMN 3020-3. Advanced Conversation and Composition.** Required for German majors.

**GRMN 3030-3. Business German.** A study of general commercial practices, vocabulary, and terminology applied in business transactions of various kinds with special emphasis on oral and written communications and correspondence; useful in subsequent business careers.

**GRMN 3090-2. German Pronunciation and Diction.** An introduction to phonetics.

**GRMN 3110-3. German Literature 1.** An examination of selected literary texts from 1910 to the present. May be taken either before or after GRMN 3120.

**GRMN 3120-3. German Literature 2.** An examination of selected literary texts up to 1910. May be taken either before or after GRMN 3110.

**GRMN 3900 (1-3). Independent Study.**

**GRMN 4010-3. Advanced Composition, Conversation, and Stylistics 1.** Required for German majors.

**GRMN 4020-3. Advanced Composition, Conversation, and Stylistics 2.** Required for German majors.

**GRMN 4100/5100-3. Applied Linguistics.** Introduction to the study of language and its applications to the teaching of German. Analysis of phonology, grammatical structure, and vocabulary of German and English for high school and college teachers of German.

**GRMN 4230/5230-3. German Civilization 1.** From the beginnings to 1870. Readings and illustrated lectures on the main cultural movements as they are manifested in the various arts and intellectual traditions in the German speaking countries.

**GRMN 4240/5240-3. German Civilization 2.** From 1870 to the present. Continuation of GRMN 4230/5230.

**GRMN 4330-3. The Age of Goethe.** German literature from 1770 to 1830. A close examination of representative texts from the periods of Storm and Stress, classicism, and romanticism. Emphasis on the philosophical and social background.

**GRMN 4340-3. Seminar in German Literature.** Intensive study of a particular literary period, author, or genre, e.g., Brecht, contemporary literature, nineteenth-century drama. Secondary sources are utilized. Course content differs each time.

**GRMN 4370-3. Introduction to German Literary History 1.** From the beginnings to 1750. An examination of the main currents in German literature, including the Middle Ages, the Renaissance, baroque, and early classicism.

**GRMN 4380-3. Introduction to German Literary History 2.** Continuation of GRMN 4370. From 1750 to the present. Covers Weimar Classicism, romanticism, realism, naturalism, and the currents of the last 100 years.

**GRMN 4450-3. Methods of Teaching German.** Required of students who desire the recommendation of the Department for secondary school teaching positions. For student teaching in German, see EDUC 4712 under the School of Education.

**GRMN 4460-6. High School German Teaching.** Part of the supervised student teaching in a secondary school required for state certification to teach German.

**GRMN 4900 (1-3). Independent Study.**

*Note:* Prerequisite for all courses above 5000 (including double-listed courses): graduate standing.

**GRMN 5010-3. Advanced Language Skills.** Training in oral and written language arts: speaking to groups, reciting, and lecturing; English to German translations of difficult texts; writing expository prose.

**GRMN 5040-3. Proseminar.** Literary genres, methods of literary analysis, and bibliography.

**GRMN 5140-3. History of the German Language.** Special emphasis on Middle High German.

**GRMN 5180-3. Old Norse.** Readings of Old Norse sagas.

**GRMN 5470-1. College German Teaching.** Required of new part-time instructors who have no previous teaching experience.

**GRMN 5900 (1-3). Independent Study.**

**GRMN 5910-3. Practicum: Teaching German Literature.** Students register with the permission of a faculty member and participate in the teaching of a literature course on the 3000 or 4000 level.

**GRMN 6100-3. Seminar: Germanic Linguistics.**

**GRMN 6110-3. Seminar: Germanic Linguistics.**

**GRMN 6300-3. Seminar: German Literature.**

**GRMN 6310-3. Seminar: German Literature.**

**GRMN 6410-2. Seminar in Language Instruction.**

**GRMN 6940-0. Master's Degree Candidate.**

**GRMN 6950-6. Master's Thesis.**

## COURSES IN TRANSLATION

**GRMN 2501-3. Twentieth-Century German Short Story.** Short stories by Thomas Mann, Kafka, Böll, and Grass, such as "Death in Venice," "Metamorphosis," and "Cat and Mouse." Emphasis on literary themes, their traditions, and their cultural significance. Taught in English.

**GRMN 4501-3. Seminar: Literature in Cultural Context.** Provides a broader basis for the work of literature, viewing it from various cultural perspectives. Specific content of course is defined by the instructor each time it is given. Taught in English.

### Scandinavian Program

**NORW 1010-5. Beginning Norwegian 1.**

**NORW 1020-5. Beginning Norwegian 2.**

**NORW 1900 (1-3). Independent Study.**

**NORW 2110-3. Second-Year Norwegian Reading and Conversation I.** Fulfills the Arts and Sciences language requirement for the B.A. and B.F.A. degrees.

**NORW 2900 (1-3). Independent Study.**

**NORW 3900 (1-3). Independent Study.**

**NORW 4900 (1-3). Independent Study.**

**SCAN 1900 (1-3). Independent Study.**

**SCAN 2900 (1-3). Independent Study.**

**SCAN 3900 (1-3). Independent Study.**

**SCAN 4900 (1-3). Independent Study.**

### COURSES IN TRANSLATION

**SCAN 2251-3. Contemporary Sweden and Norway.** A comprehensive overview of Swedish and Norwegian society with emphasis on economic and political life, institutions and organizations, people and culture, manners and customs. Taught in English.

**SCAN 2511-3. Introduction to Norwegian and Swedish Literature In Translation.** A comprehensive overview of Norwegian and Swedish literature with emphasis on the twentieth century. Taught in English.

### SWEDISH

**SWED 1010-5. Beginning Swedish 1.**

**SWED 1020-5. Beginning Swedish 2.**

**SWED 1900 (1-3). Independent Study.**

**SWED 2110-3. Second-Year Swedish Reading and Conversation 1.** Fulfills the Arts and Sciences language requirement for the B.A. and B.F.A. degrees.

**SWED 2120-3. Second-Year Swedish Reading and Conversation 2.** Satisfies the Graduate School language requirement for the Ph.D.

**SWED 2900 (1-3). Independent Study.**

**SWED 3900 (1-3). Independent Study.**

**SWED 4900 (1-3). Independent Study.**

### HISTORY

Note: for all 3000-level Readings courses, permission of the instructor is required. Preference for these courses is given to junior and senior History majors.

### Methodological and General

**HIST 1010-3. History of Western Civilization 1.**<sup>1</sup> A survey course on the development

of western civilization from its beginnings in the ancient near East to the time of the establishment of the first modern states in the seventeenth century.

**HIST 1020-3. History of Western Civilization 2.**<sup>1</sup> A survey course dealing with political, economic, social, and intellectual developments in European history from the seventeenth century to the present. Similarities and contrasts between European states are underscored, as is Europe's changing role in world history.

**HIST 1030-3. Honors: Western Civilization 1.** A thematic history of the Western world from the ancient Greeks to the beginnings of modern European society. Designed specifically for freshmen with advanced standing. Emphasis is on reading and discussion more than lectures. A student receiving credit for HIST 1010 may not receive credit for HIST 1030.

**HIST 1040-3. Honors: Western Civilization 2.** A history of the social, political, and cultural development of the Western world from the beginning of the Enlightenment to the present. Designed for freshmen with advanced standing. Emphasis is on reading and discussion. A student receiving credit for HIST 1020 may not receive credit for HIST 1040.

**HIST 2170-3. History of Christianity 1: To the Reformation.** A general introduction to the history of Christianity from its beginnings through the first period of the Protestant Reformation. Examines religious life and the church in relation to the social and cultural setting.

**HIST 2180-3. History of Christianity 2: From the Reformation.** A general introduction to the history of Christianity from the Reformation to the present. Examines religious life and the church in relation to the social and cultural setting.

**HIST 2840-variable credit. Independent Study.** Methodological and general history.

**HIST 3840-variable credit. Independent Study.** Methodological and general history.

**HIST 4110-3. Canada to 1867.** Canadian history from French colonization to the establishment of the Dominion in 1867. Main topics include French settlement, the French-English Wars, English rule and development of two conflicting societies, wars with the U.S., and growth of responsible government.

**HIST 4120-3. Canada Since 1867.** Canada's history from establishment of the Dominion to the present. Major developments emphasized are the growth of a sense of nationhood leading to a national sovereignty with multi-ethnic overtones, economic and cultural integration with the United States, and a new orientation in foreign policy away from Britain toward the United States.

**HIST 4840-3. Honors Seminar.** Practical historiography for students who wish to write a senior honors thesis. Emphasis is on the choice of topic, critical methods, research, organization, argumentation, and writing.

**HIST 4850-3. Honors Thesis.**

<sup>1</sup> Also available through correspondence study.

**HIST 5000-3. Historical Methods: Introduction to the Professional Study of History.** The purposes, materials, and techniques of historical scholarship. Theory, practice, and criticism.

**HIST 5010-3. Historiography: Introduction to the Professional Study of History.** Covers some of the major historiographical schools and concerns that have emerged during the course of the discipline's development in Europe and the United States.

**HIST 5020-3. Quantification in History.** An introduction to the range of applications of quantification techniques to the study of history. Includes historiography, theory, and practical applications.

**HIST 5050-3. Introduction to Historic Preservation.** An introduction to historic preservation programs and the techniques employed by private and public agencies at the local, state, and national levels to safeguard America's heritage.

**HIST 5060-3. Introduction to Archival Management: Lecture.** The evolution of archival and manuscript repositories and the methods employed to preserve and make available to researchers public and private records; covers the acquisition, arrangement, and description of records, and techniques for making them available for reference.

**HIST 5840-variable credit. Independent Study.** Methodological and general history.

**HIST 6050-3. Training in Historic Preservation.** Training in government agencies in the Denver area to give students opportunities for practical experience in various applications of historic preservation.

**HIST 6060-3. Training in Archival and Records Management Procedures.** Practical training in archival and records management through on-the-job experience in public and private archival and records management programs operative in the Denver area.

**HIST 6940-0. Master's Degree Candidate.**

**HIST 6950 (4-6). Master's Thesis.**

**HIST 7840-variable credit. Independent Study.** Methodological and general history.

**HIST 8990 (0-9). Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of this *Catalog*.

### Europe: Ancient and Medieval

**HIST 1051-3. The World of the Ancient Greeks.** (CLAS 1051.) A survey of the emergence, major accomplishments, and decline of the world of the ancient Greeks from the Bronze Age civilizations of the Minoans and Mycenaeans to the career of Alexander the Great.

**HIST 1061-3. The Rise and Fall of Ancient Rome.** (CLAS 1061.) A survey of ancient Roman history from the origins of the city to the decline of the Roman Empire in the Western Mediterranean and the emergence of the Byzantine Empire in the Eastern Mediterranean.

**HIST 2511-3. Culture and Institutions of the Middle Ages: Fourth to the Twelfth Century.** Political, institutional, and cultural history of Europe from the fourth to the twelfth centuries.

**HIST 2521-3. Culture and Institutions of the Middle Ages: Thirteenth to the Fifteenth Century.** Political, institutional, and cultural history of Europe from the thirteenth to the fifteenth centuries with particular attention to the disintegration of the medieval order resulting from the national state, the secularization of society, and the decline of the church.

**HIST 2841-variable credit. Independent Study.** Europe: Ancient and Medieval.

**HIST 3011-3. Selected Readings in Ancient History.**

**HIST 3511-3. Selected Readings in Medieval History.**

**HIST 3551-3. Research Seminar: Medieval History.**

**HIST 3841-variable credit. Independent Study.** Europe: Ancient and Medieval.

**HIST 4021-3. Athens and Greek Democracy.** See CLAS 4021.

**HIST 4031-3. Alexander and the Hellenistic World.** See CLAS 4031.

**HIST 4071-3. History of the Byzantine Empire.** (CLAS 4071.) Approaches Byzantium as the heir to the Greco-Roman tradition, paying considerable attention to the lines of continuity with the ancient past but recognizing discontinuity as well. Readings present a survey of Byzantine history and civilization.

**HIST 4081-3. The Roman Republic.** See CLAS 4081.

**HIST 4091-3. The Roman Empire.** (CLAS 4091.) A study of Imperial Roman history beginning with the Roman Revolution and ending with an examination of the passing of centralized political authority in the Western Mediterranean. Emphasis is on life, letters, and personalities of the empire.

**HIST 4511-3. Social Foundations of European Civilization.** The study of the social structures of Europe and their relationship to political, religious, and economic institutions A.D. 400-1500.

**HIST 4521-3. Intellectual History of Medieval Europe.** Changing theories and realities of the relationship between religious and secular elements of medieval civilization with particular emphasis on the evolution of the medieval empire and the culture of the universities and schools.

**HIST 4711-3. History of the Mediterranean World, 1099-1571.** An examination of Mediterranean civilizations from the First Crusade to the Battle of Lepanto. Topics include the Commercial Revolution, medieval colonization, the Byzantine and Ottoman states, shipping and navigation, and the "Atlantic threat." An equal treatment of the Eastern and Western Mediterranean.

**HIST 5841-variable credit. Independent Study.** Europe: Ancient and Medieval.

**HIST 6011-3. Readings in Ancient History.**

**HIST 6511-3. Readings in Medieval History.**

**HIST 7551-3. Seminar: Medieval History.**

**HIST 7841-variable credit. Independent Study.** Europe: Ancient and Medieval.

**HIST 8991-10. Doctor's Dissertation.**

## Europe: Modern

**HIST 2842-variable credit. Independent Study.** Europe: Modern.

**HIST 3012-3. Selected Readings in Modern European History.**

**HIST 3052-3. Research Seminar in Modern European History.**

**HIST 3112-3. Selected Readings in Renaissance and Reformation.**

**HIST 3212-3. Selected Readings in Early Modern Europe.**

**HIST 3842-variable credit. Independent Study.** Europe: Modern.

**HIST 4112-3. Venice and Florence in the Renaissance.** A comparative urban study of Florence and Venice from the thirteenth through the sixteenth centuries. The principal subjects are the distinctive economies of the cities, political developments, Renaissance humanism, patronage of the arts, and foreign policy.

**HIST 4122-3. Europe During the Renaissance.** Explores the history and culture of Western Europe, circa 1300-1520. Comprehensive in scope, with analysis of political, economic, social, religious, intellectual, and artistic matters. Discusses the significance of the Renaissance for the origins of modern civilization.

**HIST 4222-3. War and the European State, 1618-1793.** A study of the development of the European states in response to international power struggles in the seventeenth and eighteenth centuries (up to the French Revolution).

**HIST 4232-3. The Age of Reason, Montaigne to Voltaire.** A study of major European intellectual trends from the late sixteenth century through the Enlightenment.

**HIST 4312-3. Nineteenth-Century Europe.** Concerned with the major social, political, and cultural developments in Europe from circa 1800 to the outbreak of World War I. Special emphasis is placed upon the Napoleonic experience, the rise of modern nationalism, romanticism, Darwinism and its social applications, the Industrial Revolution, imperialism, the emergence of modern ideologies, and the background of World War I.

**HIST 4412-3. Twentieth-Century Europe.** Involved with European political, economic, and social institutions from WWI to the present, with emphasis on twentieth-century communism and fascism and developments in the western European democracies.

**HIST 5842-variable credit. Independent Study.** Europe: Modern.

**HIST 6012-3. Readings in Modern European History.**

**HIST 6112-3. Readings in Renaissance History.**

**HIST 6122-3. Readings in Sixteenth-Century History.**

**HIST 6212-3. Readings in Seventeenth-Century Europe.**

**HIST 7052-3. Seminar: Modern European History.**

**HIST 7162-3. Seminar: Reformation Europe.**

**HIST 7252-3. Seminar: Early Modern Europe, Sixteenth-Eighteenth Centuries.**

**HIST 7842-variable credit. Independent Study.** Europe: Modern.

## Europe: Specific Countries

**HIST 1113-3. The History of England 1.** Deals with the period from Roman time to the seventeenth century. Covered are social, political, and constitutional affairs which contributed to the creation of the English nation.

**HIST 1123-3. The History of England 2.** Deals with the period from the seventeenth century to the present. Political, economic, social, and imperial developments which contributed to the creation of the modern industrial and democratic state are the major issues covered.

**HIST 2433-3. Problems in German History: Nazi Germany.** Concerned with the origins of German National Socialism, with the rise of the National Socialist movement to power, and with Nazi social and racial policies.

**HIST 2843-variable credit. Independent Study.** Europe: Specific Countries.

**HIST 3113-3. Selected Readings in Early English History.**

**HIST 3153-3. Research Seminar: Early English History.**

**HIST 3713-3. Selected Readings in Russian History.**

**HIST 3753-3. Research Seminar: Russian History.**

**HIST 3843-variable credit. Independent Study.** Europe: Specific countries.

**HIST 4013-3. Constitutional and Legal History of England to 1485.** The origins and development of the legal and political institutions and concepts of England. Special reference and emphasis is accorded the implications of those developments to contemporary American and English systems.

**HIST 4033-3. Constitutional and Legal History of England, 1714-1832.** Deals with the emergence of the modern constitution in the wake of the Revolution of 1688 and the ensuing Revolutionary Settlement. Special attention given to the role of the aristocracy and the monarchy in the development of the mixed constitution of the Georgian Era.

**HIST 4043-3. Constitutional and Legal History of England, 1832-Present.** Covers the development of the constitution from the Reform Act of 1832 through the emergence of the administrative state. Topics include legal and administrative reform, the rise of parties and decline of the prerogative, and

the constitutional role of modern institutions of government.

**HIST 4063-3. Women in Victorian England.** (WMST 4063.) Examines changing roles, status of women in a period of expansion; impact of industrialization on working women, sexuality, family planning, expansion of women in education, politics and the professions, the single women crisis, and women's rights.

**HIST 4123-3. Medieval England.** Treats the major developments in English history from the Anglo-Saxon period through the fifteenth century. Emphasis is given to late medieval English society during the thirteenth, fourteenth, and fifteenth centuries.

**HIST 4133-3. Tudor England.** An examination of the Tudors and the developments (constitutional, political, imperial, and artistic) of Renaissance England under this remarkable dynasty.

**HIST 4143-3. Stuart England.** An examination of England in its age of greatest political crisis and hurried transformation from nearly absolute monarchy to a parliamentary oligarchical form of government.

**HIST 4153-3. England in the Age of Revolution, 1688-1832.** Deals with the major political, social, and economic events and movements between the accession of King James II and the passage of the Reform Act of 1832.

**HIST 4163-3. England in the Age of Collectivism, 1832-Present.** Deals with the major themes in political history: economic change, social and class developments, overseas empire, and foreign relations from the passage of the Reform Act of 1832 to the present.

**HIST 4223-3. French Revolution and Napoleon.** The causes of the French Revolution are analyzed. Covers in detail the basic political, economic, and social changes, and the legacy in Europe and the world of the French revolutionary and Napoleonic eras.

**HIST 4413-3. German History to 1849.** A cultural, political, and social history of Germany up to and including the revolutions of 1848. Particular emphasis placed upon the political history of Prussia and upon such cultural phenomena as German romanticism.

**HIST 4423-3. German History Since 1849.** A cultural, political, and social history of Germany since 1849. Particular emphasis placed upon German unification, Bismarckian foreign policy, the rise of neo-Romanticism, Weimar politics, and the rise of National Socialism.

**HIST 4613-3. History of East-Central Europe to 1815.** History of Eastern theocratic empires of Turks and Hapsburgs from the fifteenth to nineteenth centuries, the development of political consciousness of various peoples composing these empires, conflicts between Eastern theocracies and rising secularism of Western Europe, culminating with the Napoleonic Wars.

**HIST 4623-3. History of East-Central Europe Since 1815.** Problems connected with dissolution of East European empires at the end of WWI, the formation of the nation states, the viability of these states in the

twentieth century, and the restoration of the imperial order after WWII.

**HIST 4713-3. History of Russia Through the Seventeenth Century.**<sup>1</sup> The establishment and expansion of the Russian state and the development of the political, economic, and social machinery necessary to administer it. From ancient times to the reign of Peter the Great and the proclamation of a Russian empire.

**HIST 4723-3. Imperial Russia.**<sup>1</sup> A survey of the major cultural, social, and economic changes from the reign of Peter the Great through the first Russian revolution of 1905.

**HIST 4733-3. The Russian Revolution and the Soviet Regime.**<sup>1</sup> Soviet Russia from the February Revolution of 1917 to the fall of Khrushchev. Begins with a description of the early careers and ideas of Lenin, Trotsky, and Stalin, and thereafter covers in detail the significant domestic and international events.

**HIST 5843-variable credit. Independent Study.** Europe: Specific countries.

**HIST 6113-3. Readings in English History to 1714.**

**HIST 6123-3. Readings in English History Since 1688.**

**HIST 6413-3. Readings in Modern German History.**

**HIST 6613-3. Readings in History of East-Central Europe.**

**HIST 6723-3. Readings in Modern Russian History.**

**HIST 6733-3. The Russian Revolutionary Movement.**

**HIST 7153-3. Seminar: English History, 800-1688.**

**HIST 7163-3. Seminar: English History, 1688-Present.**

**HIST 7653-3. Seminar: East Central Europe.**

**HIST 7773-3. Seminar: Modern Russian History.**

**HIST 7843-variable credit. Independent Study.** Europe: Specific countries.

## Europe: Topical

**HIST 2114-3. Modern Warfare and Society Since the Eighteenth Century.** Examines the nature of Western warfare from Europe's Renaissance to the present. Emphasis placed upon the role of personality in the conduct of war, military plans and doctrines, and social and technological change.

**HIST 2844-variable credit. Independent Study.** Europe: Topical.

**HIST 3014-3. Selected Readings in Comparative European History.** Permission of instructor required. Preference given to junior and senior History majors.

**HIST 3054-3. Research Seminar: Comparative European History.**

**HIST 3414-3. Selected Readings in European Intellectual History.**

**HIST 3454-3. Research Seminar: European Intellectual History.**

**HIST 3844-variable credit. Independent Study.** Europe: Topical.

**HIST 4314-3. History of Science From the Ancients to Sir Isaac Newton.** A history of science from the Pre-Socratics to Isaac Newton, underscoring major intellectual themes in scientific thought and the historical context in which they developed.

**HIST 4414-3. European Intellectual History, 1750-1870.** Treats the major developments in European thought from the Enlightenment to Nietzsche. Special attention given to the individuals whose ideas have had the greatest influence on modern intellectual history, e.g., Rousseau, Hegel, Herder, Marx, Kierkegaard, Baudelaire, Darwin, and others.

**HIST 4424-3. European Intellectual History, 1870-Present.** Topics receiving particular emphasis: Nietzsche and the youth revolt against middle class society, the literary and artistic avant garde (Impressionism to Existentialism), the psychoanalytic movement, the European Right and Left, and Post WW II European thought.

**HIST 4434-3. Topics in European Thought to 1900.** Enables students to explore a historical theme in pre-1900 Western thought or culture. The theme (varied each semester) is explored in its social context and with reference to contemporary issues.

**HIST 4444-3. Topics in European Thought: Twentieth Century.** Focuses on a selected theme in the history of ideas since 1900. Topics vary each term but may include themes such as critical theory, European fascism, and contemporary developments in the philosophy of history.

**HIST 4614-3. Women and Society in Industrial Europe.** (WMST 4614.) Examines the impact of industrialization and related social change on women in modern European history. Topics include work, family, sexuality, and women in movements for social and political change.

**HIST 5844-variable credit. Independent Study.** Europe: Topical.

**HIST 6414-3. Readings in European Intellectual History.**

**HIST 7464-3. Seminar: European Intellectual History.**

**HIST 7844-variable credit. Independent Study.** Europe: Topical.

**HIST 8764-3. History of Economic Development.** See ECON 8764.

## United States: Chronological Periods

**HIST 1015-3. The United States to 1865.**<sup>1</sup> A survey of American history from the first settlement until the end of the Civil War.

**HIST 1025-3. The United States Since 1865.**<sup>1</sup> A survey of the social, economic, political, and cultural development of the United States from the close of the American Civil War to the present.

<sup>1</sup>Also available through correspondence study.

<sup>1</sup>Also available through correspondence study.



**HIST 1035-3. Honors: The United States to 1865.** A survey of American history from the first settlement until the end of the Civil War, taught for students with honors standing. Emphasizes reading and discussion of recent interpretations of the period; willingness to participate in class is necessary. A student receiving credit for HIST 1015 may not receive credit for HIST 1035.

**HIST 1045-3. Honors: The United States Since 1865.** A survey of American history from the Civil War to the present, taught for students with honors standing. Emphasizes reading and discussion of recent interpretations of the period; willingness to participate in class is necessary. A student receiving credit for HIST 1025 may not receive credit for HIST 1045.

**HIST 2845-variable credit. Independent Study.** United States: Chronological Periods.

**HIST 3115-3. Selected Readings in Early American History.**

**HIST 3155-3. Research Seminar: Early American History.**

**HIST 3415-3. Selected Readings in Recent American History.**

**HIST 3455-3. Research Seminar: Recent American History.**

**HIST 3845-variable credit. Independent Study.** United States: Chronological Periods.

**HIST 4115-3. British Colonial America, 1492-1689.** Study of the exploration, settlement, and early development of the British Colonies in North America from the perspective of the participants themselves: Indian, European, and African.

**HIST 4125-3. British Colonial America, 1690-1750.** The second part of a year-long sequence in early American history. Concentrates on the economic, social, cultural, and political processes underway in the British colonies of North America during the period between the Glorious Revolution and the French and Indian War. HIST 4115 is desirable but not a prerequisite.

**HIST 4215-3. The American Revolution.** An examination of the events leading to the War of Independence and the creation of the United States.

**HIST 4225-3. The New Nation: America, 1789-1828.** A history of the United States from George Washington's inauguration to the election of Andrew Jackson. Deals with the political, social, economic, and cultural currents in the life of postrevolutionary America.

**HIST 4235-3. Jacksonian America.** Focuses on the creation of the American party system and the political events that shaped it: sectionalism, slavery, moral reform, and the way the party system was destroyed.

**HIST 4315-3. Civil War and Reconstruction.** Describes the forces at work in the antebellum period that led to sectional warfare; the social, economic, and political changes effected by the war; the American agony of reconstruction; and the long-range results of that difficult era.

**HIST 4325-3. The Gilded Age.** Examines the social and economic changes which transformed American life during the years 1870-1900. Labor violence, agrarian protest, political corruption, and racial and ethnic conflict are some of the consequences of those changes.

**HIST 4415-3. United States History, 1900-1929.** History of the United States during the progressive years, 1900 to 1929, with emphasis on the social, economic, cultural and political evolution of the American people and the nation's role in world affairs.

**HIST 4425-3. United States History, 1929-1952: Lecture.** An examination of American history, 1929-1952, with attention to domestic and foreign policy issues. Emphasis placed upon the Great Depression, WWII, the Cold War, the Korean conflict, and the Truman administration's Fair Deal.

**HIST 4435-3. United States History, 1948 to the Present: Lecture.** Emphasis on the Eisenhower years, the New Frontier, the Great Society of the 1960s, American involvement in Vietnam and popular reaction to that conflict, the Nixon domestic and foreign policies, and the social and economic problems of the 1970s.

**HIST 5845-variable credit. Independent Study.** United States: Chronological Periods.

**HIST 6115-3. Readings in American Colonial History.**

**HIST 6325-3. Readings in United States History, 1870-1900.**

**HIST 6425-3. Readings in United States History, 1929-1952.**

**HIST 6435-3. Readings in United States History, 1948-Present.**

**HIST 7155-3. Seminar: Early American History.**

**HIST 7475-3. Seminar: United States History, 1929-1952.**

**HIST 7485-3. Seminar: United States History, 1948-Present.**

**HIST 7845-variable credit. Independent Study.** United States: Chronological Periods.

## United States: Topical Courses I

**HIST 2616-3. History of Women in the United States to 1890.** (WMST 2616.) Designed as a survey of recent scholarship in the field of women's history. Discussion focuses on the structure of gender in America from the seventeenth through nineteenth centuries. Topics for analysis include prescribed ideals of womanhood, public and private roles, the nature and meaning of marriage, family, sexuality, and work across race, class, and time.

**HIST 2626-3. History of Women in the United States from 1890 to Present.** (WMST 2626.) Designed as a survey of recent scholarship in the field of women's history. Discussion focuses on the structure of gender in America in the twentieth century. Topics for analysis include prescribed ideals of womanhood, public and private roles, the nature

and meaning of marriage, family, sexuality, and work across race, class, and time.

**HIST 2846-variable credit. Independent Study.** United States: Topical Courses I.

**HIST 3116-3. Selected Readings in American Diplomatic History.**

**HIST 3156-3. Research Seminar: American Diplomatic History.**

**HIST 3416-3. Selected Readings in American Society and Thought.**

**HIST 3846-variable credit. Independent Study.** United States: Topical Courses I.

**HIST 4116-3. Diplomatic History of the United States to 1920.<sup>1</sup>** Traces the rise of the United States from the status of a weak new nation to that of an imperial world power with interests everywhere.

**HIST 4126-3. Diplomatic History of the United States Since 1920.<sup>1</sup>** Traces the rise of the United States to a position of dominance from 1900 until the present. Not only describes the events of diplomatic history but seeks to explain the economic, social, and intellectual roots of foreign policy.

**HIST 4146-3. Military History: Lecture.** An examination of America's national defense and war efforts from the Spanish American War to the present, with emphasis on the causes and consequences of modern conflicts.

**HIST 4326-3. Twentieth-Century American Intellectual History.** Traces the transit of American ideas from turn-of-the-century reformism to the neo-conservatism of the 1980s. Special attention is given to the interaction of social change, political power, and intellectual life.

**HIST 4516-3. American Society and Thought to 1865.** Concerned with the American family and community in different social environments. Examines families of different ethnic, religious, and class backgrounds, observing how they are changed by the passage of time, new economic conditions, or new political institutions.

**HIST 4526-3. American Society and Thought Since 1865.** Primarily concerned with family roles and community values, and how they are altered by economic, demographic, and intellectual changes. Some of the most important themes are acculturation, changing occupational opportunity, the idea of success, and popular culture.

**HIST 4536-3. Popular Culture in America to 1900.** A study of the cultural predispositions of the people as contrasted with high culture in America. Popular arts, literature, music, folklore, sports, psychology, religion, and science are covered.

**HIST 4546-3. Popular Culture in America: The Twentieth Century.** Continuation of HIST 4536.

**HIST 4556-3. History of Urban America.** Examines the growth of American cities and urban lifestyles from the eighteenth century to the present. Compares the role of cities, their structure and problems, during three

<sup>1</sup>Also available through correspondence study.

stages of growth—commercial, industrial, and modern.

**HIST 4566-3. United States Labor History Since the Industrial Revolution.** Traces the development of an industrial labor force in the United States and focuses on gender, ethnicity, and class. The three major themes covered are the transformation of the organization of work, the everyday lives of workers, and the role of the government.

**HIST 4576-3. United States Immigration History, 1815-Present.** Covers four major waves of immigration to the United States and places them within the larger context of global population movements. Focuses on the lives of immigrants and how they were affected by economic and social developments of the period.

**HIST 5846-variable credit. Independent Study.** United States: Topical Courses I.

**HIST 6116-3. Readings in American Diplomatic History.**

**HIST 6516-3. Readings in United States Society and Thought.**

**HIST 6526-3. Readings in the History of Urban America.**

**HIST 6536-3. Readings in International Labor Migration History, 1900-Present.**

**HIST 6616-3. Readings in the History of American Women.**

**HIST 7156-3. Seminar: American Diplomatic History.**

**HIST 7556-3. Seminar: American Society and Thought.**

**HIST 7566-3. Seminar: History of Urban America.**

**HIST 7656-3. Seminar: Women's History.**

**HIST 7846-variable credit. Independent Study.** United States: Topical Courses I.

## United States: Topical Courses II

**HIST 2117-3. History of Colorado.**<sup>1</sup> Emphasizes the historical variety and ethnic diversity of Colorado. Along with traditional themes in Colorado history, such as the gold rush, attention is given to Indian and Hispanic activity and culture.

**HIST 2417-3. Afro-American History 1.** Survey of the history of Afro-Americans. Study, interpretation, and analysis of major problems, issues, and trends affecting Blacks from pre-slavery to the present.

**HIST 2427-3. Afro-American History 2.** Continuation of HIST 2417.

**HIST 2517-3. Chicano History to 1848.** (CHST 2517.) Introduction to the historical developments of Chicano society and thought from the pre-Columbian period to 1848.

**HIST 2527-3. Chicano History: 1848 to Present.** (CHST 2527.) Introduction to the historical development of Chicano society and thought from 1848 to the present.

**HIST 2717-3. Asian-American History.** An introductory-level survey of the social history of Asians in America from the nineteenth century to the present. The primary focus is on delineating and explaining the changes that Asian Americans, one of the most visible ethnic groups in our society, have undergone since their arrival in the United States.

**HIST 2847-variable credit. Independent Study.** United States: Topical Courses II.

**HIST 3317-3. Selected Readings in the American West.**

**HIST 3357-3. Research Seminar: The American West.**

**HIST 3417-3. Selected Readings in Afro-American History.**

**HIST 3847-variable credit. Independent Study.** United States: Topical Courses II.

**HIST 4217-3. The Early American Frontier.**<sup>1</sup> Examination of the westward movement from the colonial period through 1850 in the region east of the Mississippi, with major stress on unique problems of societies on the successive frontiers and their relationship to the determination of national policies.

**HIST 4227-3. The Later American Frontier.**<sup>1</sup> Deals primarily with the Trans-Mississippi west during the nineteenth century, the westward advance of various frontiers, and their influence upon national development. Emphasis upon the economic factors and the associated cultural and social growth of the region.

**HIST 4327-3. The American Southwest.** Focusing on the region's three main peoples (Indian, Hispanic, and Anglo), this course emphasizes the dynamics of interethnic relations. Indian migrations, Spanish conquest and Indian response, Mexican-Indian interaction, and Anglo domination are some of the themes discussed.

**HIST 4617-3. The Indian in American History: The Eastern Region.** Pre-European social and cultural developments, longevity, and continuity of human history in North America is explored. By examining the ways in which Indian societies east of the Mississippi River responded to Euro-Americans, the Indian's roles in eastern North American history are demonstrated.

**HIST 4627-3. The Indian in American History: The Western Region.** By discussing pre-European social and cultural developments, the longevity and continuity of human history in North America is explored. By examining the ways in which Indian societies west of the Mississippi River responded to Euro-Americans, the Indian's role in western North American history is demonstrated.

**HIST 5847-variable credit. Independent Study.** United States: Topical Courses II.

**HIST 6317-3. Readings in the American West.**

**HIST 7257-3. Seminar: History of the American Frontier.**

**HIST 7847-variable credit. Independent Study.** United States: Topical Courses II.

## Third World: Specific Regions

**HIST 1038-3. Introduction to Latin American History.** A broad survey of the history of that part of the Western hemisphere now known as Latin America. Chronologically covers the pre-historical period to the present. Provides an understanding of the relationship of Latin America to the Western world, and is concerned with Latin American social and political development.

**HIST 1208-3. Introduction to African History.** Introduces the student to African civilization and to its historical evolution from the dawn of humanity to the present. Topics include social patterns, economic structure, and religious and political systems. The latter part of the course considers the impact the Atlantic and East African Slave Trade had on societies as well as colonialism.

**HIST 1308-3. Introduction to Middle Eastern History.** An interdisciplinary course that focuses on the medieval and modern history of the Middle East (circa 600 CE to the present). Provides an introduction to the Islamic civilization of the Middle East and to the historical evolution of the region from the traditional into the modern eras. Covers social patterns, economic life, and intellectual trends, as well as political development.

**HIST 1408-3. Introduction to Indian History.** An introduction to the origins of the civilization of India and to the historical evolution of India from tradition to modernity. Addresses social, economic, political, artistic, and religious patterns.

**HIST 1608-3. Introduction to Chinese History.** Introduces the student to Chinese civilization and to its historical evolution, from the neolithic period to the present. Focuses on such subjects as social patterns, economic structure, and intellectual trends, as well as political developments. In addition, the latter part of the semester involves such issues as the impact of imperialism, the significance of nationalism, and the emergence of revolution.

**HIST 1708-3. Introduction to Japanese History.** An introduction to the origins of Japan and to the historical evolution of Japan from tradition to modernity. Addresses social, economic, religious, political, artistic, and intellectual patterns, and the process of modernization in Asia's most successful modern power.

**HIST 2718-3. History of Japan Through Cinema.** (FILM 2711.) Commercial feature-length films are used as a vehicle for looking at different chronological periods and understanding life and times. The films of Karosawa, Mizaguchi, Ozu, and other leading directors are featured.

**HIST 2848-variable credit. Independent Study.** Third World: Specific Regions.

**HIST 3018-3. Selected Readings in Latin American History.**

**HIST 3628-3. Selected Readings in Recent Chinese History.**

**HIST 3718-3. Selected Readings in Japanese History.**

<sup>1</sup>Also available through correspondence study.

**HIST 3848-variable credit. Independent Study.** Third World: Specific Regions.

**HIST 4118-3. History of Mexico to 1821.** Study of Mexican history beginning with the roots and evolution of Pre-Columbian civilizations and concluding with the gaining of Mexican Independence in 1821. Emphasis on the society and culture of the Aztecs and Mayans, the Spanish conquest of Mexico, and the colonial regime of New Spain.

**HIST 4128-3. The Emergence of Modern Mexico.** Study of Mexican history continues with the establishment of independence in 1821, examines the upheavals of the Mexican Revolution, and culminates with recent events in Mexico.

**HIST 4218-3. History of West Africa.** Examines the history of West Africa from earliest times through the era of European imperialism to the contemporary era of independence.

**HIST 4238-3. History of Southern Africa Since 1800.** Examines the history of Southern Africa. Special emphasis placed on the history of South Africa. Focuses on the decline of white rule and the region's strategic importance.

**HIST 4318-3. The Medieval Middle East, A.D. 500-1600.** An examination of Islam from 600 to the early modern period. Attention is divided equally between Arab, Iranian, and Turkish political and economic history, and the arts and sciences characteristic of the civilization of Islam (theology, philosophy, mysticism, etc.).

**HIST 4328-3. The Modern Middle East, 1600 to the Present.** Primarily from 1800 to the present. Attention is divided equally between political history and international relations in the region and patterns of economic, social, and cultural modernization in the main countries of the region.

**HIST 4338-3. The Arab-Israeli Problem.** An examination of the clash between modern Jewish and modern Arab nationalism over the area of Palestine/Israel since the late 1800s. Concludes with a simulation exercise in which the students work through a hypothetical crisis.

**HIST 4428-3. History of Modern India.** An examination of the history of modern India. Covers such major themes as Mogul rule, the British Raj, the growth of nationalism, and the independence struggle.

**HIST 4618-3. History of Traditional China.** An examination of major traditions in philosophy, art, politics, society, and economy of China during the premodern period.

**HIST 4628-3. Rise of Revolutionary China.** An examination of political, social, and economic events in China since 1750.

**HIST 4648-3. History of Modern Chinese Intellectual Thought.** An examination of the major intellectual movements in modern China from Ch'ing Neo-Confucianism, empiricism, nationalism, to Chinese communism.

**HIST 4718-3. Ancient and Medieval Japanese History.** Beginning with the long prehistoric and protohistoric period, the course continues into the age of the bureaucratic state, then focuses on Japan's exceptionally

long feudal experience which brought Japan to the Meiji Restoration of 1868.

**HIST 4728-3. Modern Japanese History.** Begins with early modern Japan in the late feudal period, proceeds into the spectacular and rapid modernization of the Meiji era, including Japan's prewar experience of democracy and peaceful diplomacy, and concludes with WWII and postwar reforms.

**HIST 4738-3. Japan at War.** History of Japan at war from the feudal period through World War II, with emphasis on the twentieth century.

**HIST 4748-3. Modern Japanese Intellectual History.** Explores salient issues in modern intellectual history in Japan and examines such themes as the debate over opening Japan, the Meiji Enlightenment, the high tide of liberal democracy, the socialist solution, the rise of feminist consciousness, ultranationalism, Pan-Asianism, existentialism, Japanese Christianity, and pacifism.

**HIST 5848-variable credit. Independent Study.** Third World: Specific Regions.

**HIST 6018-3. Readings in Latin American Colonial History.**

**HIST 6318-3. Readings in Middle Eastern History.**

**HIST 6618-3. Readings in Chinese History.**

**HIST 6718-3. Readings in Modern Japanese History.**

**HIST 7848-variable credit. Independent Study.** Third World: Specific Regions.

### Third World: Comprehensive and General

**HIST 1009-3. Introduction to Third World History.** Focuses on the modern history of Asia and Africa (circa 1500 to the present). The first half of the course deals with the creation of the "Third World" in the early modern period and the impact of European imperialism upon it. The second half deals with political, economic, and social problems in the twentieth century Third World.

**HIST 2849-variable credit. Independent Study.** Third World: Comprehensive and General.

**HIST 3019-3. Selected Readings in Asian and African History.**

**HIST 3849-variable credit. Independent Study.** Third World: Comprehensive and General.

**HIST 4019-3. Comparative World History to 1500.** The first half of a two-semester course on comparative world history. Systematically compares and contrasts central aspects of the society, politics, economy, and ideas of different civilizations in the premodern era.

**HIST 4029-3. Comparative World History Since 1500.** The second half of a two-semester course on comparative world history. Systematically compares and contrasts central aspects of the society, politics, economy, and ideas of different civilizations in the modern era.

**HIST 4619-3. Women in Asian History.** (WMST 4619.) A consideration of major issues affecting Asian women throughout history, focusing on aspects of development as they affect women: traditional roles and ideals, the family, colonialism, nationalism, education, the industrial revolution, and the impact of technological change and aid programs.

**HIST 5849-variable credit. Independent Study.** Third World: Comprehensive and General.

**HIST 6019-3. Readings in Third World History.**

**HIST 6329-3. Readings in Comparative Ethnohistory.**

**HIST 7849-variable credit. Independent Study.** Third World: Comprehensive and General.

## HUMANITIES

**HUMN 1010-6. Introduction to the Humanities 1.** Six meetings a week (three discussion classes, three lecture-demonstrations in art and music). Analytical and comparative study of works in literature, philosophy, music, and the visual arts. From Aegean to Baroque eras, emphasizing structure, content, and style in specific examples.

**HUMN 1020-6. Introduction to the Humanities 2.** Continuation of HUMN 1010. From Baroque to contemporary styles. Credit cannot be received for both HUMN 1010-1020 and ENGL 2600-2610.

**HUMN 3000-3. Images of the Twentieth Century.** An interdisciplinary study built around the tension between conflicting attitudes toward the work of art in the twentieth century: art for art's sake, or art engagé. In each of four different art forms (literature, film, painting, music), students study works which assume one or the other, or both, of these polarities. Team-taught.

**HUMN 4160-3. Myth in the Arts.** (CLAS 4160/5160.) A study of representative myths in the art, music, and literature of the ancient and modern worlds. It is recommended that students first take HUMN 1010-1020, or CLAS 1100.

**HUMN 4840 (1-3). Independent Study.**

**HUMN 3051-3. Film History 1.** (FILM 3051.) Follows film's historical and aesthetic growth by viewing silent and early sound films (half of the films shown are silents). Genres studied include documentaries, experimental films, and classic Russian, German, French, and American films made before 1940.

**HUMN 3061-3. Film History 2.** (FILM 3061.) Starts with the late 1930s and early 1940s films of Renoir, Welles, Cocteau, and Hitchcock and follows the historical growth and evolution of film aesthetics to the present. Neo-realist, French New Wave, and recent experimental films are studied.

**HUMN 4082-3. Period Studies.**

**HUMN 4092-3. Period Studies.**

**HUMN 4102-3. Studies in Humanities.**

**HUMN 4122-3. Period Studies.** Focuses on the literature, art, and music of a particular period or movement.

**HUMN 3033-3. The Comic Sense.** An interdisciplinary approach to comedy, examining art, music, literature, and film from different periods. Comic theory interlaced with the study of particular works.

**HUMN 3043-3. The Tragic Sense.** A study of some of the great tragic works of art, music, and literature from the Greeks to the twentieth century. Tragic theory invoked as an aid to interpretation.

**HUMN 4003-3. Film and Fiction.** (FILM 4003.) Explores the similarities and differences between literature and film as narrative arts. Several novels, short stories, and plays and the films made from them are studied. Problems in point of view, manipulation of time, tone, structure, and setting are examined.

**HUMN 4013-3. Narrative in the Arts.** Explores the nature of narrative, its forms of presentation in literature, film, dance, art, and music; verbal and nonverbal modes of relating a story with consideration of the importance of fictional and documentary narrative.

**HUMN 4093-3. Studies in Humanities.**

**HUMN 4004-3. Film Theory.** (FILM 4004.)

**HUMN 4155-3. The Legacy of Humanism.** Examines the traditions of humanism from Erasmus to the present day. The concepts of man shared by Petrarch, Erasmus and More, Shakespeare and Milton, Newman and Whitehead are examined closely.

**HUMN 4825-3. Law and Literature.** Exploration of law as theme and structure from *Antigone* and Utopia to modern fiction, plus readings in legal materials.

## KINESIOLOGY

See also courses listed under Physical Education.

**KINE 1010-2. Introduction to Kinesiology.** An introduction to the scientific foundation of kinesiology (the study of human movement and performance). Includes the historical and philosophical development of the discipline and introduces students to its many facets including exercise physiology, motor behavior, and social psychological aspects of human function.

**KINE 2840-variable credit. Elective Activity.** Only by consent of Departmental Chair.

**KINE 2910 (1-3). Practicum in Kinesiology.** Practical experience in organized situations with direct supervision. Prereq., instructor consent.

**KINE 3200-3. Sport and American Society.** Introduction to sport as one of the most pervasive human activities in America. Relationship of sport to various social institutions and processes. A multidisciplinary approach to subject matter taken from physical education, sociology, psychology, American literature, religious studies, and anthropology.

**KINE 3230-3. Health and Physiological Values of Exercise.** Physiological adaptations to

exercise with consideration of the biophysical values of exercise in maintaining fitness and health throughout an individual's life span.

**KINE 3420-3. Nutrition and Health.** The basic principles of nutrition and their relationship to health. Students may not receive credit for both KINE 3420 and PSYC 2062.

**KINE 3500-3. Human Development and Movement Behavior.** The study of changes in motor behavior and skill performance across the life span; factors affecting such changes including physical growth and physiological changes, perceptual change, cognitive change, socio-cultural practices and interventions. Prereqs., PHED 2790 and 2800, or EPOB 3420 and 3430.

**KINE 3710-3. Psychosocial Aspects of Exercise, Sport, and Physical Activity.** Examines theoretical concepts and current research concerning psychological phenomena as they relate to motor performance, exercise, and sport. Topics include a scientific approach to studying movement behavior, arousal, anxiety, personality, group dynamics, modeling, efficacy, and exercise adherence. Prereqs., KINE 1010 and PSYC 1001.

**KINE 3720-3. Motor Learning and Performance.** An introduction to theories of perceptual motor learning and variables affecting motor performance; laboratory sessions and individual research projects are required. Prereqs., KINE 1010, PSYC 1001, and either PHED 2790 or EPOB 3420.

**KINE 4450-3. Disabilities and Motor Development.** Survey of orthopedic and perceptual motor conditions encountered within the realm of special physical education, suggested screening, and corrective procedures. Prereq., PHED 2790 or EPOB 3420.

**KINE 4460-3. Prevention and Management of Sports Injuries 1.** Application of activity science concepts to sports injury prevention. Techniques of basic evaluation and treatment of injuries common to organized and recreational sport. Prereq., PHED 2790 or EPOB 3420.

**KINE 4480-3. Perspectives on Aging.** Designed to create an awareness of aging as a developmental process and to foster an understanding of the older person in a changing social milieu. Physiological, psychological, and sociological aspects of aging are examined. Prereq., KINE 1010.

**KINE 4540-4. Analysis of Human Movement.** The biomechanical and anatomical concepts serving as a basis for analysis of movement are studied. In addition, the applications of these principles to work, general physical activity, sports performance, and physical medicine are presented. Prereq., PHED 2790 or EPOB 3420.

**KINE 4650-3. Exercise Physiology.** Examines the physiological adjustments that occur in selected organ systems with acute and chronic exercise. Topics center on the physiological mechanisms pertaining to metabolic, cardiovascular, respiratory, and hormonal alterations. Prereqs., PHED 2790 and 2800, or EPOB 3420 and 3430.

**KINE 4660-3. Selected Topics in Exercise Physiology.** Covers specific exercise physiology topics such as cellular cause of fatigue and muscle soreness, heart disease, diabetes, aging, training adaptations, ergogenic aids, and excitation-contraction of muscles. Prereq., KINE 4650.

**KINE 4670/5670-3. Exercise Science Laboratory Techniques.** Laboratory procedures and biomedical instrumentation pertinent to measuring and evaluating human performance. Prereq. or coreq., KINE 4650.

**KINE 4680/5680-3. Exercise Management.** Lectures and practical experiences in delivery principles and practices for wellness programs. Application of physiological and biomechanical principles to normal and clinical populations is presented. Prereqs., KINE 4540 and 4650.

**KINE 4700-3. Introduction to Research in Kinesiology.** An introduction to types of research, the methods for accomplishing research, and the skills necessary to complete research in the fields of health, physical education, and recreation. Prereq., KINE 1010.

**KINE 4850 (1-3). Independent Study: Physical Therapy.**

**KINE 4860 (1-3). Independent Study: Undergraduate.**

**KINE 4930 (1-6). Internship.** Opportunity for field/laboratory work in a variety of different settings. Consult with faculty for approval.

**KINE 5010, 5020, 5030 (1-3). Semiar.** Presentation of special topics in physical education, kinesiology, or sport.

**KINE 5140-3. Current Trends in Teaching Physical Education.** An examination of current trends in teaching physical education at all levels. Prereq., PHED 4170 or 4580.

**KINE 5520-3. Seminar: Physical Growth and Motor Development.** Examination of current literature pertaining to changes in motor behavior and skill performance. Prereq., KINE 3500.

**KINE 5550-3. Biochemical Basis of Exercise.** An examination of the underlying biochemical mechanisms that are responsible for the physiological adaptations to short- and long-term dynamic exercise. Prereq., one year of chemistry.

**KINE 5600-3. Physiological Basis for Physical Activity.** Examines the immediate and long range adaptations of the body to exercise, and the adjustment of selected body systems to the stress of physical activity. Prereqs., KINE 4650 and EPOB 3430.

**KINE 5620-3. Prevention and Management of Sports Injuries 2.** Lectures and laboratory presentations relative to physical aspects of sports training, rehabilitation, nutrition, prevention, evaluation, and injury management. The medical aspects of sport are emphasized. Prereq., KINE 4460.

**KINE 5630-3. Sports Medicine.** Investigation and demonstration of applied exercise physiology, medicine, biopsychology, and other related disciplines contributing to the assessment and improvement of human physical performance. Prereqs., KINE

4650 and EPOB 3430 (or equivalent) and college anatomy.

**KINE 5640-2. Clinical and Exercise Electrocardiography.** Involves lectures and laboratory practice in the recognition and evaluation of normal and pathological electrical activity of the heart as demonstrated by the electrocardiogram. Intended to prepare graduate students who will monitor laboratory physiological testing and/or prescriptive exercise programs in laboratory settings. Prereqs., KINE 4650 and EPOB 3430.

**KINE 5650-3. Clinical Aspects of Exercise in Health and Disease.** An assessment of the use of exercise as a tool for preventive medicine and rehabilitation from disease. Includes exercise evaluation, exercise prescription, and cardiac rehabilitation.

**KINE 5660-3. Human Performance Laboratory Techniques.** Laboratory procedures and biomedical instrumentation pertinent to human performance and muscle biology laboratories are presented through lecture and laboratory participation. Prereq. or coreq., KINE 5600.

**KINE 5700-3. Sociological Basis of Sport.** An examination of the interrelationships between human movement and sociocultural variables, with emphasis on the social structure and dynamics of sport groups.

**KINE 5710-3. Advanced Laboratory Techniques in Motor Behavior.** Focuses on the acquisition and analysis of biokinetic signals associated with human movement, including kinetic and kinematic data. Laboratory and individual research projects required. Prereq., KINE 3720 or instructor consent.

**KINE 5720-3. Motor Learning.** Presumes a background in learning theory. Critical analysis of theories and conditions affecting motor learning and modification of performance. Laboratory sessions and individual research projects required. Prereq., KINE 3720.

**KINE 5750-3. Psychology of Sport.** Examines psychological factors as they relate to motor performance, exercise, and sport. Current theoretical concepts and research are examined. Prereq., KINE 3710.

**KINE 5790-3. Psychological Basis for Human Performance.** An advanced course dealing in depth with specialized topics relevant to motor performance, exercise, and sport. Critical analysis of theories and research. Discussion, evaluation, and pursuit of research interests and projects of students and faculty. Prereq., KINE 3710 or 3720.

**KINE 5800-3. Historical Basis of Sport and Physical Activity.** A cultural, historical development of sport and exercise in ancient societies with emphasis on the development in America from the colonial period to the current era.

**KINE 5810-3. Philosophical Basis of Sport and Physical Activity.** A analysis of the various schools of philosophic thought and their influence on the meanings inherent in sport and physical activity.

**KINE 5820-3. Interpretation of the Values of Physical Activity.** Identification, analysis, and interpretation of the values of human

movement and physical activity in contemporary society.

**KINE 5830-3. Applications of Statistics to Kinesiology.** Considerations of descriptive, inferential, and correlational statistics and how they apply specifically to health, physical education, and recreation data. Introduction to related computer programs. Prereq., PHED 4290 or KINE 4700.

**KINE 5840 (1-3). Independent Study (Graduate).**

**KINE 6010, 6020 (1-3). Seminar.** Presentation of special topics in physical education, kinesiology, or sport.

**KINE 6200-3. Administration of Physical Education and Athletics.** Affords an examination and analysis of modern administrative practices in physical education and athletics. Current problems of the teacher, coach, and administrator are reviewed in the context of administration and management.

**KINE 6400-3. Special Physical Education.** Advanced theoretical and applied studies in physical education for individuals with chronic and permanent disabilities and individuals with developmental disabilities; perceptual motor learning theories and the exceptional child; organization and administration; diagnostic and prescriptive techniques; implications of federal and state law; applied behavior analysis; and mainstreaming techniques. Prereq., PHED 3460.

**KINE 6620-3. Current Topics in Exercise Science.** A presentation and evaluation of relevant issues in the field of exercise science; conducted in a seminar format. Prereq., KINE 5600.

**KINE 6830-3. Methods of Research in Kinesiology.** Focus is on the delineation of research problems, types of research, design of experiments, specific research procedures and tools, and instruction in preparation of proposals, research papers, and theses. Prereq., KINE 5830.

**KINE 6840 (1-3). Research Project.** Scholarly investigation of a selected topic utilizing literature and/or experimental techniques. Advisor required.

**KINE 6940-3. Master's Degree Candidate.**

**KINE 6950 (1-6). Master's Thesis.**

For the listing of Physical Education (PHED) courses, see page 287.

## LATIN AMERICAN STUDIES

### Interdisciplinary Study

**LAMS 3804-3. Seminar in Latin American Studies.**

**LAMS 4854 (1-3). Independent Study.**

### Latin American Culture

**LAMS 4815-3. Senior Seminar in Latin American Studies.**

## LINGUISTICS

**LING 1000-3. Language.** A nontechnical exploration of human language for the general citizen. Emphasis on the basics of how language works, the creative aspects of language, and the languages of America today.

**LING 1500-3. Basic Traditional Grammar.** Presents the fundamentals of grammar in the Western tradition. Emphasis is on making the concepts and uses of grammar (as exemplified in English and closely related foreign languages) understandable to the nonspecialist.

**LING 2000-3. Introduction to Linguistics.** An introduction to the study of languages as structural systems. Principles of sound patterns, word formation, meaning, and sentence structure. Some attention to language acquisition, psycholinguistics, language families, dialects, historical change in languages, and different language types.

**LING 2110-3. Writing Systems of the World.** An overview of the structural features of human languages and a review of the different ways these features are represented in selected ancient and modern writing systems.

**LING 2200-3. Language in its Social Context.** Students explore the relation of language to society. Varieties of language are described, and the relationship between social class, ethnic group, gender, etc., and language is discussed. The view that language is a means of social interaction is developed.

**LING 2800-variable credit. Special Topics in Linguistics.** Intensive study of a selected area or problem in linguistics.

**LING 2900 (1-3). Independent Study.**

**LING 3430-3. Semantics.** Theoretical and practical study of meaning in natural language. Both semantic theories and semantic phenomena from diverse languages are considered. Does not treat techniques for improving the use of language.

**LING 3500-3. Language and the Public Interest.** A study of language in public and private use, with concentration on semantic devices as found in the language of political propaganda, advertising, business, and government, as well as in the everyday use of language between and among people.

**LING 3800-variable credit. Special Topics in Linguistics.** Intensive study of a selected area or problem in linguistics.

**LING 4030/5030-3. Linguistic Phonetics.** Introduction to the practical and theoretical aspects of phonetics. Training in recognition and production of speech sounds, lectures on the fundamentals of articulatory, acoustic, and auditory phonetics. Visits to the sound laboratory.

**LING 4220-3. Psycholinguistics.** (PSYC 4220.) Study of the processes of perceiving speech and interpreting it as meaningful and of expressing intentions to communicate as utterances. The roles of the brain and of

perceptual and motor systems are emphasized. Writing, gestural, and animal communicative systems are also treated. Prereqs., LING 2000 and PSYC 1001.

**LING 4240/5240-3. Survey of the History of Linguistics.** Historical survey of views on language, and examination of linguistic thought in all historical periods from Panini to de Saussure.

**LING 4410/5410-3. Phonology.** Treats the study of sound systems of language. Introduces both the principles of organization of sound systems and the major kinds of phonological structures found worldwide. Extensive practice in applying phonological principles to data analysis is provided. Prereqs., LING 2000 and 4030.

**LING 4420/5420-3. Morphology and Syntax.** Introduces the principles of word formation and sentence structure. Covers major morphological and syntactic structures found in the world's languages, and methods for describing grammatical structures, and includes practice in analyzing data from a variety of languages. Prereq., LING 2000.

**LING 4560-3. Language Development.** (CDSS/PSYC 4560.) Emphasizes the acquisition of language by young children; development in later years and into adulthood is also treated. Particular attention is given to the roles of environment and of neurophysiological endowment in learning to communicate with words, sentences, and narratives. Prereqs., LING 2000 and PSYC 1001.

**LING 4570/5570-3. Introduction to Diachronic Linguistics.** Designed to familiarize the student with the terminology, methods, and theories dealing with phenomena of language change through time. Prereqs., LING 4410 and 4420.

**LING 4610/5610-3. English Structure for Teachers of English to Speakers of Other Languages.** Description of the morphological and syntactic categories and structures of English. Prereq., LING 2000 or graduate standing.

**LING 4810-3. Senior Seminar in Linguistics.** Topics offered in the senior seminar vary from year to year, depending on interest of faculty and prospective students. Offerings are at an intermediate level of difficulty.

**LING 4830-3. Honors Thesis.** Required for students who elect departmental honors. Students write an honors thesis based on independent research under the direction of a faculty member.

**LING 4900 (1-3.) Independent Study.**

**LING 5200-3. Teaching Linguistics.** Students prepare for teaching introductory linguistics courses by review of background, readings, preparation of course materials, and supervised practice in instruction. May not be applied toward the M.A. or Ph.D.

**LING 5430-3. Semantics and Pragmatics.** Explores the fundamental concepts of semantics and pragmatics, including theories of communication and meaning representation, conversational implicatures, speech acts, and discourse structure. Prereq., LING 5420 or consent of instructor.

**LING 5450-3. Formal Grammar.** An introduction to the use of formal models of grammar in the study of language. Emphasis is on the claims, assumptions, and consequences of a particular formal system such as GPSG, Montague grammar, or government and binding theory. Prereq., LING 5420 or consent of instructor; LING 5430 is recommended.

**LING 5900 (1-3.) Independent Study.**

**LING 6940-0. Master's Degree Candidate.**

**LING 6950 (4-6.) Master's Thesis.**

**LING 7000-3. Methods of Typological Research.** Research practicum that provides experience in discovering generalizations about language from observations over a sample of individual languages. Students practice the steps in such research from formulation of research questions to presentation of results under close faculty supervision. Prereqs., LING 5410, 5420, and 5570 or equivalent.

**LING 7100-3. Field Methods 1.** Introduction to the process of obtaining language data directly from a speaker, analysis of the data, discovery of the structure of a language from data obtained directly from its speakers. Emphasis is on effectiveness in the field context, rapid recognition of structural features, and preliminary formulation using computational tools. Prereqs., LING 5410 and 5420.

**LING 7110-3. Field Methods 2.** Continuation of LING 7100. Students continue field investigation of the same language, further applying the techniques introduced in LING 7100, but are expected to undertake a deeper analysis of one aspect of the structure of the language. Prereq., LING 7100.

**LING 7410-3. Phonological Theory.** Phonetic and (morpho-) phonological representations: distinctive features, segments, prosodic structures, morphological structures. Phonological processes and their interaction. Naturalness conditions. Prereq., LING 5410.

**LING 7420-3. Syntactic Theory.** Covers various topics in syntactic theory. Prereq., LING 5420.

**LING 7430-3. Semantic Theory.** Current developments in the theory of linguistic semantics. Topics include truth-conditional theories, generative linguistic theories, semantic theories of communicative competence, and the integration of these theories in the development of a combined theory of semantics and pragmatics. Prereq., LING 5430.

**LING 7510-3. Language Structures.** Survey of the structure of one or more languages, with emphasis on understanding how the parts of the language interact. Designed to supplement courses in which parts of languages are used to illustrate theoretical claims. Prereqs., LING 5410 and 5420.

**LING 7520-3. Topics in Comparative Linguistics.** Students compare and contrast selected structures of the languages treated from a typological, genetic, or areal contact perspective. No special prior knowledge of the subject languages is required. Prereqs., LING 5410, 5420, and 5570.

**LING 7560-3. Language Acquisition.** Theories and research methods in first-language acquisition of phonology, morphology, syntax, semantics and pragmatics. Prereqs., LING 5410, 5420, and 5430 or consent of instructor.

**LING 7570-3. Advanced Diachronic Linguistics.** Presents theories of language change. The mechanisms of language change and its trajectories over linguistic categories and items are discussed as is its relation to theories of grammar and of language variation. Prereq., LING 5570.

**LING 7900 (1-3.) Independent Study.**

**LING 8100-3. Seminar: Field Methods.** Provides students with the opportunity to analyze selected structures of a language from data elicited from a native speaker. Prereqs., LING 7100 and at least one of LING 7410, 7420, and 7430.

**LING 8240-3. Seminar: History of Linguistics.** Treats different topics chosen from the four or five historical periods covering the history of linguistics. Intended to reveal the coherence of linguistic ideas in their historical setting.

**LING 8410-3. Seminar: Advanced Phonology.** Advanced topics in phonological theory. Prereq., LING 7410 or consent of instructor.

**LING 8420-3. Seminar: Advanced Syntax.** Deeper analysis of one aspect of a language of the individual student's choice according to a particular theory of grammar. Each student is expected to produce a partial grammar of one linguistic topic. Prereq., LING 7420 or consent of instructor.

**LING 8430-3. Seminar: Topics in Semantic Theory.** Devoted to some particular topic in semantic theory, such as the place and nature of the lexicon in linguistic theory, a particular semantically-based theory of general linguistics (e.g., Montague grammar), or some aspect of lexicology (e.g., dictionaries). Prereq., LING 7430 or consent of instructor.

**LING 8530-3. Seminar: Areal Linguistics.** Study of linguistic features shared by numerous languages or dialects within a given region, usually Africa or North America. The particular area or areas studied, however, depends on the interests of the instructor and of the students. Prereq., consent of instructor.

**LING 8540-3. Seminar: Language Variation.** Selected topics on the systematic variation of language. The relative emphasis on contextual, geographical, stylistic, and social variation differs from offering to offering. Prereq., consent of instructor.

**LING 8560-3. Seminar: Issues in Language Acquisition.** A few current issues in language acquisition are explored in depth through readings and through analyses of audio and video tapes of young children. The particular issues covered vary. Prereq., LING 7560 or consent of instructor.

**LING 8570-3. Seminar: Diachronic Linguistics.** Advanced topics in the theory of language change or in the reconstruction of language history. Prereq., LING 7570 or consent of instructor.



**LING 8990-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

### English as a Second Language

Students may take a maximum of 6 credit hours of ESL course work. These 6 hours will count as part of the 30 hours of credit which degree-seeking students may take outside of the College of Arts and Sciences. Students may, although they are not required to, take courses numbered 1110, 1210, or 1310 as sequences.

**ESGL 1110-3. Spoken English for Foreign Students.** Oral drills with the goal of promoting fluency and listening comprehension. Does not fulfill humanities or major requirements.

**ESGL 1120-3. Advanced Spoken English for Foreign Students.** Continued practice in speaking and listening comprehension, with attention to grammar and pronunciation as well as meaning and appropriateness. Does not fulfill humanities or major requirements.

**ESGL 1210-3. Written Composition for Foreign Students.** Distinction between spoken and written English with an emphasis on the grammar and vocabulary of the latter. Does not fulfill humanities or major requirements.

**ESGL 1220-3. Advanced Written Composition for Foreign Students.** Continued work on grammar and vocabulary but with greater focus on the mechanics of writing and organization of material for longer connected discourse. Does not fulfill humanities or major requirements.

**ESGL 1310-3. Intermediate English for Foreign Students.** Instruction and practice at the non-beginning level in both colloquial and written American English. Intended for foreign students who require additional study in order to become competent in English for most university needs. Does not fulfill humanities or major requirements.

**ESGL 1320-3. Advanced English for Foreign Students.** Instruction and practice at the advanced level in both colloquial and written American English. Intended for foreign students who need additional formal study of English in order to function to the best of their ability in the university. Does not fulfill humanities or major requirements.

## MATHEMATICS

*Note:* A prerequisite course must be completed with a grade of C or better.

### Applied Mathematics

**APPM 1350-4. Calculus 1 for Engineers.** Selected topics in analytical geometry and calculus. Rates of change of functions, limits, derivatives of algebraic and transcendental functions, applications of derivatives, and integration. Prereqs., two years of high

school algebra, one year of geometry, one-half year of trigonometry, and satisfactory performance on the Math Placement Examination, or C or better in MATH 1100.

**APPM 1360-4. Calculus 2 for Engineers.** Continuation of APPM 1350. Applications of the definite integral, methods of integration, improper integrals, Taylor's theorem, infinite series, and vector algebra. Prereq., APPM 1350 or MATH 1300.

**APPM 1370-4. Honors Calculus 1 for Engineers.** Differential and integral calculus. Theory of limits, continuity, derivatives, and integral. Analysis of standard functions through hyperbolic and gamma functions, techniques in integration. Application to physics and geometry. Prereqs., two years of high school algebra, one year of geometry, one-half year of trigonometry, one year of calculus.

**APPM 1380-4. Honors Calculus 2 for Engineers.** Continuation of APPM 1370. Topics include differential equations, plane and solid analytic geometry, Newtonian dynamics, and Taylor's series. Prereq., APPM 1370.

**APPM 2350-4. Calculus 3 for Engineers.** Continuation of APPM 1360. Completion of required work in the differential and integral calculus. Covers solid analytic geometry, polar coordinates, vector functions and derivatives, partial differentiation, multiple integrals, vectors, parametric equations, and vector analysis. Prereq., APPM 1360 or MATH 2300.

**APPM 2360-3. Introduction to Linear Algebra and Differential Equations.** Introduction to ordinary differential equations, systems of linear equations, matrices, determinants, vector spaces, linear transformations, and systems of linear differential equations. (No credit to students having previous credit in both MATH 3130 and MATH 4430.) Prereq., APPM 2350.

**APPM 2370-4. Honors Calculus 3 and Differential Equations.** Includes multivariable calculus, vector analysis, theorems of Gauss, Green, and Stokes, and an introduction to Fourier series. Prereq., APPM 1380.

### Mathematics

After completing one semester of calculus with a grade of C or better, general students (non-Math majors) may not take MATH 1010, 1020, 1080, 1100, 1110, or 1120 for credit.

**MATH 1010-3. College Algebra.** Simplifying algebraic expressions, factoring linear and quadratic equations, inequalities, exponentials, logarithms, functions and graphs, complex numbers, binomial theorem. No credit for students with credit in MATH 1100. MATH 1010 and 1020 are equivalent to MATH 1100. Prereq., 1 year of high school algebra.

**MATH 1020-2. College Trigonometry.** Trigonometric functions, identities, solutions of triangles, addition and multiple angle formulas, inverse trigonometric functions, laws of sines and cosines. No credit for students with credit in MATH 1100. MATH 1010 and 1020 are equivalent to MATH 1100. Prereqs.,

1½ years of high school algebra and 1 year of geometry or MATH 1010.

**MATH 1070-3. Mathematics for Social Science and Business.** Systems of linear equations; an introduction to matrices, linear programming, and probability. Does not prepare students for MATH 1100 or MATH 1300. Prereq., 1½ years of high school algebra.

**MATH 1080-3. Calculus for Social Science and Business.** Differential and integral calculus of algebraic, logarithmic, and exponential functions. MATH 1300 carries only 2 hours credit. APPM 1350 carries only 1 hour credit, if student has credit in MATH 1080. Prereq., 2 years of high school algebra or MATH 1010.

**MATH 1100-5. College Algebra and Trigonometry.** Intended primarily for students who plan to take MATH 1300. Equivalent to MATH 1010 plus MATH 1020. See descriptions for those courses. Students with credit in MATH 1010 will receive only 2 hours credit in MATH 1100; students with credit in MATH 1020 will receive only 3 hours credit in MATH 1100. Prereqs., 1½ years of high school algebra and 1 year of geometry.

**MATH 1110-3. The Spirit and Uses of Mathematics 1.** For liberal arts students and prospective elementary teachers. Includes a study of the nature of mathematics, its methods, its role in our society, and the structure of our number systems. Additional topics are chosen from number theory, elementary calculus, computer science, modern geometry and algebra, and logic. Prereqs., 1 year of high school algebra and 1 year of geometry.

**MATH 1120-3. The Spirit and Uses of Mathematics 2.** Continuation of MATH 1110. Prereqs., 1 year of high school algebra and 1 year of geometry.

**MATH 1300-5. Analytic Geometry and Calculus 1.** Rates of change of functions, limits, derivatives of algebraic functions, applications of derivatives, integration and applications of the definite integral. Students with credit in MATH 1080 will receive only 2 hours credit in MATH 1300. Students with credit in MATH 1300 may not receive credit in APPM 1350 or APPM 1370. Note: APPM 1350, 1360, 2350, and 2360 is a sequence designed for engineering students. Prereqs., 2 years of high school algebra, 1 year of geometry, ½ year of trigonometry or MATH 1100; or MATH 1010 and 1020.

**MATH 1840 (1-3.) Independent Study.**

**MATH 2300-5. Analytic Geometry and Calculus 2.** Continuation of MATH 1300. Transcendental functions, methods of integration, plane analytic geometry, polar coordinates, and parametric equations. Students with credit in MATH 2300 may not receive credit in APPM 1360 or APPM 1380. Prereq., MATH 1300 or APPM 1350 or 1370.

**MATH 2400-4. Analytic Geometry and Calculus 3.** Continuation of MATH 2300. Solid analytic geometry, vector functions and derivatives, partial differentiation, multiple integrals, infinite series. Students with credit in MATH 2400 may not receive credit in APPM 2350 or APPM 2370. Prereq., MATH 2300 or APPM 1360 or 1380.

**MATH 2510-3. Introduction to Statistics.**

Study of the elementary statistical measures. Introduction to statistical distributions, statistical inference, and hypothesis testing. Students may not receive credit for both MATH 2510 and MATH 4570/5570. Prereq., 2 years of high school algebra or MATH 1010.

**MATH 2720-3. Introduction to Abstract Mathematics.**

Designed to bridge the gap between lower-division mathematics courses and the more abstract and theoretical upper-division courses. Topics vary but often include informal logic, set theory, relations and functions, axiomatic systems with examples from algebra or geometry, and number systems. Prereq., MATH 2300 or APPM 1360 or 1380.

**MATH 2750-3. Analytical Computations.**

Designed to introduce students to rigorous mathematical analysis. Emphasizes the logic behind calculations based on topics students are familiar with in elementary calculus and topics growing out of elementary calculus. Topics vary from term to term. Prereq., MATH 2300 or APPM 1360 or 1380.

**MATH 3110-3. Introduction to Theory of Numbers.**

A careful study of the set of integers: divisibility, congruences, arithmetic functions, sums of squares, quadratic residues and reciprocity, and elementary results on distributions of primes. Prereq., MATH 2400 or APPM 2350 or 2370.

**MATH 3130-3. Introduction to Linear Algebra.**

Introduction to basic properties of systems of linear equations, vector spaces, linear independence, dimension, linear transformations, matrices, determinants, eigenvalues and eigenvectors. Students with credit in MATH 3130 may not receive credit in MATH 3150. Prereq., MATH 2400 or APPM 2350 or 2370.

**MATH 3140-3. Introduction to Modern Algebra.**

A careful study of the elementary theory of groups, rings, fields, polynomials, group and ring homomorphisms, and isomorphisms. Prereq., MATH 2720 or 3130 or 3110 or 3150.

**MATH 3150-4. Honors Linear Algebra and Matrix Theory.**

The subject matter is the same as MATH 3130, but the treatment is more thorough, with greater emphasis on theoretical concepts, as opposed to mere computational procedure, although the latter is not neglected. Students with credit in MATH 3150 may not receive credit in MATH 3130. Prereq., MATH 2400 or APPM 2350 or 2370.

**MATH 3170-3. Advanced Finite Mathematics 1.**

Basic methods and results in combinatorial theory. Enumeration methods, elementary properties of functions and relations, graph theory. Considerable emphasis is placed on applications. Prereq., MATH 2300 or APPM 1360 or 1380.

**MATH 3210-3. Euclidean and Non-Euclidean Geometries.**

Axiomatic systems. The foundations of Euclidean and Lobachevskian geometries. Prereq., MATH 2300 or APPM 1360 or 1380.

**MATH 3720-3. Computable Functions.** Topics include Turing computers, computable

functions, the halting problem and noncomputable functions, Church's thesis, universal machines, Goedel's incompleteness theorem, and undecidable theories. Prereq., MATH 2300 or APPM 1360 or 1380.

**MATH 3840 (1-3.) Independent Study.**

**MATH 4180-3. Advanced Finite Mathematics 2.** More advanced techniques in enumeration theory and graph theory. Finite groups, Polya's theory of counting, digraphs, finite rings and fields are discussed, as are applications in computer science, switching theory, and coding theory. Prereq., MATH 3170.

**MATH 4220-3. Projective Geometry.** An introduction to the study of synthetic projective geometry. The relation of the projective and affine planes. Coordinates in the projective plane. Prereq., MATH 3130 or 3150.

**MATH 4270-3. Computer Geometry.**

Involves synthetic and analytic projective geometry, especially as applied to depicting mathematical phenomena. Topics may include tangents, envelopes, splines, quadric surfaces, conformal mappings, singular points of surfaces, level curves, vector fields, and polyhedra. Prereqs., MATH 2400, MATH 3130, CSCI 1200, and consent of instructor.

**MATH 4310-3. Advanced Calculus 1.**

Calculus of one variable. The real number system, continuity, differentiation, sequences and series, convergence, uniform convergence, Taylor's theorem, integration. Prereq., MATH 2400 or APPM 2350 or 2370. MATH 2720, 3130, or 3150 recommended.

**MATH 4320-3. Advanced Calculus 2.**

Calculus of several variables. Continuity, differentiation and integration, implicit function theorem, inverse function theorem, Fourier series if time permits. Prereqs., MATH 4310, and either MATH 3130 or 3150 or APPM 2360.

**MATH 4350-3. Advanced Mathematics for Engineers 1.**

Selected topics in ordinary differential equations, including linear equations with constant coefficients, matrix methods, power series solutions, Bessel functions, Legendre functions, and Laplace transforms. Prereq., APPM 2360. Will not apply toward the B.A. degree in mathematics; may be used toward the B.S. (APPM) degree.

**MATH 4360-3. Advanced Mathematics for Engineers 2.**

Selected topics in partial differential equations and complex variables; the divergence theorem in two and three dimensions, Fourier series, eigen function expansions, and the method of separation of variables. Prereq., APPM 2360. Will not apply toward the B.A. degree in mathematics; may be used toward the B.S. (APPM) degree.

**MATH 4430-3. Ordinary Differential Equations.**

An elementary systematic introduction to first-order scalar differential equations,  $n$ th order linear differential equations, and  $n$ -dimensional linear systems of first order differential equations. Additional topics are chosen from equations with regular singular points, Laplace transforms, phase plane techniques, basic existence and uniqueness, and numerical solutions. Prereqs., MATH 2400 or APPM 2350 or 2370, and either MATH 3130 or 3150 or APPM 2360.

**MATH 4450-3. Introduction to Complex Variables.** Theory of functions of one complex variable, including integrals, power series, residues, conformal mapping, and special functions. Prereq., MATH 2400 or APPM 2350 or 2370.

**MATH 4460-3. Applied Topics in Complex Variables.**

Applications of complex variables with topics chosen from the following: classical functions (e.g., Legendre, Bessel) defined by differential equations, especially their asymptotic properties and their behavior under changes of variable; Laplace, Fourier and Z-transforms; conformal mapping with applications to solving boundary value problems; other topics as interest and time permit. Prereq., MATH 4450.

**MATH 4470-3. Introduction to Partial Differential Equations 1.**

Initial and boundary value problems for the wave, heat, and Laplace equations; separation of variables method, eigenvalue problems, Fourier series, orthogonal systems. Prereq., APPM 2360 or MATH 4430.

**MATH 4480-3. Introduction to Partial Differential Equations 2.**

Continuation of MATH 4470. Boundary value problems, initial value problems, eigenvalue problems in higher dimensions, Sturm-Liouville problems, Fourier and Laplace transforms, approximation methods. Prereq., MATH 4470.

**MATH 4510-3. Introduction to Probability Theory.**

Axioms, combinatorial analysis, independence and conditional probability, discrete and absolutely continuous distributions, expectation and distribution of functions of random variables, laws of large numbers, central limit theorems, simple Markov chains. Prereq., MATH 2400 or APPM 2350 or 2370.

**MATH 4520-3. Introduction to Mathematical Statistics.**

Point and confidence interval estimation. Principles of maximum likelihood, sufficiency, and completeness; tests of simple and composite hypotheses, linear models, and multiple regression analysis. Analysis of variance distribution-free methods. Prereq., MATH 4510.

**MATH 4570/5570-3. Statistical Methods.**

Topics covered are discrete and continuous probability laws, random variables; expectation; laws of large numbers and central limit theorem; estimation, testing hypotheses, analysis of variance, regression analysis, nonparametric methods. Emphasis on applications using packaged computer programs. Credit cannot be received in both MATH 2510 and 4570/5570. Prereq., MATH 2300, APPM 1360 or 1380.

**MATH 4650-3, 4660-3. Intermediate Numerical Analysis 1 and 2.**

Solution of algebraic and transcendental equations, linear and nonlinear systems of equations. Interpolation, integration, solution of ordinary differential equations, least squares, sources of error and error analysis. Computer implementation of numerical methods. Matrix eigenvalue problems and summation of infinite series. Prereqs., CSCI 1200 or CSCI 1700; and APPM 2360 or MATH 3130 or APPM 3150. Prereq. for MATH 4660 is MATH 4650.

**MATH 4710-3. Introduction to Mathematical Logic.** Sentential logic and first-order logic. Completeness theorems. Prereq., two upper-division courses in mathematics.

**MATH 4730-3. Set Theory.** A careful study of the theory of cardinal and ordinal numbers, definition by recursion, the statement of the continuum hypothesis, simple cardinal arithmetic, and other topics chosen by the instructor. Prereq., MATH 2400 or 2720 or APPM 2350 or 2370.

**MATH 4800/5800-3. History of Mathematics.** A selection of topics in the history of mathematics from the earliest times to the present, with emphasis on Greek mathematics, the development of the calculus in the seventeenth century, and the history of algebra, analysis, and geometry in the nineteenth and twentieth centuries. Prereq., two upper-division courses in mathematics.

**MATH 4840 (1-3.) Independent Study.**

## General Graduate Courses

Note: Undergraduates must have departmental approval to take 5000-6000 level mathematics courses; 7000-8000 level courses are open *only* to graduate students.

**MATH 5030-3, 5040-3. Intermediate Mathematical Physics 1 and 2.** (PHYS 5030/5040.) Survey of classical mathematical physics, starting with complex variable theory and finite dimensional vector spaces. Topics in ordinary and partial differential equations, the special functions, boundary value problems, potential theory, and Fourier analysis are discussed. Prereqs., MATH 4310 and 4320.

**MATH 5150-3. Linear Algebra 1.** Vector spaces, linear transformations, eigenvalues and eigenvectors, canonical forms. Prereq., MATH 3130.

**MATH 5180-3. Advanced Finite Mathematics 2.**

**MATH 5430-3. Ordinary Differential Equations.** Introduction to the theory and applications of ordinary differential equations, including existence and uniqueness theorems, qualitative behavior, series solutions, and numerical methods, for scalar equations and systems. Prereq., MATH 3130 or APPM 2360.

**MATH 5460-3. Applied Topics in Complex Variables.** See MATH 4460.

**MATH 5470-3. Introduction to Partial Differential Equations 1.** See MATH 4470.

**MATH 5480-3. Introduction to Partial Differential Equations 2.** See MATH 4480.

**MATH 5570-3. Statistical Methods.** Design and analysis of experiments, employing t-tests, chi-square tests, analysis of variance and covariance, regression analysis, distribution-free methods, graphical and other quick and approximate procedures, with emphasis on applications in the behavioral, biological, and physical sciences. No credit for graduate students in Mathematics.

**MATH 5800-3. History of Mathematics.** See MATH 4800.

**MATH 6110-3. Theory of Numbers 1.** Divisibility properties of integers, congruences, diophantine equations, arithmetic functions, quadratic residues, distribution of primes, and algebraic number fields. Prereq., MATH 3140.

**MATH 6120-3. Theory of Numbers 2.** Selected topics in algebraic and analytic number theory. Prereq., MATH 6110. MATH 6130 and 6350 are recommended.

**MATH 6130-3, 6140-3. Modern Algebra 1 and 2.** Groups, rings and ideals, fields, polynomials, Galois theory. Prereq., MATH 3140.

**MATH 6160-3. Linear Algebra 2.** Prereq., MATH 5150.

**MATH 6210-3, 6220-3. Introduction to Topology 1 and 2.** Elements of general topology, algebraic topology, differentiable manifolds. Prereqs., MATH 3130, 3140, 4310, and 4320.

**MATH 6230-3, 6240-3. Introduction to Differential Geometry 1 and 2.** Differential forms in Euclidean 3-space, frame fields, Frenet formulas, calculus of differential forms on surfaces, extrinsic and intrinsic geometry of surfaces, Riemannian geometry of differentiable manifolds, geodesics, curvature, the Gauss-Bonnet theorem. Prereqs., MATH 3130 and 4320.

**MATH 6310-3, 6320-3. Introduction to Real Analysis 1 and 2.** Zorn's lemma, metric and normed linear spaces, completions, continuous functions, Riemann-Stieltjes and Lebesgue integration, measure theory. Prereq., MATH 4310.

**MATH 6350-3, 6360-3. Functions of a Complex Variable 1 and 2.** Complex numbers and complex plane. Cauchy-Riemann equations, complex integration, Cauchy integral theory, infinite series and products, residue theory, conformal mapping, analytic continuation, singularities, elementary special functions. Prereq., MATH 4310.

**MATH 6410-3, 6420-3. Calculus of Variations and Control Theory.** Classical necessary and sufficient conditions with emphasis on the simplest problems; the problem of Lagrange; Hamiltonian and Lagrangian and other quick and approximate procedures with emphasis on applications in the behavioral, biological, and physical sciences. Prereqs., consent of instructor.

**MATH 6470-3, 6480-3. Partial Differential Equations 1 and 2.** General theory, first order equations; classification of second order equations; theory and methods of solution of elliptic, parabolic, and hyperbolic types of equations; maximum principles; Green's functions; potential theory. Prereqs., MATH 4310 and 4320.

**MATH 6510-3, 6520-3. Mathematical Statistics.** Mathematical theory of statistics. Topics covered include distribution theory, estimation and testing of hypotheses, multivariate analysis, and nonparametric inference. Prereqs., MATH 3130 and 4510, or consent of instructor.

**MATH 6540-3. Time Series Analysis.** Basic properties, linear extrapolation, and filtering of stationary random functions. Spectral and cross-spectral analysis; estimation of the

power spectrum using computers; nonstationary time series; comparison of various computer programs. Prereq., MATH 4510 or consent of instructor.

**MATH 6550-3. Introduction to Stochastic Processes.** A systematic study of Markov chains and some of the simpler Markov processes including renewal theory, limit theorems for Markov chains, branching processes, queueing theory, and birth and death processes. Applications to physical and biological sciences. Prereqs., MATH 4510 and 4310, or consent of instructor.

**MATH 6580-3. Statistical Methods for Data Analysis.** Continuation of MATH 5570. The method of least squares in fitting linear and nonlinear models to data. Analysis of balanced, unbalanced, and unplanned experiments. Use of packaged computer programs. Practical aspects of applying statistical techniques to the analysis of data. Prereqs., MATH 5570 or consent of instructor.

**MATH 6600-3. Numerical Analysis 1.** Solution of linear systems, least squares approximations, nonlinear algebraic equations, interpolation, and quadrature. Prereqs., calculus, MATH 3130, CSCI 1200.

**MATH 6610-3. Numerical Analysis 2.** Solution of ordinary and partial differential equations; matrix eigenvalue eigenvector problems. Prereq., MATH 6600.

**MATH 6620-3. Numerical Solution of Initial Value Problems.** Includes multi-step and single-step methods for ODE; stability; stiff equations; difference schemes for heat and wave equations; Applications. Prereqs., CSCI 3656 or 5606; MATH 3130, 4310, 4430.

**MATH 6630-3. Numerical Solution of Boundary Value Problems.** Includes finite difference solution of two-point boundary problems and elliptic problems; methods of SOR, ADI, conjugate gradients; finite element method; nonlinear problems; applications. Prereqs., MATH 3130, 4310, 4430, or 4650.

**MATH 6640-3. Numerical Methods for the Solution of Eigenvalue Problems.** Provides a survey of numerical methods which are useful for the solution of eigenvalue and eigenvector problems. The algorithms to be studied include Power method, Rutishauser's LR method, the OR and Lanczo's algorithms. The algorithms are applied to various problems. Prereq., MATH 6600.

**MATH 6650-3. Numerical Methods for Optimization.** Linear programming. Unconstrained minimization, one-dimensional search, gradient methods. Nonlinear and quadratic programming. Prereqs., MATH 4650 or 6600, MATH 3130.

**MATH 6710-3, 6720-3. Mathematical Logic 1 and 2.** Alternate years. First-order logic, completeness theorem, introduction to model theory, ultraproducts, Goedel's incompleteness theorems, theory of recursive functions. Prereqs., MATH 4710 and 4730, or consent of instructor.

**MATH 6730-3, 6740-3. Advanced Set Theory 1 and 2.** Cardinal and ordinal arithmetic, generalizations of Ramsey's theorem, independence of the axiom of choice and of the generalized continuum hypothesis.

Prereqs., MATH 4710 and 4730, or consent of instructor.

**MATH 6900 through 6908 (1-3). Independent Study.**

**MATH 6950 through 6958 (4-6). Master's Thesis.**

**MATH 7030-3, 7040-3. Advanced Mathematical Physics 1 and 2.** (PHYS 7030/7040). Hilbert space, theory of distributions,  $L^2$ -spaces, Sobolev spaces, methods of functional analysis, spectral theory of operators, applications to quantum theory, and group theory. Prereqs., MATH 4310 and 4320, and MATH 4450 or 6350.

**MATH 7050-3, 7060-3. Advanced Mathematical Physics 3 and 4.** (PHYS 7050/7060.) Further topics in modern mathematical physics with applications. Prereqs., MATH 7030 and 7040.

**MATH 8130-3. Theory of Groups 1 and 2.** Abelian groups, homomorphism, permutation groups, Sylow theorems, solvable groups, group representations and characters. Prereq., modern algebra.

**MATH 8230-3, 8240-3. Algebraic Topology 1 and 2.** Homology and cohomology theories, homotopy theory, obstruction theory, and applications. Prereqs., modern algebra and topology or consent of instructor.

**MATH 8250-3, 8260-3. Mathematical Theory of Relativity.** Maxwell equations; Lorentz force; Minkowski space-time; Lorentz, Poincaré, and conformal groups; metric manifolds; covariant differentiation; Einstein space-time; cosmologies; unified field theories. Prereq., consent of instructor.

**MATH 8270-3, 8280-3. Differential Topology 1 and 2.** Differentiable manifolds, tangent bundles, vector fields, differential forms. Frobenius theorem, Riemannian metrics, selected topics. Prereqs., MATH 6210 and 6220, 5150, 6310, and 6320.

**MATH 8330-3, 8340-3. Functional Analysis 1 and 2.** Introduction to such topics as Banach spaces (Hahn-Banach theorem, open mapping theorem, etc.), operator theory (compact operators and integral equations, spectral theorem for bounded self-adjoint operators), and Banach algebras (the Gelfand theory). Prereqs., MATH 6310 and 6320.

**MATH 8370-3, 8380-3. Harmonic Analysis.** Trigonometric series, periodic functions, diophantine approximation, Fourier series. Bohr and Stepanoff almost periodic functions, positive definite functions, the  $L^1$  and  $L^2$  theory of the Fourier integral. Applications to group theory and differential equations. Prereqs., MATH 5150 and 6320.

**MATH 8430-3, 8440-3. Theory of Ordinary Differential Equations 1 and 2.** Prereqs., MATH 5150, 6320, and consent of instructor.

**MATH 8470-3, 8480-3. Theory of Partial Differential Equations 1 and 2.** Differentiation theory, Sobolev theory, *a priori* inequalities, variational methods. Existence and regularity theory for elliptic equations, hyperbolic equations, parabolic equations. Particular equations of mathematics physics. Prereqs., MATH 6310 and 6320.

**MATH 8510-3, 8520-3. Advanced Probability Theory.** Independent random

variables, processes with independent increments, martingales, Brownian motion, stochastic integrals, and diffusions. Prereqs., MATH 6310 and 6320.

**MATH 8750-3, 8760-3. Lattices and General Algebra 1 and 2.** Modular, distributive, Brouwerian, Boolean lattices. Applications to algebra and topology. Homomorphism, congruence relations, direct factorization, free algebras, varieties. Prereqs., MATH 4730, 6130, and 6140.

**MATH 8900 through 8908 (1-3.) Independent Study.**

**MATH 8990 through 8998-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## Topics

**MATH 6174-3. Topics in Combinatorial Analysis.** Topics such as finite combinatorial analysis, combinatorial questions entering in topology, infinite permutations and transformations, graph theory. Prereq., consent of instructor.

**MATH 6404-3, 6414-3. Topics in Applied Mathematics.** Selected topics in mathematical problems arising from various applied fields such as mechanics, electro-magnetic theory, and economics. Prereq., consent of instructor.

**MATH 6534-3. Topics in Mathematical Probability.** Prereqs., advanced calculus and MATH 4510.

**MATH 8114-3, 8124-3. Topics in Number Theory 1 and 2.** May include theory of algebraic numbers,  $L$ -series and zeta functions, the zeta functions of an algebraic variety, character sums, multiplicative and additive number theory, diophantine equations and approximations, or other topics chosen by instructor. Prereq., MATH 6120 or consent of instructor.

**MATH 8174-3, 8184-3. Topics in Algebra.** Detailed study of advanced topics not covered in modern algebra or other courses, to be chosen by instructor. Prereq., modern algebra. MATH 8174 is not required for MATH 8184.

**MATH 8304-3, 8314-3. Topics in Analysis 1 and 2.** Selected advanced topics to be chosen by the instructor.

**MATH 8324-3, 8334-3. Topics in Real Variables 1 and 2.** Abstract measure theory, function spaces, and other topics. Prereqs., MATH 6310 and 6320, or consent of instructor.

**MATH 8364-3, 8374-3. Topics in Complex Variables 1 and 2.** Prereqs., MATH 6350 and 6360.

**MATH 8714-3, 8724-3. Topics in Logic.** Selected advanced topics in logic or foundations to be chosen by the instructor.

## Seminars

Normally about half of the following seminars are given each year. The same seminar number may be repeated for credit several times.

**MATH 8115-3. Seminar: Number Theory.**

**MATH 8135-3. Seminar: Algebra.**

**MATH 8205-3. Seminar: Topology.**

**MATH 8315-3. Seminar: Analysis.**

**MATH 8325-3. Seminar: Functional Analysis.**

**MATH 8405-3. Seminar: Applied Mathematics.**

**MATH 8435-3. Seminar: Differential Equations.**

**MATH 8505-3. Seminar: Probability Theory and Statistics.**

**MATH 8605-3. Seminar: Numerical Analysis.**

**MATH 8705-3. Seminar: Logic and Foundations of Mathematics.**

**MATH 8805-3. Seminar.**

**MATH 8815-3. Seminar.**

## MEDIEVAL STUDIES

**MEDV 4020/5020-3. Introduction to Medieval Culture.**

## MUSEUM

### Independent Study

**MUSM 4840/5840-variable credit. Independent Study.**

**MUSM 4900/5900-variable credit. Independent Study.**

### Museum Studies

**MUSM 4011-4/5011-3. Introduction to Museology.** For majors in anthropology, biology, fine arts, geological sciences, history, or other museum-related subjects. Background in history and literature of museums, their objectives and methods; laboratory exercises in curatorship, exhibition theory, and administration.

**MUSM 4021/5021-2. Selected Museum Topics.** Provides framework for student projects on varied museum topics, i.e., ethics of collecting, data management, the museum's role in the community. Student projects include case study analysis, interviewing, and original presentations. Topics vary each semester.

### Anthropology

**MUSM 4462/5462-3. Museum Field Methods in Anthropology.** Archaeological field techniques including excavation, mapping, recording, photography, interpretation, and field laboratory.

**MUSM 4932/5932-3. Museum Internship in Anthropology.**

## Botany

MUSM 4933/5933-3. **Museum Internship in Botany.**

## Geology

MUSM 4484/5484-3. **Museum Field Methods in Geology.** Paleontological and paleoecological field techniques including collecting; recording of geographic, stratigraphic, and quarry information; preservation; and interpretation, including applicable readings.

MUSM 4934/5934-3. **Museum Internship in Geology.**

## Zoology

MUSM 4935/5935-3. **Museum Internship in Zoology.** Introduces the student to the animal kingdom and basic curatorial techniques and problems of zoological museum operation. All aspects of zoological specimens (except insects) are studied in depth from relaxing, fixing, positioning, preserving, cataloging, storing, and shipping.

## Entomology

MUSM 4936/5936-3. **Museum Internship in Entomology.**

## Museography

MUSM 4927/5927-3. **Museum Internship in Techniques 1.** Covers the basics of modeling, molding, casting, and restoration of objects related to historical and natural history museums. Research, label writing, and construction of a small loan exhibit are required.

MUSM 4937/5937-3. **Museum Internship in Techniques 2.** Continuation of MUSM 4927. More advanced techniques in restoration, molding, casting, and the making of facsimile reproductions. Students have the opportunity to orient their learning more toward their major field.

## Osteology

MUSM 4498/5498-2. **Mammalian Osteology.** Identification of modern mammal bones, with emphasis on skulls and mandibles of North American terrestrial genera.

## MUSIC

The following courses offered in the College of Music are accepted for College of Arts and Sciences credit (see College of Music in Course Description section.)

MUSC 1830 **Appreciation of Music**

MUSC 1850 **Music of the Rock Era**

MUSC 2750 **History of United States Folk/Popular Music**

MUSC 2760 **Music and Drama**

MUSC 2770 **World Music**

MUSC 3080 **American Popular Music**

MUSC 3640 **History of Jazz**

MUSC 3650 **Music of the Twenty-First Century**

MUSC 3820 **Music Literature 1**

MUSC 3830 **Music Literature 2**

MUSC 4750 **Women Composers**

MUSC 4890 **Latin American Music**

## NATURAL SCIENCE

NASC 1230-4. **Biology: A Human Approach.** Principles of biology and their implications. Central theme is humans and the environment, with an emphasis on ecology, natural resource conservation, and the interrelatedness of a growing human population. Lectures, recitations, open laboratories, optional field studies. For nonscience majors.

NASC 1240-4. **Biology: A Human Approach.** A continuation of NASC 1230, with the emphasis on humans as functioning organisms. Organ systems including common malfunctions are studied around the central theme of a constant internal environment.

NASC 1250-6. **Nature and Society.** Selected general themes involving the human relationship to the environment are used to integrate the physical and biological sciences. Such themes include energy and its transformations, humans as knowers and controllers of nature, and humans as agents in the processes of the biosphere.

NASC 1870 (1-3). **Independent Study.** Individual projects, including the opportunity to aid in the teaching activities of the staff.

NASC 3180-3. **Global Ecology.** (EPOB 3180.) Involves the study of ecological principles and problems at the biosphere level. Concerns a world-wide approach to life support systems, populations, biotic resources, public health and biomedical problems, ecological interactions, agricultural ecology, environmental deterioration, species diversity and losses, and environmental ethics.

NASC 3410-3. **History of Science: Ancients to Copernicus.** (PHIL 3410.) Traces the history of science and natural philosophy from the ancients through the Hellenistic and medieval developments of astronomy, physics, biology, and medicine to the recasting of Ptolemaic astronomy by Copernicus. Taught collaboratively by faculty in the sciences and philosophy.

NASC 3420-3. **History of Science: Copernicus to Newton.** (PHIL 3420.) The genesis of modern science in the sixteenth and seventeenth centuries through the achievements of Bacon, Descartes, Kepler, Galileo, and Harvey, including such strands as the Reformation, Renaissance mysticism, advances in mathematics and instrumentation, and the rise of the atomistic-mechanical philosophy.

NASC 3430-3. **History of Science: Newton to Einstein.** (PHIL 3430.) The history of physical and biological science, from the epoch-making achievements of Charles Darwin in biology to the dawn of the twentieth-century revolutions in physics, chemistry, and genetics. Deals with the successes of the mechanical philosophy of nature and its eventual problems.

NASC 3440-3. **Perspectives of Twentieth-Century Science.** (PHIL 3440.) A historical study of some of the leading developments of twentieth-century science, selected for their scientific or social significance, including quantum theory of atomic structure and the chemical bond, Einstein's relativity theory, nuclear fission, the genetic code, continental drift, concepts of the ecosystem, and other topics.

NASC 3870 (1-3). **Independent Study.**

NASC 4870 (1-3). **Independent Study.**

NASC 3251-3. **History of Biology.** Survey of major themes in the development of biological theory from ancient times to the present, emphasizing complementary roles of observation, experiment, and technical innovation, and influence of general cultural environment on scientific advance. Lectures, discussions, readings in primary and secondary sources.

NASC 3261-3. **The Darwinian Revolution.** An examination of the origins, development, and influence of evolutionary theory. Reading, discussion, lectures. A course paper is required.

## ORIENTAL LANGUAGES AND LITERATURES

### Chinese

CHIN 1010-5. **First-Year (Beginning) Chinese 1.** A thorough introduction to modern Chinese (Mandarin), with emphasis on speaking, as well as reading and writing. Basic fluency in the spoken language is developed through intensive use and repetition of fundamental sentence patterns and vocabulary. Students learn both traditional full-form characters and the simplified versions now in use on Mainland China.

CHIN 1020-5. **First-Year (Beginning) Chinese 2.** Continuation of CHIN 1010. Prereq., CHIN 1010.

CHIN 1900-variable credit. **Independent Study.**

CHIN 2110-5. **Second-Year (Intermediate) Chinese 1.** Reading, speaking, and writing modern Chinese, including continued study of both full-form and simplified characters, introduction to dictionaries, principles of character formation and classification, and the phonetic writing system (*chu-yin fu-hao*). Prereq., CHIN 1020.

CHIN 2120-5. **Second-Year (Intermediate) Chinese 2.** Continuation of CHIN 2110. Prereq., CHIN 2110.

CHIN 2900-variable credit. **Independent Study.**

CHIN 3110-3. **Third-Year (Advanced) Chinese 1.** A survey of a wide variety of materials written in modern Chinese, including selections from the works of Lu Hsun, newspaper articles from both Taiwan and mainland China, and readings from the Great Proletarian Cultural Revolution. Students also view at least one full-length Chinese movie. Equal emphasis is placed on enhanced reading, writing, and oral communication skills.

Class is conducted entirely in Chinese. Prereq., CHIN 2120.

**CHIN 3120-3. Third-Year (Advanced) Chinese 2.** Continuation of CHIN 3110. Prereq., CHIN 3110.

**CHIN 3210-3. Introduction to Classical Chinese.** A systematic introduction to the classical language based on texts from the pre-Han and Han periods. Stresses precise knowledge of grammatical principles and exactitude in translation; the basis for all further work in Classical Chinese. Prereq., CHIN 2120.

**CHIN 3220-3. Readings in Classical Chinese.** A close reading of selected texts of medieval literature (primarily from the T'ang dynasty), both prose and poetry. Emphasis throughout is on a disciplined, philological approach to the texts, with proper attention to diction, tone, and nuance. Prereq., CHIN 3210.

**CHIN 3900-variable credit. Independent Study.**

**CHIN 4110-3. Readings in Modern Chinese Literature 1.** A survey of a wide variety of literary works by modern Chinese authors, including Lu Hsun, Kuo Mo-jo, Ting Ling, Lao She, and Hao Jan. Special attention is given to analyzing narrative style and character development. Prereq., CHIN 3120.

**CHIN 4120-3. Readings in Modern Chinese Literature 2.** Continuation of CHIN 4110. Prereq., CHIN 4110.

**CHIN 4230-3. Seminar in Classical Chinese.** Intensive study of selected texts on a particular topic, usually from medieval China. Topics change each term, and the course may be taken for credit more than once. Prereq., CHIN 3220.

**CHIN 4300-3. Open Topics in Chinese Literature.** Intensive study of selected texts on a particular topic taught by regular or visiting faculty. Topics change each term, and the course may be repeated for credit once. Prereq., junior standing and consent of instructor.

**CHIN 4900-variable credit. Independent Study.**

**CHIN 5900-variable credit. Independent Study.**

*Chinese Courses in English.* The following courses require no knowledge of Chinese:

**CHIN 4811-3. Chinese Poetry in Translation.** Lectures and discussion. A study of ancient and medieval Chinese poetry, with special emphasis on the great masters of the T'ang (618-907) dynasty. The unique cultural setting of the worlds inhabited and created by the poets is studied—particularly relations with Taoism, Buddhism, natural history, and the astral domains explored and sung of by inspired poetic sky-treaders. Attention is focused not just on what a poem says, but on how it says it. Prereq., junior standing.

**CHIN 4821-3. Chinese Fiction in Translation.** Lectures and discussion. A study of representative samples of Chinese fiction, ranging from medieval short stories and

anecdotes written in the classical language to the longer, more involved, vernacular stories and novels of the Ming (1368-1644) and Ch'ing (1644-1911) dynasties. Special emphasis is placed on tracing the development of fiction in terms of narrative stance, characterization, and plot, as well as on comparisons between different genres of Chinese imaginative writing. Prereq., junior standing.

**CHIN 4831-3. Chinese Drama in Translation.** Lectures and discussion. A survey of the major works of Chinese drama, with emphasis on historical background, social milieu, structure, theme, and language. Special attention is given to dramas of the Yuan dynasty (1279-1368), especially the works of Kuan Han-ch'ing. The class also reads two *nan-hsi* or "Southern dramas"—T'ang Hsien-tsu's "Peony Pavilion" and K'ung Shang-jen's "Peach Blossom Fan." Prereq., junior standing.

## Japanese

**JPNS 1010-5. First-Year (Beginning) Japanese 1.** Skills of listening, speaking, reading, and writing are progressively developed on the basis of pattern approach.

**JPNS 1020-5. First-Year (Beginning) Japanese 2.** Continuation of JPNS 1010. Prereq., JPNS 1010.

**JPNS 1900-variable credit. Independent Study.**

**JPNS 2110-5. Second-Year (Intermediate) Japanese 1.** Skills of reading and writing are further developed; comprehension of instructional Japanese. Prereq., JPNS 1020.

**JPNS 2120-5. Second-Year (Intermediate) Japanese 2.** Continuation of JPNS 2110. Prereq., JPNS 2110.

**JPNS 2900-variable credit. Independent Study.**

**JPNS 3110-3. Third-Year (Advanced) Japanese 1.** Develops the student's competence in reading a wide variety of materials by contemporary Japanese writers. Prereq., JPNS 2120.

**JPNS 3120-3. Third-Year (Advanced) Japanese 2.** Continuation of JPNS 3110. Prereq., JPNS 3110.

**JPNS 3900-variable credit. Independent Study.**

**JPNS 4110-3. Readings in Classical and Modern Japanese 1.** A study of selected works of classical literature, mainly from the Heian and medieval periods; reading, writing, and discussing a wide variety of works of modern writers. Prereq., JPNS 3120.

**JPNS 4120-3. Readings in Classical and Modern Japanese 2.** Continuation of JPNS 4110. Prereq., JPNS 4110.

**JPNS 4900-variable credit. Independent Study.**

**JPNS 5900-variable credit. Independent Study.**

*Japanese Courses in English.* The following courses require no knowledge of Japanese:

**JPNS 2211-3. Language and Patterns of Thinking and Behavior in Japanese Culture.** Analysis and elucidation of the patterns of the language as related to the thought and behavior of the Japanese people in the social and cultural context.

**JPNS 4811-3. Classical Japanese Literature.** A study of major works of classical literature, both poetry and prose, from the earliest period to the mid-nineteenth century. Prereq., junior standing.

**JPNS 4821-3. Modern Japanese Literature.** A study of major works of modern literature, both poetry and prose, from the Meiji period (1868-1912) through the postwar period (World War II). Prereq., junior standing.

## PHILOSOPHY

Specific class content varies by semester. Complete course descriptions are available each semester from the Philosophy Department, Hellem 169. Courses at the 1000 and 2000 levels have no prerequisites.

**PHIL 1000-3. Introduction to Philosophy.** An introduction to the fundamental questions of philosophy through a study of the ideas of several major philosophers.

**PHIL 1100-3. Ethics.** Introductory study of major philosophies on the nature of the good for humanity, principles of evaluation, and moral choice.

**PHIL 1200-3. Philosophy and Society.** Introduction to philosophical thought through critical analysis of the institutions of society. Representative topics: the university in American society, militarism, imperialism, racism, revolution, participatory democracy vs. representative democracy, or others.

**PHIL 1300-3. Ways of Knowing.** An introductory study of the nature and sources of knowledge and related topics.

**PHIL 1400-3. Philosophy and the Sciences.** Consideration of topics and problems related to the physical and biological sciences, such as freedom and determinism; mind and body; artificial intelligence; science and ethics; current theories of the universe, space, time, matter, energy, and causality.

**PHIL 1440-3. Introductory Logic.** Introductory study of definition, informal fallacies, and the principles and standards of correct reasoning. Practice in analyzing, evaluating, and constructing frequently encountered types of arguments. Does not fulfill major requirement in logic.

**PHIL 1600-3. Philosophy and Religion.** A philosophical introduction to problems of religion, such as the existence of God, faith and reason, religious language, and others.

**PHIL 1700-3. Philosophy and the Arts.** Consideration of philosophic questions involved in the analysis and assessment of artistic experiences and of the objects with which the arts, including the literary arts, are concerned.

**PHIL 1750-3. Philosophy Through Literature.** Introduction to philosophy through literature. Selected novels, plays, and short



stories which exemplify traditional problems in philosophy are read and discussed.

**PHIL 1800-3. Open Topics in Philosophy.** A variety of new courses at the introductory level. See current departmental announcements for specific content.

**PHIL 1840 through 1900-variable credit. Independent Study.** (Freshman standing).

**PHIL 2200-3. Major Social Theories.** Introductory study of major philosophies of the past in relation to political, economic, and social issues.

**PHIL 2220-3, 2230-3. Nature of Law 1 and 2.** An examination of the nature of law with focus on its underlying principles and its historical and comparative development.

**PHIL 2290-3. Philosophy and Women.** (WMST 2290.) Provides for the exploration of different approaches to the study of women.

**PHIL 2390-3. Philosophy and Psychology.** Interdisciplinary course on issues where philosophy and psychology meet; for example, topics such as selfhood, motivation, psychotherapy, freedom, and human behavior are examined. Selected readings in philosophy and psychology are required.

**PHIL 2440-3. Symbolic Logic.**

**PHIL 2800-3. Open Topics in Philosophy.** A variety of new courses at the 2000 level. See current departmental announcements for specific content.

**PHIL 2840 through 2900-variable credit. Independent Study.** (Sophomore standing).

All courses at the 3000 level require 6 hours of philosophy unless otherwise indicated.

**PHIL 3000-3. History of Philosophy.** Ancient and medieval. No prerequisite.

**PHIL 3010-3. History of Philosophy.** Modern. No prerequisite.

**PHIL 3060-3. Chinese Philosophy.** An examination of various schools of Chinese philosophy including Confucianism, Taoism, Buddhism, and neo-Confucianism. No prerequisite.

**PHIL 3100-3. Ethical Theory.** A study of major issues and theories in ethics.

**PHIL 3140-3. Environmental Ethics.** Examines the major traditions in moral philosophy to see what light they shed on value issues in environmental policy and the value presuppositions of the economic, ecological, and juridical approaches to the environment. Prereq., junior standing, or PHIL 1100, 1200, 2200, 3100, or 3200.

**PHIL 3160-3. Ethical Issues in Medicine.** An analysis of ethical problems involved in such issues as abortion, euthanasia, organ transplants, eugenics, the treatment of the patient as a person, and the institutional nature of the health care delivery system. Prereq., upper-division standing.

**PHIL 3200-3. Social and Political Philosophy.** Systematic discussion and analysis of such philosophic ideas as community, freedom, political power, and violence.

**PHIL 3260-3. International Human Rights.** An examination of the international human rights movement and the philosophical issues it raises. Topics include the history and documents of the human rights movement, the nature and grounds of human rights, skeptical doubts about human rights, and the relevance of human rights to foreign policy. Prereq., upper-division standing.

**PHIL 3300-3. Philosophy of Mind.** Problems in the philosophy of mind, including the mind-body problem, knowledge of other minds, compatibility of free will and determinism, with discussion of such concepts as action, intention, desire, enjoyment, memory, imagination, dreaming, and self-knowledge.

**PHIL 3350-3. Metaphysics and Epistemology.**

**PHIL 3360-3. Models of Medicine.** An examination of such problems as the nature and evidence for current medical models; the roots of modern medicine in Greek thought; alternative models of medicine (Shamanistic, Eastern, Holistic); the medical model and psychoanalytic therapies; the concepts of mental health and physical health; the relation of medical and therapeutic models to theories of human nature.

**PHIL 3400-3. Philosophy of Science.** Examination of some major concepts and problems of scientific thought: explanation, confirmation, causality, measurement, and theory construction.

**PHIL 3410-3. History of Science, Ancients to Copernicus.** See NASC 3410.

**PHIL 3420-3. History of Science, Copernicus to Newton.** See NASC 3420.

**PHIL 3430-3. History of Science, Newton to Einstein.** See NASC 3430.

**PHIL 3440-3. Perspectives of Twentieth-Century Science.** See NASC 3440.

**PHIL 3450-3. Topics in the History and Philosophy of Physics.** (PHYS 3450.) Topics vary from year to year and may include scientific methodology, the role of experiment, and case studies in the history of physics. Prereq., one year of physics or instructor consent.

**PHIL 3490-3. Philosophy of Language.** Examination of theories and problems regarding the nature of language and its relation to reality. Concepts discussed include sense, reference, conventions, intentions, and their relation to science and social life. The relevant literature includes readings in Frege, Russell, Quine, Putnam, Kripke, and Chomsky.

**PHIL 3600-3. Philosophy of Religion.** Philosophical discussion of fundamental issues in religion, such as the existence of God, religious experience, faith and reason, evil, immortality, and religious language.

**PHIL 3610-3. From Paganism to Christianity.** (CLAS 3610.) Treats the history of Greek and Roman religion from its Bronze Age origins through the rise of Christianity.

**PHIL 3700-3. Aesthetic Theory.** Introduction to major theories of aesthetics and contemporary discussions of problems in aesthetics, i.e., the nature of art, the problem of evaluations in art.

**PHIL 3800-3. Open Topics in Philosophy.** A variety of new courses at the 3000 level. See current departmental announcements for specific content.

**PHIL 3840 through 3900-variable credit. Independent Study.** (Junior standing).

All courses at the 4000 level require 9 hours of philosophy unless otherwise indicated.

**PHIL 4010-3. Single Philosopher.** Intensive study of one systematic philosophy with attention to the scope, methods, and integrity accomplished by it.

**PHIL 4030-3. Studies in Nineteenth-Century Philosophy.** Students study selections from four or five major nineteenth-century figures such as Hegel, Schopenhauer, Marx, J. S. Mill, Kierkegaard, Nietzsche, and Dostoyevski.

**PHIL 4040-3. Twentieth-Century Philosophy.** Study of two or three major philosophies prominent during the present century.

**PHIL 4070-3. Existentialist Philosophy.**

**PHIL 4080-3. Introduction to Phenomenology.** An examination of the contribution of phenomenology to selected topics in the theory of meaning, philosophy of mind, ontology, and epistemology through a study of such philosophers as Husserl, Heidegger, Sartre, and Merleau-Ponty.

**PHIL 4090/5090-3. Kierkegaard.** Primarily an analysis of selected texts of Soren Kierkegaard. Specific topics considered include Kierkegaard's notions of Christianity, faith, the Paradox, truth, reason, and history.

**PHIL 4250-3. Marxism.** A historical and systematic study of the principal themes of Marxist thought, from its Hegelian origins to its contemporary varieties, emphasizing in particular the works of Marx and Engels themselves.

**PHIL 4260/5260-3. Philosophy of Law.** Consideration of various views of the nature of law, its role in society, and its relation to other disciplines. Investigation of philosophical commitments that underlie and affect legal conceptions and procedures. No prerequisite.

**PHIL 4380-3. Rationality, Democracy, and Policy.** Provides philosophical and political approaches to an understanding of social decision making and to examine the possibilities for choosing rational courses of action. To this end, concrete problems in rational decision making are dealt with. Prereq., any two-course combination in political science, philosophy, or economics.

**PHIL 4390/5390-3. Philosophy and Psychological Theory.** Conceptual problems in psychological theories, e.g., issues such as models, metaphysical views, value assumptions, theory in psychotherapy. Selected readings in both philosophy and psychology.

**PHIL 4440/5440-3. Mathematical Logic.** Prereq., PHIL 2440 or equivalent.

**PHIL 4600-1. Theology Forum Seminar.** Discussions on a variety of theological and philosophical topics. Some reading, much discussion, occasional guest speakers. Students may enroll for repeated credit with

permission of instructor to a maximum of 3 hours.

**PHIL 4700-3. History of Aesthetics.** Study of the principal historical systems of aesthetic inquiry, tracing the development of central themes in such writers as Plato, Aristotle, Plotinus, Kant, and Hegel.

**PHIL 4730-3. Philosophy and Literature.** No prerequisite.

**PHIL 4740-3. Philosophy and Literature: Philosophical Sources of Literature.** Study of individual philosophers and philosophic movements which are significant for the understanding of literature.

**PHIL 4800-3. Open Topics in Philosophy.** A variety of new courses at the 4000 level. See current departmental announcements for specific content.

**PHIL 4840 through 4900-variable credit. Independent Study.** (Senior standing).

**PHIL 4950-3. Honors Thesis.**

All courses at the 5000 and 6000 levels require 12 hours of philosophy unless otherwise indicated.

**PHIL 5020-3. Topics in the History of Philosophy.**

**PHIL 5080-3. Philosophy of Plato.** (CLAS 5800.)

**PHIL 5081-3. Philosophy of Aristotle.** (CLAS 5810.)

**PHIL 5082-3. Philosophy of Hume.**

**PHIL 5083-3. Philosophy of Kant.**

**PHIL 5084-3. Philosophy of Spinoza.**

**PHIL 5086-3. Philosophy of Wittgenstein.**

**PHIL 5089-3. Philosophy of Hegel.** Textual explication of Hegel's *Logic* and his *Phenomenology of the Spirit*, with special emphasis on the latter.

**PHIL 5091-3. Philosophy of St. Thomas Aquinas.** Study of major writings of St. Thomas.

**PHIL 5092-3. Philosophy of Husserl.**

**PHIL 5093-3. Later Work of Sartre.** A study of Sartre's sociological and psychological theory as developed in the *Critique of Dialectical Reason* and in the sociopsychological biographies of Genet and Flaubert.

**PHIL 5100-3. Ethics.** Representative positions in normative ethics and metaethics.

**PHIL 5200-3. Social and Political Philosophy.** Systematic study of traditional and current theories of the philosophical justification of kinds of social and political orders.

**PHIL 5210-3. Philosophy and Social Policy.** A study of philosophical approaches to social and political issues such as abortion, bioethics, environmental preservation, human rights, and reverse discrimination. Attention is given to the strengths and weaknesses of philosophical treatments of these issues.

**PHIL 5230-3. Bioethics and Public Policy.** Examines public policy implications of contemporary biological, genetic, biomedical, and behavioral science in the light of ethics and human values. Considers theoretical and

practical grounds for moral assessment of scientific research and possible applications of technology.

**PHIL 5240-3. Seminar in Environmental Philosophy.** A philosophical examination of several different approaches to environmental problems: economic, juridical, political, and ecological. Some specific environmental problems are discussed, focusing on their moral dimensions, e.g., wilderness preservation, animal rights, and land use and urban planning.

**PHIL 5290-3. Topics in Values and Social Policy.** Deals with topics in the area of philosophy and public policy and is often interdisciplinary in focus. Topics vary from one semester to another. Course may be repeated when topic is different.

**PHIL 5300-3. Philosophy of Mind.** Some of the main topics in philosophy of mind, such as the mind-body problem and the problem of knowledge of other minds, with discussion of such concepts as consciousness, self-knowledge, action, explanation of behavior, intention, dreaming, and sensations.

**PHIL 5340-3. Epistemology.** A study of some of the main topics of epistemology, such as skepticism, the foundations of knowledge, perception, introspection, belief, certainty, and the analytic-synthetic distinctions.

**PHIL 5350-3. Analytic Philosophy.** A survey of representative philosophers, methods, or problems in the twentieth-century analytic tradition.

**PHIL 5380-3. Metaphysics.** Traditional and contemporary theories of the basic categories used to describe nature and the human relationship to it, including such concepts as substance, identity, space and time, causality, determination, and systematic ontology.

**PHIL 5400-3. Philosophy of Science.** Topics connected with development and nature of science; structure of scientific theories, testing of hypotheses. Theory of decisions in science and ethics. Basic conceptions and models of abstraction in the history of science.

**PHIL 5490-3. Philosophy of Language.** A study of some of the main topics in the philosophy of language, such as meaning and theories of meaning, translation, speech acts, rules of language, references, relevance of psycholinguistics, language and thought, and language and ontology.

**PHIL 5600-3. Philosophy of Religion.** A study of topics falling under the philosophy of religion, such as proofs for God's existence, religious language, mysticism, psychology of religion, modern theological movements, miracles, and study of individual theologians.

**PHIL 5700-3. Aesthetics.** An analysis of the principal topics of aesthetics, including such issues as the formal structure of aesthetics, the nature of critical judgments, and the status of the work of art.

**PHIL 5800-3. Special Topics in Philosophy.** Seminars not listed as courses in which the instructor meets regularly with three or more students to discuss special topics in philosophy.

**PHIL 5840 through 5900-variable credit. Independent Study.** (Graduate standing).

**PHIL 6040-3. Seminar: Phenomenology.**

**PHIL 6050-3. Seminar in Continental Philosophy.**

**PHIL 6940-3. Master's Candidate for Degree.**

**PHIL 6950 (4-6). Master's Thesis.**

**PHIL 6960-3. Master's Research.**

**PHIL 7840 through 7900-variable credit. Independent Study.** (Doctoral).

**PHIL 8990-variable credit. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

**PHIL 8991-10. Doctor's Dissertation.** For students who wish to register for 10 hours of thesis work.

## PHYSICAL EDUCATION

See also courses listed under Kinesiology.

**PHED 1130-2. Conditioning.**

**PHED 1140-2. Advanced Life Saving.**

**PHED 1150-2. Water Safety Instructor.**

**PHED 1160-1. Recreational Dance Forms.** Dance techniques. Open to dance, physical education, and recreation majors.

NOTE: PHED 2010 through 2300 are open to Kinesiology majors only.

**PHED 2010-1. Conditioning.**

**PHED 2020-1. Golf.**

**PHED 2030-1. Gymnastics.**

**PHED 2040-1. Badminton.**

**PHED 2050-1. Recreational Sports.**

**PHED 2060-1. Tennis.**

**PHED 2070-1. Track and Field.**

**PHED 2080-1. Activities of Low Organization.**

**PHED 2090-2. Adapted Activities.**

**PHED 2100-1. Basketball.**

**PHED 2110-1. Field Hockey.**

**PHED 2120-1. Flag Football/Speedaway.**

**PHED 2130-1. Soccer, Speedball.**

**PHED 2140-1. Softball.**

**PHED 2150-1. Volleyball.**

**PHED 2300-2. Advanced First Aid.** Standardized Red Cross certification for immediate care. CPR included.

**PHED 2310-1. Seminar in Teaching.** Sophomore year. Introduction to teaching physical education in elementary and secondary schools.

**PHED 2500-3. Survey of Contemporary Health.** A survey of selected contemporary health problems.

**PHED 2510-3. Environmental Health.** The impact of the environment on health, including the effects of population, pollution, communicable diseases, and climate.

**PHED 2790-3. Kinesiological Anatomy.** Anatomy as applied to human movement and basic movement skills and sports is presented. The central focus is the study of skeletal and muscular systems of the body. A lecture and laboratory class designed for physical education majors. Prereqs., EPOB 1210, 1220, 1230, 1240, or MCDB 1050 and 1060.

**PHED 2800-3. Kinesiological Physiology.** Designed for physical education majors. Focus is on the body systems and their functions especially in relationship to how they are affected by exercise and movement. Prereqs., EPOB 1210, 1220, 1230, 1240, or MCDB 1050 and 1060; one year of chemistry.

**PHED 3460-3. Introduction to Special Physical Education.** Overview of handicapping conditions, Public Law 94-142, mainstreaming, behavior management techniques, assessment and evaluation, and perceptual motor learning and the exceptional child. Prereq., PHED 2790 or EPOB 3420.

**PHED 3690-3. Sports Humanities.** The development, characteristics, and values of sport and exercise systems in American culture with reference to societal values assigned these areas in past cultures. Prereq., PHED 2790 or EPOB 3420.

**PHED 4010 (1-3). Professional Seminar: Physical Education.** Presentation of special aspects of current practices, materials, and trends in physical education. Prereqs., PHED 2790 and 2800 or EPOB 3420 and 3430.

**PHED 4130-3. Curriculum and Administration in Physical Education.** The development of curriculum in physical education is examined. In addition, the functions and processes of administration and the organization of instructional and interscholastic athletic programs are presented. School visits included in the course. Prereqs., PHED 2790 and 2800.

**PHED 4150-3. Management of Aquatic Programs.** Designed to provide the necessary techniques, management skills, and knowledge required to administer modern aquatic programs. Prereq., junior standing.

**PHED 4170-3. Physical Education in the Elementary School.** Activities, program planning, and teaching methods for grades 1-6. Prereqs., junior standing and PHED 2080.

**PHED 4180-2. Theory of Athletic Coaching.** Fundamental and technical problems in connection with coaching of athletic teams. Prereq., junior standing.

**PHED 4190-2. Leadership and Values in Modern Sports Programs.** Explores the underlying values and principles that dictate the nature, scope, and practices associated with the administration and management of sports programs. Prereq., junior standing.

**PHED 4200-2. Physical Education and Health for the Elementary School.** (For elementary education majors only.) A study of activities, teaching methods, and program

planning for grades 1-6. Also involves discussions of middle school activities and programs. Opportunities to work with children are provided. Prereq., junior standing.

**PHED 4290-3. Tests and Measurements in Physical Education.** The techniques for constructing, interpreting, and administering performance, affective, and knowledge tests in physical education settings are analyzed and applied. Includes an introduction to computer applications in physical education. Prereqs., PHED 2790 and 2800.

**PHED 4490-2. Seminar-Practicum in Adapted Physical Education.** Theory and practice in therapeutic aspects of physical education and/or recreation. Readings, discussions on current trends and problems. Prereq., PHED 3460.

**PHED 4580-3. Methods of Teaching Physical Education in Secondary Schools.**

**PHED 4830-6. Student Teaching in Physical Education.** Student teaching in the public schools. Graded on a Pass/Fail basis.

## PHYSICS

**PHYS 1010-3, 1020-3. Physical Science for Nonscientists.** Lect. Topics range from Newtonian mechanics to modern physics. Emphasizes the social and historical aspects of physics and its connection to the humanities. Prereq., PHYS 1010 or instructor consent.

**PHYS 1110-4. General Physics 1.** Three lect., one rec. per week, plus three evening exams in the semester. First semester of 3-semester sequence for science and engineering students. Covers kinematics, dynamics, momentum of particles and rigid bodies, work and energy, gravitation, simple harmonic motion, and introduction to thermodynamics. Coreq., APPM 1350, or 1352, or MATH 1300.

**PHYS 1120-4. General Physics 2.** Three lect., one rec. per week, plus three evening exams in the semester. Second semester of 3-semester introductory sequence for science and engineering students. Covers electricity and magnetism, wave motion, and optics. Prereq., PHYS 1110; coreq., MATH 2300 or APPM 1360 or 1362.

**PHYS 1140-1. Experimental Physics 1.** To be taken concurrently with PHYS 1120. One lect., one 2-hour lab per week.

**PHYS 1150-2. Experimental Physics 2.** One lect., two 2-hour labs per week. To replace PHYS 1140 and to be taken concurrently with PHYS 1120 for physics majors in Plan 3. Registration by special arrangement with lecturer.

**PHYS 1810, 1820, 1830-variable credit. Special Topics in Physics.** Various topics not normally covered in the curriculum; offered intermittently depending on student demand and availability of instructors.

**PHYS 2010-5, 2020-5. General Physics.** Three demonstration lectures, one two-hour lab/rec. per week, plus three evening exams in the semester. PHYS 2010 covers mechanics, heat, and sound; PHYS 2020 covers electricity and magnetism, light, and modern

physics. An elementary but thorough presentation of the fundamental facts and principles of physics. Majors in mathematics, chemistry, and others taking calculus are urged to take instead PHYS 1110, 1120, 1140, 2130, and 2150. Prereq. for PHYS 2010 is ability to use high school algebra; prereq. for PHYS 2020 is PHYS 2010.

**PHYS 2070-3. Energy in a Technical Society.** Lect. Various aspects of energy: the physics involved in the sources and uses of energy in our society; the state of depletion of the fossil fuels; nuclear energy, solar energy, and other alternative sources of energy and their possible effects on the environment. No background in physics is required.

**PHYS 2080-3. The Physics of Contemporary Social Problems.** Lect. Continuation of PHYS 2070. Various contemporary areas of concern such as air and water pollution, transportation, resources, and communications are discussed from the point of view of the physical principles involved and the impact on society. The object of this course is to understand the scientific questions involved in making decisions in these areas. No background in physics is required. Prereq., PHYS 2070.

**PHYS 2130-3. General Physics 3.** Lect. Third semester of introductory sequence for science and engineering students. Covers special relativity, quantum theory, atomic physics, solid state, and nuclear physics. Prereq., PHYS 1120 and PHYS 1140; coreq., MATH 2400.

**PHYS 2140-3. Methods of Theoretical Physics.** Lect. Introduces mathematical techniques required for a quantitative understanding of the phenomena of modern physics, including vector algebra and vector calculus, Fourier analysis, and some of the differential equations of physics. Prereq., PHYS 2130.

**PHYS 2150-1. Experimental Physics.** One lect., one 2-hour lab per week. Includes many experiments of modern physics, including atomic physics, solid state physics, electron diffraction, radioactivity, and quantum effects. Coreq., PHYS 2130.

**PHYS 2160-2. Experimental Physics.** One lect., two 2-hour labs per week. To replace PHYS 2150 and to be taken concurrently with PHYS 2130 for Physics majors in Plan 3. Registration by special arrangement with instructor.

**PHYS 2810, 2820, 2830-variable credit. Special Topics in Physics.** Various topics not normally covered in the curriculum; offered intermittently depending on student demand and availability of instructors.

**PHYS 2840, 2850, 2860-variable credit. Independent Study.** Selected topics for undergraduate independent study. Subject matter to be arranged.

**PHYS 3210-3. Analytical Mechanics.** Lect. Covers Newtonian mechanics, including rigid body motion, coupled oscillators, central forces and scattering, and provides an introduction to Lagrange's and Hamilton's equations. Prereqs., PHYS 2140 and APPM 2360 or equivalent.

**PHYS 3220-3. Quantum Mechanics.** Lect. Provides an introduction to quantum mechanics with simple solutions to the Schrodinger equation including the harmonic oscillator, potential well and one-electron atom. Prereq., PHYS 3210.

**PHYS 3310-3, 3320-3. Principles of Electricity and Magnetism 1 and 2.** Mathematical theory of electricity and magnetism is covered, including electrostatics, magnetostatics, and polarized media, and provide an introduction to electromagnetic fields, waves, and special relativity. Prereq. for PHYS 3310 is PHYS 2140 and APPM 2360; coreq., PHYS 3210. Prereq. for PHYS 3320 is PHYS 3310.

**PHYS 3330-2, 3340-2. Junior Laboratory.** One lect. and one 3-hour lab per week. Includes experiments on data handling, electrical measurements, electronics, optics, vacuum techniques, heat and thermodynamics, mechanics, and modern physics. Emphasis is on developing basic skills and on design of experiments. Each student carries at least one project experiment each semester. Prereqs. for PHYS 3330 are PHYS 2130 and 2150; coreq., PHYS 3310. Prereq. for PHYS 3340 is PHYS 3330.

**PHYS 3450-3. Topics in the History and Philosophy of Physics.** (PHIL 3450.) Topics vary from year to year and may include scientific methodology, the role of experiment, and case studies in the history of physics. Prereq., one year of physics or instructor consent.

**PHYS 3810, 3820, 3830-variable credit. Special Topics in Physics.** Various topics not normally covered in the curriculum; offered intermittently depending on student demand and availability of instructors.

**PHYS 4140/5140-4. Experimental Plasma Physics.** See APAS 5140. Prereqs., APAS 5540 or equivalent, and PHYS 3310.

**PHYS 4230-3. Thermodynamics and Statistical Mechanics.** Statistical mechanics applied to macroscopic physical systems; statistical thermodynamics, classical thermodynamic systems; applications to simple systems. The relationship of the statistical to the thermodynamic points of view is examined. Prereq., PHYS 3210 and APPM 2360.

**PHYS 4340-3. Solid-State Physics.** (ECEN 4345.) Primarily for senior physics majors. Crystal structure lattice dynamics, band theory, semiconductors, and ferromagnetism are discussed. Prereqs., PHYS 3220 and 4230.

**PHYS 4410-3, 4420-3. Atomic and Nuclear Physics.** Topics include a quantum mechanical treatment of the one-electron atom, atomic shell structure, atomic and molecular spectroscopy, band theory of solids, X-rays, nuclear properties, radioactivity, and the properties of the fundamental particles. Prereq. for PHYS 4410 is C or better in PHYS 3220 and PHYS 3320, or instructor permission. Prereq. for PHYS 4420 is PHYS 4410.

**PHYS 4430-2, 4440-2. Senior Laboratory.** One lect., one lab per week to be taken with PHYS 4410, 4420. Experiments introduce students to realities of experimental physics so that they will gain a better understanding of theory and an appreciation of the vast

amount of experimental work done in the physical sciences today. For students registered for PHYS 4440 and not 4530, and for those who have taken PHYS 4510, or for students with instructor's consent, some experiments from the optics laboratory can be included on a replacement basis. Prereq. for PHYS 4430 is PHYS 3330; coreq., PHYS 4410. Prereq. for PHYS 4440 is PHYS 4430.

**PHYS 4510-3. Optics.** Basic electromagnetic theory of light, using Maxwell's equations. Examples in geometrical optics; extensive applications in physical optics including diffraction and polarization. Spectra, including Zeeman effect and fluorescence. Recent advances in experimental techniques: microwaves, lasers, image converters. Prereq., PHYS 3320.

**PHYS 4530-1. Optics Laboratory.** Lab experiments to supplement PHYS 4510. Emphasis is on techniques as well as basic principles. Covers linear optics, nonlinear optics, and lasers.

**PHYS 4610-2, 4620-2. Physics Honors.**

**PHYS 4810, 4820, 4830-variable credit. Special Topics in Physics.** Various topics not normally covered in the curriculum; offered intermittently depending on student demand and availability of instructors.

**PHYS 4840, 4850, 4860-variable credit. Independent Study.** Selected topics for undergraduate independent study. Subject matter to be arranged.

**PHYS 4970/5970-2. Seminar on Physical Methods in Biology.** See MCDB 4970/5970.

**PHYS 5010-3. Health Physics.** Two lect., one lab per week. Provides job-oriented skills. Topics covered include radiation dosimetry, radiation biophysics, radioecology, reactor health physics, and medical physics. The labs include exercises with radioactive isotopes as well as tours of off-campus facilities. Prereq., instructor consent.

**PHYS 5030-2, 5040-3. Intermediate Mathematical Physics 1 and 2.** (MATH 5030/5040.) Survey of classical mathematical physics, starting with complex variable theory and finite dimensional vector spaces. Topics in ordinary and partial differential equations, the special functions, boundary value problems, potential theory, and Fourier analysis. Prereq. for PHYS 5030 is MATH 4310, 4320, or equivalent. Prereq. for PHYS 5040 is PHYS 5030.

**PHYS 5050-3. Science Communication Seminar.** (JOUR 5812, GEEN 5050.) Study and practice of public interest writing in science and technology. Writers' understanding of science, scientists' understanding of writing for communication to the general public. Practice through writing and discussion with those engaged in public interest science.

**PHYS 5150-3. Introductory Plasma Physics.** See APAS 5150. Prereqs., PHYS 5140 or equivalent, and PHYS 3310.

**PHYS 5210-3. Theoretical Mechanics.** Variational principles, Lagrange's equations, Hamilton's equations, motion of rigid body, relativistic mechanics, transformation theory, continuum mechanics, small oscillations, Hamilton-Jacobi theory.

**PHYS 5220-3. Nonlinear Dynamics.** See APAS 5220.

**PHYS 5250-3, 5260-3. Introduction to Quantum Mechanics 1 and 2.** Quantum phenomena, relation to classical physics, Schrodinger and Heisenberg picture, application to problems, approximation techniques; angular momentum; scattering theory; Pauli spin theory. Coreq. for PHYS 5250 is PHYS 5210. Coreq. for PHYS 5260 is PHYS 6310.

**PHYS 5430-2, 5440-2. Modern Physics Laboratory.** One lect., one lab per week. Experiments in nuclear physics, atomic physics, and condensed matter introduce the student to a variety of techniques useful in contemporary research. Students with limited background in laboratory work are urged to take this course.

**PHYS 5770-3. Gravitational Theory.** (Theory of General Relativity.) Lect. Einstein's relativistic theory of gravitation is presented from geometric viewpoint; applications to astrophysical problems (gravitational waves, stellar collapse, etc.) are given.

**PHYS 5840, 5850, 5860-variable credit. Selected Topics for Graduate Independent Study.** Subject matter to be arranged.

**PHYS 6610-3. Earth and Planetary Physics 1.** (GEOL/APAS 6610.) Mechanics of deformable materials, with applications to earthquake processes. Introduction to seismic wave theory. Inversion of seismic data for the structure, composition and state of the interior of the earth.

**PHYS 6620-3. Earth and Planetary Physics 2.** (GEOL/APAS 6620.) Space and surface geodetic techniques as well as potential theory are covered. Other topics are the definition and geophysical interpretation of the geoid and of surface gravity anomalies, isostasy; post-glacial rebound; tides and the rotation of the earth.

**PHYS 6630-3. Earth and Planetary Physics 3.** (GEOL/APAS 6630.) The solar system: theories of its origin, meteorites. Distribution of radioactive materials; age dating. Heat flow through continents and the ocean floor; internal temperature distribution in the earth, mantle convection. Origin of the oceans and atmosphere.

**PHYS 6650-variable credit. Seminar in Geophysics.** (GEOL/APAS 6650.) Advanced seminar studies in geophysical subjects for graduate students.

**PHYS 6660-3. Geophysical Instrumentation.** (GEOL 6660.) An introduction to the principles on which the design of instruments for various geophysical observations is based. Emphasis on seismographic and strain/tilt systems, with some discussion of gravimetric and magnetometric instruments.

**PHYS 6680-3. Dynamics of Continuous Media.** (MCEN 6183, GEOL 6680.) Theory of wave motion in continuous media, with emphasis on isotropic, elastic materials, propagation, reflection, refraction, dispersion, and diffraction of body- and surface-waves in infinite and bounded systems, with applications to seismic waves.

**PHYS 6690-3. Advanced Seismology.** (GEOL 6690.) Wave propagation in the earth;

inversion of seismological data to obtain earth structure. Matrix formulation of seismic wave transmission. Theory of seismic wave generation illustrating use of contour integration techniques.

**PHYS 6940 (1-3). Master's Degree Candidate.**

**PHYS 6950 (4-6). Master's Thesis.** An approved problem in theoretical or experimental physics under the direction of staff members. Intended to introduce the student to procedures in research and development work. Work of an original nature is expected.

**PHYS 7010-2. Design and Analysis of Experiments.** Intended to aid students in planning and carrying out experiments. Methods for estimating expected noise level and maximizing signal-to-noise ratio. Topics in electronics, optics, vacuum techniques, and statistics. Examples from various areas of low energy experimental physics at the University.

**PHYS 7030-3, 7040-3. Advanced Mathematical Physics 1 and 2.** (MATH 7030, 7040.) Hilbert space, theory of distributions,  $L^2$ -spaces, Sobolev spaces, methods of functional analysis, spectral theory of operators, applications to quantum theory, and group theory. Prereq. for PHYS 7030 is MATH 4310, 4320, 4450, or 6350. Prereq. for PHYS 7040 is PHYS 7030.

**PHYS 7050-3, 7060-3. Advanced Mathematical Physics 3 and 4.** (MATH 7050, 7060.) Further topics in modern mathematical physics with applications. Prereqs. for PHYS 7050 are PHYS 7030 and 7040. Prereq. for PHYS 7060 is PHYS 7050.

**PHYS 7160-3. Intermediate Plasma Physics.** (APAS 7160.) Continuation of PHYS 5150. Topics vary yearly but include nonlinear effects such as wave coupling, quasilinear relaxation, particle trapping, nonlinear Landau damping, collisionless shocks, solitons; nonneutral plasmas; kinetic theory of waves in a magnetized plasma; anisotropy; inhomogeneity; radiation—ponderomotive force, parametric instabilities, stimulated scattering; plasma optics; kinetic theory and fluctuation phenomena. Prereq., PHYS 5150 or instructor consent.

**PHYS 7170-3. Advanced Plasma Physics.** See APAS 7170. Prereq., PHYS 5160 or instructor consent.

**PHYS 7230-3. Statistical Mechanics.** Classical and quantum statistical theory, including the study of both equilibrium and nonequilibrium systems. Topics covered in PHYS 7230 include kinetic theory, degenerate gases, microcanonical and grand canonical ensembles, and irreversible processes. Prereqs., PHYS 5250 and 5260.

**PHYS 7240-3. Advanced Statistical Mechanics.** An introduction to current research topics in statistical mechanics. Topics vary from year to year and may include phase transitions, critical phenomena, nonequilibrium phenomena, dense fluids, dynamical systems, plasma physics, or quantum statistical mechanics. Prereq., PHYS 6230.

**PHYS 7270-3. Introduction to Quantum Mechanics 3.** Radiation theory; relativistic wave equations with simple applications;

introduction to field theory and second quantization.

**PHYS 7280-3. Advanced Quantum Theory.** Quantum theory of fields, elementary particles, symmetry laws, and topics of special interest. Prereq., PHYS 7270 or instructor consent.

**PHYS 7310-3, 7320-3. Electromagnetic Theory.** Electromagnetic fields; applications of Maxwell's equations to electromagnetic wave propagation, and fundamental properties of light; relativistic electrodynamics, radiation theory. Prereqs. for PHYS 7310 are PHYS 3310 and 3320 or equivalent; PHYS 6030 or equivalent is recommended. Prereq. for PHYS 7320 is PHYS 7310.

**PHYS 7440-3, 7450-3. Theory of the Solid State.** Stresses application to the solid state of physical concepts basic to much of modern physics, single-particle approximation and the energy-band description of electron states in solids, pseudopotential theory applied to ordered and disordered systems, dynamical behavior of electrons in solids, lattice dynamics, Hartree-Fock and random-phase approximation in solids, many-body aspects of magnetism and superconductivity.

**PHYS 7510-3. Atomic, Molecular, and Nuclear Processes.** Study of physical processes of importance in astrophysics, including atomic and molecular spectrum lines, absorption, ionization, recombination, collision processes involving electrons or heavy particles, line broadening, nuclear reaction mechanisms and rates, and neutrino processes.

**PHYS 7530-3. Topics in Chemical Physics.** A broad survey is made of molecular structure as deduced primarily from molecular spectra. Topics selected from interaction of radiation with matter, molecular rotation, molecular vibration, molecular electronic energy levels, structural information provided by nuclear magnetic resonance, electron spin resonance and molecular-beam spectroscopy, structural information provided by electron, neutron, and X-ray diffraction, molecular optical dispersion phenomena. Prereqs., PHYS 3220 and CHEM 5521 or equivalent.

**PHYS 7550-3. Atomic and Molecular Spectra.** Theory of atomic structure and spectra, including coupling of angular momenta, tensor operators, energy levels, fine and hyperfine structure, transition probabilities, Zeeman and Stark effects. Molecular spectra: electronic, vibrational, and rotational states. Rotation matrices, symmetric top.

**PHYS 7710-3, 7720-3. Nuclear Physics 1 and 2.** Intrinsic properties of nucleons and the nucleon-nucleon interaction, nuclear models, scattering of nucleons by nuclei in terms of an optical model, and nuclear reactions.

**PHYS 7730-3, 7740-3. Theory of Elementary Particles.** Systematics of elementary particles; quantum numbers, Lorentz group and spin; the S-matrix and invariant amplitudes; analytical properties of amplitudes; dispersion relations; dynamical calculation of quantum numbers and masses; elementary particle spectroscopy; higher symmetries.

**PHYS 7770-3. Theory of Relativity.** Principles and applications to physics of the special and general theories of relativity.

**PHYS 7810, 7820, 7830-variable credit. Special Topics in Physics.** Various topics not normally covered in the curriculum; offered intermittently depending on student demand and availability of instructors.

**PHYS 7840, 7850, 7860-variable credit. Selected Topics for Graduate Independent Study.** Subject matter to be arranged.

**PHYS 8990-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## POLITICAL SCIENCE

### American

#### LOWER DIVISION

**PSCI 1101-3. The American Political System.** Emphasis upon interrelations among levels and branches of government, formal and informal institutions, processes, and behavior.

**PSCI 2101-3. Introduction to Public Policy Analysis.** A study of the policy-making processes in American government, the factors which shape public decision, and the issues and questions which are relevant to political inquiry.

**PSCI 2481-3. Introduction to the Legal Process.** Basic legal concepts and processes with emphasis on the American system. Special attention to the political functions of law. Recommended as preparation for PSCI 4241, 4251, 4261.

#### UPPER DIVISION

**PSCI 4001-3. Government Regulation of Business.** Consideration of theory and practice of government relationship to business and professional activity on both state and national levels. Analysis of selected regulatory programs and policies and their impact on the constitutional system. Not open to freshmen and sophomores.

**PSCI 4011-3. The American Presidency.** Covers the constitutional and institutional foundations and historical development of the presidency; roles, powers, selection, recent modifications, and institutionalization. Lectures and class discussion are utilized.

**PSCI 4021-3. Legislatures and Legislation.** Structure and organization of legislatures and process of statute lawmaking.

**PSCI 4031-3. Political Parties and Pressure Groups.** Practice of party politics in the United States. Nature, structure, organization, and functions of political parties and pressure groups. Analysis of pressure politics and political behavior.

**PSCI 4041-3. Advanced American Government: The Congress.** Provides an intensive examination of the role of Congress in American government, including congressional

elections, representation, the organization of Congress, and congressional policy making. The larger context of congressional politics, including the political parties, the president, and interest groups are also examined.

**PSCI 4051-3. Public Opinion and Political Behavior.** Measurement of public opinion and evaluation of its impact on governmental policy formation, including survey research techniques and field work in opinion sampling.

**PSCI 4061-3. State Government and Administration.** Present-day national, state, and interstate relations; constitutional development; legislative, executive, and judicial processes and problems; administrative organization and reorganization; state finances; major state services; future of the states. Special attention is given to the government of Colorado.

**PSCI 4071-3. Urban Politics.** Examination of the structure of political and social influence in urban areas; selection of urban leadership; relationship of the political system to governmental and social institutions.

**PSCI 4081-3. Municipal Government and Administration.** Municipalities and relationships to the states and the national government; local politics; forms of municipal government; application of ideas and techniques of public administration to management of municipal affairs; activities of cities, e.g., planning, public utilities, law enforcement, fire protection.

**PSCI 4091-3. Comparative Metropolitan Systems.** Comparative analysis of the major metropolitan systems of North America and Europe: the structural environment, decision making in the bureaucracies and political groupings, governmental interaction and communication.

**PSCI 4101-3. Black Politics.** Elitism and Black powerlessness; Black interest groups; base, structure, and functions of Black political organizations; goals and political styles of Black politicians; community control; trends (radicalism and separatism vs. accommodation); and future of Black politics in the United States.

**PSCI 4111-3. Urban Policy Analysis.** Examination of the processes whereby governments formulate, implement, and evaluate programs designed to deal with major social and economic problems. Special emphasis on an evaluation of urban programs in welfare, education, law enforcement, housing, and urban renewal.

**PSCI 4121-3. War, Peace, and Strategic Defense.** The role of force in American foreign policy, especially in relation to other superpowers. Particular emphasis is placed on the political and economic analysis of strategic forces and their effects. Arms control treaties and negotiations are studied.

**PSCI 4131-3. The Mexican American in Politics.** Analysis of the social, cultural, and economic factors that affect political behavior of Mexican Americans. Special attention is paid to the Mexican American cultural heritage and to relations between Mexican Americans and Anglo-Americans.

**PSCI 4141-3. Bureaucratic Power in American Politics.** Examines public agencies as political actors engaging in public policy making. Topics include sources of bureaucratic power; securing public support; relationships with legislature, political executives, interest groups, and other agencies; and an analysis of the freedom and limitations resulting from these relationships.

**PSCI 4171-3. Government and Capitalism in the United States.** An examination of competing theoretical approaches to questions related to the origins, development, and purposes of modern government in the United States; particular attention is paid to the impact of transformations in the underlying structure of the capitalist economy.

**PSCI 4181-3. Public Administration.** A comprehensive basic course which considers the power of organization, the problem of bureaucracy, the determination of organizational objectives, decision making, the allocation of resources, organizational structure, staffing problems, and the evaluation of institutional performance.

**PSCI 4191-3. National Security Organization and Policy Making.** Analysis of the governmental structure and the policy-making processes for American national security planning, decision making, and action.

**PSCI 4201-3. The Environment and Public Policy.** Consideration of constitutional, political, and geographic factors in the development of public policy affecting the use of natural resources and management of the environment; organization, procedures, and programs for use of natural resources; administration of environmental policies.

**PSCI 4211-3. Public Priorities: Revenues and Program Expenditures.** Public goals as expressed in government budgets. The politics and processes involved in raising public moneys and in determining public spending programs.

**PSCI 4231-3. Administrative Law.** General nature of administrative law, types of administrative action and enforcement, analysis of rule making and adjudication, administrative due process, judicial review.

**PSCI 4241-3. Constitutional Law 1.** Nature and scope of the following American constitutional principles as developed by the U.S. Supreme Court: federalism, jurisdiction of the federal courts, separation of powers, the taxing power, and the commerce power. Case method. Not open to freshmen and sophomores.

**PSCI 4251-3. Constitutional Law 2.** Continuation of PSCI 4241. Emphasizes the war power, powers of the president, citizenship, the Bill of Rights, and the Civil War amendments. Case method. Not open to freshmen and sophomores. Students must have completed PSCI 4241 or have consent of instructor.

**PSCI 4261-3. The Judicial System.** Examination of the principal actors in the legal system—police, lawyers, judges, citizens—and the roles they play in the political process. Differential treatment of varying economic groups is emphasized.

**PSCI 4271-3. Sex Discrimination: Constitutional Issues.** (WMST 4271.) Examines continuity and change in the legal treatment of sex and gender. Using the case method, it explores areas of the law including equal protection analysis, affirmative action, and privacy rights.

**PSCI 4291-3. Sex Discrimination: Federal and State Law.** (WMST 4291.) Examines continuity and change in the legal treatment of sex and gender. Using the case method, the focus is on family law, education equity, employment law, and gender-related criminal law.

**PSCI 4301-3. Symbolic Politics.** Provides an introduction to the uses and abuses of symbols as instruments and indicators of political change. Prereq., PSCI 1101.

**PSCI 4841 (1-3). Independent Study-American.** Subjects are chosen and arrangements are made to suit the needs of each student. Independent study is for upper-division students who have completed 9 semester hours of political science and who have an overall average of at least 3.00. Not more than 6 semester hours of independent study may be credited toward the minimum requirements in the Political Science major. Special Independent Study Approval Agreement forms must be obtained from the Department.

## GRADUATE COURSES AND SEMINARS

**PSCI 5011/7011-3. Seminar: American Politics.** Primarily for students who have taken an undergraduate course in American politics. Required of all Ph.D. students, majoring in Political Science, during first year of residence. Emphasis is on the preparation of research papers and of literature in the field.

**PSCI 5031/7031-3. Seminar: Political Attitudes and Behavior.** Intensive examination of topics in political attitudes and behavior such as political participation, ideology, voting, and elite behavior. Review of the methodology of behavioral research and introduction to ICPSR data archive and computer-based research.

**PSCI 5041/7041-3. Seminar: The Presidency.** Intensive examination and preparation of research papers on the historical, functional, and constitutional aspects of the presidency. Broad attention is given to the literature on the presidential system and to analytical comparisons with other executive systems.

**PSCI 5051/7051-3. Seminar: The United States Congress.** Comprehensive examination of the literature and selected research topics concerning the United States Congress.

**PSCI 5061/7061-3. Seminar: Urban Public Policy.** Focus on the formulation, revision, and outcomes of public policy in American urban communities. Some comparative Canadian and European literature also used.

**PSCI 5071/7071-3. Public Policy Analysis 1 (Decision Process).** Provides an introduction to a comprehensive conceptual model of the policy decision process. A completed policy is conceived to evolve through intelligence, promotion, prescription, invocation,



application, appraisal, and termination. Theoretical and case studies are used to elaborate and specify the model.

**PSCI 5081/7081-3. Problems in Public Policy Analysis.** Intensive examination of selected public policy issues. Government outputs and policy alternatives are emphasized in terms of their contribution to the net social welfare. The approach is more economic than behavioral.

**PSCI 5091/7091-3. Politics of Social Movements and Interest Groups.** Examines theoretical and empirical research on American interest groups and social movements. Emphasis is placed on the relative power of such interests and their ability to bring about changes in national policy and political institutions.

**PSCI 5101/7101-3. Seminar: Colorado Public Policy.** Examines issues of development and decline in the state. Topics change each term, but focus on policies to accommodate growth, curtail it, or ameliorate its effects; or on the political structures and processes through which growth policy decisions are made.

**PSCI 5141/7141-3. The State in American Politics.** A theoretical and empirical examination of the relationship between social class institutions and the state; particular attention is paid to the modern corporation and its impact on American politics and public policy.

**PSCI 5901/7901 (1-3). Topics in Political Science.** Not a free option; must be approved by the student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6901/8901 (1-3). Graduate Research Topic.** Independent research in a topic of special interest. Arrangements are made to suit the needs of each particular student. Not a free option; must be approved by student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6951-4. Master's Thesis.**

**PSCI 8991-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## International/Comparative

### LOWER DIVISION

**PSCI 2012-3. Introduction to Comparative Politics: Developed Political Systems.** Comparison of legal-institutional features; social, economic, ideological forces; patterns of recruitment and decision making; implications of planned socioeconomic and political change in Western politics. Geographical emphasis varies with the instructor, but there is a balanced comparison of several countries representing a broad cross section of the Western world. Closed to those with credit in PSCI 2112 and/or PSCI 2122.

**PSCI 2022-3. Introduction to Comparative Politics: Developing Political Systems.**

Comparison of political features within the non-Western world: traditional political culture, nationalism, political integration, political structures and groups, modes of recruitment, the style of politics, implications of planned socioeconomic change. Geographical emphasis varies with the instructor, but there is a balanced comparison of several countries representing a broad cross section of the non-Western world.

**PSCI 2112-3. Governments of Great Britain and France.** Governments and politics in present-day Great Britain and France, especially in comparison with the U.S. government. Emphasis on postwar reform legislation in the U.K. and recent party politics in France. Closed to those with credit in PSCI 2012.

**PSCI 2122-3. Governments of Germany and Russia.** Government and politics in present-day Russia and Germany. Development and present status of Bolshevist theory and practice. Democratic and totalitarian trends in German governments, past and present. Closed to those with credit in PSCI 2012.

**PSCI 2222-3. Introduction to International Relations.** Introductory conceptual approaches, the actors, national and international dynamics of the international environment, problems and issues.

**PSCI 2702-3. International Violence.** Introduction to knowledge about international violence. Emphasizes ecological causes of war found in the global system and ways in which decision makers and ordinary citizens can choose peace.

### UPPER DIVISION

**PSCI 4002-3. Advanced Comparative Politics—Western Europe.** An intensive comparative analysis of the political systems and processes of the Western European democracies. Focus is on political culture and constitutionalism; executive-legislative relationships; parties and interest groups; administrative processes and the impact of social changes on political institutions.

**PSCI 4012-3. Third World Politics.** Examination of the political process in the non-Western world. Includes a survey of different methodological approaches to the study of the non-Western systems, the components of political development, effective political units in a transitional society, and prevailing "styles" of political action.

**PSCI 4022-3. The Canadian Political System.** The political practices and institutions of Canada. Monarchy, parliament, administration, and courts; federal-provincial relations; provincial and local government; political parties and political behavior at all levels; Canadian relations with the United States and with the Commonwealth.

**PSCI 4032-3. Latin American Political Systems.** Topics include the impact of social, cultural, and economic variables on the political system, key political groups, varying patterns of political organization and behavior, sources of conflict and violence, major developmental problems and obstacles to change.

**PSCI 4042-3. Political Systems of the Middle East and North Africa.** Comparative analysis of the political process in the Middle East and North Africa. Focuses on Islamic political theory and its contemporary manifestation, the role of nationalism and the "quest for modernity" in the development of this region, and programmed modernization in transitional politics.

**PSCI 4052-3. Political Systems of China, Japan, and Korea.** Contemporary government and politics in China, Japan, and Korea. Analysis of selected political structures, processes, and problems in the light of changing patterns of sociopolitical thought and behavior and economic conditions. Comparisons with other nations.

**PSCI 4062-3. Eastern European Communism: Soviet Satellites and Yugoslavia.** Developments in the Soviet satellites and Yugoslavia, their governmental organizations, and their relation to the Soviet Union and the West.

**PSCI 4072-3. Government and Politics in Southeast Asia.** A survey of the historical and contemporary forces shaping relations among states in Southeast Asia. Special attention is given to big power involvement in the region and to the factors linking Southeast Asia to the international system.

**PSCI 4082-3. Political Systems of Sub-Saharan Africa.** Analysis of major types of political systems in Sub-Saharan Africa and intensive case studies of selected countries exemplifying each type. Anti-colonial movement and adoption of new political institutions and values. Special political problems of multiracial and multicultural societies.

**PSCI 4092-3. Governments of South Asia.** The study of the political systems of India, Pakistan, Ceylon, and Nepal. The impact of British rule on the development of political institutions on the subcontinent as well as the problems of political development at all levels is considered.

**PSCI 4102-3. The Government and Politics of Israel.** Historical and contemporary responses by Jews to the conditions of diaspora and statehood are studied. Israel's political culture, governmental structure and processes, and party politics. Problems of integration, defense, and relations with the diaspora Jewish community.

**PSCI 4112-3. Problems in Latin American Politics.** Analysis of selected political problems of specific countries. Focus varies from year to year. Emphasis on political change and conflict.

**PSCI 4122-3. The Military in Politics.** An analysis of the sources and uses of the political power of the armed forces, the causes and consequences of military intervention in politics, and contrasting patterns of civil-military relationships in Western and non-Western societies.

**PSCI 4142-3. International Relations.** Readings and discussion of the actors, international interaction, and the international system. Emphasis on assessing relationships between concepts, approaches, goals, methods, and substance of relations among states and on trends which transcend sovereignty.

**PSCI 4152-3. Seminar: Control of Foreign News Coverage—International Perspectives.** Studies formal and informal controls and their consequences, chiefly in print media. Special attention to the new information order, and opportunities for substantive/conceptual and empirical research with domestic and foreign materials.

**PSCI 4162-3. American Foreign Policy.** Examination of the foundations, assumptions, objectives, and methods of U.S. foreign policy. Special attention is given to the domestic and external problems of adapting U.S. policy to the changing world environment.

**PSCI 4172-3. International Organization.** Analyzes the phenomenon known as international organization to determine whether it is an effective instrument for achieving peace and security and for the promotion of human welfare.

**PSCI 4182-3. International Law.** An investigation of the body of law which regulates relations between nation states and provides a framework for the solving of common problems. Its nature and effectiveness is explored as well as its adaptability to a changing environment.

**PSCI 4192-3. International Behavior.** Presentation of alternate theoretical frameworks for the explanation of international processes. Theories of conflict behavior and social organization are applied to problems of war and peace.

**PSCI 4202-3. Alternative World Futures.** Aims to help students think about the future of the world in a systematic way. Focuses on alternative projections and policies dealing with major problems.

**PSCI 4212-3. Europe in the International System.** European and Atlantic regionalism. Discussion of such communities as the Council of Europe, NATO, EFTA, Comecon, and OECD, and a detailed examination of the European Common Market. Theories of integration, problems of partnership and interdependence, rival nationalisms and strategic doctrines.

**PSCI 4222-3. Soviet Foreign Policy.** Foreign policy of the Soviet Union, including the international communist movement, its ideological bases, its impact on international politics, and its relations to domestic developments in the U.S.S.R.

**PSCI 4232-3. The Middle East and World Affairs.** Evolution and revolution in the Middle East. The character of nationalism in the area. Analysis of intraregional and international problems affecting the Middle East with special emphasis on the Arab-Israeli imbroglio.

**PSCI 4252-3. International Relations of China, Japan, and Korea.** Major developments in the modern relations of China, Japan, and Korea with each other and with other world regions. Analysis of selected issues in contemporary East Asian international politics.

**PSCI 4262 (1-3). Senior Seminar: International Affairs.** An interdisciplinary course designed primarily to help majors in international affairs bring together, review, and

apply what they have learned in their IA courses in the various disciplines and geographic areas. Emphasizes interrelation between fact and theory. For seniors only; permission of instructor required.

**PSCI 4842 (1-3). Independent Study-International/Comparative.** Subjects are chosen and arrangements are made to suit the needs of each student. Independent study is for upper-division students who have completed 9 semester hours of political science and who have an overall average of at least 3.00. Not more than 6 semester hours of independent study may be credited toward the minimum requirements in the Political Science major. Special Independent Study Approval Agreement forms must be obtained from the Department.

## GRADUATE COURSES AND SEMINARS

**PSCI 5012/7012-3. Seminar: Comparative Politics—Western Europe.** Examination and writing of research papers on selected topics of industrial democracies, especially those of Western Europe. Focus on a comparative analysis of changes in political institutions and processes and their impact on macro-economic policies, e.g., growth, employment, redistribution, and welfare. Required of all Ph.D. students majoring in Political Science during first year of residence.

**PSCI 5032/7032-3. Seminar: Latin American Politics.** Seminar designed to stress intensive study of the political process in Latin America with special emphasis on the variables which affect Latin American political behavior and development.

**PSCI 5042/7042-3. Seminar in Comparative Political Systems.** Discussion of current literature on comparative politics including theoretical and methodological issues.

**PSCI 5072/7072-3. Seminar: Comparative Politics—Sub-Saharan Africa.** Writing and discussion of analytical literature reviews and research papers on various aspects of political change in Sub-Saharan Africa. Stress on comparisons among African political systems as well as with other areas of the world, and on explanation of change.

**PSCI 5112/7112-3. Seminar: Comparative Political Parties and Interest Groups.** Critical examination of topics relating to social forces, parties, and interest groups. Analysis of concepts, theories, and case studies with particular emphasis on Western political systems. Party systems in comparison. The role of groups and the determinants of group politics.

**PSCI 5122/7122-3. Seminar: The Middle East.** Advanced comparative study and critical examination of the modern Middle East. Stresses the analysis of political consequences of modernization, the Arab-Israeli problem, pan-Arabism, and petroleum politics. Seminar papers reflecting a research design are required.

**PSCI 5132/7132-3. Comparative Politics and Ideologies.** Scholarly analysis and instruction on the contrast between contemporary totalitarianism and liberty under law. Taught by outstanding professors from leading universities in the United States and

abroad. Designed primarily for social science teachers, graduate students, newspapermen, clergymen, and radio and television commentators.

**PSCI 5902/7902 (1-3). Topics in Political Science.** Not a free option; must be approved by the student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6902/8902 (1-3). Graduate Research Topic.** Independent research in a topic of special interest. Arrangements are made to suit the needs of each particular student. Not a free option; must be approved by student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6952-4. Master's Thesis.**

**PSCI 8992-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## International Relations

**PSCI 5013/7013-3. Seminar: International Relations.** Review of the salient literature on international relations, and subsequent presentation and critical discussion of analytical studies. Students have wide latitude in substantive and methodological approaches. Emphasis on changing trends and on efforts to understand the bases for cooperation and conflict. Required of all Ph.D. students majoring in Political Science during their first year of residency.

**PSCI 5023/7023-3. Seminar: American Foreign Relations.** Critical review of select conceptual, prescriptive, and methodological literature; examination of select foreign policy problems; discussion of seminar papers. Accent is on student contribution and participation.

**PSCI 5033/7033-3. Seminar: International Relations—Law and Organization.** Seminar devoted to study and research on selected problems concerning international law as a viable legal order and the role of international organization in relations among nations.

**PSCI 5043/7043-3. Seminar: Problems of International Organization.** Devoted to the study of selected problems concerning administration and operation of public international organizations, including the United Nations and its specialized agencies. Decision making, executive leadership, internal organization, personnel policies, coordination of activities, and financing are considered.

**PSCI 5053/7053-3. Seminar: The Causes of International Violence.** Systematic treatment of the causes of war from the perspective of recent findings in international relations. Historical and contemporary examples used in the analysis of warlike behavior. Models of war are applied to other conflict phenomena such as urban violence.

**PSCI 5073/7073-3. Seminar: Global Political Economy.** Introduces graduate students

to the concepts, theories, and data used to study the global system from a political-economic framework. World systems analysis, regime change theory, and dependency theory are all examined with respect to the operation of the exchange and power relationship within the contemporary world system.

**PSCI 5083/7083-3. Soviet Foreign Policy.** Covers the foreign policy of the Soviet Union, its relation to Marxism-Leninism and/or Russian nationalism, as well as to the international communist movement. Special attention is given to the impact of domestic and foreign factors and science and technology on policy formation.

**PSCI 5093/7093-3. Seminar: Africa in World Affairs.** Examines motives, objectives, nature, and methods of intra-African and international behavior of independent African states, through such issues as national sovereignty, African unity, national liberation, and economic development. Special attention to values, decision making, systems, and authority and legitimacy.

**PSCI 5903/7903 (1-3). Topics in Political Science.** Not a free option; must be approved by the student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6903/8903 (1-3). Graduate Research Topic.** Independent research in a topic of special interest. Arrangements are made to suit the needs of each particular student. Not a free option; must be approved by student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6953-4. Master's Thesis.**

**PSCI 8993-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## Political Theory

### LOWER DIVISION

**PSCI 2404-3. Introduction to Political Theory.** Introduces the student to the main issues and concepts of both political philosophy/ethics and empirical theories as they try to deal with contemporary political realities.

### UPPER DIVISION

**PSCI 4004-3. History of Political Philosophy.** Study of the main political philosophies and political issues of the Western culture, from antiquity to the twentieth century.

**PSCI 4024-3. Senior Seminar—Theory.** Intensive analysis and discussion of the major theories and issues of both contemporary political thought and the history of political philosophy. The topic is announced by the instructor, but might include analysis of concepts (justice, human rights, democracy, etc.) or major theories. Emphasis is on advanced discussion plus individual research.

**PSCI 4034-3. Politics and Literature.** An examination of broadly political topics as they are presented in important literary works and an analysis of the problems involved in using the literary mode to present political teachings.

**PSCI 4044-3. Jurisprudence.** Development of different legal theories and their social significance. Special attention is given to the modern jurisprudential concepts and to the political parameters of their formation.

**PSCI 4054-3. American Political Thought.** Development of American political theories and ideas from colonial period to present. This course can also be taken for American field credit.

**PSCI 4064-3. Revolution and Political Violence.** Study, discussion, and evaluation of alternative frameworks for the analysis of revolution and political violence. The theoretical material is firmly couched in case situations such as Western, class, colonial, urban, international, historical, racial, religious, and intergenerational violence.

**PSCI 4074-3. Quantitative Research Methods.** Introduction to quantitative research methods used in political science. Basic tools of analysis: data collection, processing, and evaluation, with special attention to survey techniques. Includes elite and case study analysis; aggregate, cluster, and content analysis; use of computers in political research.

**PSCI 4084-3. Research Practicum in Systematic Political Science Inquiry.** The application of systematic research methods to problems of political science inquiry. Students define their own individual substantive areas of research concern or engage in a common project established by the class in consultation with the instructor. The types of research method used and the speed of their introduction depend on the substantive problem areas chosen for research.

**PSCI 4224-3. Rationality, Democracy, and Policy.** Philosophical and political approaches to an understanding of social decision making; examination of the possibilities for choosing rational courses of action and of concrete problems of rational decision making.

**PSCI 4284-3. General History of Law.** A comparative survey of the development of written law and case law systems in the Western world. Special attention is given to the historical bases of the contemporary Anglo-American, French, German, and Soviet legal concepts and institutions.

**PSCI 4844 (1-3). Independent Study—Theory.** Subjects are chosen and arrangements are made to suit the needs of each student. Independent study is for upper-division students who have completed 9 semester hours of political science and who have an overall average of at least 3.00. Not more than 6 semester hours of independent study may be credited toward the minimum requirements in the Political Science major. Special Independent Study Approval Agreement forms must be obtained from the Department.

## GRADUATE COURSES AND SEMINARS

**PSCI 5024/7024-3. Seminar: Selected Political Theories.** Selected political philosophies or theories in classical or modern political thought.

**PSCI 5044/7044-3. Law and Politics Core Seminar.**

**PSCI 5054/7054-3. Seminar: American Political Thought.** Intensive research in and presentation of selected topics intended to introduce the mature student to the broad context within which political ideas arise. Deals with classical and modern thought.

**PSCI 5084/7084-3. Seminar: Political Theory.** Intensive research in and presentation of selected topics. Introduces the student to the broad context within which political ideas arise. Deals with classical and modern thought.

**PSCI 5104/7104-3. The Analysis of Political Systems.** Examination of concepts, propositions, and theories employed in the analysis of territorially inclusive political systems—national, subnational, and international. Systems, functional and political economy, conceptual frameworks and their relationship to personality, cultural, role, group, power, elite, and conflict "theories."

**PSCI 5904/7904 (1-3). Topics in Political Science.** Not a free option; must be approved by the student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6904/8904 (1-3). Graduate Research Topic.** Independent research in a topic of special interest. Arrangements are made to suit the needs of each particular student. Not a free option; must be approved by student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6954-4. Master's Thesis.**

**PSCI 8994-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## Empirical Theory and Research Methodology

**PSCI 5015/7015-3. Seminar: Science and Politics.** Intensive reading and discussions of the impact of the scientific enterprise on the world of politics. The scientific and the political perspectives; democracy and the technological society; science and the non-Western world; nuclear science and international relations.

**PSCI 5025/7025-3. Seminar: Conflict Behavior—The Politics of Violence.** Surveys historical, theoretical, and empirical analyses of violent conflict behavior, including the causes and consequences of riots, terrorism, revolution, international war, and intervention. Enrollment is recommended in both semesters of the two semester sequence.

**PSCI 5035/7035-3. Seminar: Conflict Behavior—The Politics of Violence.** Surveys historical, theoretical, and empirical analyses of violent conflict behavior, including the causes and consequences of riots, terrorism, revolution, international war, and intervention. Enrollment is recommended in both semesters of the two semester sequence.

**PSCI 5075/7075-3. Introduction to Professional Political Science.** Introduces graduate students to the intellectual foundations and historical development of political science; the epistemologies, subfields, intellectual approaches, methodological strategies of the discipline; and the ethics and norms of professional conduct.

**PSCI 5095/7095-3. Advanced Political Data Analysis.** Provides advanced training in empirical and analytic methods of political analysis. Covers the general multivariate linear (regression) model as it is employed in political science. Also covers a variety of dynamic approaches to empirical analysis (stochastic models, time series, and simulation). Prereq., instructor consent.

**PSCI 5905/7905 (1-3). Topics in Political Science.** Not a free option; must be approved by the student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6905/8905 (1-3). Graduate Research Topic.** Independent research in a topic of special interest. Arrangements are made to suit the needs of each particular student. Not a free option; must be approved by student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6955-4. Master's Thesis.**

**PSCI 8995-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## Public Administration

**PSCI 5016/7016-3. Seminar: Public Personnel Administration.** Intensive research into the issues of public personnel administration in national, state, and local governments; organization, functions, and policies; loyalty and security; human relations; the role of unions, recruitment and selection; compensation; and related topics.

**PSCI 5026/7026-3. Governmental Planning.** Application of governmental planning to problems of the nation, the states, cities, and urban counties; organization, procedures, and problems of planning agencies. Emphasis is given to planning in cities.

**PSCI 5056/7056-3. Seminar: Natural Resources Policy and Administration.** Resources in the American economy, consideration of constitutional, political, and geographic factors in development of resources policy; organization procedures, and programs for administration and development of natural resources; selected topics.

**PSCI 5106/7106-3. The Political System and Telecommunications.** (TLEN 5106.) Introduction to roles played by political institutions in the utilization of telecommunications for the common good. Emphasis on American regulatory agencies, such as the Federal Communications Commission, and agencies of international cooperation, such as the International Telecommunications Union.

**PSCI 5906/7906 (1-3). Topics in Political Science.** Not a free option; must be approved by the student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6906/8906 (1-3). Graduate Research Topic.** Independent research in a topic of special interest. Arrangements are made to suit the needs of each particular student. Not a free option; must be approved by student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6956-4. Master's Thesis.**

**PSCI 8996-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## Law and Politics

**PSCI 5037/7037-3. Criminal Justice.** Evaluative study of the criminal law system of the United States and of its actual work in comparative perspective.

**PSCI 5057/7057-3. Seminar: Selected Constitutional Issues.** Intensive analysis of selected constitutional issues: civil rights, civil liberties, procedural due process, administrative law, and welfare law. Primarily for graduate students who intend to offer constitutional law as a field of examination for an advanced degree.

**PSCI 5067/7067-3. Seminar: American Constitutional Law.** Intensive analysis of the most recent doctrinal developments in the key areas of constitutional law. Designed primarily for graduate students who intend to offer American government as a field for examination for an advanced degree.

**PSCI 5077/7077-3. Seminar: Behavioral Study of Public Law.** Intensive, critical examination of theoretical and substantive literature dealing with the behavior of the primary actors in the legal system—police, lawyers, judges, and citizens. Emphasis is on the empirical approach and quantitative methods. Research papers are required.

**PSCI 5907/7907 (1-3). Topics in Political Science.** Not a free option; must be approved by the student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6907/8907 (1-3). Graduate Research Topic.** Independent research in a topic of special interest. Arrangements are made to suit the needs of each particular student. Not a free option; must be approved by student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6957-4. Master's Thesis.**

**PSCI 8997-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## General

**PSCI 4018-3. Honors in Political Science Seminar.** Writing and discussion of selected topics in political science. Critical review of the major methodological and conceptual features of the discipline. Students prepare their honors papers in the seminar.

**PSCI 4028-3. Special Topics.** Offers subjects not covered by existing courses. Offered when the Department approves a special topic.

**PSCI 4038-3. Special Topics.**

**PSCI 4848 (1-3). Independent Study.** Subjects are chosen and arrangements are made to suit the needs of each student. Independent study is for upper-division students who have completed 9 semester hours of political science and who have an overall average of at least 3.00. Not more than 6 semester hours of independent study may be credited toward the minimum requirements in the Political Science major. Special Independent Study Approval Agreement forms must be obtained from the Department.

**PSCI 4938 (3-6). Internship in Government.** Working individually under the guidance of a public official, students are assigned to projects selected for their academic suitability as well as for their value to the official. A biweekly seminar is held by the instructor to evaluate experiences, discuss relevant readings, or present project papers. Since prior approval by both the instructor and the public official is required, prospective students should make their interest known before early registration.

**PSCI 5098/7098 (1-3). Topics in Political Science.** Not a free option; must be approved by the student's advisor and Department Chair. Does not count as a seminar.

**PSCI 6908/8908 (1-3). Graduate Research Topic.** Independent research in a topic of special interest. Arrangements are made to suit the needs of each particular student. Not a free option; must be approved by student's advisor and Department Chair. Does not count as a seminar.

**PSCI 7908-4. Master's Thesis.**

**PSCI 8998-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## PSYCHOLOGY

### Special

**PSYC 2700-3. Psychology of Contemporary American Women.** (WMST 2700.) A survey

of psychological theory and research concerning contemporary American women. Deals with such issues as masculine bias in American culture, sex difference in cognitive functioning and personality, psychological conflict for women between career and home, and, finally, specific areas pertaining to women's mental health. Prereq., PSYC 1001 or WMST 2000.

**PSYC 4030-4. Applications of Computers in Psychology.** Theory and practice of applications of computers in psychological research. Introduction to basic computing skills, use of statistical packages, and a programming language. Recommended: an undergraduate statistics course.

**PSYC 4220-3. Psycholinguistics.** (LING 4220.) Study of the processes of perceiving speech and interpreting it as meaningful and of expressing intentions to communicate as utterances. The roles of the brain and of perceptual and motor systems are emphasized. Writing, gestural, and animal communicative systems are also treated. Prereq., PSYC 1001 and LING 2000.

**PSYC 4560-3. Language Development.** (CDSS/LING 4560.) Emphasizes the acquisition of language by young children; development in later years and late adulthood is also treated. Particular attention is given to the roles of environment and of neurophysiological endowment in learning to communicate with words, sentences, and narratives. Prereq., PSYC 1001 and LING 2000.

**PSYC 4700-3. Women and Mental Health.** (WMST 4700.) Examines mental health issues of women by focusing on theories of female personality development. Prereq., PSYC/WMST 2700.

**PSYC 5030 (1-4). Seminar: Applications of Computers in Psychology.** Theory and practice of applications of computers in psychological research. Introduction to basic computing skills, use of statistical packages, and a programming language.

**PSYC 5800-5. Neuroscience Research Lab.** (EPOB 5830, MCDB 5800.) An intensive study of methods and techniques in neuroscience research for advanced graduate students. Methods are drawn from electrophysiology, neurohistology, computer neural modeling, neurochemistry, neuropharmacology, and psychophysics. Faculty and topics vary from term to term. Prereqs., graduate standing and recommendation of campus neuroscience faculty.

## General

Many of the following courses have controlled enrollment by application. Please check with the departmental office in Muenzinger D243 for further information.

**PSYC 1001-4. General Psychology.** Three hours of lect. and one hour rec. per week. General one-semester survey of major topics in psychology, including sensory and perceptual processes, human development, personality, frustration and conflict, learning and memory, and the biological bases of

behavior. Students are required to participate as subjects for several hours in ongoing research.

**PSYC 2101-4. Statistics and Research Methods in Psychology.** Three hours of lect. and one 2-hour lab per week. Introduction to descriptive and inferential statistics and to their roles in psychological research. Topics include correlation, regression, *t*-test, analysis of variance, and selected nonparametric statistics. Prereq., PSYC 1001. College algebra is recommended.

**PSYC 2841 (1-3). Independent Study (Lower Division).** Freshman or sophomore standing.

**PSYC 3001-3. Honors Seminar.** Focuses on research design. Each student prepares an original, detailed research proposal, which can become the honors thesis. Open only to students who have been accepted into the Psychology Department honors program. Consent of Psychology honors director is required.

**PSYC 4001-3. Honors Seminar.** Survey and integration of general psychology for seniors majoring in psychology. Open only to juniors and seniors who have been accepted into the Psychology Department honors program. Consent of the Psychology honors director is required.

**PSYC 4011 (1-6). Senior Thesis.** An honors thesis consists of (1) a critical review of some aspect of the psychological literature, (2) a scholarly analysis of a major psychological issue, and/or (3) an empirical research project. See Psychology honors director for further information.

**PSYC 4241-3. Teaching of Psychology.** Students receive concrete experience in the teaching of general psychology under supervision of a Psychology faculty member. Alternative pedagogical strategies are discussed. Prereq., 16 hours of psychology.

**PSYC 4511-3. History of Psychology.** Includes an outline of the development of psychological theories since the Greek philosophers, the story of experimental psychology and its problems, and schools of psychological thinking. Students read original sources in English and English translations. Prereq., 12 hours of psychology.

**PSYC 4521/5521 (1-6). Special Topics in Psychology.** Special interest topics from the broad and diversified field of psychology are studied and analyzed in depth. The particular section content is determined by the instructor.

**PSYC 4551-3. Practicum in Peer Advising.** Students are trained and then participate under faculty supervision in an academic peer advising program.

**PSYC 4841 (1-6). Independent Study (Upper Division).** Junior or senior standing.

**PSYC 4851 (1-3). Independent Study (Upper Division).** Junior or senior standing.

**PSYC 5741-4. General Statistics.** A survey of probability and statistics in psychology.

**PSYC 5751-4. General Statistics.** Continuation of PSYC 5741.

**PSYC 6031-2. Research Practicum.**

**PSYC 6841 (1-3). Independent Study.** Graduate student standing.

**PSYC 6851 (1-3). Independent Study.** Graduate student standing.

**PSYC 6941-3. Master's Degree Candidate.**

**PSYC 6951 (4-6). Master's Thesis.**

**PSYC 7001 (1-3). Teaching of Psychology.** A consideration of problems, techniques, and subject matter related to the teaching of psychology.

**PSYC 7021-2. Research Problems.**

**PSYC 7051-2. Research Practicum.** Ongoing, current research projects are discussed and students formulate and complete an empirical study of their own. For cognitive and social graduate students.

**PSYC 7061-2. Research Practicum.** Continuation of PSYC 7051.

**PSYC 7271-3. Causal Models and Correlational Data.** The construction, estimation, and testing of causal models for correlational data. Particular attention given to models with unobserved variables.

**PSYC 7281-2. Mathematical Theories in Psychology.** Seminar on topics in mathematical theories of psychology. Specific topics vary depending on interests of students and instructors.

**PSYC 7291-3. Multivariate Analysis.** Scientific concepts, matrix theory, and computer techniques of multivariate analyses for psychological research. Topics include cluster and factor analysis, multiple regression, and discriminant functions. Emphasis on research technology rather than mathematical theory.

**PSYC 7521-3. History and Theory.** A brief survey of the chronological development of psychology with emphasis on theories. Provides an opportunity for intensive examination of a few selected topics, which differ from year to year.

**PSYC 7831-2. Practicum in Survey Research.** Students learn to do survey research by working on an actual, large-scale research project. Lectures cover such standard survey research topics as survey design, sampling, frame construction, questionnaire design, interviewing, editing and coding, computer analysis, budget preparation, and report writing.

**PSYC 8991-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## Biological

**PSYC 2042-3. Clinical Neuroscience and Behavioral Medicine.** Integrates the clinical, biological, developmental, and cognitive aspects of psychology and explores the influences that genetics, physiology, chemistry, and behavior play in understanding problems related to health and disease.

**PSYC 2052-3. Introduction to Biopsychology.** Lect. A broad survey course in the

physiological, endocrine, and genetic bases of behavior. Topics covered include the biological bases of learning motivation, emotion, movement, comparative animal behavior, sexual and reproductive activity, instinctual behavior, neurobiology of language and thought, neurophysiology, and neuroanatomy in relation to behavior. Prereq., PSYC 1001.

**PSYC 2062-3. Nutrition and Behavior.** A basic introduction to the science of nutrition together with an examination of its relationship to the biochemical and physiological foundations of behavior. Cannot be taken for credit if KINE 3420 has been taken.

**PSYC 4052/5052-4. Physiological Psychology.** An intensive survey of the morphological, neurochemical, and physiological aspects of behavior. One lab./disc. section per week required. Prereq., PSYC 2042, 2052, or 3 hours of college biology.

**PSYC 4072/5072-3. Behavioral Neuroscience: A Clinical and Pathological Perspective.** Provides basic science background for understanding the mechanism of behavioral disturbances resulting from brain damage. Special emphasis is on pathological neuroanatomy, neurophysiology, and neuropharmacology, which is essential for understanding problems related to health and disease. Prereq., one of the following: PSYC 2042, 2052, 4052, EPOB 4190, or MCDB 4190.

**PSYC 4092/5092-3. Hormones and Behavior.** Represents the application of endocrinological concepts and techniques to the problems of motivation and behavior. Prereqs., junior standing and one year of biology.

**PSYC 4102/5102-3. Behavioral Genetics.** The inheritance of behavioral characteristics. PSYC 2101 or equivalent is recommended.

**PSYC 4112-2. Behavioral Genetics Laboratory.** Demonstrations and experiments in behavioral genetics. Basic behavioral and genetic techniques employed in studying the inheritance of behavior in laboratory animals. Emphasis is placed upon individual projects. Prereq., PSYC 4102.

**PSYC 4122/5122-3. Quantitative Genetics.** Survey of the principles of genetics of quantitative characteristics. Topics include gene frequencies, effects of mutation, migration, and selection; correlations among relatives, heritability, inbreeding, crossbreeding, and selective breeding. Prereq., PSYC 2101.

**PSYC 4132/5132-3. Drugs and the Nervous System.** Covers the physiological basis of drug action on the nervous system and behavior, with emphasis on the use of drugs as analytic tools in the study of behavior. Not concerned with the subjective, social, or legal consequences of drug use. Part I: Chemical basis of conduction and transmission in the nervous system. Part II: Pharmacology of sleep, pain, addiction, dependence, appetite, anxiety, learning, memory, and perception. Prereq., PSYC 4052.

**PSYC 4212/5212-3. Gerontology: A Multidisciplinary Perspective.** Covers biological, psychological, and social issues in gerontology. The topics emphasized in these

three main research areas include brain changes with age, learning/memory changes with age, and social impact of an increasingly older population distribution. Prereq., PSYC 4052 or 4205 or 4406 or 4145, or instructor consent.

**PSYC 4672-3. Principles of Developmental Psychobiology.** Principles useful in understanding biobehavioral development are presented, together with a critical analysis of theories and research methodologies. The perspective is comparative, focusing on both human and animal research and on diverse cultures and ecologies. Prereqs., PSYC 2052, or 4052, or EPOB 1410 and 1420, or EPOB 4420, or EPOB 4200.

**PSYC 5042-3. Mammalian Neurophysiology.** In-depth examination of selected topics in the neurophysiological basis of higher brain function in mammals. Central theme is how neurophysiological data can provide insight into the type of information processing involved in sensation, perception, cognition, and action. Prereq., PSYC 4052 or EPOB 4205 or MCDB 4190.

**PSYC 5062-4. Functional Neurochemistry.** Mechanisms of neuronal signaling are examined in the course of a timely review of the experimental literature in the areas of transmitter synthesis, transport, secretion, turnover, reuptake, and postsynaptic effect. Other special topics included. Prereq., PSYC 4052 or MCDB 4190 or EPOB 4220.

**PSYC 5082-2. Seminar: Biological Psychology.** Special topics concerning the biological bases of behavior. Prereq., PSYC 4052.

**PSYC 5112-3. Concepts in Behavioral Genetics.** Each term selected topics are examined in greater detail than is possible in the comprehensive undergraduate course in behavioral genetics (PSYC 4102). Topics covered may include the inheritance of behavioral characteristics from the perspectives of pharmacogenetics, transmission genetics, biochemical genetics, and evolutionary genetics. Course may be repeated.

**PSYC 5162-3. Developmental Behavioral Genetics.** The application of behavioral genetic strategies to the study of individual differences in development, primarily human development.

**PSYC 5222-3. Evolution and Behavior.** The evolutionary basis of behavior. Covers topics such as fitness maximization, the biology of altruism, reproductive and parenting strategies, and the genetic and physiological bases of aggression and dominance.

**PSYC 5232-3. Molecular Genetics and Behavior.** Fundamental mechanisms of gene action including DNA structure and regulation of gene expression. Discussion of molecular techniques used to examine human genetic diseases. Emphasizes genetic diseases with behavioral and neurological abnormalities.

**PSYC 5242-3. Biometrical Methods in Behavioral Genetics.** Studies the development of structural models appropriate to behavioral genetics and the estimation procedures necessary for their application.

**PSYC 5252-2. Seminar: Animal Behavior.** Theories and methods of experimentation in

the field of animal behavior are critically examined. Observations on live animals in structured environments are conducted with emphasis on innate behavior patterns.

**PSYC 5262-3. Mammalian Neuroanatomy.** Covers microscopic anatomy and function of different brain regions. Emphasis on the correlation between structure and function, particularly at the cellular and synaptic level. Course includes brain dissection, description of neuroanatomical and neurohistological techniques, and an introduction to the ultrastructure of neurons. Prereq., PSYC 4052 or MCDB 4190 or EPOB 4220.

**PSYC 5272-3. Neuronal Plasticity.** Describes the types of changes which occur in the nervous systems as a result of lesions or altered environment during development. These changes are examined relative to factors that provoke them, to their significance for the organism, and to the mechanisms that underlie them. Helps students understand such phenomena as behavioral plasticity and recovery of function after injury.

**PSYC 5282-3. Basic Neurosciences.** An overview of major disciplines in the fields of basic anatomy, physiology, and pharmacology of the neuron and the system's developmental neurobiology, and adaptation of the brain to injury and experience during development and adulthood. Prereq., PSYC 4052 or EPOB 4220 or MCDB 4190.

**PSYC 7012 (0-3). Research in Behavioral Genetics.** Individual research projects.

**PSYC 7102-2. Seminar: Behavioral Genetics.** Intensive study of selected topics in behavioral genetics. Emphasis is on recent research, and attention is given to both human and animal studies.

## Clinical

**PSYC 2303-3. Psychology of Adjustment.** A survey of concepts bearing upon the processes of normal psychological adjustment, with emphasis upon using the concepts to understand common human problems in personal growth and relationships with others.

**PSYC 2643-3. Child and Adolescent Psychology.** Principles of development in childhood and adolescence. Prereq., PSYC 1001.

**PSYC 2653-2. Child Psychology Practicum.** Volunteer work with children in local day-care centers, nursery schools, community youth organizations, or the like. Periodic training sessions and discussion group meetings with agency and departmental staff are also required. Coreq., PSYC 2643.

**PSYC 4303-3. Abnormal Psychology.** Examines borderline disorders as extreme variations of the normal personality. Focuses on major functional and organic disorders, theories of mental disorders, and methods of psychotherapy. Not open for credit to those who have credit for PSYC 4313. Prereq., PSYC 1001.

**PSYC 4313-4. Psychopathology.** One two-hour rec. per week. Intensive analysis of the major theories of personality and behavior disorders. Not open for credit to those who



have credit for PSYC 4303. Prereqs., PSYC 1001 and 6 hours of psychology.

**PSYC 4713-3. Survey of Clinical Psychology.** Theories and practices relating to problems of ability and maladjustment. Diagnostic procedures and treatment methods with children and adults. Prereq., PSYC 4303 or 4313. Open to majors only.

**PSYC 4723-3. Community Psychology and Mental Health.** Focuses on issues in the organization, financing, and delivery of mental health services within the community, innovative techniques for the provision of mental health-related services, the role of community factors in the production of emotional disorder, and the technologies of community change. Prereq., PSYC 4303 or 4313.

**PSYC 4733-3. Principles of Psychological Testing.** Test design, construction, and analysis is studied through active student participation in ungraded interest inventories, and personality and achievement tests. Application of testing results and principles to personal career goals and interests is emphasized. Prereq., PSYC 2101.

**PSYC 7493-2. Developmental Psychopathology.** Childhood psychopathology is presented as deviations from normal development. Both normal development and childhood psychopathology are reviewed from dynamic, cognitive, and behavioristic theoretical perspectives.

**PSYC 7593-2. Research Problems in Clinical Psychology.** A systematic examination of research issues relevant to the field of clinical psychology and mental health for the purpose of developing familiarity with substantive and methodological problems facing the field.

**PSYC 7603-2. Practicum in Community Psychology.** Direct field experience in community psychology and community mental health settings for Ph.D. candidates in clinical and social psychology only.

**PSYC 7673-3. Seminar: Psychotherapy.** Selected topics in the field of psychotherapy including content consideration and pertinent research. Topics vary from semester to semester.

**PSYC 7683-2. Objective Testing in Clinical Psychology.** Focuses on administering and interpreting the objective test results commonly used in clinical psychology practice. Probable inventories to be used are the MMPI, SCII, WISC, WAIS, plus other objective measures where relevant. Case study format is used.

**PSYC 7693-2. Personality Measurement.** Theory and practice primarily in the areas of individual intelligence testing. Involves intensive field work and report writing.

**PSYC 7703, 7733, 7763-2. Seminar: Clinical Psychology.** Selected topics in the area of clinical psychology.

**PSYC 7713-2. Practicum in Clinical Psychology.** Direct clinical experience for Ph.D. candidates in clinical psychology only.

**PSYC 7743-2. Primary Prevention in Community Mental Health.** A survey of the factors at work in the United States that have culminated in the community mental health

movement and of the current factors to be considered in future developments in the field.

**PSYC 7773-3. Clinical Study of the Individual.** A focus upon the ideographic study of the attitudes, values, and personality characteristics of individuals using data obtained from personal interviews. The theory and practice of various interviewing approaches are also covered. Open to Ph.D. candidates in clinical psychology only.

**PSYC 7783-2. Advanced Psychopathology.** An intensive survey of the major theories, research findings, and behavioral characteristics associated with deviant reaction patterns.

## Developmental

**PSYC 4684-3. Developmental Psychology.** An overview of major theories concerning the development of knowledge in children. Emphasis is on the contrast between empiricist, nativist, and constructivist viewpoints, as applied to the same content areas (e.g., perception, cognition, social development). Open only to juniors and seniors. Prereq., PSYC 1001.

**PSYC 5204-3. Current Issues in Human Infancy.** Examination of theoretical issues and experimental methods in the study of human infant behavior and development. Specific topics vary with current interests of students and instructors.

**PSYC 5294-2. Current Research Issues in Perceptual Development.** The first half of the semester includes background lectures on perception, physiology, and philosophical questions of how humans know their world. The second half of the course focuses on current research in the development of perception and information processing capacities.

**PSYC 5304-3. Proseminar: Developmental Psychology—Theory and Issues.** In-depth survey of issues in theoretical approaches to developmental psychology. Open to graduate students and senior undergraduate psychology majors with consent of instructor.

**PSYC 5314-3. Proseminar: Developmental Psychology—Sensory Development.** An intensive coverage of selected topics in sensory development. Emphasis is on the role of experience in the development of neural mechanisms of human sensory systems. Considerable attention is given to understanding the historical foundations of current problems. Open to graduate students or senior undergraduate majors with consent of the instructor.

**PSYC 7624-3. Issues in Developmental Psychology.** Emphasis is on analysis of theoretical issues and research strategies.

## Experimental

**PSYC 4145-4. Cognitive Psychology.** One lab, three lect. per week. Introduction to the study of cognitive processes of human beings: memory, conceptual behavior, and thinking. Emphasis of the course varies with the instructor. Prereqs., PSYC 1001 and 2101.

**PSYC 4165-4. Psychology of Perception.** One lab, three lect. per week. An analysis of peripheral and central mechanisms involved in the transduction and interpretation of experience. Special attention is given to vision and audition; major theories in these areas are discussed in terms of the research they have inspired. Prereqs., PSYC 1001 and 2101.

**PSYC 4175/5175-3. Introduction to Cognitive Simulation.** A survey of major simulation programs in perception, learning, memory problem solving and discovery. Students must complete a simulation project as part of the course requirement. Prereqs., PSYC 1001, CSCI 1210, and CSCI 3245.

**PSYC 4205-4. Psychology of Learning.** One lab per week. Conditions of learning in animals and humans as found in experimental literature. Prereqs., PSYC 1001 and 2101.

**PSYC 4385/5385-3. Ethology and Comparative Psychology.** Discusses behavior of representative members of each animal phylum. Emphasis is placed on ontogeny of behavior as well as on phylogeny. Prereq., PSYC 1001 or general biology.

**PSYC 4505/5505-4. Behavior of Zoo Animals.** An intensive examination of behavioral research conducted at zoos of the world. Emphasis is placed on courtship and copulation, offspring development, socialization, intellectual processes, and animal communications. Classes and labs are held at the Denver Zoo. Prereqs., PSYC 1001, 2101, EPOB 1210, and 1220.

**PSYC 5665-3, 5675-3. Proseminar: Advanced Experimental Psychology.** An advanced and intensive survey of topics in experimental psychology. General areas are conditioning and learning, and cognitive psychology.

**PSYC 5685-3. Proseminar: Advanced Experimental Psychology.** An advanced and intensive survey of topics in experimental psychology. General areas include sensation and perception, and history and theory.

**PSYC 5775-3. Proseminar: Quantitative Psychology.** Introduction to measurement, scaling, and test theory.

**PSYC 5795-3. Proseminar: Quantitative Psychology.** Introduction to the use of computer simulation in psychological theorizing.

**PSYC 7205-2. Seminar: Learning.** A detailed study of one or more important topics in the psychology of learning. Content of seminar varies from semester to semester.

**PSYC 7215-2. Seminar: Experimental Psychology.** An advanced seminar dealing with different specialized topics, at the discretion of the instructor, in different years. The topics chosen are within the broad range of experimental psychology.

**PSYC 7225-2. Seminar in Psycholinguistics.** An analysis of theoretical and experimental contributions by psychologists and linguists to the areas of first-language acquisition and grammatical correlates of verbal behavior. The role of language in association, formation, thought perception, and second-language learning are also considered.

## Social

**PSYC 2406-3. Social Psychology of Ethnic Groups.** Focuses on the social-psychological approaches to the study of American ethnic-minority groups, utilizing both traditional and contemporary perspectives on race, ethnicity, and culture of the individual or groups being studied. Prereq., PSYC 1001.

**PSYC 2456-3. Social Psychology of Social Problems.** An examination of social psychological aspects of a variety of social issues and problems in contemporary society. Issues are diverse, ranging from problems of poverty or minority status to topics such as prejudice, drug use, student protest, and patterns of sexual behavior. Psychological theory and research relevant to these areas are considered, as are the processes involved in defining social behavior as a "problem."

**PSYC 4406-3. Social Psychology.** General psychological principles underlying social behavior. An overview and analysis of the major social psychological theories, methods, and topics, including attitudes, conformity, aggression, attraction, social perception, helping behavior, and group relations. Prereq., PSYC 1001. Recommended, PSYC 2101.

**PSYC 4436-3. Human Judgment and Social Policy.** Two lect., one lab per week. A systematic treatment of the problem of human judgment in relation to social policy and its application to social problems.

**PSYC 4456-3. Psychology of Personality.** The psychological study of the structure, organization, and development of the person as a whole. Analysis of major theories, methods, and research dealing with personality, including topics such as emotion, motivation, temperament, inner experience, identity and the self, personality change, and the influence of the sociocultural context. Prereq, 12 hours of psychology.

**PSYC 4486/5486-3. Women in Cross-Cultural Perspective.** Reviews contemporary theory and research on the psychology of women. Material is drawn from the fields of anthropology, social psychology, clinical psychology, and sociology. Open only to Psychology, Anthropology, and Sociology majors.

**PSYC 4496-3. Cross-Cultural Psychology.** Social factors in the development of personality. Social and cultural variations in mental illness. The psychology of cultural and social change, including revolutions and economic growth. Prereq., 12 semester hours of courses from psychology, sociology, and anthropology. Open only to majors in those fields.

**PSYC 5546-3. Cultural Aspects of Language.** Examines how different languages structure human experience and interaction, with study of diverse dialects and language groups. Focuses on the Sapir-Whorf hypothesis, especially in relation to subgroups in the Rocky Mountain region, including Hispanics, Native American Indians, and Blacks.

**PSYC 5556-2. Personality in Cultural Contexts.** Ideally, cultural influences in child-training would prepare the person for optimal, stress-free, adult participation in the

culture. This course explores factors in individual personality and in cultural contexts that make reality depart from the ideal.

**PSYC 5576-3. Cross-Cultural Research: Theory and Method.** Surveys theory and method in cross-cultural psychological anthropology. Students select a topic, review the existing literature, and plan to utilize various methods in researching that topic. Students are graded on participation and a term paper.

**PSYC 5606, 5616, 5626, 5636-2. Proseminar: Social-Personality Psychology.** Four topics provide a systematic introduction to the area of social-personality psychology. Two are offered each semester on a rotating basis. Topics are as follows: 5606, organizational and small group processes; 5616, cognitive social psychology; 5626, social interaction; 5636, social psychology of the individual.

**PSYC 7126-3. Experimental and Quasi-Experimental Methods in Social Psychology.** The uses and limitations of experimental methodologies for the study of social behavior are examined. Alternative small-scale methodologies are considered, including simulation, systematic observation, and content analysis.

**PSYC 7486-2. Advanced Personality Theory.** Consideration of foundation issues in the construction of theories of the person; appraisal of the structure and content of representative theories of personality; analysis of the implications for theory of various current areas of personality research.

**PSYC 7536-2. Personality and Social Psychology.** Selected topics in the area of social-personality psychology.

## RELIGIOUS STUDIES

**RLST 1620-3. Religious Dimension in Human Experience.** A critical study of religion as individual experience and social phenomenon. Varieties of religious language (symbol, myth, ritual, scripture) and of religious experience (Asian, Western, archaic) are examined.

**RLST 1950-3. Women and Religion.** An examination of attitudes toward women in the historic religions including the Judeo-Christian-Islamic tradition, Hinduism, Buddhism, and primitive religions.

**RLST 2600-3. World Religions: Western.** An introduction to the literature, beliefs, practices, and institutions of Judaism, Christianity, and Islam, in historical perspective.

**RLST 2620-3. World Religions: Eastern.** An introduction to the literature, beliefs, practices, and institutions of Hinduism, Buddhism, Taoism, Shintoism, and Confucianism, in historical perspective.

**RLST 2660-3. Mythic Visions of America.** An examination and interpretation of mythic visions of America as a religious place and time. Focus is on European, Anglo, Indian, Mexican, and Black visions of America.

**RLST 2700-3. American Indian Religions.** An introduction to the religions of the peoples indigenous to the Americas. Concerns include the ritual, mythology, and symbolism

occurring throughout these many cultures in such areas as art, architecture, cosmology, shamanism, sustenance modes, trade, and history.

**RLST 2840-variable credit. Independent Study.**

**RLST 3000-3. The Christian Tradition.** An exploration of the evolution of Christian theology, myth, ethics, ritual, and social institutions.

**RLST 3100-3. Judaism.** An exploration of Jewish religious experience and its expression in thought, ritual, ethics, and social institutions.

**RLST 3200-3. Hinduism.** An in-depth study of the literature, beliefs, practices, and institutions of Hinduism, in historical perspective.

**RLST 3300-3. Indian Buddhism.** An in-depth study of selected aspects of Buddhist tradition in India, including the life of the Buddha, the development of the early community, Buddhist contemplative tradition, early Buddhist philosophy and psychology, and the origins, development, and view of Indian Mahayana Buddhism.

**RLST 3400-3. Japanese Religions.** A study of the literature, beliefs, practices, and institutions of Shinto, Buddhism, and Confucianism within the development of Japanese culture.

**RLST 3600-3. Islam.** Introduction to the Islamic beliefs and practices through an examination of the Qur'an, Muhammad's life, ritual duties, law and theology, mysticism, and social institutions.

**RLST 3700-3. Religion and Psychology.** An examination of the relation between religion and psychology in the understanding of human nature. A variety of contemporary theories and models in both psychology and religious studies is considered.

**RLST 3800-3. Chinese Religion.** A study of classical Confucianism, Taoism, Buddhism, and Neo-Confucianism within the historical context of Chinese culture.

**RLST 3820-3. Topics in Religious Studies.** Intensive study of a selected area or problem in religious studies.

**RLST 4010/5010-3. Biblical Christianity.** A study of Christian origins, including the Jewish and Greco-Roman contexts. Exegesis of representative passages for the synoptic, Johannine, and Pauline writings. Treatment of the historical person of Jesus and theological perspectives of the New Testament. Emphasis is on methodology, e.g., textual criticism, literary criticism, form criticism.

**RLST 4100/5100-3. Biblical Judaism.** A study of the development of Jewish religious thought and institutions in the Biblical period, with special emphasis on the literature of the Bible as a source for the study of religious experience.

**RLST 4150/5150-3. Topics in Jewish Thought.** Intensive study of a selected topic in Jewish theology, philosophy, or mysticism in the post-Biblical period.

**RLST 4200/5200-3. Topics in Hinduism.** Examines in depth central themes, schools

of thought, and movements in Hinduism, such as myth and ritual, renunciation, Vedanta, and nineteenth-century Renaissance.

**RLST 4250/5250-3. Topics in Buddhism.** Examines in depth central themes, schools of thought, and movements in Buddhism, such as Theravada in Southeast Asia, Mahayana and Tantrayana thought, and Buddhism in America.

**RLST 4270/5270-3. Zen Buddhism.** An inquiry into the history and meaning of one of the major traditions of China and Japan, based on the interpretation of primary sources and leading to an appreciation of its influence on Chinese and Japanese cultures.

**RLST 4300/5300-3. Topics in Native American Religions.** An examination of a topic (to vary at different offerings) focusing on the religions of peoples indigenous to the Americas. Topics such as mythology; shamanism and medicine; trickster, clown, and fool; and crisis cult movements may be considered.

**RLST 4350/5350-3. Native American Religions: Regional Studies.** An in-depth study of the religion(s) of a single native North American tribe or geographic region within the context of the history and culture of the tribe(s).

**RLST 4400/5400-3. Topics in Mesoamerican Religions.** An in-depth study of various topics in Mesoamerican religions such as Nahuatl sources in translation, rhetorical structure and ritual, Aztec and Maya religion, and human and animal sacrifice.

**RLST 4500/5500-3. City and Symbol in Mesoamerican Religion.** An interdisciplinary analysis of Mesoamerican cosmology and ceremonial centers by means of history of religions and archaeoastronomy. Comparisons with sacred capitals from various cultures are considered in this examination of orientation, architecture, and ritual activities.

**RLST 4600-3. Crisis Cults and Millenarian Movements.** An examination of crisis cults from the variety of perspectives which constitute millenarian studies. Focus on causes, charismatic leaders, millenarian visions, and the impact of prophecies that fall on cult members.

**RLST 4650/5650-3. Islam in the Modern World.** A global survey of Islam in the recent past and in the present, covering such topics as religion and politics; Islam and the West; the Islamic revival and its varied forms in Iran, Indonesia, Libya, and Pakistan; development and change; the status of women; and media and academic stereotyping.

**RLST 4700/5700-3. Confucianism.** A study of Confucianism, one of the most influential traditions of East Asia. Focuses on major writings of classical Confucianism as well as Neo-Confucianism and analyzes the religious dimension of the tradition.

**RLST 4750/5750-3. Taoism.** The historical development and influence of the Taoist tradition in Chinese culture, focusing on classical philosophical Taoism, religious Taoism, and neo-Taoism.

**RLST 4760/5760-3. Sufism.** An in-depth study of the origins and aims of Islamic mysticism, with a concentration on the thought and practice of Al-Hujwiri, Al-Ghazali, Rumi, and others.

**RLST 4820/5820-3. Interdisciplinary Seminar on Religion: Topics.** A variable topics course in religion, drawing from a variety of disciplines and methodologies as they shed light on specific traditions and issues.

**RLST 4830-3. Senior Majors Seminar.** Topics and instructors vary, but the goal is to bring advanced majors together in order to focus their major experience on significant topics and issues of common interest. Required of all majors.

**RLST 4840-variable credit. Independent Study.**

**RLST 5800-3. Religious Texts and Contexts.** Examines ways in which religious texts (e.g., scriptures, commentaries, pictographs) relate to their contexts (e.g., cultural, ritual, territorial). Variable topics include Mesoamerican codices and urban ceremonial centers, Buddhist scriptures and iconography in Southeast Asia, Confucian canon and state orthodoxy, and others.

**RLST 5810-3. Religious Dimensions of Space and Time.** Examines symbols, myths, rites, and contexts in which the categories space and time have religious meaning. Variable topics include sanctuaries, calendars, eschatologies, other worlds, pilgrimages, rites of passage, archaeoastronomy, topocosms, centers and peripheries, linear vs. cyclical time, seasons, and others.

**RLST 5840-variable credit. Independent Study.**

**RLST 6830-3. Theory and Method in the Study of Religion.** Provides an advanced orientation in the academic study of religion, focusing on methods and theories. Historical, phenomenological, and social scientific approaches are examined, in the context of the history and present state of the discipline.

**RLST 6840-variable credit. Independent Study.**

**RLST 6950. Master's Thesis.**

## SLAVIC LANGUAGES AND LITERATURES

### Polish

**PLSH 1010-5. Beginning Polish 1.** Elementary description and analysis of the pronunciation, morphology, grammar, and usage of modern standard Polish is supported by contemporary readings in Polish. Not designed to enable students to fulfill the foreign language requirement of the College of Arts and Sciences.

**PLSH 1020-5. Beginning Polish 2.** Continuation of PLSH 1010. Prereq., PLSH 1010.

### Russian

**RUSS 1010-5. Beginning Russian 1.** Introduction to the Russian language. Two different approaches are available. See Department's general information announcement.

**RUSS 1020-5. Beginning Russian 2.** Continuation of RUSS 1010. Prereq., RUSS 1010.

**RUSS 1030-3. Beginning Russian for Scientists and Social Scientists 1.** An approach to Russian through the reading of texts in the student's special field of study.

**RUSS 1040-3. Beginning Russian for Scientists and Social Scientists 2.** Prereq., RUSS 1010 or 1030.

**RUSS 1900-variable credit. Independent Study.**

**RUSS 2010-3. Second-Year Russian Grammar and Composition 1.** Reading, writing, and understanding contemporary Russian. Recommended to students who intend to continue their formal study of Russian into the third and fourth years. Prereq., RUSS 1020 or 1040.

**RUSS 2020-3. Second-Year Russian Grammar and Composition 2.** Continuation of RUSS 2010. Prereq., RUSS 2010.

**RUSS 2030-2. Second-Year Russian Oral Practice 1.** Enables students to speak and understand contemporary spoken Russian. Recommended to students who intend to continue their formal study of Russian into the third and fourth years. Prereq., RUSS 1010 or 1030.

**RUSS 2040-2. Second-Year Russian Oral Practice 2.** Continuation of RUSS 2030. Prereq., RUSS 2030.

**RUSS 2110-3. Reading Russian.** Reading of significant texts in Russian from the sciences, social sciences, and press. Prereq., RUSS 1020 or 1040.

**RUSS 2900-variable credit. Independent Study.**

**RUSS 3010-3. Third-Year Russian 1.** A review of Russian grammar is coordinated with reading, speaking, writing, and understanding modern Russian. Some texts from modern and nineteenth-century Russian literature are used. Prereq., RUSS 2020.

**RUSS 3020-3. Third-Year Russian 2.** Prereq., RUSS 3010.

**RUSS 3030-2. Russian Conversation 1.** Prereq., RUSS 2020.

**RUSS 3040-2. Russian Conversation 2.** Prereq., RUSS 3030.

**RUSS 3200-3. Russian Phonetics.** Scientific analysis of the sound inventory of Russian and the use of tape materials in the language laboratory. Prereq., RUSS 2020.

**RUSS 3900-variable credit. Independent Study.**

**RUSS 4010-3. Advanced Grammar Topics and Composition 1.** Prereq., RUSS 3020.

**RUSS 4020-3. Advanced Grammar Topics and Composition 2.** Prereq., RUSS 4010.

**RUSS 4210-3. Open Topics: Nineteenth-Century Russian Literature in Russian.** Provides an intensive investigation of selected topics in nineteenth century Russian literature. Primary texts are read in Russian; secondary sources are partly in Russian, partly in English. Prereq., RUSS 3020.

**RUSS 4310/5310-3. Pushkin and His Time.** A survey of Pushkin's major works and a study of his influence on Russian literature. Prereq., RUSS 3020.

**RUSS 4420/5420-3. Gogol.** Representative short stories, novels, and plays. Prereq., RUSS 3020.

**RUSS 4430/5430-3. Dostoevsky.** Selected short novels and novels. Prereq., RUSS 3020.

**RUSS 4440/5440-3. Tolstoy.** Noteworthy short stories, short novels, and novels. Prereq., RUSS 3020.

**RUSS 4450/5450-3. Chekhov.** Major plays and short stories. Prereq., RUSS 3020.

**RUSS 4460/5460-3. Solzhenitsyn.** Significant short novels and novels. Prereq., RUSS 3020.

**RUSS 4510/5510-3. Twentieth-Century Russian Poetry.** A survey of the major figures in this period, with particular emphasis on Modernist poets active between 1895 and 1930. Prereq., RUSS 3020.

**RUSS 4610/5610-3. Twentieth-Century Russian Literature: Prose in the Soviet Union.** A survey of short stories and novels written in Russian for citizens of the Soviet Union between 1917 and the present. Prereq., RUSS 3020.

**RUSS 4720/5720-3. History of the Russian Language.** Surveys the development of Russian from the eleventh century to the present, supported by reading in medieval texts. Prereq., RUSS 3020.

**RUSS 4900-variable credit. Independent Study.**

**RUSS 5900-variable credit. Independent Study.**

**RUSS 6900-variable credit. Independent Study.**

## RUSSIAN COURSES IN TRANSLATION

**RUSS 2211-3. Introduction to Russian Culture.** What Russians are like and how they got that way; development of national consciousness from feudalism through imperialism; Russian cookery, folklore, popular literature, religious thought, art, and architecture. Lectures, slides, films, guest speakers.

**RUSS 2221-3. Introduction to Soviet Culture.** Forces shaping modern Soviet people's conception of themselves. Evolution of Russian music, theatre, education, and ballet in the twentieth century. Lectures, films, music, guest speakers, slides.

**RUSS 4811-3. Nineteenth-Century Russian Literature.** Background survey of Russian literature from 1000 to 1900. Russian writers and literary problems in the nineteenth century with emphasis on major authors: Pushkin, Gogol, Dostoevsky, Tolstoy, and Chekhov.

**RUSS 4821-3. Twentieth-Century Russian Literature.** Emphasis on Soviet literature, major writers and problems, the theory and practice of Socialist Realism.

## Slavic

**SLAV 1900-variable credit. Independent Study.**

**SLAV 2900-variable credit. Independent Study.**

**SLAV 3900-variable credit. Independent Study.**

**SLAV 4610-3. Ukrainian Literature, World War I to World War II.** Chronological examination of the greater figures, forces, and ideas in the Ukrainian literature between the two world wars. Prereq., junior standing.

**SLAV 4620-3. Ukrainian Literature Since World War II.** Analysis of significant works and literary figures in the Ukrainian Soviet Republic and the free world. Problems and ideas of dissident literature. Prereq., junior standing.

**SLAV 4710-3. Introduction to Ukrainian Civilization.** A survey of Ukrainian history and culture from prehistoric to present times. Prereq., junior standing.

**SLAV 4720-3. Slavic Immigrants in North America and the Free World.** A general introduction to the history of Slavic emigration, settlement in various countries; process of assimilation; contribution to the social, cultural, political, and economic life of the particular countries with emphasis on North America. Prereq., junior standing.

**SLAV 4900-variable credit. Independent Study.**

**SLAV 5900-variable credit. Independent Study.**

**SLAV 6900-variable credit. Independent Study.**

## SOCIOLOGY

**SOCY 1001-3. Introduction to Sociology 1.** A general survey of sociology as the study of people and culture, social groups and institutions, social continuity and change, and efforts to resolve social problems.

**SOCY 1011-3. Introduction to Sociology 2.** A review of important studies that have shaped the field of sociology and produced the essential theory and methods of the sociologist at work. Recommended, SOCY 1001.

**SOCY 1021-3. Twentieth-Century Social Theory.** A review of major sociological theorists of the twentieth century such as Duncan, Garfinkel, Goffman, Merton, and Parsons.

**SOCY 1031-3. Introduction to Social Psychology.** A survey of social psychology with special attention given to theories such as psychoanalysis, symbolic interactionism, culture and personality, and structural-functionalism.

**SOCY 1841 (1-3). Independent Study in Sociology.** Lower-division variable credit. Consent of instructor required.

**SOCY 2001-3. Mass Society.** An analysis of structural features of modern society such as technology, bureaucracy, urban life, mass communication and social disorganization, and how individuals adapt to mass societal conditions.

**SOCY 2011-3. Contemporary Social Issues.** Consideration of major national and global issues such as capitalism, socialism, race, ethnic and sex discrimination, poverty and wealth concentration, crime and deviance, human rights, peace and war.

**SOCY 2021-3. Social Movements.** The social origins and patterns of development of modern social and political movements.

**SOCY 2031-3. Social Problems and Social Change.** A study of leading theories of social change, transformation of major social institutions, and current social problems such as distribution of power in society, unemployment, poverty, racism and sexism, the changing role of the family, and drugs.

**SOCY 2041-3. The Social Construction of Reality.** An analysis of the human environment as a human product. A study of how all the things that make up the objective social facts of our social world are created, reproduced, maintained, and distributed by specific human interaction processes.

**SOCY 3001-3. History of Sociological Thought 1.** Analysis of major social theorists from Aristotle to Comte and Spencer.

**SOCY 3011-3. History of Sociological Thought 2.** Continuation of SOCY 3001. Analysis of major social theorists from the mid-nineteenth century to the present.

**SOCY 3021-3. Urban Sociology.** Analysis of the social structure and problems of modern metropolitan areas.

**SOCY 3031-3. Perspectives on Alienation.** Different historical and sociological theories of alienation are examined, explained, and compared to define problems confronting people in modern society.

**SOCY 3041-3. Self and Consciousness.** An exploration of human development from a psycho-social perspective, focusing on the interplay between psychological patterns and social forms. Issues such as personal image, shadow, and transformation are studied within the larger context of the individual versus the collective forces leading to conformity.

**SOCY 3051-3. Communities.** Consideration of community as a basic unit of society with analysis of the range of communities from village to metropolitan area.

**SOCY 3061-3. Statistics.** An introduction to the quantitative analysis of social phenomena. Topics include strategies for data analysis, measurement, sampling, description, correlation, statistical and sociological significance, and inference.

**SOCY 3071-3. Sociology of Adolescence.** Adolescence is examined historically and crossculturally, giving special emphasis to adolescence in the U.S. The relationship between social climates and patterns of behavior, such as academic performance and dating, are analyzed.

**SOCY 3081-3. Social Relations.** Improves students' abilities to observe, analyze, and understand their own behavior and that of others; improves their ability to see the small group as a social system. Students are expected to demonstrate their abilities by participation in groups as well as in written analyses.

**SOCY 3091-3. Environment and Behavior.** Focuses on the influences of both natural and man-made environments upon human behavior and social organization. Consideration is given to both microenvironments and their influence on individuals, as well as to the impact of macroenvironments on the organization of society.

**SOCY 3101-3. Social Control.** The study of formal and informal mechanisms of social control, such as the political order, the legal system, the police, the mass media, and other institutions.

**SOCY 3111-3. Social Change.** A historical and crosscultural study of the causes of modernization and its effects upon the individual, the family, and economic and political institutions.

**SOCY 3121-3. Sociology of Language.** More than anything else, it is the fact that humans use language that makes them what they are. The focus of this course is language in its social context, and what happens when people talk.

**SOCY 4001-6. Research Methods in Sociology.** Teaches quantitative research methods with an emphasis on survey research including sampling, measurement, interviewing, computer methods, and statistical analysis. Students design and execute a project and prepare research papers on the basis of the collected data. Prereqs., SOCY 1001 and 1011.

**SOCY 4011-6. Field Experience in Sociology.** Emphasizes ethnographic techniques including intensive interviewing, direct observation, coding, participant observation, interpretation of data, theory construction, and report writing. Students conceive and execute a field research project, with data collection, analysis, and a report. Prereqs., SOCY 1001 and 1011.

**SOCY 4031-3. Social Psychology.** A study of individuals in social context. Reviews philosophical and sociological treatments of the relation between the individual and society. More specific topics include the socialization process, theories of human development and personality formation, language acquisition, conformity, aggression, sex differences in personality and gender identity, the relation between attitudes and overt behavior.

**SOCY 4041-3. The Creative Self.** An experimental approach to the creative process that fosters experimentation outside of conventional patterns of thinking and expression, and explores the use of imagination and creative thinking in problem-solving, writing, and art.

**SOCY 4051-3. Computer Applications in Sociology.** The use of computer models to enhance sociological reasoning and to help solve social problems is examined. Students learn how to write programs that simulate

social structures, processes, and complex systems such as friendship networks, social mobility, and world systems respectively.

**SOCY 4061/5061-3. Statistics Through Computers.** Introduction to basic statistical concepts and methods such as correlational and regression analysis. Students learn to use a computer and apply these methods to specific research problems.

**SOCY 4071-3. Technology and Modernization.** An analysis of social structures and social relationships that change in response to technological innovation. Emphasis is also given to the role of technology in the development of countries other than the United States.

**SOCY 4081/5081-3. Sociology of Education.** Analysis of the school as a social organization. Among the topics considered are power and control in the school; classroom organization and procedures and their relation to learning and personality development in students; roles of educators; and reciprocal relations of school and community.

**SOCY 4091-3. Uses of Photography in Sociology.** Examines how still photography can be used in sociological investigation, particularly in ethnographic field work. Each student is required to design and carry out a field project. Direct experience in investigative inquiry and sharpening of the student's observational and analytical skills are the goals.

**SOCY 4101/5101-3. Education in Multilingual Communities.** Examines the roles of language and social inequality in educational achievement, particularly among students with differing mother tongues, and analyzes the politics and pedagogy of bilingual education.

**SOCY 4111-3. Ideas in Society.** Investigates selected contrasting theories and idea systems in four areas: the sociology of knowledge, philosophy, ideology, and supernatural-paranormal phenomena. Central concerns include how knowledge about "reality" is generated, explained, verified, and changed in differing idea systems.

**SOCY 4121-3. Sociology of Religion.** Issues studied include the social origin of religion, its significance as a cultural factor and as a form of social control in contemporary society, and its relationship to other institutions.

**SOCY 4151/5151-3. Sociology of the Future.** A systematic analysis of future societies. A variety of possible social arrangements is examined, and the social, economic, and political consequences of each are assessed. Computer simulation is taught as an optional method.

**SOCY 4441-3. Senior Honors Seminar 1.** A critical assessment of major accomplishments of sociology and contemporary challenges to the field. This is the initiation of the honors thesis. Limited to Sociology majors with a grade point average of 3.20 or by permission of the instructor.

**SOCY 4451-3. Senior Honors Seminar 2.** Preparation of an honors thesis: research strategies, theory construction, and use of theory. Research methods and data analysis are used in reference to students' honors

theses. Limited to Sociology majors with a grade point average of 3.20 or by permission of the instructor.

**SOCY 4841 (1-3). Independent Study in Sociology.** Upper-division variable credit. Consent of instructor required.

**SOCY 5001-3. Proseminar 1.** A survey of sociological theory into the early twentieth century and its influence in the emergence of major contemporary theoretical perspectives.

**SOCY 5011-3. Proseminar 2.** A survey of post-World War II sociological theory with emphasis on such theories as functionalism, symbolic interactionism, exchange theory, conflict theory, and phenomenology.

**SOCY 5021-3. Research Methods 1.** The principles and practice of quantitative and qualitative research, including the nature of scientific explanation, the relationship between theory and research, the research design, measurement problems, sampling questionnaire construction, interviewing, ethnographic methods, and statistical analysis.

**SOCY 5031-3. Research Methods 2.** An examination of modern methods of quantitative and qualitative data analysis such as regression analysis, casual modeling, computer methods, content analysis, and written presentation of findings.

**SOCY 5041-3. Assessment Research.** Concerned with methods of assessing the effectiveness of action programs conducted in various institutional sectors of the community. Basic principles of research design, measurement, and administration in the behavioral sciences are applied to the situations likely to be encountered when social research is conducted in an action setting.

**SOCY 5051-3. Sociology of Religion.** A comparative analysis of religion as a social institution.

**SOCY 5061-3. Statistics Through Computers.** See SOCY 4061.

**SOCY 5071-3. Sociology of Language and Knowledge.** Student-conducted field projects are involved using all the sequential steps from collection of original data through its analysis and evaluation. Perspectives from the sociology of knowledge and science are united with those from the sociology of language.

**SOCY 5081-3. Sociology of Education.** See SOCY 4081.

**SOCY 5091-3. Sociological Analysis of Organizations.** An examination of theory and research in the field of formal organization. Special attention is given to problems of organizational change and to the difficulties a social scientist working in a bureaucratic organization might encounter.

**SOCY 5101-3. Education in Multilingual Communities.** See SOCY 4101.

**SOCY 5111-3. Research in Survey Methods.** Students conduct sample surveys to gain practical experience in sampling, questionnaire construction, interviewing, scaling, coding, and computerized data analysis.

**SOCY 5121-3. Research in Ethnographic Methods.** Students are trained in the systematic observation of people *in situ*, finding

them where they are, staying with them in a role acceptable to them which allows intimate observations of their behavior, and reporting it in ways useful to social science but not harmful to those observed.

**SOCY 5131-3. Research in Dialectical and Historical Methods.** The application of dialectical logic and historical methods in individual and group analysis of historical data.

**SOCY 5141-3. Sociolinguistics.** A research seminar incorporating theories of language use in society and in social scientific inquiry together with practical experience in observing, recording, and analyzing actual language data from some arena of social action chosen by the student.

**SOCY 5151-3. Sociology of the Future.** See SOCY 4151.

**SOCY 5841 (1-3). Independent Study in Sociology.** Graduate variable credit. Consent of instructor required.

**SOCY 6841-variable credit. Guided Research in Sociology.**

**SOCY 6941 (1-3). Candidate for Degree for Master's Thesis.**

**SOCY 6951. Master's Thesis.**

**SOCY 8991-30. Doctoral Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## Population Studies

**SOCY 1002-3. Introduction to Demography and Human Ecology.** Explores global survival issues such as overpopulation, poverty, pollution, resource shortages, hunger and environmental degradation in terms of socioeconomic organization, technology, environment and population dynamics.

**SOCY 1012-3. Introduction to Population Issues.** An introduction to the sociological study of human populations—their size, composition, and distribution—and changes in these factors as they occur through the processes of mortality, fertility, and migration.

**SOCY 3002-3. Population and Society.** Examines population, its structure and processes and its relationships to selected areas of the social structure. Malthusian, neo-Malthusian, and Marxist perspectives are examined.

**SOCY 3012-3. Women, Development, and Fertility.** (WMST 3012.) An investigation into the status of women and fertility in the context of social and economic development.

**SOCY 4012-3. Population Control and Family Planning.** (WMST 4012.) The determinants of population and economic growth in developing countries are examined to assess the adequacy of current population policies. The determinants of fertility, family size, childlessness, and the changing nature of reproductive freedom are also considered sociologically and from a feminist standpoint. Open to juniors and seniors only.

**SOCY 4022/5022-3. Population Studies: Fertility and Mortality.** Sociological causes and consequences of different levels of fertility, mortality, and population growth are examined. The course emphasizes methods, theory, policy, and practical applications.

**SOCY 4032/5032-3. Population Studies: Migration and Distribution.** Examines migration as a major determinant of population growth and distribution as mortality and fertility rates decline, especially in the United States. Covers theory and methods but concentrates on policy and social issues.

**SOCY 5012-3. Population Issues, Problems and Policies.** Presents relations between population and society, covers contemporary perspectives, and attends to theoretical and empirical substance. Focuses on mortality, fertility, and migration, the major demographic areas, with reviews of specific demographic phenomena and controversies.

**SOCY 5022-3. Population Studies: Fertility and Mortality.** See SOCY 4022.

**SOCY 5032-3. Population Studies: Migration and Distribution.** See SOCY 4032.

**SOCY 5042-3. Sociology of the Family.** Recent trends in research and theory are examined, with an emphasis on the American family.

**SOCY 5052-3. Research in Demographic Methods.** A survey of demographic data and methods, social indicators, ecological and cohort analysis, with individual research done in a student's area of interest.

## Health and Medicine

**SOCY 1003-3. Social Issues in Health and Medicine.** A discussion of current ethical and policy issues in health and medicine, including alcohol and drug abuse, organ transplants and substitutes, genetic engineering, contraception, abortion, occupational safety and health, and euthanasia.

**SOCY 2003-3. Sociology of Death and Dying.** An examination of the event of death and the process of dying: the causes of death; who dies; the experience of death in nursing homes, emergency rooms, intensive care, and hospices; ethical and political issues.

**SOCY 2013-3. Social Issues in Mental Health.** Examination of the relationship of economic factors, aging, and social policy to mental health and mental illness.

**SOCY 2023-3. Folk Medicine and Psychiatry in Mexican/Chicano Communities.** Focuses on folk medicine and folk psychiatry in the Mexican/Chicano communities of the Southwestern United States. Includes theories on the roles, characteristics, prevalence, and future of folk practitioners in their dealings with illnesses as well as beliefs in magic and witchcraft.

**SOCY 3003-3. Sociology of Health and Illness.** An examination of the relationships among illness causation and belief systems, socioeconomic status, social stress, and the social role of the sick person.

**SOCY 3013-3. Sociology of Health Institutions.** An analysis of the institutional and

organizational characteristics of hospitals and other medical institutions with special attention given to the learning and performance of health professional roles.

**SOCY 4003-3. Sociology of Aging.** The present and future roles of the aged in the family, the community, and the economic, political, health, and retirement systems are studied.

**SOCY 4013-3. Sociology of Mental Health.** A consideration of the historical, social, and normative determinants of mental illness with particular attention given to mental hospitals, social therapy, and mental health services.

## Criminology

**SOCY 1004-3. Deviance.** The study of norm-violating behavior and social responses to such behavior. Special emphasis is given to understanding the social context in which deviance takes place.

**SOCY 4004-3. Topics in Criminology.** A variety of courses in criminology to be taught by visiting lecturers. See current departmental announcements for specific content.

**SOCY 4014-3. Criminology.** The scientific study of criminal behavior. Special attention is given to the development of criminal law and its use to define crime, the cause of law violation, and the methods used to control criminal behavior.

**SOCY 4024-3. Juvenile Delinquency.** Studies factors involved in the causes and distribution of delinquent behavior; problems of adjustment of delinquents; and factors in treatment and in post-treatment adjustment.

**SOCY 4034-3. The Treatment of Offenders.** Principles of treating offenders are studied, including attitude formation and change, group dynamics, behavior modification, skill development, work programs, and social re-education.

**SOCY 5014-3. Seminar in Criminology.** An examination of the theories of the social causation of crime and crime control policies.

**SOCY 5024-3. Deviant Behavior.** Examination of current theory and research on deviant behavior with emphasis on the interrelationships between various forms of deviance and social responses to deviance.

**SOCY 5034-3. Prevention and Control of Delinquency and Crime.** Examination and evaluation of policies and programs for the prevention and control of delinquency and crime, and the principles and theories underlying them.

## Social Conflict

**SOCY 1005-3. Exploring Social Conflict.** How conflict originates, escalates, and is resolved at all levels of human society is explored through the major conflict theorists, conflict simulation, negotiation exercises, and class presentations by conflict specialists.

**SOCY 1015-3. Race and Minority Problems.** Examination of race and racism, and facts



and myths about great populations, including psychological, social, and cultural sources of bias and discrimination.

**SOCY 2015-3. Sociology of Natural and Social Environments.** A sociological interpretation of the increasingly traumatic interaction of ecological and social systems in the Rocky Mountain West where the natural environment is impacted by recreation and energy development.

**SOCY 2025-3. Sociology of Nonviolence.** What nonviolent social behaviors do societies invent in response to violence? Special attention is given to racial and economic justice movements, nonmilitary national defense, civil disobedience, and conscientious objection to war.

**SOCY 3005-3. Sociological Analysis of Revolution.** A comparative analysis of major revolutions with emphasis on causation, revolutionary process, and long-term consequences. Attention is given to social stratification, political organization, economic processes, ideological systems, and international relations.

**SOCY 3015-3. Sociology of Peacemaking.** An analysis of the institutions of war and of forces emerging to counter them, such as negotiation, nonviolent national defense strategies, and peace movements.

**SOCY 4005/5005-3. Sociology of War.** What causes war? How are wars fought? How do wars end? What impact do wars have upon the development of social organization? These and other questions are considered by applying modern sociological theory and methods to armed conflicts from the ancient Peloponnesian War to Vietnam.

**SOCY 4015/5015-3. Theories of Conflict.** Discussion of theories about causes of conflict, its consequences, and methods of conflict resolution. Examples are drawn from the fields of small groups, community conflict, and international disputes. The relationship between the theory of conflict resolution and practices, such as mediation, are explored.

**SOCY 4025/5025-3. Conflict Management in Social Systems.** Explores conflict resolution theory and method as applied to interpersonal, intergroup, and interorganizational conflict.

**SOCY 4035/5035-3. Social Stratification.** The study of theories of social, ethnic, sex, and age stratification. Social inequality in the United States is examined, giving emphasis to the analysis of resulting conflicts.

**SOCY 5005-3. Sociology of War.** See SOCY 4005.

**SOCY 5015-3. Theories of Conflict.** See SOCY 4015.

**SOCY 5025-3. Conflict Management in Social Systems.** See SOCY 4025.

**SOCY 5035-3. Social Stratification.** See SOCY 4035.

**SOCY 5055-3. Modern Marxist Social Theory.** An analysis of recent Marxist theories of class structure, political economy, alienation, culture, and the state as discussed in the work of Althusser, Dobb, Gramsci, Lukacs, Mandel, Marcuse, and others.

**SOCY 5085-3. Topics in Social Conflict.** Visiting conflict management specialists examine the theory/practice relationship from the perspective of the professional third-party neutral. Types of conflict explored include family disputes, environmental and resource conflict, and international and civil wars.

**SOCY 5915-3. Conflict Management.** Students learn conflict management skills in field placements with governmental, educational, industrial, and mediation organizations.

## Sex and Gender

**SOCY 1006-3. The Social Construction of Sexuality.** (WMST 1006.) Current perspectives on the social determinants of sexuality. Emphasis is on sociological critique, analyzing the interfacing of societal, psychological, and cultural influences. An interactional perspective of human sexuality is presented.

**SOCY 1016-3. Sex, Gender and Society 1.** (WMST 1016.) An examination of status and power differences between the sexes at the individual and societal levels. Emphasis is given to the historical cross-cultural context of gender roles and status, and major theories of gender stratification are reviewed.

**SOCY 2016-3. Sex and Gender in Futuristic Literature.** (WMST 2016.) Examines the social structural causes and social psychological consequences of sex stratification in the context of futuristic literature, including nonfiction, science fiction and utopian, and dystopian novels.

**SOCY 4016-3. Sex, Gender and Society 2.** (WMST 4016.) Status and power differences between the sexes are studied at the individual, group, and societal levels. Empirically established psychological sex differences are examined, and biological, psychological, and sociological explanations for gender differences are reviewed.

**SOCY 4086/5086-3. Family and Society.** (WMST 4086.) The historical and sociological study of the changing relationship between the family and the economic structure. Households that differ from the nuclear family are examined, taking into account the political, social, ideological, demographic, and economic determinants of family formation. Open to juniors and seniors only.

**SOCY 5006-3. Sociology of Sex and Gender.** Theoretical and empirical examination of sex stratification, sex role differentiation, and sex differences in socialization, personality, institutions, and culture.

**SOCY 5086-3. Family and Society.** See SOCY 4086.

## SPANISH AND PORTUGUESE

### Spanish

**SPAN 1010-5. Beginning Spanish 1.** Offers students a firm command of Spanish grammar. Grammar is used as a point of departure for development of oral skills. Reading and writing is stressed to a lesser degree.

Attendance at the language laboratory is mandatory.

**SPAN 1020-5. Beginning Spanish 2.** Continuation of SPAN 1010. Attendance at the language laboratory is mandatory. Prereq., SPAN 1010 or placement.

**SPAN 1150-5, 1160-5. Intensive First-Year Spanish.** An intensive beginning course covering the same material as SPAN 1010 and 1020. Students must enroll in *both* SPAN 1150 and 1160 simultaneously. Not open to students with credit in SPAN 1010 and 1020. Prereq., placement and departmental approval.

**SPAN 2110-3. Second-Year Spanish 1.** Includes grammar review and a study of Hispanic culture, civilization, literature, and art. Prereq., SPAN 1020 or 1150 or placement.

**SPAN 2120-3. Second-Year Spanish 2.** Includes grammar review and a study of Hispanic culture, civilization, literature, and art. Prereq., SPAN 2110 or placement.

**SPAN 2150-6. Intensive Second-Year Spanish.** An intensive review of the structures normally covered in SPAN 2110 and 2120, including the study of Hispanic culture, civilization, literature, and art. Not open to students with credit in SPAN 2110 and 2120. Prereq., SPAN 1020 or 1150 or placement and departmental approval.

**SPAN 3000-6. Advanced Spanish Language Skills.** A transitional and introductory course for students who want to pursue a major in Spanish. Involves compositions, reading, and oral discussions. Prereqs., SPAN 2120 and 2150 or equivalent, or placement.

**SPAN 3030-3. Professional Spanish for Business 1.** Includes the study of terminology and techniques used in business transactions and the interpretation and understanding of the ideas expressed in business letters and simple documents. Prereq., SPAN 3000.

**SPAN 3040-3. Professional Spanish for Business 2.** Includes writing, interpreting, and elementary translation. Some attention is given to the writing of resumes and application letters, as well as to the entire job-search process. Prereq., SPAN 3030.

**SPAN 3050-3. Spanish Phonology and Phonetics.** Designed to teach some of the methods, techniques, and tools of descriptive linguistics as they apply to articulatory phonetics. Students analyze the important contrasts between the sounds of Spanish and English by means of phonetic transcription. Prereq., SPAN 3000.

**SPAN 3100-3. Literary Analysis in Spanish.** Students read short stories and other brief narrative texts, critical and creative essays, short plays, and poems to facilitate the acquisition of critical skills in the identification of basic ideological and formalistic issues within the texts being studied. Reading selections from Spain and Spanish America. Lectures, oral discussions, and written reports in Spanish. Prereq., SPAN 3000 or instructor permission.

**SPAN 3120-3. Advanced Spanish Grammar.** Analysis of texts from morphological and syntactic perspectives. The structural and semantic characteristics of major features of

Spanish are studied at the sentence level. The use of these grammatical features is then studied in selected literary texts. Prereq., SPAN 3000 or equivalent.

**SPAN 3200-3. Spanish Culture.** An examination of the historical bases of modern Spain's cultural and political currents. Prereq., SPAN 3000.

**SPAN 3210-3. The Cultural Heritage of Latin America.** Examines literary, artistic, and philosophical currents in Latin America beginning with the pre-Columbian indigenous cultures and continuing to the present. Prereq., SPAN 3000.

**SPAN 3310-3. Twentieth-Century Spanish Literature.** A survey of the leading writers of Spain from 1898 until the present. Prereq., SPAN 3100.

**SPAN 3340-3. Twentieth-Century Spanish-American Literature.** Introduction to contemporary Spanish-American literature. Prereq., SPAN 3100.

**SPAN 4000/5000-3. Mexican-American Culture of the Southwest.** (CHST 4002.) Does not count for major. Taught in English.

**SPAN 4010-3. Advanced Rhetoric and Composition.** Designed to improve written expression in Spanish. Detailed study of the nuances of grammar points most difficult for students. Attention is given to errors in student compositions and to the various styles of written Spanish. Prereqs., SPAN 3100 and 3120 or equivalent.

**SPAN 4060-3. Problems of Business Translation in Spanish 1.** The development of skills in English-Spanish and Spanish-English translation and interpretation. Prereq., SPAN 3040 or equivalent.

**SPAN 4070-3. Problems of Business Translation in Spanish 2.** Legal and commercial documents are studied, prepared, and discussed to enable students to perform successfully in real translation situations. Prereq., SPAN 4060 or equivalent.

**SPAN 4110-3. Women in Hispanic Literature.** Image of women in Spanish literature through the centuries using works by representative female writers. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4150-3. Masterpieces of Spanish Literature to 1700.** Treats the major literary tendencies of Spanish literature from its origins to the end of the baroque period. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4160-3. Masterpieces of Spanish Literature: 1700 to Present.** Requires a reading of selected masterpieces and an examination of major movements and figures in the literature of Spain from 1700 to the present. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4170-3. Masterpieces of Spanish-American Literature to 1898.** Examines the major works of Spanish-American literature from the colonial period to the late nineteenth century. Emphasis is on major figures and their works. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4180-3. Masterpieces of Spanish-American Literature: 1898 to Present.** Examines the major works of Spanish-American literature from the late nineteenth century to the present. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4220 (1-3). Special Topics in Spanish and/or Spanish-American Literature.** Designed to examine intensively particular topics or issues concerning Spanish and/or Spanish-American literature to be selected by the instructor. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4230-3. Literature Written in Spanish in the United States.** The knowledge and study of the body of literature written in Spanish by Hispanos living in the United States gives another perspective to American letters and life within the Hispanic group. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4620-3. Cervantes.** Reading and analysis of selected works by Cervantes. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4650/5650-3. Methods of Teaching Spanish.** Familiarizes students with current methodology and techniques in foreign language teaching. Peer-teaching coupled with the opportunity to teach mini-lessons provide students with actual teaching experience in the foreign language classroom. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000.

**SPAN 4660-6. High School Spanish Teaching.** Part of the supervised secondary school teaching required for state certification to teach Spanish. These hours do not count toward student hours in the major nor in the maximum departmental hours allowed. The credit is Pass/Fail only. Prereqs., SPAN 4650/5650.

**SPAN 4840 (1-3). Independent Study.** Departmental approval required.

**SPAN 4930 (1-4). Languages Internship for Professions.** Participants interested in public service or management-oriented careers in government or business are able to work as interns in public sector agencies or in private industry, on campus or abroad. Enrollment only with instructor's consent. Prereqs., SPAN 3100, 3200, an additional course above SPAN 3000, and departmental approval.

**SPAN 5010-1. Bibliography and Methods of Literary Research.** Designed to provide a background on the fundamental literary bibliographical research tools. Considers the standard library works on the subject and others that are little-known to facilitate the research efforts of students insofar as the location and identification of critical studies are concerned. The predominate style sheets available to Spanish researchers are also discussed in detail. Prereq., graduate standing or departmental consent.

Note: All Spanish seminars may be retaken for credit provided the subject differs from one course to another.

**SPAN 5120/7120 (1-3). Seminar: Spanish Literature and/or Spanish-American Literature.** Selected topics in Spanish and/or Spanish-American literature. Prereq., graduate standing or departmental consent.

**SPAN 5130/7130 (1-3). Seminar: Critical Approaches to Hispanic Literature.** Various topics and genres are treated, each requiring a semester's study, as needs and resources indicate. Special attention is given to theoretical and critical analysis of Hispanic literature with greatest emphasis placed on contemporary trends. Genres might include narrative, poetry, and theatre. Prereq., graduate standing or departmental consent.

**SPAN 5140/7140 (2-4). Seminar: Spanish Literature, Medieval Period.** Study of medieval works, authors, and themes, with a consideration of principal influences from other literatures. Reading in Old Spanish. Prereqs., graduate standing and SPAN 5420/7420.

**SPAN 5200/7200 (2-4). Seminar: Spanish Literature, Renaissance and Baroque.** Various topics are treated, each requiring a semester's study, as needs and resources dictate. Special attention is given to developing the historical and current theoretical and critical background of each topic. Representative topics might include Renaissance poetry in Spain, Cervantes, *Don Quijote* and *Novelas ejemplares*, picaresque novel, and the Spanish comedia of the seventeenth century. Prereq., graduate standing or departmental consent.

**SPAN 5210/7210 (2-4). Seminar: Spanish Literature, Eighteenth and/or Nineteenth Centuries.** Various topics are treated, each requiring a semester's study, as needs and resources dictate. Special attention is given to developing the historical and current theoretical and critical background of each topic. Representative topics might include romantic prose, poetry and theatre, realism and naturalism (prose narrative), nineteenth-century poetry, and nineteenth-century theatre. Prereq., graduate standing or departmental consent.

**SPAN 5220/7220 (2-4). Seminar: Spanish Literature, Twentieth Century.** Various topics are treated, each requiring a semester's study, as needs and resources dictate. Special attention is given to developing the historical and current theoretical and critical background of each topic. Representative topics might include the generation of 1898, poetry of the twentieth century, theatre of the twentieth century, pre-Civil War novel, and post-Civil War novel. Prereq., graduate standing or departmental consent.

**SPAN 5300/7300 (2-4). Seminar: Spanish-American Literature, Colonial Period and/or Nineteenth Century.** Various topics, each requiring a semester's study, are treated as needs and resources dictate. Special attention is given to developing the historical and current theoretical and critical background of each topic. Representative topics might include pre-Columbian literature, colonial prose and narrative, colonial poetry, romantic novel, the realist and naturalist novel and short story, nineteenth-century poetry, and gaucho literature. Prereq., graduate standing or departmental consent.

**SPAN 5320/7320 (2-4). Seminar: Twentieth-Century Spanish-American Literature.** Various topics, each requiring a semester's study, are treated as needs and resources dictate. Special attention is given to developing the historical and current theoretical and critical background of each topic. Representative topics might include modernism, theatre, the essay, the regional novel, the novel of the Mexican Revolution, the modern novel, contemporary theatre, and contemporary poetry. Prereq., graduate standing or departmental consent.

**SPAN 5400/7400 (2-4). Seminar: Spanish Phonology.** Topics within Spanish phonology are treated, each requiring a semester's study, as needs and resources dictate. Special attention is given to different schools and contemporary theoretical developments. Representative topics might include generative phonology applied to Spanish, Spanish phonology for college teaching, and different schools of Spanish phonology. Prereq., graduate standing or departmental consent.

**SPAN 5410/7410 (2-4). Seminar: Spanish Syntax.** Topics within Spanish syntax are treated, each requiring a semester's study, as needs and resources dictate. Special attention is given to different schools and contemporary theoretical developments. Representative topics may include generative/transformational grammar applied to Spanish, fundamental problems in Spanish syntax, and different schools of Spanish syntax. Prereq., graduate standing or departmental consent.

**SPAN 5420/7420 (2-4). Seminar: History of the Spanish Language.** Topics within the history of the Spanish language are treated, each requiring a semester's study, as needs and resources dictate. Concerned with the linguistic evolution of Spanish from neo-Latin to its present status as a world language; important historic, linguistic, literary, and cultural currents are considered. Representative topics might include a diachronic study of Spanish linguistic forms, the extension of Spanish to the New World, and linguistic and literary texts in Old Spanish. Prereq., SPAN 3050 and graduate standing, or departmental consent.

**SPAN 5430/7430 (2-4). Seminar: Hispanic Linguistics.** A detailed study of a major topic from an area such as phonology, syntax, history of the Spanish language, Hispanic linguistics and literature, or applied Hispanic linguistics is treated. Prereq., graduate standing or departmental consent.

**SPAN 6840 (1-3). Independent Study.** Graduate standing and departmental approval required.

**SPAN 6940-variable credit. Master's Degree Candidate.** Prereq., departmental approval.

**SPAN 6950-4. Master's Thesis.** Prereqs., graduate standing and departmental consent.

**SPAN 6990-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School section of this *Catalog*.

**SPAN 8840 (1-3). Independent Study.** Graduate standing and departmental approval required.

## Portuguese

**PORT 1010-5. Beginning Portuguese 1.** Offers students a firm command of Portuguese grammar. Grammar is used as a point of departure for the development of oral skills. Reading and writing is stressed to a lesser degree. Attendance at the language laboratory is mandatory.

**PORT 1020-5. Beginning Portuguese 2.** Continuation of PORT 1010. Prereq., PORT 1010 or placement.

**PORT 1150-5, 1160-5. Intensive Beginning Portuguese.** An intensive review of the structures normally covered in PORT 1010 and 1020. Attendance at the language laboratory is mandatory. Not open to students with credit in PORT 1010 and 1020. Students must enroll in *both* PORT 1150 and 1160 simultaneously. Prereqs., placement and departmental approval.

**PORT 2110-3. Second-Year Portuguese 1.** Includes grammar review and a study of Portuguese and Brazilian culture, civilization, literature, and art. Prereq., PORT 1020 or 1150 or placement.

**PORT 2120-3. Second-Year Portuguese 2.** Includes grammar review and a study of Portuguese and Brazilian culture, civilization, literature, and art. Prereq., PORT 2110 or placement.

**PORT 2150-6. Intensive Second-Year Portuguese.** An intensive review of the structures normally covered in PORT 2110 and 2120. Not open to students with credit in PORT 2110 and 2120. Prereqs., PORT 1020 or 1150 or placement and departmental approval.

**PORT 2350-2. Portuguese for Spanish Speakers.** An intensive introduction to the Portuguese language for those able to speak Spanish. Prereq., five semesters of college Spanish or equivalent, or departmental approval.

**PORT 4030/5030-3. Topics: Luso-Brazilian Civilization.** Designed to examine particular topics or issues concerning Portuguese and/or Brazilian culture. Prereq., PORT 2120 or 2150 or 2350 or equivalent.

**PORT 4110/5110-3. Survey of Brazilian Literature.** Examines the major works of Brazilian literature. Prereq., PORT 2120 or 2150 or 2350 or equivalent.

**PORT 4150/5150-3. Survey of Portuguese Literature.** Examines the major works of Portuguese literature. Prereq., PORT 2120 or 2150 or 2350 or equivalent.

**PORT 4220/5220-3. Special Topics in Luso-Brazilian and/or African Literature.** Designed to examine intensively particular topics or issues concerning the literatures of Portugal, Brazil, and/or the African countries of Portuguese colonization. May be retaken as long as the topic varies. Prereq., PORT 2110 or 2150 or 2350.

**PORT 4840 (1-3). Independent Study.** Prereq., departmental approval.

**PORT 5850 (1-3). Independent Study.** Prereq., graduate standing and departmental approval.

## THEATRE AND DANCE

### Theatre

#### HISTORY/DRAMATURGY/DIRECTING

**THTR 1011-3. Development of Theatre and Drama 1.** Examines the interaction of dramatic literature and theatre in performance from the Greeks to the eighteenth century. Introduction to theatrical styles and artists, basic repertoire of world drama, and analysis of drama in performance.

**THTR 1021-3. Development of Theatre and Drama 2.** Continuation of THTR 1011. Examines the interaction of dramatic literature and theatre in performance from the eighteenth century to the present. Introduction to theatrical styles and artists, basic repertoire of world drama, and analysis of drama in performance.

**THTR 3001-3. Dramatic Theory and Criticism.** A survey of theories and criticism of theatrical art from Aristotle to Peter Brook. Allows practical application through assignments in writing theatre critiques and play analyses.

**THTR 3071-3. Directing.** Theory and practice of directing for the stage. BFA directing/criticism concentration students should enroll in their junior year. Other students, in their senior year.

**THTR 4001-3. American Theatre Studies.** Examines theatre in America from its beginning to the present; particular attention is paid to theatres, plays and players since 1800, including frontier theatres, regional repertory theatres, music theatre, and the evolution of Broadway and Off-Broadway.

**THTR 4011/5011-3. Seminar: Theory and Criticism.** A study of theories and criticism of dramaturgy and theatrical performance from Aristotle to Schechner. Allows practical application through assignments in writing theatre critiques and play analyses.

**THTR 4031-3. European Theatre Studies.** An examination of theatrical styles and conventions as they emerged in various European countries through the ages; particular attention to Classical Greece, Italy, France, and England. Prereqs., THTR 1011 and 1021.

**THTR 4051-3. Playwriting.** An introductory course in the craft of playwriting; primary focus on the technique of developing short plays.

**THTR 4061-3. Seminar in Modernism and Postmodernism.** A study of postmodern productions and practitioners and their avant-garde predecessors. Works by such artists as Robert Wilson, Meredith Monk, Lee Breuer, and Richard Foreman are examined in light of Jarry, Strindberg, Meyerhold, Beckett, and other modernists.

**THTR 4071/5071-3. Advanced Directing.** Advanced study of theory and practice of play direction through the preparation of a one-act play. Graduate students are required

to prepare a full-length play or two one-acts. Prereq., THTR 3071.

**THTR 5021-3. Seminar: Perspectives on Acting.** The art of acting is examined through a study of acting theories and practices developed during major periods of theatre history, as well as an examination of the variety of theories about acting that remain today.

**THTR 5031-3. Seminar: Theatre Aesthetics.** Studies in performance styles, with emphasis on the visual design elements of theatre as they have influenced and reflected changing aesthetic tastes through the centuries.

**THTR 5041-3. Seminar: Contemporary British and American Theatre.** Contemporary British and American theatre since 1950 is examined: plays, productions, theories, and criticism. Particular attention is given to non-traditional styles that distinguish later twentieth-century theatre from earlier forms of modernism.

**THTR 5051-3. Special Topics in Theatre History.** A detailed study of a particular topic in theatre history: e.g., an era, a style, a country, or an organization. Topic specified in *Schedule of Courses*.

**THTR 5061-3. Asian Theatre Studies.** An in-depth study of theatre and drama of India, China, and Japan: theatre history, dramatic literature, production styles and methods, and social functions of the theatre. Students must have a background in theatre, Asian studies, or both.

**THTR 5081-3. Advanced Playwriting.** Practical study and experience in writing and/or adapting the full-length play. Prereq., THTR 4051.

The following courses are open to graduate students only:

**THTR 6001-3. Theatre Dramaturgy.** Provides a study of the roles and techniques of the dramaturg in the contemporary theatres of Europe and America, with specific applications to the Colorado Shakespeare Festival.

**THTR 6011-3. On-Stage Studies: Classical and Neoclassical Drama.** A study of classical and neoclassical drama in performance, with particular attention to twentieth-century productions and the critical and scholarly responses to these productions.

**THTR 6021-3. On-Stage Studies: Elizabethan and Jacobean Drama.** A study of Elizabethan and Jacobean drama in performance, with particular attention to nineteenth- and twentieth-century productions, and the critical and scholarly responses to these productions. Landmark productions of selected plays by Shakespeare and his contemporaries are examined.

**THTR 6031-3. On-Stage Studies: American Theatre and Drama.** A study of American drama in performance, with particular attention to critical and scholarly responses to landmark productions of American "classics."

**THTR 6041-3. On-Stage Studies: Modern European Drama.** A study of modern European drama in performance, with particular attention to critical and scholarly

responses to landmark productions of modern "classics."

**THTR 6051 (1-3). Production Research and Practicum: Directing.** Allows the student to undertake a production project, normally within the major theatre season, which requires detailed preparational research, testing of ideas, and public presentation of theories and concepts in practice. The student works under faculty supervision and prepares a documented written report and evaluation of the research, rehearsal, and performance process. Prereq., advanced course work in directing, and approval by the student's committee.

## PERFORMANCE

**THTR 2003-3. Acting Fundamentals.** Course emphasizes principles of acting, focusing on exercises in relaxation, talking and listening, use of images, sense memory, actions and objectives, and basic concepts of process work. There is a required reading list of five plays.

**THTR 2013-3. Performance of Literature.** The student learns to perceive literary form and content and to translate that perception into classroom performances of selected modern plays and short stories.

**THTR 2023-3. Acting: Contemporary Scene Study.** Continuation of the techniques introduced in THTR 2003. Emphasis is placed on scene study using plays of modern realism for material. Basic techniques in building a character are explored. There is a required reading list of five plays. Prereqs., THTR 2003 and 2013.

**THTR 3003-4. Acting: Survey of Styles.** Acting principles and techniques learned in prerequisite courses are adapted and applied to five period styles, with emphasis on standardizing speech sounds, developing speech styles appropriate to plays studied, and exploring how costumes, properties, and activities shape movement and characterization. Prereqs., THTR 2003 and 2023.

**THTR 3013-5. Studio 1: Internal Acting Process.** An in-depth study of the internal acting process for the student training for a career in professional theatre. Includes craft work in voice, speech, dialects, and stage movement as well as text analysis of contemporary plays. Prereq., admission into the B.F.A. Acting program.

**THTR 3023-5. Studio 2: External Acting Process.** Continues the acting principles begun in THTR 3013 and builds external technique for the purposes of making actions physical and exploring character based on external choices, with concentration in voice and speech styles, dialects, beginning period movement. Prereq., THTR 3013.

**THTR 3033-3. Vocal and Physical Preparation.** The natural resources of the human voice and body are studied as artistic resources for the performing artist. Designed to examine both the process and products of vocal and physical craft work. Prereq., THTR 2003.

**THTR 4003-3. Ensemble Performance of Literature.** Analysis and performance of fiction and nonfiction. Research into the life and times of a historical personage, culminating in the creation of a script and one-person performance. Emphasis upon scripting and ensemble performance. Prereq., THTR 2013.

**THTR 4013-4. Studio 3: Master Class in Specialized Style.** Students study advanced problems in a particular acting style—oriental or another highly conventionalized form. Concentration is on analysis and performance. Choice of style varies, dependent upon instructors, and the course may be repeated as long as each repetition encompasses a different style. Prereqs., THTR 3013 and 3023.

**THTR 4023-4. Studio 4: Performance of Elizabethan Roles.** Speech and movement styles characteristic of the period are explored in depth through study of sense, scansion, sound, shape, imagery, decorum, manners, and presentational acting. Analyses and performances from the work of seven playwrights, including Shakespeare, are required. Prereqs., THTR 3013 and 3023.

**THTR 4043-4. Studio 5: Performance of Classical Roles.** Examines the acting styles necessary to perform the works of pre-nineteenth-century playwrights. Emphasis is given to the vocal and physical aspects of presentational performance balanced with the internal acting process. Prereqs., THTR 3013 and 3023.

**THTR 4053-4. Studio 6: Senior Repertory.** The culminating course in the Studio series in which students prepare one or two full-length productions and monologues for public performance.

**THTR 6003 (1-3). Production Research and Practicum: Acting.** Allows the student to undertake an acting project, normally within the major theatre season, which requires detailed preparational research, testing of ideas, and public presentation of theories and concepts in practice. The student works under faculty supervision and prepares a documented written report and evaluation of the research, rehearsal, and performance process. For graduate students only. Prereq., advanced studies in acting and approval by the student's committee.

## DESIGN AND TECHNICAL THEATRE

**THTR 2005-3. Stagecraft.** An introduction to technical elements and procedures, including materials, organization, and equipment used to realize theatrical designs. Coreq., THTR 2015.

**THTR 2015-1. Stagecraft Laboratory.** One three-hour lab per week providing practical, hands-on experience in production preparation of lights, sets, costumes, and props. Practical application of lectures and discussions in THTR 2005, which must be taken concurrently.

**THTR 2035-3. Design Fundamentals.** Introduces principles and techniques relevant to the expression of dramatic mood and idea through the visual elements of the theatre, giving practice in concept development,

style selection, and rendering techniques in scenery and costume design.

**THTR 2045-2. Principles and Practice of Stage Makeup.** Introduces the student to the basic principles of stage makeup, and through a structured lab provides practical application of these techniques. Further practical experience is gained through work on University Theatre productions.

**THTR 2085-3. History of Fashion 1.** A detailed study of the history of fashion from the Egyptian and Asian civilizations to the European Renaissance, including fabrics, accessories of dress, and ornaments; influence of cultural factors; study of available collections.

**THTR 2095-3. History of Fashion 2.** Continuation of THTR 2085. A detailed study of the history of fashion from the Renaissance to contemporary times, including fabrics, accessories of dress, and ornaments.

**THTR 3005-3. Costume Design 1.** Study and application of the principles of design as applied to stage costume with special emphasis on the two-dimensional presentation of ideas.

**THTR 3015-3. Scene Design 1.** The study and practice of scene design with an emphasis on the study of design theory, color, and space. Special emphasis is placed on two-dimensional and three-dimensional presentation of ideas. Prereqs., THTR 2005, 2015, and 2035.

**THTR 3025-3. Developments in Theatre Architecture and Design.** Traces the evolution of the theatre structure: stage, audience area, and backstage equipment. Particular attention is paid to the development of the twentieth-century theatre and its associated technology.

**THTR 3035-2. Theatre Practicum.** Practical production projects within a designated area of technical theatre, design, stage/house management, and assistant directing, normally related to the department's season of major productions. Course may be repeated to a maximum of eight credits. Graded on a Pass/Fail basis; to pass, a student must put in required hours, meet all calls, and satisfactorily complete required work.

**THTR 3065-3. Theatre Management.** Introduces the theory and practice of the management aspects of the performing arts, with primary emphasis on theatre and dance. Includes study of marketing and promotional aspects of the arts, along with house and stage management procedures. Practical experience included. Prereqs., THTR 2005 and 2015.

**THTR 4005-3. Costume Design 2.** Students explore and practice the application of design techniques and theories studied in THTR 3005, as they are related to the total production scheme of various styles of drama. Prereq., THTR 3005.

**THTR 4015-3. Scene Design 2.** Presented in sequence with THTR 3015, the emphasis is placed on research, the rendering of major scenes and settings, plus model building. Prereq., THTR 3015.

**THTR 4035-3. Design Ornamentation.** One-hour lecture, two three-hour labs. A study of

architectural design elements and the methods of representation on stage through painting. Prereq., THTR 3015.

**THTR 4045-3. Stage Lighting Design.** The study and practice of lighting and design, with emphasis on the principles of electricity, optics, color theory, instrumentation, and their aesthetic application to the stage.

**THTR 4065 (1-3). Advanced Design Projects.** A practical course in the application of design theory in which the student undertakes the design of major costume, lighting, or scenic elements in one of the major season productions. Design concept and process must be explained and defended. Repeatable to a maximum of six credits. Prereq., instructor consent.

**THTR 4075 (1-3). Advanced Technical Projects.** The assumption of responsibility, under faculty supervision, for planning and execution of specific technical responses to a design concept in the department's season of major productions. Course may be repeated to a maximum of six credits. Prereq., instructor consent.

**THTR 6005 (1-3). Production Research and Practicum: Designing.** Allows the student to undertake a design project, normally within the major theatre season, which requires detailed preparational research, testing of ideas, and public presentation of theories and concepts in practice. The student works under faculty supervision, and prepares a documented written report and evaluation of the research, design, and realization process—as well as fully rendered designs and/or plots. Projects may be in costumes, lights, or scenery. For graduate students only. Prereqs., advanced studies in design and approval of student's committee.

## SHAKESPEAREAN PRODUCTION

**THTR 2017-2. Introduction to Shakespeare in Production: Director and Text.** A study of the relationship between script analysis and directorial approach in the production of three Shakespeare plays presented in the current Colorado Shakespeare Festival.

**THTR 2027-1. Introduction to Shakespeare in Production: Staging Methods.** A study of how production elements are determined and integrated in the staging of three Shakespeare plays presented in the current Colorado Shakespeare Festival.

**THTR 2037 (1-2). Basic Problems in Producing Shakespeare.** Provides exploration, through practical experience and research, of the nature and solution of a specific problem in the production of a Shakespeare play.

**THTR 4017/5017-2. Shakespeare in Production: Director and Text.** A study of the theory and implications of the director's script analysis and production approach as related to the three plays of the current Colorado Shakespeare Festival.

**THTR 4027/5027-1. Shakespeare in Production: Staging Theory and Technique.** A study of the intentions, methods, and results achieved in integrating the production elements involved in the staging of three Shakespeare plays.

**THTR 4037/5037 (1-2). Advanced Problems in Producing Shakespeare.** Provides exploration, through practical experience and research, of the nature and solution of a complex problem in the production of a Shakespeare play.

**THTR 4047/5047-5. Shakespeare in Production.** A detailed study of script analysis, directing concepts, staging and criticism of three plays being produced by the Colorado Shakespeare Festival.

## SPECIAL COURSES IN THEATRE

**THTR 1009-3. Introduction to Theatre.** An introduction to the varieties of theatrical art, past and present, contributions of the various theatrical artists to the total production, and the place of theatre art in today's society. Readings, lectures, and demonstrations. Designed for nonmajors.

**THTR 2849 (1-3). Independent Study.**

**THTR 3849 (1-3). Independent Study.**

**THTR 4009-3. Methods of Teaching Theatre.** Curriculum, materials, methods, evaluation, and related aspects of instruction. Secondary level.

**THTR 4019 (3-12). UCB Touring Theatre.** Participation in Colorado Caravan Touring Theatre Program.

**THTR 4029 (3-12). UCB Touring Theatre Dance.** Participation in Colorado Caravan Touring Theatre Dance Program.

**THTR 4039/5039-3. Musical Theatre Repertory.** Developed around the learning of complete scenes, songs and dances which are representative of the periods and styles within musical comedy from the 1920s to the present. Emphasis on in-class performance. Admission by audition.

**THTR 4049/5049 (1-4). Problems in Theatre.** Opportunity for students to explore, upon consultation with the instructor, areas in theatre which the normal sequence of offerings may not allow.

**THTR 4059-3. Special Topics in Theatre and Drama.** Intensive study of specialized topics in theatre and dramatic literature. (Topic to be specified in the *Schedule of Courses*).

**THTR 4069-4. British Theatre Studies.** Requires attendance and evaluation of theatre, dance, and opera during the current theatre season in London and Stratford. Guest lectures, backstage theatre tours, and museum and historic site visits provide the student with the basis for comparing British and American theatre techniques.

**THTR 4079/5079-6. Lessac Summer Workshop.** Special studies in the Arthur Lessac techniques of voice and body training, conducted by several Lessac instructors. An intense program of morning, afternoon, and evening workshop sessions for a period of five weeks. Other courses cannot be taken simultaneously.

**THTR 4849 (1-3). Independent Study.**

**THTR 5849 (1-3). Independent Study.**

**THTR 6009-3. Research Strategies and Techniques.** Examines research methodologies appropriate to the performing arts, particularly theatre and dance. Pilot studies are aimed at familiarizing the graduate student with the library and other resources, and the development of thesis and dissertation prospecti.

**THTR 6019-3. Professional Orientation.** Intended to prepare the doctoral student in theatre to understand and carry out successfully the responsibilities of a college faculty member. Topics include examination and evaluation of texts, teaching methodologies, professional organizations and publications, program funding, season planning, and a comparison of professional and academic theatre rules and policies.

**THTR 6849 (1-3). Independent Study.**

**THTR 6949 (1-4). Master's Candidate.**

**THTR 6959 (1-4). Master's Thesis.**

**THTR 8999-30. Doctor's Dissertation.** All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the *Catalog*.

## Dance

### NONMAJOR TECHNIQUE

**DNCE 1000/1010-1. Beginning Modern Dance.**

**DNCE 1100/1110-1. Beginning Ballet.**

**DNCE 1120/1130-1. Beginning Ballet with Experience.** Prereq., DNCE 1100 or 1110.

**DNCE 1160-1. Dance Techniques: Recreational Dance Forms.** Open to dance, physical education, and recreation majors and by consent of instructor.

**DNCE 1200/1210-1. Beginning Jazz Dance.**

**DNCE 1220/1230-1. Beginning Jazz with Experience.** Prereq., DNCE 1200 or 1210.

**DNCE 2040/2050-1. Intermediate Modern Dance.** Prereq., DNCE 1000 or 1010.

**DNCE 2140/2150-1. Low Intermediate Ballet.** Prereqs., DNCE 1120 or 1130, and DNCE 1100 and 1110.

**DNCE 2240/2250-1. Intermediate Jazz.**

**DNCE 2400-2. Theatre Dance Forms.** Classes begin with a warm-up followed by dance sequences based on social dance forms of the twentieth century and discussion of their use in musical theatre choreography.

**DNCE 3160/3170-1. Intermediate Ballet.**

**DNCE 4180/4190-1. Advanced Ballet.**

### MAJOR TECHNIQUE

The following undergraduate Dance courses are open to Dance majors. Other students admitted by audition.

**DNCE 1001-2. Dance Techniques: Modern Dance.**

**DNCE 1011-2. Dance Techniques: Modern Dance.** Prereq., DNCE 1001.

**DNCE 1101-2. Dance Techniques: Ballet.**

**DNCE 1111-2. Dance Techniques: Ballet.** Prereq., DNCE 1101.

**DNCE 2021-2. Dance Techniques: Modern Dance.** Prereq., DNCE 1011.

**DNCE 2031-2. Dance Techniques: Modern Dance.** Prereq., DNCE 2021.

**DNCE 2121-2. Dance Techniques: Ballet.** Prereq., DNCE 1111.

**DNCE 2131-2. Dance Techniques: Ballet.** Prereq., DNCE 2121.

**DNCE 3041-2. Dance Techniques: Modern Dance.** Prereq., DNCE 2031.

**DNCE 3051-2. Dance Techniques: Modern Dance.** Prereq., DNCE 3041.

**DNCE 3141-2. Dance Techniques: Ballet.** Prereq., DNCE 2131.

**DNCE 3151-2. Dance Techniques: Ballet.** Prereq., DNCE 3141.

**DNCE 4061-2. Dance Techniques: Modern Dance.** Prereq., DNCE 3051.

**DNCE 4071-2. Dance Techniques: Modern Dance.** Prereq., DNCE 4061.

**DNCE 4161-2. Dance Techniques: Ballet.** Prereq., DNCE 3151.

**DNCE 4171-2. Dance Techniques: Ballet.** Prereq., DNCE 4161.

The following graduate-level courses are open only to graduate Dance majors.

**DNCE 5001-2. Modern Dance for Graduate Students.**

**DNCE 5011-2. Modern Dance for Graduate Students.**

**DNCE 5101-2. Ballet for Graduate Students.**

**DNCE 5111-2. Ballet for Graduate Students.**

**DNCE 6001-2. Modern Dance for Graduate Students.** Prereq., DNCE 5011.

**DNCE 6011-2. Modern Dance for Graduate Students.** Prereq., DNCE 6001.

**DNCE 6101-2. Ballet for Graduate Students.** Prereq., DNCE 5111.

**DNCE 6111-2. Ballet for Graduate Students.** Prereq., DNCE 6101.

### PRODUCTION

**DNCE 2012-2. Dance Production.** Designed to provide the student with theoretical knowledge and practical experience in producing a dance concert. The areas of study include lighting, sound, costuming, publicity, budget, and management.

**DNCE 5052 (1-3). Studio Concert.**

### COMPOSITION

**DNCE 2013-2. Dance Improvisation.** An exploration of the aesthetic elements of movement through improvisational structure. Guided dance experiences are designed to allow for individual response and group instruction while providing an opportunity for spontaneous self expression.

**DNCE 2033-3. Beginning Composition.**

An introduction to the basic elements of dance composition through compositional studies evolved from readings, discussion, and improvisation.

**DNCE 3043-3. Intermediate Dance Composition.** An opportunity for the student to increase knowledge and understanding of the elements of dance composition as they relate to group forms, theme, development, and phrase manipulation. Prereqs., DNCE 1011 and 2033.

**DNCE 4053-3. Advanced Dance Composition.** An in-depth approach to composition with an emphasis on personal invention, solo and group forms; styles based on historical art forms; exploration of the evaluative process. Prereqs., DNCE 3041 and 3043.

**DNCE 5053-3. Advanced Dance Composition.** Same as DNCE 4053 with the addition of graduate papers and/or a project.

**DNCE 6073 (2-4). Choreography.** Advanced composition choreographed and presented for public performance and criticism.

### MUSIC

**DNCE 2014-2. Rhythmic Analysis and Accompaniment.** Emphasis is on the elements of rhythm in relation to dance. Experiences with rhythmic drills, rhythmic notation, and percussion accompaniment for the modern dance class comprise the body of the course.

**DNCE 3024-2. Musical Resources for Dance.** Surveys basic musical notation and terminology, the elements and forms of music, and historical styles, supported by guided listening to representative works. Special emphasis is placed on twentieth-century techniques and on the relationship of various musics to dance. Coreq., DNCE 2014.

### MOVEMENT ANALYSIS

**DNCE 3015-3. Movement Analysis.** The basic elements of Laban Movement Analysis are introduced as a framework for perceiving and understanding movement. Major body therapies and their implication for dance training and application to individual movement problems are explored. Prereq. PHED 2790.

**DNCE 5055-2. Applied Labananalysis.** The body, effort, space, and shape components of the Laban Movement Analysis framework are considered in relation to dance technique, composition, style analysis, and individual movement styles. Emphasis is on application of theory.

### EDUCATION

**DNCE 4016-3. Creative Dance for Children.** A methods course for prospective teachers of creative dance for children. Lectures, readings, and laboratory experiences are followed by observation and teaching in the primary grades.

**DNCE 4036-3. Methods of Teaching Dance.** Practical experience in teaching modern dance to the young adult follows theoretical grounding in specific teaching methods.



Examines the values and goals of dance in education and fundamental movement principles as related to the teaching of technique and improvisation. Prereqs., DNCE 2013, 2014, 2033, and 3015.

**DNCE 5016-3. Creative Dance for Children.** Same as DNCE 4016 with the addition of book reports in related fields and a resource file of materials for children's classes.

**DNCE 5036-3. Methods of Teaching Dance.** Same as DNCE 4036 with the addition of a paper developed in consultation with the teacher.

**DNCE 6056-2. Problems in Dance Administration and Curriculum.** An examination of current problems in the administration of dance programs at the college level in relation to curriculum development and trends in curriculum construction.

## HISTORY

**DNCE 4017-3. History and Philosophy of Dance.** The history and philosophy of dance from primitive times to 1900.

**DNCE 4027-3. Dance in the Twentieth Century.** Development of modern dance from Isadora Duncan to the present through lectures, discussions, critical reviews, and films.

**DNCE 5017-3. History and Philosophy of Dance.** Same as DNCE 4017 with the addition of graduate papers and/or a project.

**DNCE 5027-3. Dance in the Twentieth Century.** Same as DNCE 4027 with the addition of graduate papers and/or a project.

## PERFORMANCE

**DNCE 4018-2. Performance Improvisation Techniques.** An interdisciplinary approach to dance, theatre, and music performance. Improvisational techniques are utilized to enhance creative skills. The objective is to help the individual discover and make accessible the diversity of the human instrument and develop practical tools to broaden expressive range.

**DNCE 4038-3. Dance Repertory.** Learning and performing dances from the repertory of current faculty members, artists-in-residence, and upon occasion from the repertory of historic modern dancers.

**DNCE 4068-2. Composition/Repertory.** Students explore the improvisational and choreographic style of the artist-in-residence; repertory may also be taught.

**DNCE 5038-3. Dance Repertory.** Same as DNCE 4038 except graduate students are required to keep a log of the learning process involved in repertory to document and analyze each work in terms of stylistic differences, musical/sound accompaniment, and trends.

**DNCE 5068-3. Composition/Repertory.** Same as DNCE 4068 with an additional performance project approved by the artist-in-residence and the Academic Director of the summer dance program.

## PHILOSOPHY AND INDEPENDENT STUDY

**DNCE 2849 (1-3). Independent Study.**

**DNCE 3849 (1-3). Independent Study.**

**DNCE 4849 (1-3). Independent Study.**

**DNCE 4909-2. Problems in Dance.** Explores current topics and research in relation to teaching methods, performance, and criticism that the normal sequence of offerings may not allow.

**DNCE 4919 (1-3). Dance Practicum.** Project in dance under supervision of senior faculty.

**DNCE 5849 (1-3). Independent Study.**

**DNCE 5909-2. Problems in Dance.** Exploration of current topics and research in relation to teaching methods, performance, and criticisms which the normal sequence of offerings may not allow.

**DNCE 5919-2. Dance Practicum.** Project in dance under supervision of graduate faculty.

**DNCE 6009-3. Research Strategies and Techniques.** Resources and approaches to scholarly research and writing. Expectations in class participation, performance activities, and writing. Requirements and procedures of the department and of the Graduate School. Required for all departmental graduate students.

**DNCE 6019-2. Readings in Dance.** A survey of dance literature including an opportunity for graduate students to familiarize themselves with resources, current publications, theoretical materials, and professional organizations in the dance area.

**DNCE 6049-3. Seminar: Dance.** Intensive study of selected topics related to the art of dance, dance criticism, research in dance, and dance in relationship to the other arts (performing and visual) with an emphasis on the avant-garde.

**DNCE 6949. Candidate for Degree.**

**DNCE 6959 (1-4). Master's Thesis.**

**DNCE 6969-3. The Graduate Project.** Provides the opportunity for synthesizing the graduate experience through the execution of a project related to the student's major area of interest. The project must be approved by the graduate faculty advisor.

## UNIVERSITY WRITING PROGRAM

**UWRP 1050-3. Introductory Composition: Directed Writing.** For students who require the rudiments of college composition. Students are taught how to plan a paper, prepare a rough draft, and revise it for both clarity and accuracy. All sections are conducted as workshops; that is, student papers are discussed at every class meeting.

**UWRP 1150-3. Introductory Composition: Expository Writing.** For students who require instruction in organizing descriptive material and presenting it coherently. All sections are conducted as workshops; that is, student papers are discussed at every class meeting. Students are required to

revise their papers frequently throughout the term.

**UWRP 1250-3. Introductory Composition: Argumentative Writing.** For students who require instruction in stating an argumentative thesis and defending it. All sections are conducted as workshops; that is, student papers are discussed at every class meeting. Students are required to revise their papers frequently throughout the term.

**UWRP 1840-variable credit. Independent Study.**

**UWRP 2050-3. Intermediate Composition: Prose Strategies.** Addresses matters of style, tone, and audience in both descriptive and argumentative writing. All sections are conducted as writing workshops; that is, student papers are discussed at every class meeting. Consent of instructor required.

**UWRP 3050-3. Advanced Composition: Argument.** The first in a sequence of four intensive writing workshops for accomplished student writers, irrespective of major. Addresses the many arts of persuasion, which include appeals not only to reason, but also to emotion. Students are taught how to coordinate the parts of a complicated proof, how to qualify a problematic thesis, and how to discover and challenge fallacies in the arguments of others. Consent of instructor required.

**UWRP 3150-3. Advanced Composition: Style.** The second of four intensive writing workshops, this course introduces students to major prose stylists in the English language, both classic and contemporary. While exploring the characteristics, the uses, and the limitations of different stylistic devices, students set about fashioning and refining a style of their own. Consent of instructor required.

**UWRP 4050-3. Advanced Composition: Form.** The third of four intensive writing workshops, this course addresses the issue of form: for example, in interviews, in biographies, in autobiographies, or in narratives. By writing essays patterned on the different organizational principles displayed in these texts, students can explore the strengths and weaknesses inherent in particular structural devices. Consent of instructor required.

**UWRP 4150-3. Advanced Composition: The Portfolio.** In this, the last of four intensive writing workshops, students prepare portfolios of essays that reflect a full range of their talents and skills. Consent of instructor required.

**UWRP 5050-3. Graduate Composition: Writing About \_\_\_\_\_.** These topic-oriented graduate courses are for students engaged in writing theses, articles, or applications for grant support. Students are taught how to temper the jargon of academic prose, so that their writing is clear without being elementary, and concise without being elliptical. Consent of instructor required. The courses do not apply to the minimum number of hours required for graduate degrees on the Boulder Campus.

## WOMEN STUDIES

**WMST 1260-3. Introduction to Women's Literature.** See ENGL 1260.

**WMST 2000-3. Introduction to Women Studies.** The variety of women's roles and statuses are examined from an interdisciplinary and cross-cultural perspective with the goal of generating and evaluating various theoretical explanations for the differences in access to power of women and men. Includes consideration of psychology and physiology, sex roles and socialization, marriage and the family, work and economics, history, and social change.

**WMST 2010-3. Contemporary Issues.** Examines current social, political, and economic issues related to women. Includes consideration of women of all social classes and ethnic backgrounds, primarily in the United States. Possible topics include violence against women, women in the labor force, reproductive freedom, women in poverty, sexuality, and the women's movement.

**WMST 2100-3. Women in Antiquity.** See CLAS 2100.

**WMST 2260-3. Images of Women in Literature.** See ENGL 2260.

**WMST 2290-3. Philosophy and Women.** See PHIL 2290.

**WMST 2300-3, 2310-3. Topics in Women Studies.** Designed to examine, at an introductory level, selected topics in women studies. Content varies by semester and reflects relevant contemporary issues in women studies scholarship, e.g., women and crime, women in film, sex and gender in futuristic literature, and women and technology.

**WMST 2700-3. The Psychology of Contemporary American Women.** See PSYC 2700.

**WMST 2910-3. Crisis Intervention Practicum: Women's Line.** Introduces basic theories and principles of crisis intervention, the helping process, and counseling of women. Includes weekly presentations on women's issues such as eating disorders, rape, incest, single parenting, sexuality, birth control, loss and separation, assertiveness, and battering. Emphasis on correlating theory with practice. Course requires 100 volunteer hours on the Women's Line. Prereqs., WMST 2000 and 2001.

**WMST 3000-3. Women in Organizations.** Examines a variety of topics of special interest to women in the context of organizations: power, institutional racism and sexism, organizational structure, leadership, conflict and change. All topics are examined from both traditional and feminist perspectives for the purposes of comparison and in-depth analysis. Prereq., WMST 2000 or 2001 or PSYC 1001 or SOCY 1001.

**WMST 3550-3. Male/Female Relationships.** Designed to explore the influence of 20 years of feminism on the nature of male/female relationships. Topics addressed include the interrelationship between social structures and individual psychology, problems in male/female relationships (sexuality, intimacy, power), and changing roles and changing arrangements, e.g. cohabitation,

equal parenting, double careers. A cross-disciplinary course that draws primarily from sociology, psychology, and communication. Prereq., one course in sociology, psychology, or women studies.

**WMST 3700-3, 3710-3. Topics in Women Studies.** Designed to examine selected topics in women studies. Content varies by semester and reflects relevant contemporary issues in women studies scholarship, e.g., women and public policy, women in film, and women and crime. Prereqs., WMST 2000 and 2001.

**WMST 3730-3. Women in the Third World.** Introduces women's roles in development, struggle, and social change in the Third World through both theoretical discussions and concrete case studies. The cases involve colonial, capitalist, and socialist transformations, and raise issues concerning family structure, class, migration, and urbanization. Prereqs., WMST 2000 and 2001.

**WMST 3840-variable credit. Independent Study.**

**WMST 4000-3. Senior Seminar: Special Topics.** Advanced interdisciplinary course organized around a specific topic, problem, or issue relating to women in culture and society (such as women and public policy, women's role in world development, women and work). Course work includes discussion, reading, and written projects. Prereqs., WMST 2000 and 2001.

**WMST 4020-3. Senior Research Seminar.** Students work in groups on research projects related to women (such as oral histories of women in management). Projects are designed to introduce students to basic research techniques, to develop research skills, and to contribute to knowledge of contemporary and historical Rocky Mountain women.

**WMST 4090-3. Feminist Theory.** Examines major theoretical writings on feminist theory, including both historical and contemporary works—e.g., Marx, Mill, de Beauvoir. Major divisions within contemporary feminist thought (radical, liberal, psychoanalytic) are discussed. Topics include philosophical notions of equality, the development of feminist thought, and social-historical analysis of feminism as a social movement. Prereqs., WMST 2000 and 2001.

**WMST 4700-3. Women and Mental Health.** See PSYC 4700.

**WMST 4710-3. The Black Female: A Feminist Analysis.** See BLST 4710.

**WMST 4840-variable credit. Independent Study.**

### Cross-Listed Courses

**WMST 4271-3. Sex Discrimination: Constitutional Issues.** See PSCI 4271.

**WMST 4291-3. Sex Discrimination: Federal and State Laws.** See PSCI 4291.

**WMST 3012-3. Women, Development, and Fertility.** See SOCY 3012.

**WMST 3262-3. Women Writers.** See ENGL 3262.

**WMST 4012-3. Population Control and Family Planning.** See SOCY 4012.

**WMST 4272-3. Topics in Women's Literature.** See ENGL 4272.

**WMST 4063-3. Women in Victorian England.** See HIST 4063.

**WMST 4614-3. Women and Society in Industrial Europe.** See HIST 4614.

**WMST 3135-3. Study of Chicanas.** See CHST 3135.

**WMST 1006-3. The Social Construction of Sexuality.** See SOCY 1006.

**WMST 1016-3. Sex, Gender and Society 1.** See SOCY 1016.

**WMST 2016-3. Sex and Gender in Futuristic Literature.** (SOCY 2016.) Examines the social structural causes and social psychological consequences of sex stratification in the context of futuristic literature, including nonfiction, science fiction, and utopian and dystopian novels.

**WMST 2616-3. History of Women in the United States to 1890.** See HIST 2616.

**WMST 2626-3. History of Women in the United States, 1890 to the Present.** See HIST 2626.

**WMST 4016-2. Sex, Gender and Society 2.** See SOCY 4016.

**WMST 4086-3. Family and Society.** See SOCY 4086.

**WMST 4619-3. Women in Asian History.** See HIST 4619.

**WMST 4809-3. Women Artists From the Middle Ages to the Present.** See FINE 4809.

## College of Business and Administration and Graduate School of Business Administration

Courses open to both undergraduate and graduate students are designated by slashes (e.g., ACCT 4240/5240).

### ACCOUNTING

**ACCT 2000-3. Introduction to Financial Accounting.** The preparation and interpretation of the financial statements of the business enterprise, with emphasis on asset and liability valuation problems and the determination of net income. Prereq., sophomore standing.

**ACCT 2310-3. Managerial Cost Accounting 1.** Measurement and reporting of product manufacturing and service costs. Identifies and analyzes the role of product costs in income determination. Includes computer processing of cost data. Prereqs., ACCT 2000 and sophomore standing.

**ACCT 3220-3. Intermediate Financial Accounting 1.** Intensive analysis of generally accepted accounting principles, accounting theory, and preparation of annual financial

statements for public corporations. Prereqs., ACCT 2000 or 2310 and junior standing.

**ACCT 3230-3. Intermediate Financial Accounting 2.** Continuation of ACCT 3220. Prereqs., ACCT 3220 and junior standing.

**ACCT 3320-3. Managerial Cost Accounting 2.** Cost analysis for purposes of control and decision making. Analysis of cost behavior, role of accounting in planning and control, and managerial uses of cost accounting data. Includes use of computer-assisted decision models. Prereqs., ACCT 2000 and 2310, or ACCT 5010, and junior standing.

**ACCT 4240/5240-3. Advanced Financial Accounting.** Advanced financial accounting theory and practice with emphasis on accounting for partnerships, business combinations, and consolidations. Prereqs., ACCT 3230 or 6220.

**ACCT 4250/5250-3. Financial Accounting Issues and Cases.** In-depth analysis of contemporary accounting issues, the development of accounting thought and principles, and critical review of generally accepted accounting principles. Prereq., ACCT 3230 or 6220 or equivalent.

**ACCT 4330/5330-3. Managerial Accounting Issues and Cases.** Critical analysis of advanced topics in managerial accounting. Considerable use of cases and current readings. Prereq., ACCT 3320.

**ACCT 4410/5410-3. Income Tax Accounting.** Provisions and procedures of federal income tax laws and requirements affecting individuals and business organizations. Prereq., ACCT 2000 or 5010.

**ACCT 4420/5420-3. Advanced Income Tax Accounting.** Continuation of ACCT 4410, with special emphasis on the income tax problems of partnerships and corporations. Prereq., ACCT 4410 or 5410.

**ACCT 4540/5540-3. Accounting Systems and Data Processing.** The design and analysis of management information systems and automated data processing methods, with special emphasis on computers and the role of accounting in the management process. Prereq., 9 semester hours of accounting courses.

**ACCT 4620/5620-3. Auditing.** Generally accepted auditing standards, professional ethics, and auditing techniques. Authoritative pronouncements of the AICPA stressed. Prereq., ACCT 3230 or 6220.

**ACCT 4800/5800-3. Accounting for Government and Nonprofit Organizations.** Planning and control of government and nonprofit organizations. Includes program budgets, responsibility accounting, and fund accounting. Prereq., ACCT 2000 or 5010 or equivalent.

**ACCT 4810-3. Honors Seminar: Business 1.** Social responsibilities of the business executive, business ethics, business-government relations, and business in literature. Open to seniors who have completed at least 30 hours of business courses, have obtained not less than a 3.30 grade point average over those hours, and have received consent of instructor.

**ACCT 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in accounting. Prereq. varies.

**ACCT 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**ACCT 5010-3. Fundamentals of Accounting.** Provides basic understanding of financial accounting essential for graduate study of business. Open only to graduate degree candidates.

**ACCT 6200-3. Administrative Controls.** Accounting concepts and techniques of analysis for management planning, control, and decision making. Prereqs., ACCT 5010, OPMG 5020, and FNCE 5050, or equivalent. Open only to graduate degree students.

**ACCT 6220-5. Financial Accounting Concepts and Practice.** An in-depth study of the concepts underlying contemporary financial accounting practice. Topics include the history, environment, and process of standard-setting, competing theories of accounting, and the application of concepts to selected current issues. Students with credit for ACCT 3220 and 3230 or equivalent may not receive credit for ACCT 6220. Prereq., ACCT 5010 or equivalent.

**ACCT 6250-3. Seminar: Accounting Theory.** Nature and origin of accounting theory and the development of postulates, principles, and practices. Methodology appropriate to development and evaluation of accounting theory, with special emphasis on accepted research standards and procedures. Prereq., ACCT 3230 or 6220 or equivalent.

**ACCT 6260-3. Seminar: Managerial Accounting.** In-depth exploration of the broad professional field of managerial accounting, especially as related to organizational decision making, planning, and control. Development and current problems of the managerial accounting function analyzed. Prereq., ACCT 6220 or equivalent, or instructor consent.

**ACCT 6270-3. Seminar: Income Determination.** Critical analysis of problems and theory of measurement and reporting of periodic net income of business organizations. Net income models, research efforts, and role of professional accounting organizations. Current issues and problems given special attention. Prereq., ACCT 6250.

**ACCT 6350-3. Current Issues in Professional Accounting.** In-depth analysis of current issues in the accounting profession, including ethics, development and validity of standards, and regulation. Prereq., ACCT 6250 or instructor consent.

**ACCT 6420-3. Research Problems in Income Tax Accounting.** A study of the methodology used in tax research and in tax planning, together with a study of some aspects of tax administration and tax practice. Prereq., ACCT 4410, 5410, or instructor consent.

**ACCT 6430-3. Taxation of Partnerships and S Corporations.** Examines the taxation of

partnerships, S corporations, and the owners of these entities. Covers partnership formation and operation, sale or exchange of partnership interests, distribution of partnership property, partners' deaths or retirements, and tax shelters. Prereq., ACCT 5410 or equivalent, or instructor consent.

**ACCT 6440-3. Tax Policy.** A research seminar exploring policy issues of taxation. Areas reviewed include recent legislative proposals on tax simplification, flat rate taxation, and the value-added tax. Students are expected to prepare a publishable research paper on a tax policy topic mutually agreed upon with the instructor. Prereq., ACCT 5410 or equivalent, or instructor consent.

**ACCT 6450-3. Taxation of Corporations.** Examines the taxation of corporations and their shareholders. Covers corporate formation and operation, distributions to shareholders, stock redemptions, liquidations, reorganizations, and penalty provisions. Prereqs., admission to the graduate tax program, ACCT 5410 or equivalent, or instructor consent.

**ACCT 6460-3. Civil and Criminal Tax Procedure.** An introduction to the procedural aspects of tax law administration. Studies include a review of the Internal Revenue Service enforcement structure and practice at both the civil and criminal level. The jurisdiction of the Tax Court and the Federal District Courts is also reviewed. Prereqs., admission to the graduate tax program, ACCT 5410 or equivalent, or instructor consent.

**ACCT 6470-3. Foreign Source Income Taxation.** A study of the federal income taxation of foreign source income of U.S. individuals and international businesses. Tax problems related to foreign losses and repatriation of earnings are also considered. Prereqs., admission to the graduate tax program, ACCT 5410 or equivalent, or instructor consent.

**ACCT 6490-3. Taxation of Natural Resources.** Concerned with tax problems encountered in the acquisition, operation, and disposition of natural resource properties. Topics include depletion, lease bonuses, intangible drilling costs, depreciation, and financing arrangements. Prereqs., admission to the graduate tax program, ACCT 5410 or equivalent, or instructor consent.

**ACCT 6500-variable credit. Special Topics in Taxation.** Covers a diverse array of issues in taxation not covered in other courses. Designed to highlight areas of particular current interest and to draw on the strengths of leading outside authorities in various topic areas. Prereq., ACCT 6420.

**ACCT 6620-3. Advanced Auditing Theory.** Contemporary issues, historical developments, and in-depth study of selected topics pertinent to independent audits by Certified Public Accountants. Emphasis is on the critical analysis of current standards and practices. Prereq., ACCT 5620 or equivalent.

**ACCT 6710-3. Federal Estate and Gift Tax.** See LAWS 7207.

**ACCT 6720-2. Advanced Estate Planning.** See LAWS 7217.

**ACCT 6730-3. Real Estate Planning.** See LAWS 7024.

**ACCT 6740-3. Business Planning.** See LAWS 7211.

**ACCT 6750-3. Natural Resource Taxation.** See LAWS 7307.

**ACCT 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in accounting. Prereq. varies.

**ACCT 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**ACCT 6940-variable credit. Master's Candidate.** Departmental form required.

**ACCT 6950 (4-6). Master's Thesis.**

**ACCT 7300-3. Doctoral Seminar: Accounting Research 1.** Examination and evaluation of current theories, issues, and problems relating to accounting. Primary emphasis on accounting theory and research. Open only to doctoral students. Prereqs., ACCT 6250 and 6260 or equivalent, or instructor consent.

**ACCT 7320-3. Doctoral Seminar: Accounting Research 2.** A continuation of ACCT 7300. Students' primary responsibilities include investigating and reporting (orally and in writing) related empirical research topics. Current theories, tests of theories, and alternative research methods are analyzed. A final research proposal is required. Prereq., ACCT 7300.

**ACCT 7830-3. Doctoral Seminar: Dissertation Research.** A seminar designed to assist the doctoral student in integrating courses and fields of study in order to be able to apply knowledge and skills to problems in accounting. Special attention is given to the development of thesis topics.

**ACCT 8820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in accounting. Prereq. varies.

**ACCT 8900-variable credit. Independent Study.** Instructor's consent and departmental form required.

**ACCT 8990 (1-10). Doctor's Thesis.**

## BUSINESS LAW

**BSLW 3000-3. Business Law.** A study of the legal significance of business transactions as part of the decision-making process in business. Coverage of text and statutes includes law and its enforcement and integration of the Uniform Commercial Code with the law of Contracts, Bailments, Warehousemen and Carriers, Documents of Title, Sales of Goods, and Commercial Paper. Prereq., junior standing. Students must request BSLW lecture section 3000-100 and recitation section 101-110.

**BSLW 4120/5120-3. Advanced Business Law.** Property security transactions (UCC9), suretyship and guaranty, bankruptcy, agency, partnerships, and corporations (UCC8). Prereq., BSLW 3000 or 5060.

**BSLW 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in Business Law.

**BSLW 5060-3. Legal Environment of Business.** Provides understanding of the private and public law essential for graduate study in business. Open only to graduate degree candidates; may be limited to Business graduate students only.

**BSLW 6040-3. Space Law and Policy.** Current issues of space commercialization and military use of space. Topics include institutional framework of space law and policy, treaties, world political ramifications of activities in space, and national legislation and the roles of federal agencies.

## BUSINESS ENVIRONMENT AND POLICY

**BPOL 1500-3. Introduction to Business.** Explores the nature of business enterprise, the role of business in our society, and the problems confronting business management. Discusses career opportunities in business. Business students are advised to take this course during their freshman year. Open only to freshmen and sophomores.

**BPOL 4500-3. Cases and Concepts in Business Policy.** Emphasis is on integrating the economic, market, social-political, technological, and competition components of the external environment with the internal characteristics of the firm; and deriving through analysis the appropriate interaction between the firm and its environment to facilitate accomplishment of the firm's objectives. Priority for enrollment is given to business seniors in their final semester prior to graduation. Prereqs., FNCE 3050, MKTG 3000, OPMG 2010 and 3000, and ORMG 3300. For graduating seniors only.

**BPOL 4510-3. Management Game and Cases in Business Policy.** Computerized management simulation is used as a means of giving the student practical, simulated experience in developing and analyzing business problems and building a framework for decision making, policy formulation, and plans of action. Priority for enrollment is given to business seniors in their final semester prior to graduation. Prereqs., FNCE 3050, MKTG 3000, OPMG 2010 and 3000, and ORMG 3300. For graduating seniors only.

**BPOL 4520-3. Small Business Strategy, Policy, and Entrepreneurship.** Emphasis is on planning, organizing, and operating small business firms. The role of the entrepreneur is examined in the conception, organization, and development of firms. Extensive use is made of small business cases. Priority for enrollment is given to Entrepreneurship and Small Business Management majors who are seniors in their final semester before graduation. Prereqs., FNCE 3050, MKTG 3000, OPMG 2010 and 3000, and ORMG 3300. For graduating seniors only.

**BPOL 4550-3. Business and Society.** An examination of interrelationships between business, society, and the environment. Topics include perspectives on the socio-economic-business system, current public policy

issues, and social responsibilities and ethics. Prereqs., ECON 2010 and 2020, and SOCY 1001. Seniors only.

**BPOL 6500-3. Business Policy.** Emphasizes problem analysis and decision making at integrative-management level. Devoted to internal policy making. Emphasis on integrated use of research, analysis, and control in policy decisions. Open only to Business graduate students. Completion of all 5000 fundamentals is a firm prerequisite. This course *must* be taken in the candidate's final term of the program.

**BPOL 7500-3. Doctoral Seminar: Administrative Policy 1.** Examination and evaluation of current theories, issues, and problems involved in the formulation, administration, and appraisal of administrative policies. Includes both study of relevant literature and examination of administrative policies in operation in business enterprises. Open to doctoral candidates only. Prereq., BPOL 6500.

**BPOL 7530-3. Doctoral Seminar: Administrative Policy 2.** Continuation of BPOL 7500. Prereq., BPOL 7500.

**BPOL 7560-3. Directed Study and Research in Current Policy Issues.** For doctoral candidates with primary interest in administrative policy. Directed intensive study of important policy issues, both on an individual basis and in small groups. Reading and research. Prereqs., BPOL 7500 and 7530.

**BPOL 8900-variable credit. Independent Study.** With the consent of instructor under whose direction study is taken. Departmental form required.

**BPOL 8990 (1-10). Doctor's Thesis.**

## ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT

**ESBM 4700-3. Entrepreneurship and Small Business Management.** Analysis of managerial problems of small businesses. Case studies, outside speakers, and individual reports on local small business enterprises supplement class discussions. Student must have an understanding of elementary accounting, finance, and business law, or have experience in small business operation. Prereqs., senior standing, INFS 2000, ACCT 2000, FNCE 3050, and BSLW 3000. Required for students whose area of emphasis is ESBM.

**ESBM 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**ESBM 6700-2. Entrepreneurship and Small Business.** Advanced course. Research studies of conditions that make for success or failure by localities. Prereq., ESBM 4700 or MKTG 5700, or instructor consent.

**ESBM 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

## FINANCE

**FNCE 3050-3. Basic Finance.** Primary emphasis is placed on building an understanding of the basic concepts, tools, and techniques used by the financial manager. Also includes a study of the financial manager's role in business and the sources of capital for financing required asset investments. Prereqs., ECON 2010 and 2020, ACCT 2000, OPMG 2010, and junior standing.

**FNCE 3210-3. Personal Finance.** Problems of personal financial management: use of credit, personal budgets, insurance, small investments in securities, buying a home, creating an estate, providing for old age, and making a will. Intended for nonbusiness students. No credit given toward business degree requirements.

**FNCE 3330-3. Investments.** Study of the basic problems concerning the development and implementation of a personal investment program. Includes analysis of investment risks, alternative investment media, and designing and executing an investment program. No credit given toward business degree for finance majors. Students may not receive credit for both FNCE 3330 and 4330. Prereq., FNCE 3050.

**FNCE 3550-3. Financial Markets.** Discusses major operating characteristics and problems of money and capital markets, both national and international. Emphasizes the sources and availability of money and capital for financing business and the market structure for the employment of savings. No credit given toward business degree for finance majors. Students may not receive credit for both FNCE 3550 and 4550. Prereq., FNCE 3050.

**FNCE 4010-3. Business Finance 1.** Covers the basic principles and practices governing management of capital in the business firm. Determinants of capital requirements, methods of obtaining capital, problems of internal financial management, and methods of financial analysis are examined. Financing the business corporation is given primary emphasis. Prereqs., FNCE 3050 and ACCT 2310.

**FNCE 4020-3. Business Finance 2.** Develops analytical and decision-making skills of students in relation to problems that confront financial management. Areas include planning, control, and financing of current operations and longer-term capital commitments; management of income; evaluation of income-producing property; and expansion. Case method of instruction. Prereq., FNCE 4010.

**FNCE 4100-3. Business and Government.** Study of government and its role in a market system. Topics include regulation, antitrust and other economic policies which affect business, labor, and consumers. Completion of PSCI 1101 is recommended before taking this course. Prereqs., ECON 2010 and 2020. Business seniors only.

**FNCE 4330-3. Investment and Portfolio Management.** Discusses investment problems and policies and the methodology for implementing them. Includes portfolio analysis, selection of investment media, and

measurement of performance. Students may not receive credit for both FNCE 3330 and 4330. Prereq., FNCE 4010.

**FNCE 4340/5340-3. Security Analysis.** An application of the theories and methodology for the selection of investment media for implementing an investment portfolio. Prereq., FNCE 4010.

**FNCE 4400/5400-3. International Financial Management.** Considers international capital movements and balance of payments problems, as well as problems of international operations as they affect the financial functions. Reviews foreign and international institutions and the foreign exchange process. Considers financial requirements, problems, sources, and policies of firms doing business internationally. Prereq., FNCE 3050 or 5050 or equivalent.

**FNCE 4410-variable credit. International Business Seminar in Finance.** Special topics in international business. Interested students should contact the College of Business Office of Undergraduate Studies.

**FNCE 4530/5530-3. Bank Management.** An analysis of structure, markets, regulation, and chartering commercial banks. Problems and policies of the internal management of funds, loan practices and procedures, investment behavior, deposit and capital adequacy, liquidity, and solvency. Analytical methodology for these problems is developed. Prereqs., FNCE 4010 and 4550, or FNCE 6010.

**FNCE 4550-3. Financial Markets and Institutions.** Emphasizes the economics of the financial markets and the business management of financial institutions. Additional emphasis is given to the impact of monetary and fiscal policy on international and domestic financial market conditions. Prereq., FNCE 3050.

**FNCE 4570-3. New Venture Funding.** Focuses on the financial issues confronting managers in entrepreneurial settings. Topics include raising and managing seed and growth capital from various funding sources, initial public offerings, securities law and public and private placements, understanding the deal, and buyouts. Prereq., FNCE 3050.

**FNCE 4740/5740-3. Principles of Insurance.** Fundamental principles of insurance and their application in life, disability, property, and liability insurance. Provides the basic knowledge for intelligent solution of personal and business insurance problems as well as for further specialized study of insurance. Prereq., FNCE 3050.

**FNCE 4770/5770-3. Risk Control in the Corporate Enterprise.** A systematic approach to risk control in industrial and commercial enterprises. Concerns the interworkings of human behavior, natural phenomena, and chance involved in situations of risk and the great variety of combinations of preventive measures, insurance provisions, and loss absorption arrangements. Prereq., FNCE 4740.

**FNCE 4810-3. Hours Seminar.** Social responsibilities of the business executive, business ethics, business-government relations, and business in literature. Open to

seniors who have completed at least 30 semester hours of business courses, have obtained not less than a 3.30 grade point average over those hours, and have received consent of instructor.

**FNCE 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in finance.

**FNCE 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**FNCE 5050-3. Fundamentals of Finance.** Provides basic understanding of business finance essential for graduate study of business. Prereq., ACCT 5010 or equivalent. Open only to graduate degree candidates.

**FNCE 5080-3. Economic Theory and Application for Managers.** An introduction to micro- and macroeconomic theory for M.B.A. candidates. No credit for students with credit in ECON 2010 and 2020. Open only to graduate degree candidates.

**FNCE 6010-3. Problems and Policies in Financial Management 1.** Emphasizes analysis of financial condition, planning and control of current assets and current liabilities, and long-term financial arrangements. Specific topics include management of working capital; short, intermediate, and long-term financing; leasing, valuation, and capital structure policies. Theory and case studies. Prereq., FNCE 5050 or equivalent.

**FNCE 6020-3. Special Topics in Financial Management.** Topics include capital budgeting, capital structure theory, valuation, dividend policy, mergers and divestitures, and financial distress. Theory and empirical analyses. Prereq., FNCE 6010.

**FNCE 6100-3. Business, Government, and Society.** The interdependence of business with societal, governmental, and economic environments. Explores the firm's social and ethical responsibilities. Considers the relationship between business and government and the control and regulation of business. (Note: FNCE 6150 should be completed before enrolling in this course.) Prereq., FNCE 5080 or equivalent, or 12 hours of 5000-level fundamentals. Open only to Business graduate students.

**FNCE 6150-3. Managerial Economics.** A presentation of the concepts, tools, and methods of economic analysis relevant to a broad cross-section of decisions within the business firm. Particular attention is given to market demands and the interrelationships between price policy, costs, and production. (Note: Should be completed before FNCE 6100 is completed.) Prereqs., INFS 5020 and microeconomics, or OPMG 5020 and FNCE 5080. Open only to Business graduate students.

**FNCE 6330-3. Investment Management and Analysis.** The theory of investment management and security values; portfolio management including the analysis of investment risks and constraints on investment policies and objectives; the analysis and use of

investment information; and the development and application of the tools for determining values. Prereq., FNCE 6010.

**FNCE 6550-3. Economics of Financial Markets.** Emphasizes the economic analysis of domestic and international financial markets. Considerable emphasis is placed on developing an understanding of the various factors that influence the cost and availability of capital for financing business enterprise. Prereq., FNCE 5050 or equivalent.

**FNCE 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in finance.

**FNCE 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**FNCE 6940-variable credit. Master's Candidate.** Departmental form required.

**FNCE 6950 (4-6). Master's Thesis.**

**FNCE 7200-3. Doctoral Seminar 1.** Topics and course outline vary from semester to semester.

**FNCE 7330-3. Doctoral Seminar 2.** Topics and course outline vary from semester to semester.

**FNCE 7550-3. Doctoral Seminar 3.** Topics and course outline vary from semester to semester.

**FNCE 7830-3. Doctoral Seminar: Dissertation Research.** A seminar designed to assist the doctoral student in integrating courses and fields of study in order to be able to apply knowledge and skills to problems in finance. Special attention is given to the development of thesis topics.

**FNCE 8820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in finance.

**FNCE 8900-variable credit. Independent Study.** Instructor's consent and departmental form required.

**FNCE 8990 (1-10). Doctor's Thesis.**

## INFORMATION SYSTEMS

**INFS 2000-3. Business Information Systems and the Computer.** A study of business information systems focusing upon computer hardware and software as they relate to business information. Includes computer modeling, computer systems, and computer applications. Introduces students to the concepts, vocabulary, and functions of business information systems and the computer. Not open to freshmen. Prereq., MATH 1070. Students must request lecture and recitation.

**INFS 2200-3. Business Programming 1: Structured COBOL.** An introductory course intended to provide the student with a thorough programming foundation in COBOL using structured programming concepts and techniques. The basic elements of the language are discussed and demonstrated through applications in a business environment.

**INFS 2210-3. Business Programming 2: Structured COBOL and Data Organization Techniques.** Continuation of INFS 2200. Introduces the student to advanced topics in COBOL and their applications in business. Special emphasis on alternative physical data and file structures, their implementation in COBOL, and their use in a business setting. The use of system software and utilities is integrated with the topics. Case studies may be used to illustrate applications of the material. Prereq., INFS 2200 or instructor consent.

**INFS 3300-3. Operations Research for Decision Support.** Objectives and models of operation research and their application in a managerial setting. Includes topics such as inventory models and control, simulation, nonmathematical programming topics, and network models. Prereq., OPMG 2010.

**INFS 3500-3. Logical Data Structures and Database Management Systems.** An introduction to database management systems, online query, and management control systems. Concerned with database structure and design and the integration of the logical view of the data with its physical storage. Extensive use may be made of a commercial DBMS in student projects to develop an appreciation of the use and organizational issues as well as the technical considerations.

**INFS 4200/5200-3. Introduction to Expert Systems.** The design and use of expert systems in business. Topics include alternative forms of knowledge representation, user interfaces, inference engines, search strategies, and elicitation of knowledge from experts. Existing commercial development shells for expert systems are reviewed. Students may be expected to develop a small expert system using a commercial shell.

**INFS 4650-3. Systems Analysis and Design 1.** Introduces the student to basic system analysis tools and the procedures for conducting a system analysis. Topics covered may include system requirements, the initial analysis, the general feasibility study, structured analysis, detailed analysis, logical design, and the general system proposal. Students gain practical experience through projects and/or case studies.

**INFS 4660-3. Systems Analysis and Design 2.** Continuation of INFS 4650. Covers topics such as structured design, physical system design, detailed feasibility analysis, specification of input-output methods and formats, design of files, programs and procedures, system testing, implementation procedures, and system life cycle management. Students implement these concepts through case studies and/or projects. Prereq., INFS 4650.

**INFS 4700/5700-3. Computer and Information Technology.** Provides students with a conceptual foundation in the areas of computer architecture, operating systems, programming translators, and telecommunications. Intended to serve as a facilitating course to allow the student to communicate more readily with other technical members of the data processing community.

**INFS 4810-3. Honors Seminar.** Social responsibilities of the business executive,

business ethics, business-government relations, and business in literature. Open to seniors who have completed at least 30 semester hours of business courses, have obtained not less than a 3.30 grade point average over those hours, and have received consent of instructor.

**INFS 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in information systems.

**INFS 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**INFS 5000-3. Introduction to Computing.** Introduces the student to applications of computers to business problem solving. Software may include word processing, databases, spreadsheets, and applications-oriented packages. Application areas may include problems in accounting, management science, finance, marketing, and other business disciplines. Business graduate students only.

**INFS 6040-3. Telecommunications and Networking.** Analysis and design of networks to support management information systems. Objective is to familiarize the student with the concepts and terminology of data communications, network design, and distributed information systems. Heavily slanted toward managerial considerations in the space systems environment. Instructor consent required.

**INFS 6450-3. Information Systems and Management.** Information processing, the analysis and design of information systems, management query systems, and database design and management. Designed for non-Information Systems majors, the course provides an overview of data processing functions and management in a business setting.

**INFS 6500-3. Database Management Systems.** Theory of data structures; implementation of database models. Comparative analysis of available systems and in-depth applications in conventional and innovative circumstances, especially in development of information for operations and control of administrative functions.

**INFS 6650-3. Systems Analysis and Design 1.** Introduces the student to basic system analysis tools and the procedures for conducting a system analysis. Topics covered may include system requirements, the initial analysis, the general feasibility study, structured analysis, detailed analysis, logical design, and the general system proposal. Students gain practical experience through projects and/or case studies.

**INFS 6660-3. Systems Analysis and Design 2.** Continuation of INFS 6650. Covers topics such as structured design, physical system design, detailed feasibility analysis, specification of input-output methods and formats, design of files, programs and procedures, system testing, implementation procedures, and system life cycle management. Students implement these concepts through case studies and/or projects. Prereq., INFS 6650.



**INFS 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in information systems.

**INFS 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**INFS 6940-variable credit. Master's Candidate.** Departmental form required.

**INFS 6950 (4-6). Master's Thesis.**

**INFS 8820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in information systems.

**INFS 8900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**INFS 8990 (1-10). Doctor's Thesis.**

## MARKETING

**MKTG 3000-3. Principles of Marketing.** Analytical survey of problems encountered in distributing goods and services. Takes a marketing-management approach in attacking problems related to product planning, channels of distribution, pricing, advertising, and selling. Emphasizes role of consumer and the social responsibility of marketer. Prereq., junior standing.

**MKTG 3100-3. Personal Selling.** Principles and methods of personal salesmanship with attention to development and demonstration of effective sales presentation techniques. Prereq., junior standing.

**MKTG 3200-3. Consumer Behavior.** Survey of contributions of behavioral sciences to understanding and prediction of consumer behavior. Contributions of research techniques in social sciences to understanding of consumer purchasing and decision-making processes. Survey of consumer purchasing behavior, brand loyalty, and product cycles. Prereq., MKTG 3000.

**MKTG 3300-3. Marketing Research.** Explores the fundamental techniques of marketing through practical experience in research methodology: planning an investigation, questionnaires, sampling, interpretation of results, and report preparation. Discusses research techniques for product analysis, motivation research, sales and distribution-costs analyses, and for advertising research. Students incur project expenses. Prereqs., MKTG 3000 and OPMG 2010. Students without proper prerequisites may be administratively dropped.

**MKTG 3400-3. Marketing Institutions and Retailing.** A study of the macroeconomic foundations of marketing intermediaries, middlemen, and institutional alignments. Emphasis placed on development and change of institutional structures, functions, and roles played by participants in moving goods to the ultimate consumer, focusing on retailing functions and strategies. Prereq., MKTG 3000.

**MKTG 3500-3. Principles of Advertising.** Analysis of principles and practices in advertising from the executive's viewpoint. Considers whether a firm should advertise; product and market analysis as planning phase of advertising program; media; survey of creation and production of advertisements; advertising budgets, copy testing, and organization. Prereq., MKTG 3000.

**MKTG 4100/5100-3. International Marketing.** Studies managerial marketing policies and practices of firms marketing their products and services in foreign countries. An analytical survey of institutions, functions, policies, and practices in international marketing. Relates marketing activities to the market structure and marketing environment. Prereq., MKTG 3000 or 5030.

**MKTG 4300-3. Research Design and Experimental Methods in Marketing.** Advanced course in marketing research. Stresses design of marketing research projects and application of statistical techniques. Covers the collection, analysis, and interpretation of marketing information, as well as techniques of experimental design and application as a basis for decision making in marketing. Students design and manage a planned marketing information system. Prereqs., MKTG 3000 and 3300.

**MKTG 4400-3. International Business Seminar.** Examines the international business environment as it affects company policy and procedures. Integrates all the functions undertaken in international operations through depth analysis and comprehensive case studies. Prereq., 6 hours of required international courses or any two of the following: ECON 4410, FNCE 4400, MKTG 4100, or TRMG 4580.

**MKTG 4420-variable credit. International Business Seminar in Marketing.** Special topics in international business. Interested students should contact the College of Business Office of Undergraduate Studies. Prereq. varies.

**MKTG 4500/5500-3. Advertising Management.** Advertising problems from management point of view. Topics include stimulating primary and selective demand, selection of media, building promotional programs, advertising appropriations and campaigns, evaluations of results, and agency relations. Prereq., MKTG 3500 or instructor consent.

**MKTG 4600/5600-3. Industrial Marketing.** Activities involved in marketing of industrial goods. Topics include analysis of market structures, habits and motives of purchasers, types of industrial products, pricing problems, and distribution channels. Also covers problems in selling to agencies of government. Oriented to engineers and others entering the fields of industrial selling or marketing. Prereq., MKTG 3000 or 5030.

**MKTG 4650/5650-3. Physical Distribution Management.** Investigation and analysis of logistics of distribution systems for firms engaged in manufacturing and marketing. Component parts of each system are studied and analytical tools are presented for selecting alternatives which will attain distribution goals of the firm. Prereq., MKTG 3000 or equivalent, or MKTG 5030.

**MKTG 4700/5700-3. Sales Management.** Problems involved in managing a sales force. Includes sales organization, operating a sales force (recruiting, selection, training, compensation, supervision, stimulation), sales planning (forecasting, budgeting, territories), sales analysis and control. Prereq., MKTG 3000 or 5030.

**MKTG 4750/5750-3. Pricing and Price Policies.** Appraisal of price theory and limitations in actual business situations. Detailed study of impact of demand, costs, and prices upon revenues and profits through extensive use of actual case materials. Legal aspects of pricing decisions studied intensively. Prereq., MKTG 3000 or 5030, or equivalent.

**MKTG 4800-3. Marketing Strategies and Policies.** Detailed consideration of the process of formulating and implementing marketing strategy. Major emphasis on markets, distribution channels, and product analysis. Case approach utilized to develop student's analytical ability and to integrate all major areas of marketing. Prereqs., MKTG 3000 and 6 additional hours of marketing.

**MKTG 4810-3. Honors Seminar.** Social responsibilities of the business executive, business ethics, business-government relations, and business in literature. Open to seniors who have completed at least 30 semester hours of business courses, have obtained not less than a 3.30 grade point average over those hours, and have received consent of instructor. Prereq., MKTG 3000.

**MKTG 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in marketing.

**MKTG 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**MKTG 5030-3. Fundamentals of Marketing.** Provides basic understanding of marketing essential for graduate study of business. Open only to graduate degree candidates.

**MKTG 6000-3. Marketing Management.** An in-depth inquiry into marketing decision making. Emphasis is placed on strategic planning and analytical procedures for marketing decisions. Integrates all areas of marketing management and relates marketing activities to the other functional areas of the firm. Prereq., MKTG 5030 or equivalent. Graduate students only.

**MKTG 6040-3. Acquisition and Marketing of Space Systems.** Activities involved in the acquisition and marketing of space systems, including analysis of the space market structure, types of products, pricing problems, and contract administration.

**MKTG 6050-3. Marketing Research.** Problem/opportunity definition, survey and causal research designs, and reporting research results are examined from the viewpoints of practicing researchers and managers. Topics include secondary data sources, measurement of beliefs and behaviors, sampling plans, and data analysis. Emphasis on managerial applications. Prereq., MKTG 6000.

**MKTG 6100-3. Seminar: Marketing.** Intensive analytical study of certain aspects of marketing principles, institutions, policies, and operations. Prereq., MKTG 5030 or equivalent.

**MKTG 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in marketing.

**MKTG 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**MKTG 6940-variable credit. Master's Candidate.** Departmental form required.

**MKTG 6950 (4-6). Master's Thesis.**

**MKTG 7000-3. Seminar: Consumer Behavior.** A study of the nature and determinants of consumer buying behavior. In-depth investigation of contributions of behavioral sciences (especially psychology, sociology, and cultural anthropology) toward understanding consumer behavior. Influence of demographic factors, motivation, personality, culture, and purchasing behavior. Prereq., MKTG 3200 or instructor consent.

**MKTG 7100-3. Doctoral Seminar: Marketing Management.** Consideration of current problems and issues in marketing from the perspective of the individual firm. Analysis of the adjustment process of the firm in meeting changes in the market and marketing environment. New developments in techniques and procedures analyzed and evaluated. Prereq., MKTG 6000 or equivalent.

**MKTG 7200-3. Doctoral Seminar: Marketing Theory.** Investigation of development and current state of theoretical and conceptual aspects of marketing principles, institutions, and processes. Course develops an understanding of functioning, measurement, and efficiency of total distribution process. Frontiers of marketing thought are analyzed and evaluated. Prereq., MKTG 7100.

**MKTG 7300-3. Multivariable Methods in Marketing.** Multivariable methods applicable to basic research in marketing. Includes MANOVA designs, causal models, cluster analysis, discriminant function analysis, factor analysis, and latent structure analysis. Emphasis on computer applications. Prereqs., graduate courses in regression and ANOVA.

**MKTG 7400-3. Seminar: Channel Policy and Structure.** An analytical study and evaluation of the structure and evolution of marketing channels. Relationship of channel policy to business policies is stressed. Cost and effectiveness of alternative distribution policies and practices are considered, and the relationship of channel policy to physical distribution is studied. Prereq., 6 hours of marketing.

**MKTG 7500-3. Seminar: Promotional Strategy.** Principles, concepts, and problems involved in development and management of advertising, personal selling, and sales promotion program in an individual firm. Qualitative market analysis, social, ethical, and economic evaluation of the role of promotional activities in American economy.

Prereq., MKTG 3500 or instructor consent. Graduate students only.

**MKTG 7600-3. Marketing Field Problem.** Participants functioning as a research group are presented with the opportunity of analyzing and making recommendations regarding a practical marketing problem presented by a cooperating business firm. Special emphasis placed upon developing effective methodology for problem-solving processes in marketing. Prereq., MKTG 6000.

**MKTG 7830-3. Doctoral Seminar: Dissertation Research.** Designed to assist the doctoral student in integrating courses and fields of study in order to be able to apply knowledge and skills to problems in marketing. Special attention is given to the development of thesis topics.

**MKTG 8820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in marketing.

**MKTG 8900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**MKTG 8990 (1-10). Doctor's Thesis.**

## MINERALS LAND MANAGEMENT

**MLMG 4600-3. Oil-Gas and Mineral Law.** A review and examination of the legal relationships associated with mineral rights and properties. Topics include the mineral estate and the attributes of mineral ownership, conveyances and reservations of interests in the mineral estate—mineral or royalty, transgressions against the mineral estate, the fee oil and gas lease—a review of the legal consequences of typical provisions, and the federal mining law of 1872. Prereq., completion of 90 semester hours of work toward area of emphasis, including all lower-division requirements.

**MLMG 4610-3. Minerals Landman Administration.** A general overview of various aspects of land work in the petroleum and mining industries including federal oil and gas leases, federal coal leases, federal governmental leases, state and Indian leases, spacing and pooling, A.A.P.L. 610 operating agreements, federal exploratory units, secondary recovery units, farmout agreements, title curative procedures and instruments, and mineral leases. Prereq., MLMG 4600 and 90 hours of course work toward area of emphasis, or instructor consent.

**MLMG 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

## OPERATIONS MANAGEMENT

**OPMG 2010-3. Business Statistics.** Statistical applications in business. Includes descriptive statistics, time series analysis, index numbers, probability and sampling

distributions, statistical inference, simple regression, and decision analysis without sampling. Prereqs., MATH 1070 and 1080 and INFS 2000. Students must request lecture and recitation.

**OPMG 3000-3. Production and Operations Management.** An introduction to the design and analysis of production systems in manufacturing, service, and public organizations. Topics include facility location and layout; job design, safety, and work standards; production and inventory planning and control; quality control; simulation; waiting line analysis; and linear programming. Prereq., OPMG 2010.

**OPMG 3200-3. Intermediate Statistics.** Includes the intermediate treatment of regression and forecasting models in business and research, statistical quality control in manufacturing processes, sampling and analysis of variance, parametric and nonparametric statistical inferences, and decision analysis with sampling. Prereq., OPMG 2010.

**OPMG 4300/5300-3. Business Forecasting.** Analysis of fluctuations in business activity, study of responsible factors, diffusion indices, and other forecasting techniques and models. Construction of models for planning and simulation. Prereq., OPMG 2010 or 5020.

**OPMG 4400/5400-3. Production and Inventory Planning and Control.** Study of the design, implementation, and control of integrated production and inventory planning and control systems. Topics include demand forecasting, capacity planning and master scheduling, inventory management, material requirements planning, and shop floor controls. Organizations studied include manufacturing, service (including urban services), and government. It is recommended that graduate students take OPMG 6400 in lieu of this course or obtain instructor's consent. Prereq., OPMG 3000 or 5020.

**OPMG 4440/5440-3. Work Design, Measurement, and Productivity Management.** Study of the design of jobs in manufacturing, service, and public organizations. Topics include job specialization versus job enlargement, work measurement, determining job standards, job health and safety, the impact of automation on job design, and productivity measurement and management systems. Prereq., OPMG 3000 or MGMT 5040.

**OPMG 4470/5470-3. Policy Analysis in Production and Operations Management.** Study of production and operations management formulation and analysis. Emphasis is on developing decision-making skills through the use of case analysis, field study, consulting with local organizations, and other experiential activities. Prereq., OPMG 4400 or 5400.

**OPMG 4600/5600-3. Purchasing and Materials Management.** Study of the purchasing function in manufacturing, service, and public organizations. Topics include source selection, make-buy analysis, inventory control, warehousing, material quality standards and specifications, transportation alternatives, bid systems, and legal aspects.

**OPMG 4810-3. Honors Seminar.** Social responsibilities of the business executive,

business ethics, business-government relations, and business in literature. Open to seniors who have completed at least 30 semester hours of business courses, have obtained not less than a 3.30 grade point average over those hours, and have received consent of instructor.

**OPMG 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter.

**OPMG 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**OPMG 5020-3. Fundamentals of Business Statistics.** Provides basic understanding of business statistics essential for graduate study of business. Open only to graduate degree students.

**OPMG 6010-3. Deterministic Models.** Covers linear programming and its application, network analysis (including scheduling models), dynamic programming, integer programming, and nonlinear programming.

**OPMG 6020-3. Stochastic Models.** Covers probability theory, queuing theory, inventory theory, Markov decision processes, simulation, and decision analysis. Prereq., OPMG 5020.

**OPMG 6400-3. Logistics, Production, and Inventory Management.** Study of the total flow of resources to and through the production process to the ultimate consumer. Topics include integrated production, inventory, and logistics systems in manufacturing, service, and public organizations; demand forecasting; capacity planning; inventory management; material requirements planning (MRP); facility scheduling and control; and physical distribution management. Prereq., OPMG 5020 and INFS 5000.

**OPMG 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in operations management.

**OPMG 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**OPMG 6940-variable credit. Master's Candidate.** Departmental form required.

**OPMG 6950 (4-6). Master's Thesis.**

**OPMG 8820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in operations management.

**OPMG 8900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**OPMG 8990 (1-10). Doctor's Thesis.**

## ORGANIZATION MANAGEMENT

**ORMG 3300-3. Introduction to Management and Organization.** An introductory study of

management fundamentals and organizational behavior. Students learn how individuals adapt to organizations, how managers motivate and lead in work situations, and how organizations are designed and managed. Prereqs., PSYC 1001, SOCY 1001, and junior standing.

**ORMG 3350-3. Managing Individuals and Work Groups.** Examines leadership and supervision in small work groups in organizations. Focuses on how and why individuals act as they do in interpersonal relationships and in small groups. Develops interpersonal and small group skills. Prereq., ORMG 3300.

**ORMG 4320-3. Managing Complex Organizations.** From the perspective of a general manager, explores organizational design and management processes for effective organizational performance. Prereq., ORMG 3300.

**ORMG 4810-3. Honors Seminar.** Social responsibilities of the business executive, business ethics, business-government relations, and business in literature. Open to seniors who have completed at least 30 semester hours of business courses, have obtained not less than a 3.30 grade point average over those hours, and have received consent of instructor.

**ORMG 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in organization management.

**ORMG 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**ORMG 5040-3. Fundamentals of Management and Organization.** Provides basic understanding of organization theory, personnel management, labor relations, and organizational behavior essential for graduate study in business. Open only to graduate degree candidates.

**ORMG 6300-3. Organizational Behavior.** Application of behavioral science concepts and research to management of organizations. Open only to Business graduate students. Prereq., ORMG 5040 or equivalent.

**ORMG 6310-3. Individual Behavior in Work Organizations.** Explores the impact of key management and behavioral science theories, concepts, and practices on individual productivity, satisfaction, growth, and development. Prereq., ORMG 5040 or equivalent.

**ORMG 6320-3. Organization Design.** Design of organization structure and its impact on organizational processes. Analysis of alternative organization patterns and factors affecting organization design. Prereq., ORMG 5040 or equivalent.

**ORMG 6330-3. The Development of Groups and Organizations.** An introductory study of the dynamics involved in managing and facilitating change in groups and organizations by application of behavioral science knowledge. Emphasis is placed on both cognitive and experiential learning. A background in organization theory and administrative behavior is required. Prereq., ORMG 5040 or equivalent.

**ORMG 6340-3. Consultation Skills.** A seminar for doctoral and advanced master's students, oriented toward the theoretical and experiential aspects of organizational entry, contracting, data gathering, and problem diagnosis in an organizational setting. Prereq., ORMG 6330 or instructor consent.

**ORMG 6350-3. Dynamics of Interpersonal Behavior.** Application of skills in problem diagnosis, empathy, and communications in group and interpersonal settings. A strong emphasis is placed on clear understanding of human behavior and interpersonal dynamics in a laboratory setting. Prereq., ORMG 6330 or instructor consent.

**ORMG 6360-3. Intervention Theory and Methods.** Application of skills in the third party role in analysis and consultation of such processes as communication, decision making, problem solving, functional roles of group members, and nonverbal behavior in the organizational setting. Prereq., ORMG 6330 or instructor consent.

**ORMG 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in organization management.

**ORMG 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**ORMG 6940-variable credit. Master's Candidate.** Departmental form required.

**ORMG 6950 (4-6). Master's Thesis.**

**ORMG 7320-3. Seminar in Organization Theory.** Critically investigates major issues in organization theory and provides students experience in comprehensively surveying the literature in subject areas such as organization design, structure, technology, environment, size, and strategy. Prereq., instructor consent.

**ORMG 7330-3. Seminar and Practicum in Organization Development.** A doctoral-level seminar emphasizing the intervention theory and method in effectuating organizational change in a client system. Deals with group development, educational processes, conflict resolution, organizational interventions, change strategies, and the ethical and skill requirements of the consultative role. Prereq., instructor consent.

**ORMG 7830-3. Doctoral Seminar: Dissertation Research.** Designed to assist the doctoral student in integrating courses and fields of study in order to be able to apply knowledge and skills to problems in organization management. Special attention is given to the development of thesis topics.

**ORMG 8820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in organization management.

**ORMG 8900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**ORMG 8990 (1-10). Doctor's Thesis.**

## PERSONNEL-HUMAN RESOURCE MANAGEMENT

**PHRM 4400/5400-3. Management of Human Resources.** Introduction to modern personnel management policies and practices. Overview of primary issues in managing an organization's human resources, including job analysis and design; planning personnel needs; recruiting, hiring, developing and appraising employees; and discussion of current social and legal issues. A general course emphasizing awareness of issues applicable to managers in all functional areas. Prereq., ORMG 3300 or 5040 or equivalent.

**PHRM 4410/5410-3. Labor and Employee Relations.** Analysis of legal, political, social, and managerial aspects of collective bargaining and employee relations. Prereq., ORMG 3300 or 5040 or equivalent.

**PHRM 4420/5420-3. Employment Staffing and Development.** Examination of issues relating to the selection, placement, development, and retention of employees. Advanced treatment of strategies for conducting job analyses, planning staffing needs, evaluating recruitment sources, and using alternative selection techniques. How to develop, implement, and evaluate training programs. Comprehensive review of Equal Employment Opportunity and Affirmative Action requirements. Prereqs., PHRM 4400 or 5400, and OPMG 2010.

**PHRM 4430/5430-3. Compensation and Benefits.** Analysis of compensation systems and applied motivation theory. Coverage of job evaluation, wage surveys, performance appraisal, and motivational theories. Treatment of social and legal issues pertaining to salary and benefit administration, workers compensation and pay equity, including comparable worth. Prereqs., PHRM 4400 or 5400, and OPMG 2010.

**PHRM 4810-3. Honors Seminar.** Social responsibilities of the business executive, business ethics, business-government relations, and business in literature. Open to seniors who have completed at least 30 semester hours of business courses, have obtained not less than a 3.30 grade point average over those hours, and have received consent of instructor. Departmental form required.

**PHRM 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in personnel-human resource management.

**PHRM 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**PHRM 6400-3. Seminar: Personnel Administration.** Issues in all areas of personnel administration. Emphasis on research findings on human resources applications through applied models, survey methods, and other applied behavioral concepts.

**PHRM 6410-3. Seminar: Labor and Employee Relations.** Issues in all areas of industrial, labor, and employee relations.

Emphasis on research findings in industrial, labor, and employee relations through applied problems, NLRB and court decisions, arbitration cases, and conflict management models.

**PHRM 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in personnel-human resource management.

**PHRM 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

**PHRM 7400-3. Seminar in Personnel Human Resource Management.** An intensive research-based survey of contemporary issues in personnel-human resource management. Students survey the literature and conduct research in personnel human resource subject areas such as job analysis, job evaluation and compensation, human resource planning, recruitment, personnel selection, training and development, performance appraisal, labor relations, and safety. Instructor consent required.

## PUBLIC AGENCY ADMINISTRATION

The program encompasses the subject areas of budgeting, personnel management, administration, and quantitative methods. For additional information refer to public agency administration area of emphasis.

## REAL ESTATE

Note: All courses numbered 4000 and above may be limited to Real Estate majors.

**REAL 3000-3. Principles of Real Estate Practice.** Activities in the current field of real estate practice. Prereq., junior standing.

**REAL 4010/5010-3. Real Estate Development.** Methods of analyzing real estate opportunities are studied. These methods include urban economic, market and location analyses. Local government controls are studied from the developer's viewpoint. Prereq., REAL 3000.

**REAL 4300/5300-3. Residential and Income Property Appraising.** Principles and techniques of estimating the value of land, residences, and income property are studied. Prereqs., REAL 3000 and FNCE 3050; may be limited to majors or students who have completed FNCE 5050.

**REAL 4330/5330-3. Real Estate Investments.** Emphasizes problems and methodology for making the real estate investment decision. Includes real estate user and investor requirements, decision models, tax factors, and syndication. Prereq., REAL 3000 and FNCE 3050, or REAL 3000 and FNCE 5050, or equivalent.

**REAL 4540/5540-3. Real Estate Finance.** Functions and practices of various real estate financing institutions. Covers mortgage

lending, servicing, and mortgage banking relative to all types and uses of real estate. Prereqs., REAL 3000 and FNCE 3050; may be limited to majors or students who have completed FNCE 5050, or equivalent.

**REAL 4730/5730-3. Legal Aspects of Real Estate Transactions.** Topics include estates in land, purchase and sales contracts, conveyances, mortgage and trust deed transactions, property taxes, landlords and tenants, and wills and inheritance. Prereq., BSLW 3000 and REAL 3000; may be limited to majors or students who have completed BSLW 5060 and REAL 3000.

**REAL 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in real estate.

**REAL 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**REAL 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in real estate.

**REAL 6900-variable credit. Independent Study.** With the consent of instructor under whose direction the study is taken. Departmental form required.

## TOURISM AND RECREATION

**TREC 3100-3. Leisure Behavior and Recreation Services.** Leisure patterns and behaviors of selected age and interest groups and the various systems to deliver leisure services are social/psychological aspects of the leisure experience. Organizational patterns and structures used to deliver leisure services are identified and studied.

**TREC 3170 (1-4). Fieldwork—Leisure Behavior.** Through observation and involvement, each student experiences the provision of leisure activities in select settings. Skills and knowledge are applied under agency supervision allowing for a refinement of leadership and programmatic techniques.

**TREC 3400-3. Principles of Commercial Recreation.** Development of commercial recreation and the significance of American travel and tourism are the major topics. Others include private/public sector relationships, recreation for profit, historical development, economic impact of recreation services, administrative structures, and planning objectives.

**TREC 3470 (1-4). Fieldwork—Commercial Recreation.** Through observation and involvement, students experience the provision of recreation services in select settings. Skills and knowledge are applied under agency supervision allowing for a refinement of leadership and programmatic techniques.

**TREC 4010-3. Program Planning.** Basic principles of developing significant leisure experiences for various populations are examined. Program proposals, implementation, and evaluation provide the basis for

this learning experience. Client involvement, participant characteristics, scheduling, marketing, and other topics pertinent to effective program planning are studied. Prereq., TREC 2010 or 3400. May be limited to students with junior or senior standing in this area of emphasis.

**TREC 4030-3. Marketing Parks and Recreation Areas and Facilities.** Effective development and promotion of areas and facilities commonly used for recreation are studied. Federal, state, and local resources and guidelines are studied with special focus on management, programming, and maintenance. Prereq., TREC 2010, 3100, or 3400. May be limited to students with junior or senior standing in this area of emphasis.

**TREC 4050-3. Organizational Management in Recreation.** Involves the study of organizational structure of the various recreation delivery systems. Evaluative techniques which determine the effectiveness of these structures are related to administration of programs and policies. Prereq., TREC 2010, 3100, or 3400. May be limited to students with junior or senior standing in this area of emphasis.

**TREC 4070-3. Financial Management of Leisure Services.** Specific techniques of financial management currently utilized by the recreation profession. Bids, grants, tax status, program accounting, and public and private funding approaches are studied. Prereq., TREC 2010, 3100, or 3400. May be limited to students with junior or senior standing in this area of emphasis.

**TREC 4400-3. Leisure Behavior Travel and Tourism.** An in-depth analysis of tourism as an industry. Includes both the economic and social effects commercial recreation and tourism have on society with appropriate required and outside readings from current publications. Prereq., TREC 3400. May be limited to students with junior or senior standing in this area of emphasis.

**TREC 4810-3. Honors Seminar.** Social responsibilities of the business executive, business ethics, business-government relations, and business in literature. Open to seniors who have completed at least 30 semester hours of business courses, have obtained not less than a 3.30 grade point average over those hours, and have received consent of instructor.

**TREC 4820-variable credit. Topics in Business.** Experimental course offered irregularly for purpose of presenting new subject matter in tourism and recreation.

**TREC 4900 (1-3). Independent Study in Community Recreation.** Departmental form required.

**TREC 4901 (1-3). Independent Study in Commercial Recreation.** Departmental form required.

**TREC 4930-10. Internship—Leisure Behavior.** A semester placement with a leisure service agency to study the total operation of how services are managed and delivered, and how those services impact participants. Graded on a Pass/Fail basis only. Prereqs., students must have completed all recrea-

tion requirements and obtained advisor's permission.

**TREC 4931-10. Internship—Commercial Recreation.** A semester placement with a commercial recreation agency to study the total operation of how services are managed and delivered, and how those services impact participants. Graded on a Pass/Fail basis only. Prereqs., students must have completed all recreation requirements and obtained advisor's permission.

## TRANSPORTATION AND DISTRIBUTION MANAGEMENT

**TRMG 4430-variable credit. International Business Seminar in Transportation Management.** Special topics in international business. Interested students should contact the College of Business Office of Undergraduate Studies.

**TRMG 4500/5500-3. Transportation Operation and Management.** Topics include economics of transportation service and rates, history and patterns of regulation, explanation of various forms in common use in freight and passenger transportation, introduction to tariffs and their use, and service and management problems of industrial traffic managers. Prereqs., ECON 2010 and 2020, or FNCE 5080 or equivalent, or instructor consent.

**TRMG 4510/5510-3. Survey of Transportation Law and Freight Claims Procedures.** An analysis of the legal aspects of the transportation systems. Issues include carrier liability, transportation contracts, damages, freight claim preparation, licensing, and practicing before regulatory agencies. Prereq., TRMG 4500/5500 or instructor consent.

**TRMG 4520/5520-3. Problems in Surface Transportation Management.** Analysis of surface modes with emphasis on the motor carrier industry. Topics include carrier operations, regulatory structure, pricing, market structure, design of services, routes and terminals, equipment, and private fleets. Case analyses and field studies are used to develop decision-making skills. Prereq., TRMG 4500/5500 or instructor consent.

**TRMG 4560/5560-3. Air Transportation.** Particular reference to operating costs and methods, passenger and cargo rates, air routes, schedules, safety, regulation, and airport management. Prereqs., TRMG 4500, senior standing, and instructor consent, or TRMG 5500, graduate standing, and instructor consent.

**TRMG 4570/5570-3. Urban Transportation.** Analysis of the two aspects of urban transportation—freight and people. Issues in policy, modes, governmental actions and structure, investment and costs, and effect upon urban environment. Prereq., TRMG 4500/5500 or instructor consent.

**TRMG 4580/5580-3. International Transportation.** Analysis of international transportation (primarily sea and air) in the world economy. Detailed study of cargo documentation and freight rate patterns. Included are

liability patterns, logistics, economics, and national policies of transportation. Prereq., TRMG 4500/5500 or instructor consent.

**TRMG 4820-variable credit. Topics in Business.** Experimental course offered irregularly for the purpose of presenting new subject matter in transportation.

**TRMG 4900-variable credit. Independent Study.** With the prior consent of the Dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors. Departmental form required.

**TRMG 6500-3. Seminar: Issues in Transportation Policy and Management.** Public policy issues affecting the transport sector, including examination of regulation and public promotion of transportation in relation to efficient allocation of national resources, and interests of consumers, investors, and employees. Management issues include decision making in a deregulated environment, collective bargaining, facilities location, financial planning, and problems and opportunities of intermodal transportation services. Prereq., TRMG 5500.

**TRMG 6820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in transportation. Prereq. varies.

**TRMG 6900-variable credit. Independent Study.** With consent of instructor under whose direction the study is taken. Departmental form required.

## School of Education

### Teacher Education

Note: The following courses do not apply to elementary or secondary certification.

**EDUC 2010-2. Introduction to Education.** Provides a comprehensive portrayal of major issues in American education, focusing on public opinion, trends in assessing American education, students' rights, and the teaching profession today and in the future.

**EDUC 4410/5415-3. Theory and Practice of Experiential Education.** An introduction to the theoretical underpinnings in philosophy, psychology, and the natural and social sciences of the experiential and alternative education movements. Practical applications in schools and public and private agencies are observed and analyzed.

**EDUC 4570-3. Microcomputers in Education.** Introductory course to programming basic language and use of software.

**EDUC 4800 (1-4). Special Topics.** Designed to meet needs of students with topics of pertinent interest.

**EDUC 4820 (1-6). Workshop in Curricular and Instructional Development.** Consideration given to current trends in curriculum development and in organization for instruction. In-depth study of one or more specific plans for classroom procedure.

**EDUC 4830 (1-4). Instructional Workshop.** Current instructional approaches are considered. Focus is upon classroom applications with in-depth study of selected topics. Advanced-level work but credited toward graduate degrees only as a minor.

**EDUC 4840 (1-6). Independent Study.**

## Elementary Certification

**EDUC 3091-2. Social Foundations of Education.** A study of American education in its cultural setting and its nature, role, and function in society, including political, historical, philosophical, sociological, economic, religious, multicultural, and other foundation aspects. Organized to meet the needs of elementary certification students.

**EDUC 3101-2. Educational Psychology for Elementary School.** Psychological bases of teaching and learning with applications at the elementary school level. Concurrent lab experience in schools.

**EDUC 3111-2. Child Growth and Development.** Review of developing physical, mental, social, and emotional characteristics of elementary school children and implications for instructional intervention. Concurrent lab experience in schools if not taken in EDUC 3101.

**EDUC 4161-2/5165-3. Children's Literature.** Reading and evaluation of books, children's interests, authors and illustrators, folk literature, multicultural literature, modern fanciful tales, and trends.

**EDUC 4181-2/5185-3. Methods in Elementary Social Studies.** Familiarization with the social studies curriculum as it pertains to elementary public schools. Emphasizes organization (lesson plans and units), new trends, textbooks, new programs and materials, and concepts in teaching the social sciences.

**EDUC 4191-2. Methods in Elementary Reading.** Understanding and acquisition of basic methods in the teaching of reading at the elementary school level. Includes teaching basic reading programs, language experience, individualized reading, content reading, study skills, diagnosis, and remediation.

**EDUC 4201-2/5205-3. Methods in Elementary Mathematics.** Preparation in the teaching and content of mathematics at the elementary school level. Required of all students in the elementary program.

**EDUC 4211-2/5215-3. Methods in Elementary Science.** Covers the methods and materials available for teaching science in the elementary school.

**EDUC 4221-2/5225-3. Methods in Elementary Language Arts.** Current thought, as determined by research findings in the various areas of language arts: oral and written composition, spelling, handwriting, usage, grammar, listening comprehension, and bilingual education.

**EDUC 4501-1. University Aide.** Observation of and involvement with children. As term progresses, lessons may be taught to individuals and small groups. Very limited instruction involving the entire class.

**EDUC 4511-1. Student Teaching Seminar.** Meets before and during student teaching assignment. Includes topics of concern to teachers, such as classroom organization and management, lesson planning, and evaluation.

**EDUC 4521-1. Workshop: Media and Computer.** Development and use of media materials; computer instruction for classroom use.

**EDUC 4601-4. Instructional Assistant Laboratory—Elementary.** A variety of experiences and assignments in the public schools.

**EDUC 4691-6. Student Teaching—Elementary School 1.** Kindergarten and grades one through six.

**EDUC 4701-6. Student Teaching—Elementary School 2.** Kindergarten and grades one through six.

## Secondary Certification

**EDUC 4102-3. Foundations of American Education.** A study of American education in its cultural setting and its nature, role, and function in society, including political, historical, philosophical, sociological, economic, religious, multicultural, and other foundation aspects. Includes school-based tutorial experience. Organized to meet the needs of secondary students.

**EDUC 4112-3. Educational Psychology and Adolescent Development.** Analyzes the fundamental psychological concepts underlying classroom instruction, as well as adolescent growth and development.

**EDUC 4122-3. Principles and Methods of Secondary Education.** Emphasis on objectives, functions, modern philosophy, curriculum, discipline, planning, learning styles, and educational media. For junior and senior high school levels. Concurrent experience in schools required. Admission to Teacher Education required.

**EDUC 4232/5235-3. Teaching Reading in the Content Areas.** See EDUC 5235.

**EDUC 4322/5325-3. Literature for Adolescents.** Reading and evaluation of books for junior and senior high school pupils. Emphasis on modern literature.

**EDUC 4342/5345-3. Composition for Teachers.** Strategies for evaluating and teaching written composition in the secondary schools. Emphasis on structure of prose, invention, motivation, audience, and other rhetorical considerations, as well as on teaching methodologies.

**EDUC 4352/5355-3. Methods and Materials in Social Studies.** Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Secondary level.

**EDUC 4362/5365-3. Methods and Materials in English.** Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Secondary level.

**EDUC 4372/5375-3. Methods and Materials in Mathematics.** Curriculum, materials, methods, evaluation, and related subjects of instruction. Integration of content and methodology. Secondary level.

**EDUC 4382/5385-3. Methods and Materials in Science.** Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Secondary level.

**EDUC 4412-3. Teaching Reading and Writing in the Content Areas.** Presents diagnostic, remedial, and developmental techniques in reading and composition especially adapted to uses in subject matter areas. Primarily for students preparing to teach in the secondary schools.

**EDUC 4422-3. Developing Reading Skills in the Secondary School.** Format variations from content area to content area, materials, equipment, readability of content materials, vocabulary, variations in comprehension, and variations in study procedures.

**EDUC 4712 (4 or 8). Student Teaching—Secondary School 1.** Student teacher attends a junior or senior high school in the Boulder-Denver metropolitan area.

**EDUC 4722-6. Student Teaching—Secondary School 2.** Student teacher attends a junior or senior high school in the Boulder-Denver metropolitan area.

**EDUC 4732-8. Student Teaching K-12.** Required experience for art, music, and kinesiology students seeking certification.

**EDUC 4912 (1-4). Practicum in Teacher Education.** Designed for students taking the graduate equivalent of EDUC 4122. Requires 100 hours of observation and in-school experience.

## Elementary and Secondary Certification

**EDUC 3303-2. Oral Communication for Teachers.** Designed for prospective teachers. Deals with applications of oral communication methods in education. Fulfills the School of Education communication proficiency requirement.

**EDUC 4463 (2-3). Teaching Exceptional Children in the Regular Classroom.** Meets Colorado exceptional child certification requirement. Focus on knowledge about exceptional children, attitudes toward human variability, instructional methods, and strategies necessary for meeting the special needs of children in the public schools.

## Graduate Education

Note: The following courses are not program-specific and may be taken by master's and doctoral students with permission of instructor.

**EDUC 6804-3. Special Topics.** Designed to meet needs of graduate students with topics of pertinent interest.

**EDUC 6844 (1-4). Independent Study.**

**EDUC 6944-3. Candidate for Degree.**

**EDUC 6954-4. Master's Thesis.**

**EDUC 8804-3. Special Topics.** Designed to meet needs of graduate students with topics of pertinent interest.

**EDUC 8844 (1-4). Independent Study.**



**EDUC 8984 (1-10). Doctor of Education Dissertation.**

**EDUC 8994 (1-10). Doctor's Thesis.**

## **Curriculum, Foundations, and Instruction**

**EDUC 5005-3. Social Foundations of Education.** An evaluation of the social values and forces in American society that shape or influence the aims, philosophies, methods, content, issues, and problems of the American educational enterprise.

**EDUC 5015-3. International and Comparative Education.** A comparative study of education in other countries, with an emphasis on the role of education in developing nations. Political, social, and economic policies and ideologies are analyzed for their relevance to the development process.

**EDUC 5025-3. Images of the Future.** A study of the future: implications for global society, for U.S. society, and for education; dealing with several ways of imagining the future, with value dimensions, with schools and curricula of the future, and with future studies and global studies as school subjects.

**EDUC 5035-3. Proseminar in the Social Foundations of Education.** Special studies in the history and philosophy of education, comparative education, educational sociology, and the broad area of education and society.

**EDUC 5045-3. Research and Evaluation in Social and Multicultural Foundations.** Designed to meet the evaluation and research needs of practicing educators, with an emphasis on statistical and naturalistic observational techniques, and designing and constructing evaluation instruments. Specifically geared to the needs of those working in such nontraditional settings as the bilingual classroom, alternative school, or outdoor educational environment, in addition to the needs of the traditional classroom teacher.

**EDUC 5055-3. Philosophy of Education.** Traces the development of educational theory and practice from ancient times to the present day with an emphasis on contemporary philosophies and trends.

**EDUC 5105-3. Mirrors and Models.** Investigation of research on teaching and development of systems for analyzing the teaching-learning process.

**EDUC 5115-3. Modern Trends in Teaching.** Recent developments and trends in philosophy and techniques of teaching.

**EDUC 5125-3. Supervision of Student Teachers.** Designed to develop competency in the supervision of student teachers, including attention to various modern and new approaches. For cooperating teachers as well as supervisors.

**EDUC 5165-3/4161-2. Children's Literature.** Reading and evaluation of books, children's interests, authors and illustrators, folk literature, multicultural literature, modern fanciful tales, and trends.

**EDUC 5175 (2-3). Current Literature for Children.** Current books and media material in children's literature. For people who have

not had a course in this area within the past five years.

**EDUC 5185-3/4181-2. Advanced Social Studies in Elementary School.** Review and analysis of current innovations and materials for social studies instruction. Involves student examination and presentation of materials for classroom instruction.

**EDUC 5195-3. Elementary Mathematics Curriculum.** An in-depth study of curriculum building in mathematics at the elementary school level (K-8). Particular attention is given to the selection of instructional materials, establishment of content, and evaluation of programs.

**EDUC 5205-3/4201-2. Contemporary Mathematics for Elementary Schools.** Deals with contemporary mathematical content and teaching techniques. More emphasis is placed on mathematical background for the teacher and experimental projects.

**EDUC 5215-3/4211-2. Advanced Science in Elementary Schools.** Emphasis on experimental programs and implementation of these newer programs. Supervision and curriculum development considered.

**EDUC 5225-3/4221-2. Advanced Language Arts in Elementary School.** Current thought, as determined by research findings, in the various areas of the language arts: oral and written communication, spelling, handwriting, usage, grammar, foreign languages, and bilingual education.

**EDUC 5235/4232-3. Teaching Reading in Content Areas.** Format variations from content area to content area, materials, equipment, readability of content materials, vocabulary, variations in comprehension, and variations in study procedures.

**EDUC 5245-3. Processes Involved in Reading.** Concepts needed for understanding and critically evaluating the competencies involved in learning how to read. Examining and dealing with child and adolescent development and linguistic orientation.

**EDUC 5255-3. Foundations of Reading Instruction K-12.** Comparative analysis of current and emerging philosophies and programs in K-12 with focus on teaching reading and thinking skills.

**EDUC 5265-3. Processes in Writing.** Investigates processes writers from early ages to maturity use as they compose prose. Several process models are considered; current research is surveyed; research designs are proposed and evaluated.

**EDUC 5275-3. Diagnostic and Remedial Techniques of Reading.** Causes of low reading ability and techniques employed in teaching the poor reader; diagnosis, motivation, and skills.

**EDUC 5285-4. Reading Clinic Procedures K-12.** Supervised diagnosis of reading problems; evaluation instruments; pertinent research; case study approach.

**EDUC 5325/4322-3. Literature for Adolescents.** Reading and evaluation of books for junior and senior high school pupils. Emphasis on modern literature.

**EDUC 5345/4342-3. Composition for Teachers.** Strategies for evaluating and teaching

written composition in the secondary schools. Emphasis on structure of prose, invention, motivation, audience, and other rhetorical considerations, as well as on teaching methodologies.

**EDUC 5355/4352-3. Advanced Methods in Social Studies Education.** Designed to meet the needs of experienced teachers and those who will teach in public schools. Recent developments in theory and materials in the social studies are examined and current practices analyzed for their contribution to general goals of social studies education. Appropriate for teachers in grades 7-12, but also profitable for elementary teachers with a specialization in social studies.

**EDUC 5365-3. Advanced Methods in English Education.** Designed to give experienced teachers an opportunity to investigate specific methods and strategies for teaching English from the middle school through senior high school levels.

**EDUC 5375/4372-3. Advanced Methods in Secondary Mathematics.** In-depth investigation of specific methods and strategies suitable for teaching mathematics from the middle school through senior high school levels. Participants actively involved in the process of instruction by utilizing methods and strategies being considered.

**EDUC 5385/4382-3. Advanced Methods in Secondary Science.** Studies of methods, techniques, and strategies for teaching science from middle school through high school. Participation and demonstration required. Consideration of desired competencies expected. Evaluation of outcomes.

**EDUC 5395-3. Problem Solving in Logo.** Examines Logo's educational and programming principles; addresses teaching Logo to children, adolescents, and adults; includes turtle geometry, recursive functions, dynamic models, list processes, and interactive programming.

**EDUC 5405-3. Skill Development in Experiential Education.** A field-based course designed to upgrade the outdoor skills and the ability to use alternative living environments for the outdoor educator, the traditional classroom teacher, and the alternative educator. Colorado's mountains, rivers, and urban environment are utilized in the class.

**EDUC 5415/4410-3. Theory and Practice of Experiential Education.** An introduction to the theoretical underpinnings in philosophy, psychology, and the natural and social sciences of the experiential and alternative education movements. Practical applications in schools and public and private agencies are observed and analyzed.

**EDUC 5425-3. Bilingual and Multicultural Education.** Includes various components of bilingual education curricula methodology. Includes various bilingual education models for non-English speaking children as well as provision for the development of fluency in bilingualism among all children.

**EDUC 5435-3. Materials and Methods in Bilingual/Multicultural Education.** A survey of testing instruments used in Spanish-English bilingual/bicultural programs. In-depth investigation of specific methods

and materials used in bilingual/bicultural programs.

**EDUC 5445-3. Curriculum for Multicultural Education.** An analysis of curriculum programs and the application of principles and innovation for the education of ethnic-racial students at all levels of school.

**EDUC 5455-3. The Teaching of Reading in Bilingual and Multicultural Education.**

Comparative analysis of current and emerging philosophies, programs, materials, and instructional practices for the teaching of reading in the bilingual classroom.

**EDUC 5465-3. Survey of Exceptional Children.** Types of physically, mentally, and socially handicapped children; methods of diagnosis; suggested educational adjustments; and teaching techniques.

**EDUC 5475-3. Introduction to the Gifted Student.** Assists the teacher in identifying, understanding, and challenging children with unusual abilities.

**EDUC 5485-3. Teaching Exceptional Children in the Regular Classroom.** Develops knowledge about exceptional children and the ways they are served in the public schools; appropriate attitudes toward human variability and individual differences; and appropriate instructional methods and strategies necessary for meeting the special needs of children with visual, auditory, and physical impairments, mental retardation, learning disabilities, emotional disturbance, and giftedness. For graduate students and certified educators.

**EDUC 5495-3. Introduction to Educating Emotionally Disturbed Children.** Focuses on developing understandings about children and adolescents with emotional or behavioral disturbances and knowledge of educational approaches developed for these children. Surveys current research, theory, and school practices in the field of emotional disturbances; addresses major issues of identification and treatment. One 2-hour lab per week requiring observations in various school programs.

**EDUC 5505-3. Introduction to Learning Disabilities.** One 2-hour lab per week. Survey of current theory and practice in the area of learning disabilities. Emphasis is on developing a systems model for diagnosis, programming, and remediation. Observation and tutoring required.

**EDUC 5515-3. Methods for the Emotionally Disturbed Child.** Emphasizes developing skills for teaching emotionally or behaviorally disordered children, designing a classroom and curriculum, applying a variety of behavior management and crisis intervention strategies, and using affective materials for socio-emotional behavior change. One 2-hour lab per week requiring a practicum in a classroom for emotionally disturbed children.

**EDUC 5525-3. Research and Evaluation in Special Education.** One 2-hour lab per week. Students critique research and evaluation studies in special education.

**EDUC 5535-3. Diagnostic Testing in Special Education.** Preparation for the diagnostic-prescriptive facet of the special educator's

role. Includes tests and measurement concepts, demonstration and administration of tests, staffing and the IEP process, major issues, and critical review.

**EDUC 5545-3. Methods and Materials for the Learning Disabled.** Teaching strategies and materials in psychomotor, perception, memory, cognition, language, and academic areas for the learning disabled.

**EDUC 5555, 5565 (1-4). Practicum 1 and 2: The Educationally Handicapped.** Supervised field experiences with learning-disordered children (emotionally disturbed and/or learning disabled). Full-time for eight weeks, minimum 320 clock hours.

**EDUC 5575 (1-4). Workshop in Instruction and Curriculum in Content Areas.**

**EDUC 5585 (1-4). Workshop in Social, Multicultural, and Bilingual Foundations.**

**EDUC 6855 (1-4). Independent Study in Instruction and Curriculum in Content Areas—Master's.**

**EDUC 6915 (1-4). Practicum in Instruction and Curriculum in Content Areas.**

**EDUC 6925 (1-4). Readings in Instruction and Curriculum in Content Areas.**

**EDUC 7005-3. Proseminar: Research in Curriculum Foundations and Instruction.** An analysis of research in the foundations area.

**EDUC 7015-3. Teaching Internship in Teacher Education.** A one-semester teaching internship in an undergraduate or graduate foundations course.

**EDUC 7025-3. Curriculum Theories.** Intensive study of current theories of public school curriculum related to trends in actual practices in elementary and secondary schools.

**EDUC 7105-3. Seminar: Special Education.** Examination of issues in consultation, working with parents, interdisciplinary cooperation, program design, and management in relationship to practicum experiences with educationally handicapped children.

**EDUC 8855 (1-4). Independent Study in Instruction and Curriculum in Content Areas—Doctor's.**

**EDUC 8935 (1-6). Internship in Instruction and Curriculum in Content Area.**

## Research, Evaluation, and Methodology

**EDUC 5706-3. Development of Educational Measures.** The construction, interpretation, and evaluation of achievement tests, attitude measures, questionnaires, and sociometric measures. Item analysis, validity, reliability, and norming considerations. Interpretation and use of standardized intelligence and achievement tests.

**EDUC 5716-3. Basic Statistical Methods.** Introduction to descriptive statistics including graphic presentation of data, measures of central tendency and variability; correlation and prediction; and basic inferential statistics, including the t-test.

**EDUC 5726-3. Introduction to Disciplined Inquiry.** Consideration of various research approaches and methodologies including experimental and quasi-experimental methods; anthropological and case study methods; evaluative research and field studies; correlational and ex post facto research; and sociological, historical, and philosophical research. Topics include information retrieval and library research, the role of the computer, research criticism, and proposal writing.

**EDUC 5736 (1-4). Workshop in Research and Evaluation Methodology.**

**EDUC 6916 (1-4). Practicum in Research and Evaluation Methodology.**

**EDUC 6926 (1-4). Readings in Research and Evaluation Methodology.**

**EDUC 7316-3. Intermediate Statistical Methods.** Sampling theory and inferential statistics; advanced applications for the testing of hypotheses regarding central tendency, variability, proportion, correlation, and normality; Chi-square and the analysis of frequency data; multiple regression and prediction; introduction to the analysis of variance; and related computer programs for statistical analysis. Required of all doctoral candidates.

**EDUC 7326-3. Experimental Design and Analysis 1.** Experimental and quasi-experimental designs in educational research; selecting an appropriate statistical test; power and statistical efficiency; randomization and control; multiple comparisons; factorial experiments and interaction with fixed-factor and mixed designs; analysis of covariance; effects of assumption violations; related computer programs for statistical analysis.

**EDUC 7336-3. Methods of Survey Research and Assessments.** Theory and techniques involved in each stage of survey research, including problem formulation, questionnaire development, interview surveys, assessing reliability and validity, sampling plans, data reduction (e.g., factor analysis), and analysis of continuous and categorical data.

**EDUC 7346-3. Methods of Naturalistic Research.** Psychological and philosophical basis of naturalistic inquiry (i.e., ethnography, case study, field work) in educational research. Methods of observation, in-depth interviewing, documentary analysis, data analysis, confirmation, and narration. Reading of exemplary works and completion of field work project.

**EDUC 7356-3. Research Seminar for Doctoral Candidates.** The development of the thesis prospectus, including problem development, hypothesis formulation, literature review, research design, statistical analysis, related measurement, and computer considerations.

**EDUC 7366-3. Experimental Design and Analysis 2.** Intensive study of advanced experimental design and analysis. Topics to include general linear model; fixed, random, and mixed-effects analysis of variance (ANOVA) models; multiple comparisons techniques; ANOVA robustness; analysis of covariance; nested and hierarchical designs.

**EDUC 7376-3. Test Theory and Application.** Reliability and validity theory, empirical estimation of reliability and validity; standardization and norming, item analysis, problems in assessing intelligence, achievement, interest, and personality.

**EDUC 7386-3. Educational Evaluation.** Study of models and methods for the evaluation of educational programs. Evaluation models proposed by curriculum and instructional researchers are critically examined. Application of methods of measurement and experimentation to evaluation problems is studied. Exemplary evaluation projects are studied in detail.

**EDUC 7396-3. Time Series and Multivariate Analysis.** An introduction to the theory of advanced multivariate techniques and their application in educational research. Topics include the analysis of time-series experiments, MANOVA, discriminant function analysis, and multiple regression.

**EDUC 7406-3. Theory of Measurement and Scaling.** Concentrated study of special problems in the mathematical theory of behavioral measurement and scaling. Topics include generalizability theory, factor analysis applied to test development, unidimensional and multidimensional scaling.

**EDUC 7416-3. Seminar: Research Methodology.** Selected topics for advanced study in educational research, statistics, measurement, and evaluation.

**EDUC 8866 (1-4). Independent Study in Research and Evaluation Methodology—Doctor's.**

**EDUC 8936 (1-6). Internship in Research and Evaluation Methodology.**

## Educational Psychological Studies

**EDUC 6318-3. Psychological Foundations of Education.** A survey of results of psychological inquiry with emphasis on applications to educational practices. Major topics include motivation, behavior, learning, development, and individual differences.

**EDUC 6328-3. Advanced Child Growth and Educational Development.** Emphasis on developmental theories and educational implications thereof.

**EDUC 6338-3. Cognitive Processes in Education.** A review of the methods and results of the experimental investigation of memory and cognition with implications for instruction and other educational practices.

**EDUC 6348 (1-3). Instructional Psychology.** A systematic survey of current theory in instructional design psychology with emphasis on analysis of classroom behavior.

**EDUC 6358-3. Children's Thinking.** The experimental psychology of thinking with emphasis on differences between children and adults in modes of thought. Topics include memory, concept acquisition, strategies, problem solving, and originality.

**EDUC 6368-3. Adolescent Psychology for the Teacher.** A review of selected topics in adolescent behavior of special concern to educators and parents.

**EDUC 6378-3. The Student in Higher Education.** Consideration of research and theory pertaining to the college student as a learner and the effects of environmental differences on changing behavior of the student.

**EDUC 6388-3. Foundations of Personnel Services.** Introduction to the field of guidance and personnel services. Topics include objectives of guidance, counseling, and human services; theoretical bases of counseling, roles and functions of counselors, ethics, and professional issues.

**EDUC 6398-3. Laboratory in Personal Appraisal.** Taken in conjunction with EDUC 6388, this course provides the student with experience designed to stimulate self-appraisal vis-à-vis the field of guidance. Focused field experiences are employed in addition to group interaction and didactic instruction.

**EDUC 6408-3. Theory and Techniques of Counseling.** Theories of counseling and skills needed to facilitate interpersonal relationships. Interviewing techniques and other specific helping relationship skills. Twenty hours of microcounseling in a laboratory required in addition to classroom instruction.

**EDUC 6418-3. Advanced Theory and Techniques of Counseling.** The application of counseling techniques in group counseling. Emphasis on group dynamics and group process. Twenty hours of participation in an intensive group experience required in addition to classroom instruction.

**EDUC 6428-3. Professional Seminar: Counseling.** Provides in-depth attention to a limited number of special interest topics to be determined by the interests of the students and instructor.

**EDUC 6438-3. Counseling Strategies in Agency Settings.** Explores the role and function of the counselor in agency settings with emphasis on the underlying historical and theoretical concepts. Explores the use of DSM III.

**EDUC 6448 (1-3). Diagnosis and Treatment of Alcoholism.** Course work includes current issues in diagnosis of persons abusing alcohol and other drugs as well as consideration of treatment approaches.

**EDUC 6458-3. Marriage and Family Counseling.** Designed for students with counseling training and experience interested in acquiring a specialized body of knowledge and skills concerning marital and family therapy.

**EDUC 6468-3. Field Work in Guidance.** Primary emphasis is directed observational experience in various counseling and personnel service settings. The experiences help students familiarize themselves with the counseling techniques used in these settings. Ten hours in field setting in addition to class sessions.

**EDUC 6478-3. Field Work in Agency Counseling.** Directed observational experience in a variety of agency counseling settings, including rehabilitation agencies, employment services, and mental health clinics. Helps students familiarize themselves with

the techniques used in agencies. Ten hours in field setting in addition to class sessions.

**EDUC 6488-3. Field Work in College Student Personnel.** Orientation experiences in each of several student personnel services including financial aid, admissions, career development and placement, and veteran's advising. Ten hours in field setting in addition to class sessions.

**EDUC 6498-3. Problems in Instructional Computing 1.** Investigation into problems encountered in developing and integrating instructional computing in education. Hardware, software, and logistical problems included. Knowledge of BASIC is presumed.

**EDUC 6508-3. Problems in Instructional Computing 2.** Continuation of EDUC 6498. Some knowledge of the PASCAL language is presumed.

**EDUC 6518-3. Computers in Education.** Designed to provide educators, preservice and in-service, with literacy in modern educational computing technology. Content is focused on instructional and administrative computing applications with hands-on experiences stressed.

**EDUC 6528 (1-4). Workshop in Educational and Psychological Studies.**

**EDUC 6888 (1-4). Independent Study in Educational and Psychological Studies—Master's.**

**EDUC 6918 (1-4). Practicum in Educational and Psychological Studies.**

**EDUC 6928 (1-4). Readings in Educational and Psychological Studies.**

**EDUC 8318-3. Psycho-Educational Diagnostics 1.** Individual appraisal of human abilities; interpretation and application of individual intelligence data in the school setting.

**EDUC 8328-3. Psycho-Educational Diagnostics 2.** Personal appraisal of the individual with emphasis upon educational application of projective personality data.

**EDUC 8338-3. Seminar: School Psychology.** Selected topics in the field of school psychology including consideration of current practice and literature.

**EDUC 8348-3. Seminar: Human Development.** Intensive study of selected topics in growth and development, with applications to educational situations.

**EDUC 8358-3. Seminar: Human Learning.** A limited number of currently active topics in cognitive psychology are reviewed in-depth to reveal unresolved research problems. Each participant is responsible for presenting a research proposal and for being an informed critic of the presentations of others.

**EDUC 8368-3. Seminar: Instructional Psychology.** Intensive study of small sample research designs and analysis of selected topics in instructional psychology.

**EDUC 8378-3. Research Seminar: Educational Psychology.** Intensive review of special topics in the application of psychological science to educational practice.

**EDUC 8388-3. Organization Development in Schools.** Organization development in theory

and practice with special attention to organization development in schools. Requires organization development project for course completion.

**EDUC 8398-3. Career Development.** Provides students with competencies in career development and career counseling. Topics include theories of career development, information systems, decision making, and awareness of self and the world of work.

**EDUC 8408-3. Measurement and Appraisal.** Basic fundamentals of tests and measurement and their interpretation. Topics include standardization, correlation, reliability, validity, norms, scoring, standard error of measurement, restriction of range, and use of test data in counseling.

**EDUC 8418-4. Teaching Methods—Counselor Education.**

**EDUC 8428-3. Advanced Practicum in Counseling.** Supervised counseling experience, report writing, and case staffing procedures with emphasis on professional staff collaboration.

**EDUC 8438-3. Seminar: Counseling.** Specific topics depend on needs and interests of students in any particular class.

**EDUC 8448-3. Seminar: Advanced Counseling Theory.** Comparative evaluation of differing theoretical systems and constructs relevant to counseling application.

**EDUC 8458-3. Seminar: Counseling Research.** In-depth study and analysis of published research in counseling.

**EDUC 8468-3. Seminar: Group Counseling.** The implications of small group and psychotherapy theory and research are considered in regards to group counseling.

**EDUC 8478-3. Seminar: Leadership Skills and Human Behavior.** An advanced course for doctoral students preparing for teaching, consulting, and leadership roles in counseling and the facilitation of behavior change.

**EDUC 8488-3. Seminar: Human Behavior.** Explores the cognitive, affective, and psychomotor aspects of human behavior. Emphasizes both causation and the consequences of various modes of human behavior.

**EDUC 8498-6. Practicum in Secondary Guidance.** Provides in-depth practical experience in counseling in secondary schools.

**EDUC 8508-6. Practicum in Agency Counseling.** In-depth, supervised practical experience in counseling in agency settings.

**EDUC 8518-6. Practicum in College Student Personnel.** Supervised practice in college student personnel work.

**EDUC 8528-4. Computer-Assisted Instruction.** Development of techniques used to provide instruction via computer. Microcomputer instructional applications, computer management of instruction, computer authoring systems for the design of computer-assisted instruction, and the interface between computers and other technologies are emphasized.

**EDUC 8538-3. Advanced Computer-Assisted Instruction.** Focus is on the design of interactive video, interactive slide-tape, micro and mainframe authoring systems, and

advanced CAI design techniques. Applications in both educational and training settings are emphasized.

**EDUC 8548-3. Instructional Systems Design**

**1.** Systematic design of instruction in traditional settings using a variety of models. Instructional needs assessment, instructional objectives, appropriate tests and assessment procedures, selection of appropriate media, design of systematic instruction, and instructional product evaluation.

**EDUC 8558-3. Seminar: Educational Technology.** Designed as an intensive, advanced-level course in the study of the many facets of educational technology. Permits students opportunities for individual, in-depth study in areas of individual interest.

**EDUC 8888 (1-4). Independent Study in Educational and Psychological Studies—Doctor's.**

**EDUC 8938 (1-6). Internship in Educational and Psychological Studies.**

Note: These are additional courses for students in Social, Multicultural, and Bilingual Foundations. Permission of instructor is required.

**EDUC 6899 (1-4). Independent Study in Social, Multicultural, and Bilingual Foundations—Master's.**

**EDUC 6919 (1-4). Practicum in Social, Multicultural, and Bilingual Foundations.**

**EDUC 6929 (1-4). Readings in Social, Multicultural, and Bilingual Foundations.**

**EDUC 8899 (1-4). Independent Study in Social, Multicultural, and Bilingual Foundations—Doctor's.**

**EDUC 8939 (1-6). Internship in Social, Multicultural, and Bilingual Foundations.**

## College of Engineering and Applied Science

### AEROSPACE ENGINEERING SCIENCES

#### Mechanics and Orbital Mechanics

**ASEN 2010-3. Mechanics 1.** Elements of vector algebra, abstract statics of a system of bound vectors, equilibrium of rigid bodies, dynamics of a particle. Prereqs., APPM 1360 and PHYS 1110.

**ASEN 2020-3. Mechanics 2.** Kinematics of rigid bodies, principle of virtual work, kinetics of a system of particles. Prereqs., APPM 2350 and PHYS 1110.

**ASEN 3010-3. Aerospace Dynamics.** Applications of the principles of Newtonian and Lagrangian dynamics to basic aerospace vehicle motions. Prereqs., ASEN 2020 and APPM 2360.

**ASEN 4010-3. Introduction to Space Dynamics.** Topics include central force fields and satellite orbits, orbital transfer

problems, and rigid body dynamics of space vehicles. Prereq., ASEN 3010.

**ASEN 5050-3. Space Flight Dynamics.**

Includes celestial mechanics, space navigation, orbit determination; trajectory design and mission analysis trajectory requirements; orbital transfer and rendezvous. Prereq., ASEN 4010 or consent of instructor.

**ASEN 5070-3, 5080-3. Introduction to Statistical Orbit Determination 1 and 2.** Includes an introduction and description of modern methods of orbit determination currently used in NASA and DoD satellite missions. The theory of batch and sequential (Kalman) filtering is developed and examples are given. An introduction to statistical filtering theory is preceded by a review of the necessary concepts of probability and statistics. Course work includes a term project which allows the student to apply classroom theory to an actual satellite orbit determination problem.

**ASEN 5100-3. Atmospheric Entry.** Covers the atmospheric effects on satellites, atmospheric entry from orbit using several classical theories, the entry corridor, orbit contraction due to atmospheric drag, and flight path control during and after entry. Prereq., ASEN 4010, ASEN 5050, or consent of instructor.

**ASEN 6060-3. Advanced Space Flight Dynamics.** Continuation of ASEN 5050. Topics include perturbations of orbital motion due to asphericity of gravitational field, third bodies, solar radiation pressures, and atmospheric drag; classical orbit determination from angles-only observation; modern orbit determination using range and range-rate data; orbit transfer using impulses or continuous thrust; and others to be chosen. Prereq., ASEN 5050 or consent of instructor.

**ASEN 6080-3. Optimal Trajectories in Space Flight.** Includes general theory of optimal rocket trajectories, optimal trajectories in a uniform field and in an inverse square force field, and optimal transfer between Keplerian orbits. Prereq., consent of instructor.

**ASEN 6950 through 6969-variable credit. Master's Thesis.**

**ASEN 8990 through 8999 (16 to 24 maximum). Doctor's Thesis.**

#### Fluid Dynamics

**ASEN 3011-3. Fluid Dynamics 1.** Elementary theoretical approach to the problems of fluid mechanics. Includes statics theorem, stream function, velocity potential, and the Laplace equation. Prereq., APPM 2360 and PHYS 1110.

**ASEN 3021-3. Fluid Dynamics 2.** Includes dynamics of compressible flow; expansion and shock waves; design of airfoils and wings at subsonic, transonic, and supersonic speeds; dynamics of viscous fluids; laminar and turbulent boundary layers. Prereq., ASEN 3011.

**ASEN 5011-3. Ideal Fluids.** Applicability of ideal flow theory, equations of motion,

potential flow, circulation and vorticity, axially symmetric flow, review of complex variables and potential theory, conformed mappings, airfoil theory, stratified fluids, and gravity wave mechanics. Prereq., ASEN 3021.

**ASEN 5021-3. Viscous Flow.** Low Reynolds number flows, incompressible and compressible laminar boundary layer theory; similarity theory; separation, transition, and turbulent boundary layers. Prereq., ASEN 5051 or equivalent, or consent of instructor.

**ASEN 5031-3. Compressible Fluids.** Dynamics of nonviscous, compressible, subsonic, and supersonic fluid flow; theory of characteristics, shock waves; slender body and wing theory. Prereq., ASEN 4013.

**ASEN 5041-3. Introduction to Turbulence.** Physical properties of turbulence, shear flows, heat transfer, homogeneous turbulence, diffusion and turbulence in compressible and electrically conducting fluids. Prereqs., ASEN 5051 or equivalent and consent of instructor.

**ASEN 5051-3. Macroscopic Physics of Fluids.** Physical properties of gases and liquids; kinematics of flow fields; equations describing viscous, heat-conducting Newtonian fluids. Exact solutions and rational approximations for low and high speed dissipative flows, surface and internal waves, acoustics, stability, and potential flows. Prereq., consent of instructor.

**ASEN 5061-3. Microscopic Physics of Fluids.** Physics of particles, physics of uniform fluids, kinetic description of fluids; transport phenomena, radiation transport. Prereq., ASEN 4013 or consent of instructor.

**ASEN 5071-3. Introduction to Magneto-hydrodynamics.** Electromagnetism, equations of motion, magnetostatics, wave motion, exact solutions, instability, dynamo theories, and solutions of linearized equations. Prereq., graduate standing or consent of instructor.

**ASEN 5081-3. Plasma Dynamics and Plasma Physics.** Plasma kinetic theory, including charged particle and neutral collisions, ionization, electronic excitation and recombination; motion of charged particles, macroscopic equations; transport coefficients, gas discharge, instabilities, shock waves; low conductivity flow, sheaths and oscillations, electromagnetic waves and radiation, manmade applications and natural phenomena. Prereq., graduate standing or consent of instructor.

**ASEN 6031-3. Advanced Compressible Flow.** Advanced topics in dynamics and thermodynamics of compressible fluid flow. Prereq., ASEN 5031.

**ASEN 6101-3. Mathematical Theory of Hydrodynamic Stability.** Mathematical and physical study of laminar flow instability. Topics include derivation of general disturbance equation, study of linear disturbance equations for curved and parallel viscous and inviscid flows, and nonlinear theory. Prereq., ASEN 5021 or consent of instructor.

## Materials and Structures

**ASEN 2022-3. Materials Science and Engineering.** Applications of the principles of physics, chemistry, and thermodynamics to the understanding of the relationships between atomic structures engineering processes, and engineering properties of materials and to the selection and design of engineering materials. Prereq., CHEM 1111.

**ASEN 3012-3. Structures 1.** Basic methods of stress and deformation analysis of simple elements of flight structures. Prereqs., ASEN 2010 and APPM 2360.

**ASEN 3022-3. Structures 2.** Stress and deformation analysis of flight structures. Prereq., ASEN 3012.

## Thermodynamics and Propulsion

**ASEN 2013-4. Thermodynamics and Heat Transfer.** Introduction to energy and its transformation from a macroscopic approach. Topics include first and second laws of thermodynamics, entropy, cycles, psychrometrics, heat transfer, and applications. Prereqs., APPM 2350 and PHYS 1110; coreq., APPM 2360.

**ASEN 4013-3. Foundations of Propulsion.** The aerothermodynamics and design of air-breathing engines including ram jets, turbo jets, turbo fans and turbo prop engines. Prereqs., ASEN 2013 and ASEN 3021.

**ASEN 4023-3. Nuclear Energy Systems.** Foundations of nuclear energy systems; review of reactor theory; design and operation of nuclear electric power plants; systems for nuclear auxiliary power; analysis of nuclear energy systems for various applications. Prereq., senior standing.

**ASEN 5013-3. Advanced Propulsion.** Chemical combustion calculations for multicomponent gases and application to air-breathing and rocket propulsion systems; performance criteria and scaling laws; introduction to chemical reaction rates; combustion instability and nozzle heat transfer; ion propulsion and MHD generators. Prereq., ASEN 4013 or consent of instructor.

## Systems, Control

**ASEN 3014-3. Systems Analysis 1.** Representation of mechanical and electrical lumped parameter elements and systems, steady-state sinusoidal analysis, and integral transform theory. Prereqs., APPM 2360 and ASEN 2020; coreq., ECEN 3030.

**ASEN 3024-3. Systems Analysis 2.** Mathematical theory of control with application to the design of mechanical, electrical, and hydraulic systems; modeling; feedback design; specifications; stability tests; root locus methods; and frequency response. Prereq., ASEN 3014.

**ASEN 5014-3. Linear Control Design—Systems Analysis 3.** Continuation of ASEN 3024. The design of linear systems, using frequency methods, other methods of design, and introduction to sampled data systems. Prereq., ASEN 3024.

**ASEN 5024-3. Optimal Control Design—Systems Analysis 4.** Continuation of ASEN 5014. Introduction to nonlinear systems; generalized Lagrangian mechanics; Liapunov methods, calculus of variations; Pontryagin methods, and general optimal control; Hamilton-Jacobi optimization, Kalman equation. Prereq., ASEN 5014.

## Design Courses

**ASEN 3015-3. Flight Mechanics.** Airfoil design, performance of propeller-driven and jet-driven aircraft, static stability and control, design trade-offs of stability and control, and maneuvering flight. Prereq., ASEN 3011; coreq., ASEN 3021.

**ASEN 4015-3. Aerospace Laboratory 1.** One lab and one rec. per week. Fundamental measurements in experimental study of aeronautics and astronautics. Prereq., senior standing.

**ASEN 4025-3. Aerospace Laboratory 2.** One lab and one rec. per week. Fundamental measurements in experimental study of aeronautics and astronautics, including technical report writing. Prereq., ASEN 4015.

**ASEN 4035-3. Aircraft Design.** One rec. and two labs per week. Principles of aircraft layout to meet a given specification, taking account of both aerodynamic and structural considerations. Design of major elements of an aircraft. Prereq., ASEN 3015.

**ASEN 4045/5045-3. Spacecraft Design.** A systems approach to the design of an unmanned spacecraft, including guest lectures from specialists in each of the disciplines which make up a spacecraft design team. Topics include mission design, payload, launch systems, tracking and data systems, communications, structures, guidance, and control. Prereq., consent of instructor.

**ASEN 4055/5055 (3-6). Space Habitation.** An advanced design course conducted by the Department in conjunction with the NASA-University Advanced Space Mission Design program. Centered on the design of a geosynchronous space station. The NASA-Ames Research Center sponsors the University of Colorado. Prereq., consent of instructor.

**ASEN 5065-3. Experimental Space Science.** Design of instruments for remote sensing in a space environment, including optical and mechanical design, modern detector technology, and test and calibration. Examination of past and future NASA missions—spacecraft, subsystems, and experiment payloads.

## Specialized Topics

**ASEN 1016-3. Introduction to Science of Flight.** Science of flight, its history and fundamental engineering concepts. Basic understanding of lift and drag, airfoils, and aerodynamic shapes. Elements of aircraft design performance, stability, and control. For freshmen in Engineering.

**ASEN 1026-2. Introduction to Space Science.** An introduction to space science including Earth, the moon, and the solar system. Topics include orbits and trajectories,

launch systems, and satellites, as well as the engineering aspects of mankind's exploration of space. For freshmen in Engineering.

**ASEN 1036-1. Freshman Aerospace Laboratory.** Designed to accompany ASEN 1016. Introduction to aerodynamic, fluid mechanic, and aircraft design research efforts. Review of current research topics in aerospace engineering. Introduction to basic instrumentation and measurement methodologies, and to technical writing. For freshmen in Engineering. Coreq., ASEN 1016.

**ASEN 1916 through 1996 (1-3). Special Topics.** Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the lower-division level. Course content is indicated in the *Schedule of Courses*. Prereq. varies.

**ASEN 2916 through 2996 (1-3). Special Topics.** Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the lower-division level. Course content is indicated in the *Schedule of Courses*. Prereq. varies.

**ASEN 3016-3. Introduction to Acoustics and Noise.** Considers the engineering and physiological foundations of acoustics, individual and social response to sound, environmental noise problems, and engineering and legal control of noise. Prereq., junior standing or consent of instructor.

**ASEN 3916 through 3996 (1-3). Special Topics.** Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the upper-division level. Course content is indicated in the *Schedule of Courses*. Prereq. varies.

**ASEN 4846 (1-3). Undergraduate Research.** Assignment of a research problem on an individual basis.

**ASEN 4856 (1-3). Undergraduate Research.** Assignment of a research problem on an individual basis.

**ASEN 4866, 4876 (1-6). Independent Study.**

**ASEN 4916 through 4996 (1-3). Special Topics.** Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the upper-division level. Course content is indicated in the *Schedule of Courses*. Prereq. varies.

**ASEN 5016-3. Stochastic Processes.** Generalized harmonic analysis of scalar and vector variables, mapping and measurement of random fields, random flights and Markov chains, Brownian motion, noise and statistical communication, queues, and turbulence. Prereqs., graduate standing and consent of instructor.

**ASEN 5866, 5876 (1-6). Independent Study.** Study of special projects.

**ASEN 5886-1. Seminar.** Required of all aerospace engineering sciences graduate students. Provides reports on research activities and special current topics. Prereq., graduate standing.

**ASEN 5896-1. Seminar.** Required of all aerospace engineering sciences graduate students. Provides reports on research activities and special current topics. Prereq., graduate standing.

**ASEN 5906-0. Low-Gravity Seminar.** A wide variety of topics are covered in lectures, including fluid mechanics, heat and mass transfer, combustion, materials processing, and space facility design and utilization. Among the speakers are University professors, industry engineers, NASA employees, and former astronauts and payload specialists.

**ASEN 5916 through 5996 (0-3). Selected Topics in Aerospace Engineering Sciences.** Treatment of specialized aspects of the aerospace engineering sciences by staff or visiting lecturers. Course content is indicated in the *Schedule of Courses*. Prereq. varies.

**ASEN 6866, 6876 (1-3). Independent Study.** Study of special projects agreed upon by student and instructor.

**ASEN 6916 through 6996, ASEN 7916 through 7996 (1-3). Selected Topics in Aerospace Engineering Sciences.** Treatment of specialized aspects of the aerospace engineering sciences by staff or visiting lecturers. Course content is indicated in the *Schedule of Courses*. Prereq. varies.

## Geophysics and Environmental

**ASEN 4017/5017-3. Oceanography.** Fundamentals of biological, physical, and dynamic oceanography. Influence of the sea on worldwide weather and ecology. Prereq., ASEN 3021.

**ASEN 5117-3. Air Pollution.** Discusses the effect of air pollution on materials, plants, animals, humans, and ecological changes, as well as the sources of air pollution. Also explores the chemistry, diffusion, and dispersal of pollutants. Prereq., graduate standing or consent of instructor.

**ASEN 5127-3. Noise Pollution and Abatement.** Advanced course in the basic physics and physiology of sound. Study of determinants of sound leading to noise. Identification of noise sources and characterization of the detrimental physiological effects of such noise. Promotion of principles governing noise control and the application of such controls. Prereq., ASEN 3016 or consent of instructor.

**ASEN 5207-3. The Sun.** Physical processes of the sun, including the interior, photosphere, chromosphere, and corona. Topics covered include properties of the electromagnetic spectrum (X-ray, UV, visible and radio wavelength), magnetic fields, velocity fields, and flare phenomena and interpretation. Prereq., graduate standing or consent of instructor.

**ASEN 5217-3. Introduction to Magnetospheres.** Introduction to solar and stellar winds, and planetary and stellar magnetospheres. Guiding center theory for particle motion, magnetospheric topology, convection, radiation belts, magnetic storms and substorms, and auroras. Prereq., graduate standing or consent of instructor.

## Bioengineering

**ASEN 3018-3. Bioengineering 1.** Human response to environment and physical stimuli. Use of engineering and physical principles in the study of human dynamics. Prereqs., MCDB 1050, PHYS 2130, ASEN 2013, or consent of instructor.

**ASEN 4038/5038-3. Brains, Minds, and Computers.** An introductory, integrative survey of brain science, artificial intelligence, and their interrelations. Central concepts and principles from each of these areas and the similarities and differences of brains, minds, computers, robots, etc., are considered. Prereq., consent of instructor.

**ASEN 5018-3. Bioengineering 2—Neurophysiology.** Review of the organization and cell morphology of nervous tissue; electrical and physiological properties of cell membranes; intracellular recordings from single nerve cells; transmission at synapses; muscle contraction; receptor mechanisms; the human nervous system; central and autonomic systems. Prereq., senior or graduate standing, or consent of instructor.

**ASEN 5028-3. Neural Control Systems.** Survey course dealing with behavioral, neurophysiological, and biochemical controls manifested by the central nervous system. Biological background material prerequisite to application of formal control theory. Prereq., senior or graduate standing, or consent of instructor.

**ASEN 5048-3. Neural Modeling.** An integrated introductory survey of physical theories of bioelectric processes, and of models of the electrical operations of nervous systems. The physical basis of neurological signals and information processing in neurons and neural networks are discussed. Prereq., ASEN 5018 or ASEN 5028 or equivalent, or consent of instructor.

**ASEN 5058-3. Mammalian Neuroanatomy.** (PSYC 7082.) Covers the structure of the mammalian CNS with respect to functional organization and emphasis of synaptology. Includes description of neuroanatomical and neurohistological techniques and an introduction to CNS ultrastructure with demonstration of electron micrographs. Prereq., consent of instructor.

**ASEN 5068-3. Membrane Transport: Biological and Artificial.** The dynamics of membranes in regulating the chemical environment of biological systems, energy use associated with biological membranes, transport characteristics of organic and inorganic substances, theoretical and physical membrane models, and integration of membrane transport with other biological functions. Prereq., ASEN 3018 or consent of instructor.

## Computing and Modeling

**ASEN 4019-3. Computational Fluid Mechanics.** Numerical solution of fluid mechanics problems involving ordinary and partial differential equations of various types. Prereqs., CSCI 1700 and ASEN 3021.

**ASEN 5019-3. Computational Fluid Mechanics.** Similar to ASEN 4019 but involves term



project. Numerical solution of fluid mechanics problems involving ordinary and partial differential equations of various types. Prereqs., ASEN 3021 and CSCI 1700, or consent of instructor.

**ASEN 5029-3. Advanced Computational Fluid Mechanics.** Continuation of ASEN 4019/5019. Advanced computational methods are introduced for solving fluid mechanics problems on the computer, with emphasis on nonlinear flow phenomena. Prereqs., ASEN 4019 or ASEN 5019, or consent of instructor.

## APPLIED MATHEMATICS

**APPM 1350-4. Calculus 1 for Engineers.** Selected topics in analytical geometry and calculus. Rates of change of functions, limits, derivatives of algebraic and transcendental functions, applications of derivatives, and integration. Prereqs., two years of high school algebra, one year of geometry, one-half year of trigonometry, and satisfactory performance on the Math Placement Examination, or C or better in MATH 1100.

**APPM 1360-4. Calculus 2 for Engineers.** Continuation of APPM 1350. Applications of the definite integral, methods of integration, improper integrals, Taylor's theorem, infinite series, and vector algebra. Prereq., APPM 1350 or MATH 1300.

**APPM 1370-4. Honors Calculus 1 for Engineers.** Differential and integral calculus. Theory of limits, continuity, derivatives, and integral. Analysis of standard functions through hyperbolic and gamma functions, techniques in integration. Application to physics and geometry. Prereqs., two years of high school algebra, one year of geometry, one-half year of trigonometry, one year of calculus.

**APPM 1380-4. Honors Calculus 2 for Engineers.** Continuation of APPM 1370. Topics include differential equations, plane and solid analytic geometry, Newtonian dynamics, and Taylor's series. Prereq., APPM 1370.

**APPM 2350-4. Calculus 3 for Engineers.** Continuation of APPM 1360. Completion of required work in the differential and integral calculus. Covers solid analytic geometry, polar coordinates, vector functions and derivatives, partial differentiation, multiple integrals, vectors, parametric equations, and vector analysis. Prereq., APPM 1360 or MATH 2300.

**APPM 2360-3. Introduction to Linear Algebra and Differential Equations.** Introduction to ordinary differential equations, systems of linear equations, matrices, determinants, vector spaces, linear transformations, and systems of linear differential equations. (No credit to students having previous credit in both MATH 3130 and MATH 4430.) Prereq., APPM 2350.

**APPM 2370-4. Honors Calculus 3 and Differential Equations.** Includes multivariable calculus, vector analysis, theorems of Gauss, Green, and Stokes, and an introduction to Fourier series. Prereq., APPM 1380.

## ARCHITECTURAL ENGINEERING

### Building Systems Engineering

**AREN 2010-3. Introduction to Solar Utilization.** Lect. Includes coverage of heat transfer fundamentals, solar radiation, and characterization of flat plate collectors, heat exchangers, and storage systems. This material is applied to the long-term performance analysis of space and water heating systems.

**AREN 2020-3. Energy Fundamentals.** Lect. Basic principles of heat transfer and thermodynamics are presented. Emphasis directed toward building energy applications.

**AREN 3010-3. Mechanical Systems for Buildings.** Lect. Psychrometrics, thermal comfort, building heating and cooling loads, HVAC components and systems, fire protection. Prereqs., PHYS 3020 or PHYS 1110 and AREN 2020, or equivalent.

**AREN 3020-3. Energy Conservation Analysis.** Lect. Thermal network methods applied to design sizing, energy loads, and comfort conditions in buildings. Numerical methods for analyzing dynamic thermal behavior of buildings and use of microcomputer/main-frame network simulation with emphasis on energy conserving and passive solar buildings. Prereq., AREN 2020.

**AREN 3030-2. Energy Laboratory.** One lect., one 3-hour lab per week. Lab course including measurements of solar collector performance, solar radiation, flow and in situ solar system performance measurements. Prereq., AREN 3010.

**AREN 3540-3. Illumination 1.** Lect. A study of the fundamentals of illumination and the application of these principles to the illumination of buildings. (For AREN students only except by consent of instructor.)

**AREN 3630-3. Introduction to Acoustics and Noise.** (ASEN 3016.) Lect. Topics include the engineering and physiological foundations of acoustics, individual and social response to sound, environmental noise problems, and engineering and legal control of noise. Prereq., junior standing or consent of instructor.

**AREN 4010-3. Solar Design.** Lect. A design-oriented course devoted to solar heating of buildings. Subject coverage includes solar radiation prediction, methods of solar collection and thermal conversion, solar system analysis, economic analysis of solar systems, and solar design optimization.

**AREN 4050-3. Environmental Systems for Architecture 1.** Introduction to the operation and design of building systems for climate control, water and drainage, fire safety, electrical supply, illumination, transportation (elevators and escalators), and noise control. For students in the College of Environmental Design.

**AREN 4060-3. Environmental Systems for Architecture 2.** Introduction to the operation and design of building systems for climate control, water and drainage, fire safety, electrical supply, illumination, transportation

(elevators and escalators), and noise control. For students in the College of Environmental Design.

**AREN 4550-3. Illumination 2.** Lect. Application of principles of AREN 3540. Develop and apply methods for special problems in interior and exterior illumination. A study of photometry including laboratory experiments. Prereq., AREN 3540.

**AREN 4560-3. Luminous Radiative Transfer.** Lect. Numerical methods in lighting design and analysis; luminous flux interchange and transfer. Prereq., AREN 4550.

**AREN 4570-3. Building Electrical Systems Design 1.** Lect. Design of the secondary electrical distribution systems for buildings. Application of the N.E.C. Prereq., ECEN 2150 or 3030. (For AREN students only except by consent of instructor.)

**AREN 4590-3. Computer Applications in Lighting.** Lect. Solution of lighting problems by computerized techniques; lighting research and projects. Prereq., AREN 4550.

## Structures

**AREN 4035-3. Structures 1.** Lect. Analysis of basic structural systems. Principles of mechanics and mechanical properties of materials, analysis and design of trusses, arches, and cable structures. This course is for nonengineering students and will not apply toward an engineering degree. Prereq., senior standing or consent of instructor.

**AREN 4045-3. Structures 2.** Lect. Analysis of basic structural systems. Principles of mechanics as applied to the design of flexural members, columns, continuous beams, and rigid frames. This course is for nonengineering students and will not apply toward an engineering degree. Prereq., AREN 4035.

**AREN 4315-2. Design of Masonry Structures.** Lect. Design of reinforced and unreinforced masonry walls, beams, and columns, static and dynamic loading resistance, connections, and joints. Prereq., CVEN 3505.

## Construction

**AREN 1306-3. Introduction to Architectural Engineering.** Lect. A survey of the broad subject of civil and architectural engineering and professional practice emphasizing a study of construction methods including foundations, structural systems, building materials, and systems applications in building construction.

**AREN 2406-3. Introduction to Building Construction.** Lect. A survey of the broad subject of civil and architectural engineering and professional practice emphasizing a study of construction methods including foundations, structural systems, building materials, and systems applications in building construction. Note: no credit for students who have taken CVEN 1306 or AREN 1306. May not be taken by upper-division students.

**AREN 4416-3. Construction Costs, Estimating, and Prices.** Lect. Introduction to building construction costs accounting and controls, analysis of direct and indirect cost

fundamentals and collecting systems, methods engineering and value engineering. Also included is a study of the types of estimates, quantity take-off techniques and pricing applications, and the preparation of a detailed estimate for a building project including all cost analyses, a complete quantity survey, development of unit prices, and the final assembly of the bid proposal. Prereq., senior standing or consent of instructor.

**AREN 4466-3. Construction Planning and Scheduling.** Lect. A comprehensive study of construction management including the contractor's role in preconstruction activities; the construction contract; bonds and insurance; purchasing and subcontracts; contractor's central office and job organization; plant, tools, and equipment; methods engineering; value engineering; labor relations and hiring; and the particular application of CPM/PERT techniques to the planning, scheduling, and control of a construction project. Prereq., senior standing or consent of instructor.

### Miscellaneous

**AREN 1027-2. Descriptive Geometry.** Lab. Orthographic projection: point, line, and plane problems; angle problems, intersections; computer graphics using Autocad on PCs. Prereq., GEEN 1017 or equivalent.

### Special Topics

**AREN 4849 through 4909 (1-6). Independent Study.** The following Civil Engineering courses are applicable to the Architectural Engineering Program.

**CVEN 5010-3. HVAC System Controls.** Lect. Treats the theoretical and practical design of control systems for heating, ventilating, and air conditioning of both residential and commercial buildings. In addition, computer energy management system design is discussed. Prereq., AREN 3010 or equivalent.

**CVEN 5020-3. Building Energy Measurements and Audits.** Lect. Analysis and measurement of performance of HVAC systems, envelopes, lighting and hot water systems, and modifications to reduce energy use. Emphasis on existing buildings. Prereq., AREN 3020 or equivalent.

**CVEN 5050-3. Advanced Solar Design.** Lect. Performance prediction and economic analysis of high temperature and other innovative solar systems; performance prediction methods for medium and high temperature solar processes; treatment of various solar cooling technologies, solar total energy systems, solar thermal electric systems, and industrial process heat systems. Prereq., AREN 2010 or equivalent.

**CVEN 5060-3. Advanced Passive Solar Design.** Lect. Design-oriented treatment of passive solar systems is emphasized. The generic types of systems and their performance and cost are treated. In addition, passive system construction and daylighting is covered. Prereq., CVEN 5050.

**CVEN 5070-3. Thermal Analysis of Buildings.** Lect. Response factors, conduction

transfer functions, and weighting factors for dynamic analysis of building envelopes. Radiative and convective exchange in buildings, internal gains, and infiltration analysis as modeled in hourly simulations. Prereq., CVEN 5020.

**CVEN 5080-3. Computer Simulation of Building Energy Systems.** Lect. Introduction to use of major simulation programs for analysis of building energy loads and system performance. One or more programs used to develop capability for analysis of multi-zone structures. Prereq., CVEN 5070.

## CHEMICAL ENGINEERING

**CHEN 1300-2. Introduction to Chemical Engineering.** Lect. Develops principles for using concepts of chemistry and physics to conceive feasible processes for chemical change. Introduction to the chemical engineering profession. Prereq., high school chemistry or equivalent.

**CHEN 1840 through 1900 (1-6). Independent Study.** Available to freshmen with approval of Chemical Engineering Department. Subject arranged to fit needs of the particular student.

**CHEN 2010-3. Probability and Statistics for Chemical Engineers.** The use of probability model and statistical methods for analyzing data is common in chemical engineering. This course provides a comprehensive introduction to those models and methods most likely to be encountered by chemical engineers. Prereq., GEEN 1300 or equivalent.

**CHEN 2100-4. Physical and Chemical Properties of Matter.** Three lect. and two rec. per week. Emphasis is on the principles of chemistry as they relate to engineering materials and systems. (Not for CHEN majors.) Prereq., high school chemistry.

**CHEN 2120-3. Chemical Engineering Material and Energy Balances.** Lect. Introduction to the quantitative aspects of chemical engineering. Concepts of material and energy balances with and without chemical reactions. Prereq., CHEM 1071 or 1111, or equivalent; coreq., CHEN 2010 or equivalent.

**CHEN 2840 through 2900 (1-6). Independent Study.** Available to sophomores with approval of Chemical Engineering Department. Subject arranged to fit needs of the particular students.

**CHEN 3200-3. Chemical Engineering Principles 1.** Lect. Introduction to fluid mechanics and momentum transfer, with an emphasis on the application of these principles to chemical engineering systems. Prereqs., APPM 2350 and CHEN 2120.

**CHEN 3210-3. Chemical Engineering Principles 2.** Lect. Continuation of the study of chemical engineering principles. Study of the theory and application of the principles of heat transfer in chemical engineering systems. Prereq., CHEN 3200.

**CHEN 3220-4. Chemical Engineering Principles 3.** Three lect. and two rec. or calculation sessions per week. Study of the mechanisms of mass transfer including molecular diffusion, eddy diffusion, and convective mass transfer. Application of the theory of

mass transfer to the design of chemical equipment. Prereqs., CHEN 3200 and 3210.

**CHEN 3700-3. Bioenergetics: Structure and Function.** Rec. An introduction to molecular biophysics dealing principally with questions related to energy conversion as related to the structure and function of biological macromolecules. The course concludes by considering a variety of biological systems that interface between the physical and engineering sciences. Prereqs., MCDB 1060 and CHEM 3331.

**CHEN 3840 through 3900 (1-6). Independent Study.** Available to juniors with approval of Chemical Engineering Department. Subjects arranged to fit needs of particular students.

**CHEN 4030-4. Chemical Engineering Laboratory.** One lect.-rec. and two 4-hour labs per week. Experimental work and reports in unit operations. Planning and analysis of chemical engineering experiments. Heavy emphasis on preparation of formal technical reports. Prereqs., CHEN 3210 and 3220.

**CHEN 4320-3. Chemical Engineering Thermodynamics.** Lect. Thermodynamic principles of chemical and physical equilibrium, and application to chemical process problems. Prereq., CHEM 4510.

**CHEN 4330-3. Chemical Engineering Reaction Kinetics.** Lect. Introduction to chemical kinetics and chemical reactor design. Prereqs., CHEN 2010, 3210, and 4320.

**CHEN 4440-3. Chemical Engineering Materials.** Lect. An introduction to materials engineering, including properties of polymers, metals, ceramics, and semiconductors, especially as related to chemical engineering processes. Emphasis is placed on chemical stability and corrosion resistance. Prereqs., CHEN 4320 and CHEM 3311/3321.

**CHEN 4520-4. Chemical Process Synthesis.** Two lect., two rec. or calculation sessions per week. Solution of selected comprehensive problems dealing with development, equipment, process design, process control systems, materials, product allocations, and chemical process optimization. Prereqs., CHEN 3210, 3220, and 4330.

**CHEN 4570-3. Instrumentation and Process Control.** Lect. Principles of operation and applications of industrial instruments. Process control system synthesis, design, and implementation. Prereq., ECEN 3030.

**CHEN 4580-3. Process Modeling and Computer Simulation.** Lect. Development of mathematical models of chemical processes for steady-state and dynamic behavior. Computer simulation of these models to study predicted process behavior. Use of packaged computer simulation software. Prereqs., CHEN 3210 and 3220.

**CHEN 4660/5660-3. Cryogenic Engineering.** Lect. Investigation of modern cryogenic systems and processes involving mechanical, thermodynamic, heat, and mass transfer considerations. Provides insight into refrigeration, liquefaction, separation, and purification processes. Covers equipment, instrumentation and storage systems. Emphasizes safety aspects in cryogenic processing. A special term report is required of students taking

this course as CHEN 5660. Prereq., undergraduate thermodynamics and heat transfer.

**CHEN 4710/5710-3. Molecular Basis of Behavior.** Lect. A problems approach to neurobiology. A variety of model behavior systems are discussed, unicellular and multicellular, in an attempt to trace the molecular steps that occurred during the evolution of simple behavioral systems to more complex ones. CHEN 5710 students are expected to participate in an independent research project. Prereqs., CHEN 3700, and CHEM 3331 and 4551.

**CHEN 4800/5800-3. Recent Advances in Biotechnology.** Lect. Reviews the recent developments in the fields of microbiology, molecular genetics, and genetic engineering which are of commercial value and benefit to mankind. Also covers the engineering implementation of such biological processes. Prereq., senior or graduate standing in engineering or science, or consent of the instructor.

**CHEN 4810/5810-2. Biotechnology Laboratory.** One two-hour lab, one one-hour rec. per week. A "hands on" laboratory course on biotechnology which includes sterile technique, cell culture growth, fermentation, genetic transformation, and bioproduct separations. Coreq., CHEN 4800/5800.

**CHEN 4830 through 4839 (1-4). Special Topics in Chemical Engineering.** Senior-selected topic courses offered upon demand. Prereq., senior standing or consent of instructor.

**CHEN 4840 through 4900 (1-6). Independent Study.** Available to seniors with approval of Chemical Engineering Department. Subjects arranged to fit needs of particular students.

**CHEN 5010-3. Environmental Modeling.** Mathematical modeling of the natural and manmade environment as an aid in making national decisions which are politically enforceable, socially accepted, economically feasible, and technically possible. Prereqs., CHEN 2010 or equivalent, and consent of instructor.

**CHEN 5090-0. Seminar in Chemical Engineering.** Required of all chemical engineering graduate students. Reports on research activities and on special current topics.

**CHEN 5210-3. Transport Phenomena.** Fundamental relationships for transfer of heat, mass, and momentum, and their application to engineering problems. Prereq., senior or graduate standing.

**CHEN 5220-3. Mass Transport.** Diffusive and convective mass transfer in binary and multicomponent systems; scaling conservation equations for multicomponent systems; dimensional analysis in mass transfer; macroscopic species balance; mass transfer with chemical reaction; mass transport in porous media. Prereq., CHEN 5210 or consent of instructor.

**CHEN 5280-3. Statistical Thermodynamics.** (MCEN 5142.) Introduction to the molecular interpretation and calculation of thermodynamic properties of matter. Topics include thermodynamic probability, distribution functions, Schrodinger wave equation and

solutions, and ensemble theory. Applications to ideal and real gases, solids, liquids, radiation, conduction electrons, and chemical equilibrium. Prereq., MCEN 3022 or equivalent.

**CHEN 5360-3. Catalysis and Kinetics.** Study of the principles of chemical kinetics and catalytic reactions, with emphasis on heterogeneous catalysis. Coreq., CHEN 4330, or prereqs., CHEM 4551 and consent of instructor, or graduate standing in CHEN or CHEM.

**CHEN 5370-3. Intermediate Chemical Engineering Thermodynamics.** Review of the fundamentals of thermodynamics. Application to pure fluids and mixtures. Physical equilibrium and changes of state. The equation of state and computation of fluid properties for pure fluids, mixtures, and solutions. Relations between thermodynamics and statistical mechanics. Prereq., undergraduate thermodynamics (CHEN 4320 or equivalent).

**CHEN 5380-3. Macroscopic Thermodynamics.** (MCEN 5122.) Axiomatic presentation of fundamentals of classical thermodynamics. Energy, heat, work, and the first law; equilibrium, reversible and irreversible processes, entropy production, and the second law. Applications to stability, phase equilibrium, electric and magnetic work. Irreversible thermodynamics and the Onsager reciprocal relations. Prereq., MCEN 3022 or equivalent.

**CHEN 5390-3. Reaction Engineering.** Advanced study of ideal and nonideal chemical reactors including discussion of unsteady-state behavior, mixing effects, reactor stability, residence time distribution, and modeling of nonideal reactors. Additional topics covered include fluidized beds, diffusion in porous catalysts and chemical kinetics. Prereqs., undergraduate reaction kinetics and consent of instructor.

**CHEN 5420-3. Physical Chemistry and Fluid Mechanics of Interfaces.** The principal topics covered are the thermodynamics of interfaces, surface tension measurement; adsorption at liquid-gas, liquid-liquid, and solid-gas interfaces; monolayers; conservation equations for a fluid interface; rheology of interfaces; surface tension driven flows; contact angle and wettability; double layer phenomena. Prereq., CHEN 3200 or equivalent.

**CHEN 5570-3. Digital Computer Process Control.** The design and implementation of control systems based on digital computers. Conventional controller algorithms, discrete domain analysis, and high-performance control techniques. Topics in multivariable and adaptive control. Prereq., CHEN 4570 or ECEN 4138.

**CHEN 5580-3. Optimization and Control of Chemical Processes.** Optimization and control of chemical processes using differential calculus, calculus of variations, and Pontryagin's minimum principle. Minicomputer and real-time programming covered for on-line implementation of optimal control policies. Prereq., senior or graduate standing.

**CHEN 5660/4660-3. Cryogenic Engineering.** Investigation of modern cryogenic systems

and processes involving mechanical, thermodynamic, heat and mass transfer considerations. Provides insight into refrigeration, liquefaction, separation and purification processes. Covers equipment, instrumentation and storage systems. Emphasizes safety aspects in cryogenic processing. A special term report is required of students taking this course as CHEN 5660. Prereq., undergraduate thermodynamics and heat transfer.

**CHEN 5690-3. Industrial Water and Solid Waste Pollution Control.** The chemical and physical nature of water pollutants and solid wastes from industrial processes. Methods of reducing pollutant generation and treatment for pollutant disposal. Prereqs., senior standing in CHEN and consent of instructor.

**CHEN 5700-3. Biomedical Engineering.** Mathematical analysis of biomedical systems via material, energy, and momentum balances. Systems to be studied include neural transmission, renal function, circulation, and special senses. Prereq., consent of instructor.

**CHEN 5710/4710-3. Molecular Basis of Behavior.** A problems approach to neurobiology. A variety of model behavior systems are discussed, unicellular and multicellular, in an attempt to trace the molecular steps that occurred during the evolution of simple behavioral systems to more complex ones. CHEN 5710 students are expected to participate in an independent research project. Prereqs., CHEN 3700, and CHEM 3331 and 4551.

**CHEN 5740-3. Analytical Methods in Chemical Engineering.** Applied analytical mathematical methods are presented in the context of chemical engineering research problems. Topics include vector analysis, linear algebra, modeling techniques, and ordinary and partial differential equations. Prereq., graduate standing or consent of instructor.

**CHEN 5750-3. Numerical Methods in Chemical Engineering.** Applied numerical methods commonly used to solve chemical engineering problems are studied and applied via digital computer programming assignments. Topics include numerical solution of ordinary and partial differential equations, design of experiments, and treatment of data. Prereq., graduate standing or consent of instructor.

**CHEN 5760-3. Engineering Aspects of Animal Locomotion.** A survey course dealing with animal locomotion. In general, all animals swim, fly, or run. Each of these modes presents a unique physical situation to the biological system in terms of physiology, analytical mechanics, and fluid mechanics. Prereq., CHEN 3700 or consent of instructor.

**CHEN 5800/4800-3. Recent Advances in Biotechnology.** Reviews the recent developments in the fields of microbiology, molecular genetics, and genetic engineering which are of commercial value and benefit to mankind. Also covers the engineering implementation of such biological processes. Prereq., senior or graduate standing in engineering or science, or consent of the instructor.

**CHEN 5810/4810-2. Biotechnology Laboratory.** One two-hour lab; one one-hour rec.

per week. A "hands on" laboratory course on biotechnology which includes sterile technique, cell culture growth, fermentation, genetic transformation, and bioproduct separations. Coreq., CHEN 5800/4800.

**CHEN 5820-3. Biochemical Engineering Fundamentals.** Covers design and operation of fermentation processes, microbial and enzyme kinetics, multiple substrate and multiple species of fermentation, regulation of enzyme activity, energetics of cellular growth, immobilized enzyme and cell reactors, transport phenomena in microbial systems and downstream processing. Prereq., graduate standing in CHEN, CHEM, or MCDB, or consent of the instructor.

**CHEN 5840 through 5900 (1-6). Independent Study.** Available to M.S. students.

**CHEN 5910 through 5919 (0-3). Selected Topics.** Credit and subject matter to be arranged.

**CHEN 6270-3. Heat Transfer 1.** (MCEN 5162.) Review of equations governing transport of heat by conduction and radiation. Analytical and numerical solution of boundary value problems representative of heat conduction in solids. Radiation properties of solids, liquids, and gases and transport of heat by radiation. Prereq., MCEN 3042 or equivalent.

**CHEN 6280-3. Heat Transfer 2.** (MCEN 5172.) Review of equations governing transport of heat in fluids in motion. Description of heat transfer in free and forced convection including laminar and turbulent flow. Dimensional analysis and heat transfer correlations, numerical methods, combined heat transfer mechanisms. Prereq., MCEN 5121 or consent of instructor.

**CHEN 6390-3. Advanced Reaction Kinetics.** Fundamental laws pertaining to chemical reaction rates and their applications to industrial operations. Prereq., CHEN 5390 or equivalent.

**CHEN 6400-3. Advanced Fluid Dynamics.** Considers conservation equations and similarity, Navier-Stokes equations and solutions for small and large Reynolds numbers, boundary layer flow and transition phenomena, and phenomenological theories of turbulent flow. Prereq., CHEN 5210 or equivalent.

**CHEN 6570-3. Optimal Control of Chemical Processes.** Study of stability and optimal control as applied to chemical processes. Topics discussed include Liapunov stability, application to the maximum principle and variational calculus to the control of linear and nonlinear chemical systems. Prereq., CHEN 5580 or equivalent.

**CHEN 6910 through 6919 (0-3). Selected Topics.** Credit and subject matter to be arranged.

**CHEN 6940. Master's candidate.**

**CHEN 6950-variable credit. Master's Thesis.**

**CHEN 7840 through 7900 (1-6). Independent Study.** Available to Ph.D. students.

**CHEN 8990 (1-10). Doctor's Thesis.**

## CIVIL, ENVIRONMENTAL, AND ARCHITECTURAL ENGINEERING

All courses are taught at the Boulder Campus unless otherwise noted.

### Building Energy

**CVEN 5010-3. HVAC System Controls.** Lect. Treats the theoretical and practical design of control systems for heating, ventilating, and air conditioning of both residential and commercial buildings. In addition, computer energy management system design is discussed. Prereq., AREN 3020 or equivalent.

**CVEN 5020-3. Building Energy Measurements and Audits.** Lect. Analysis and measurement of performance of HVAC systems, envelopes, lighting and hot water systems, and modifications to reduce energy use. Emphasis on existing buildings. Prereq., AREN 3020 or equivalent.

**CVEN 5050-3. Advanced Solar Design.** Lect. Performance prediction and economic analysis of high temperature and other innovative solar systems; performance prediction methods for medium and high temperature solar processes; treatment of various solar cooling technologies, solar total energy systems, solar thermal electric systems, and industrial process heat systems. Prereq., AREN 2010 or equivalent.

**CVEN 5060-3. Advanced Passive Solar Design.** Lect. Design-oriented treatment of passive solar systems is emphasized. The generic types of systems and their performance and cost are treated. In addition, passive system construction and daylighting are covered. Prereq., CVEN 5050 or equivalent.

**CVEN 5070-3. Thermal Analysis of Buildings.** Lect. Response factors, conduction transfer functions, and weighting factors for dynamic analysis of building envelopes. Radiative and convective exchange in buildings, internal gains, and infiltration analysis as modeled in hourly simulations. Prereq., CVEN 5020.

**CVEN 5080-3. Computer Simulation of Building Energy Systems.** Lect. Introduction to use of major simulation programs for analysis of building energy loads and system performance. One or more programs are used to develop capability for analysis of multizone structure. Prereq., CVEN 5070.

**CVEN 5090-3. Building System Seminar.**

**CVEN 5830 through 5839 (0-3). Selected Topics.** Credit and subject matter to be arranged.

**CVEN 6940 through 6949-3. Master's Candidate.**

**CVEN 6950 through 6959-variable credit. Master's Thesis.**

**CVEN 8990 through 8999. Doctor's Thesis.** A maximum of 16 to 24 hours may be taken.

### Mechanics

**CVEN 2121-3. Analytical Mechanics 1.** Lect. A vector treatment of force systems and

their resultants; equilibrium of frames and machines, including internal forces and three-dimensional configurations; static friction; properties of surfaces, including first and second moments; hydrostatics; minimum potential energy and stability. Prereq., PHYS 1110; prereq. or coreq., APPM 2350.

**CVEN 3101-3. Applied Mechanics.** Lect. A limited study of particle and rigid body mechanics. Subject coverage introduces vector concepts of force, moment, and equilibrium, then concentrates on kinematics and kinetics of particles in motion, including oscillatory and orbital, and finally discusses rigid body motion with emphasis on energy and momentum methods. Prereqs., PHYS 1110 and APPM 2360. Not for CVEN or AREN majors.

**CVEN 3111-3. Analytical Mechanics 2.** Lect. A vector treatment of dynamics of particles and rigid bodies including rectilinear translation, central-force, free and forced vibration, and general motion of particles; kinematics of rigid bodies; the inertia tensor; Euler's equations of motion; energy and momentum methods for particles, systems of particles, and rigid bodies. Prereqs., CVEN 2121 and APPM 2360.

**CVEN 3121-3. Mechanics of Materials.** Lect. Mechanical properties of materials; stresses and strains in members subjected to tension, compression, and shear; flexural and shearing stresses in beams; deflections of beams; column analysis; stress transformation and principal stresses, impact, fatigue under fluctuating loadings. Prereq., CVEN 2121; prereq. or coreq., APPM 2360.

**CVEN 3141-2. Engineering Materials Laboratory.** One lect.-rec. and one 3-hour lab per week. Lecture sessions devoted to development and explanation of the necessary background and operations required to conduct the experiments in the lab. Lab sessions devoted to hands-on performance of a sequence of experiments which determine properties of materials of importance to engineers, verify principles from the mechanics of materials, or incorporate the requirements of ASTM Standards. Prereq., CVEN 3121.

**CVEN 4511/5511-3. Introduction to Finite Element Analysis.** Lect. Systematic formulation of finite element approximation and isoparametric interpolation (weighted residual and energy methods, triangular and quadrilateral elements). Computation applications to the solution of one- and two-dimensional stress-deformation problems, steady and transient heat conduction as well as viscous flow. Prereq., graduate standing or consent of instructor.

**CVEN 5111-3. Introduction to Structural Dynamics.** Lect. Introduction to the dynamic response of structural systems, both linear and nonlinear. Prereq., consent of instructor.

**CVEN 5121-3. Mechanics of Materials 2.** Lect. Second-level course in the mechanics of deformable bodies. Stress and strain transformation, stress-strain relations, with emphasis on elastic and inelastic behavior of members, and theories of failure. Discussion of basic methods of structural mechanics, with applications to unsymmetric and curved

beams, thick-walled pressure vessels, torsion of members of noncircular sections, and other selected problems in stress analysis. Prereqs., CVEN 3121 and differential equations.

**CVEN 7111-3. Dynamics of Structures.** Lect. General vibrations of civil engineering structures and their response to various types of time-dependent loads. Prereq., CVEN 5111.

**CVEN 7131-3. Theory of Elasticity.** Lect. Mathematical theory of elasticity and its applications to engineering problems. Discussion of the basic analytical and numerical methods of solution. Prereq., MATH 4430 or equivalent course in differential equations.

**CVEN 7141-3. Plates and Shells.** Lect. Mathematical theories of plate and shell structures and their applications. Numerical finite element solutions of plates and shells of various shapes under static and dynamic loadings. Prereq., CVEN 5121 or 7131.

**CVEN 7161-3. Buckling in Structures.** Lect. Buckling of columns, beams, frames, plates, and shells in the elastic and plastic range. Other topics are postbuckling strength of plates, beam-columns, analysis by exact and approximate methods with special emphasis on practical implications and applications of solutions. Prereq., CVEN 3121.

**CVEN 7511-3. Computational Mechanics of Solids and Structures.** Lect. Finite element methodology for geometric and material nonlinearities. Incremental formulations and iterative solution strategies for truly finite increments. Quasistatic and dynamic applications to large deformation and inelastic problems. Prereq., CVEN 5511 or 6525.

## Surveying and Transportation

**CVEN 2012-3. Plane Surveying.** Two lect., one 3-hour lab per week. Observation, analysis, and presentation of basic linear, angular, area, and volume field measurements common to civil engineering endeavors. Prereq., APPM 1350 or equivalent.

**CVEN 2022-3. Engineering Measurements.** Two lect., one 3-hour lab per week. Principles of measurements; methodology, instrumentation, and analysis of data. Prereq., CVEN 2012.

**CVEN 3032-3. Photogrammetry and Control Surveys.** Two lect., one 3-hour lab per week. Characteristics of aerial photographs; measuring and interpreting from aerial photos for planimetric, topographic, hydrological, soil, and land use surveys; analysis and presentation of field measurements over extensive reaches. Prereq., CVEN 2022.

**CVEN 3602-3. Transportation Engineering.** Lect. Introduction to the technology, operating characteristics, and relative merits of highway, airway, waterway, railroad, pipeline, and conveyor transportation systems. Focuses on the evaluation of urban transportation systems and recent transportation innovations. Prereq., consent of instructor.

**CVEN 4602-3. Highway Engineering.**<sup>1</sup> Lect. Evaluation of alternate highway routes. Discussion of highway drainage, finance, maintenance, pavement design, traffic operations, and principles of economic analysis. Impact

of the highway on the environment. Prereqs., CVEN 3602 and CVEN 3708.

**CVEN 4612-3. Municipal Traffic Engineering.**<sup>1</sup> Lect. Analysis of traffic engineering problems commonly found in urbanized areas and design of alternative solutions. Prereq., CVEN 3602 or consent of instructor.

**CVEN 5602-3. Advanced Highway Design.**<sup>1</sup> Lect. Design and location of various classes of rural and urban highways. Development of theory as a rational basis of design for highway alignment, cross-section, intersections, and interchanges is stressed. Prereq., CVEN 3602.

**CVEN 5612-3. Quantitative Techniques in Urban Transportation Engineering.**<sup>1</sup> Lect. Probability—events, sets, independence, distributions. Measures of dispersion—means, standard deviation, variance, confidence intervals. Statistical decision making—statistical hypothesis, level of significance, second type of error, tests of statistical hypotheses. Simple and multiple regression—scatter diagrams, least squares estimates, simple and multiple regression forecasting models. Queueing theory—arrivals and service distributions, queue lengths, and waiting times for single and multiple channel facilities. Prereq., CVEN 3602 or consent of instructor.

**CVEN 5622-3. Urban Transportation Planning.**<sup>1</sup> Lect. Definition of the urban transportation problem, sociology of urban regions, history of urban growth, models of urban growth, population forecasts, land use surveys and planning, trip generation, characteristics, distribution and assignment, modal split, system evaluation, and CBD transportation planning. Prereq., CVEN 5612.

**CVEN 5632-3. Airport Planning and Design.**<sup>1</sup> Lect. Includes the national airport system plan, air travel demand, geometric design of airport facilities, design of airport pavement and drainage structures, airport capacity, coordination with other modes, and airport environmental impact. Prereq., consent of instructor.

**CVEN 5642-3. Urban Traffic—Characteristics.**<sup>1</sup> Lect. Includes human and vehicular characteristics, speed and volume studies, origin and destination studies, traffic flow theory, stream characteristics, intersection characteristics, signalized intersections, accident characteristics, parking characteristics, highway lighting, and miscellaneous topics. Prereq., CVEN 3602 or consent of instructor.

**CVEN 5652-3. Urban Traffic—Operations.**<sup>1</sup> Lect. Topics are traffic control devices, traffic signal timing and equipment, signal systems, computer application to traffic control, urban operations, freeway operations, and traffic applications of linear programming, as well as Markov chains, transportation problems, dynamic programming, surveillance, and control. Prereq., CVEN 5642.

**CVEN 5662-3. Transportation System Safety.**<sup>1</sup> Lect. Safety aspects of highway, railroad, and airway transportation systems are discussed. Accident analysis, accident prevention, and economic consequences of accidents are also included. Prereq., CVEN 3602.

**CVEN 5682-3. Pavement Design.**<sup>1</sup> Lect. Design of flexible and rigid pavements for

highways and airports; stress analysis in flexible and rigid pavements; design of joints and reinforcing steel for rigid pavements; principles of subgrade stabilization. Prereq., CVEN 3602.

**CVEN 5692-3. Urban Traffic—Workshop.**<sup>1</sup> Lect. and lab. Selected laboratory problems related to urban traffic. Prereq., CVEN 5642 or equivalent.

## Fluid Mechanics and Water Resources

**CVEN 3313-3. Theoretical Fluid Mechanics.** Lect. Basic principles of fluid mechanics. Covers fluid properties, hydrostatics, fluid flow concepts, including continuity, energy, momentum, boundary-layer theory, and flow in closed conduits. Prereq., CVEN 2121.

**CVEN 3323-3. Applied Fluid Mechanics.** Two lect., one 3-hour lab per week. Application of principles of fluid mechanics and dimensional analysis to problems in open channel flow, pipe systems, hydraulic machinery, fluid flow measurement, and hydraulic models. Includes laboratory demonstrations and experiments. Prereq., CVEN 3313.

**CVEN 4333/5333-3. Applied Hydrology.** Lect. Engineering applications of principles of hydrology. Hydrologic cycle, rainfall and runoff, groundwater, storm frequency and duration studies, stream hydrography, flood frequency, and flood routing. Prereq., consent of instructor.

**CVEN 4343/5343-3. Open Channel Hydraulics.** Lect. Study of flow in open channels both natural and constructed. Topics include application of energy equation and momentum relationships, tractive force on erodible boundaries, water surface profiles theory and calculations, and design of transitions. Prereq., CVEN 3313. Graduate standing required for CVEN 5343.

**CVEN 5353-3. Groundwater Hydrology.** Studies the occurrence, movement, extraction for use, and quantity and quality aspects of groundwater. This introductory course will emphasize basic concepts and use of these concepts to solve engineering and geohydrologic problems.

**CVEN 5363-3. Modeling of Hydrologic Systems.** Introduces students to the techniques used in modeling various processes in the hydrologic cycle. Students develop numeric models and computer programs to be used in conjunction with existing simulation models such as HEC1 and HEC2 in a design project.

**CVEN 5373-3. Water Law, Policy, and Institutions.** Lect. Contemporary issues in water management based on legal doctrine. Legal issues in water resources problems are identified and discussed in close relationship with technical, economic, and political considerations. Prereq., senior or graduate standing.

**CVEN 5393-3. Seminar in Water Resources Development and Management.** (ECON 8555.) Lect. A multidisciplinary exploration

<sup>1</sup> Usually offered at Denver Campus only.

of the principles governing water resources planning and development. Emphasis is on the sciences of water—physical, engineering, chemical, biological, and social—and their interrelationships. Prereq., senior or graduate standing.

**CVEN 7353-3. Hydraulic Design.** Lect. Design of dams, spillways, stilling pools, transitions, and penstocks; flood prediction and control, detention reservoirs, and river control structures. Prereq., CVEN 5343.

## Environmental

**CVEN 3414-3. Introduction to Environmental Engineering.** Lect. An introduction to environmental protection legislation and various water, air, and hazardous waste problems. Basic geochemical, ecological, mass conservation, and environmental chemistry concepts are stressed in relation to solving environmental engineering problems. Prereqs., CHEM 1111 and APPM 2350.

**CVEN 3424-3. Water and Wastewater Treatment.** Lect. Introduction to the design and operation of facilities for treatment of municipal water supplies and wastewater. Engineering application of physical, chemical, and biological unit processes and operations for removal of impurities and pollutants. Integrated design of whole treatment systems combining process elements. Prereq., CVEN 3414.

**CVEN 3454-2. Engineering Laboratory—Water Quality.** One lect. and one 3-hour lab per week. Discussion of techniques for making and evaluating measurements of water quality and pollution parameters. Measurements of these parameters on local streams, drinking water, and municipal wastes. Prereq. or coreq., CVEN 3414, or consent of instructor.

**CVEN 4404-3. Environmental Engineering Application of Chemistry.** Lect. A quantitative treatment of the factors that determine the composition of natural water, wastewater, and drinking water, including mechanisms for transport, transformation, and attenuation of pollutants in various environments. Prereqs., CVEN 3414 and 3454.

**CVEN 4424/5444-3. Environmental Engineering Design.** Two lect. and one 3-hour lab per week. Design of wastewater and stormwater collection systems, pumping stations, and water distribution systems. Design of water and wastewater treatment plants. Prereqs., CVEN 3313 and 3424.

**CVEN 4444/5404-3. Environmental Engineering Chemistry.** Lect. A comprehensive analysis of the chemistry of natural and polluted waters and the application to environmental engineering problems. Topics include energetic principles, chemical equilibrium, coordination chemistry, adsorption phenomena, solid phase interactions, redox phenomena, natural water models, metal pollution, dynamics in aquatic ecosystems, and biogeochemical and nutrient cycling. Computer simulations are used to illustrate more complex chemical systems. Prereqs., CVEN 3414 and 3424, or instructor's consent.

**CVEN 4464-3. Wastewater Treatment Systems for Small Communities.** Lect. Design

and evaluation of wastewater treatment systems ranging from individual home systems to those for small communities. Prereq., CVEN 3424.

**CVEN 4474-3. Hazardous and Industrial Waste Management.** Lect. Evaluation of processes used for treatment of wastes requiring special handling and disposal: toxic organic chemicals, heavy metals, acidic, caustic, and radioactive waste material. Techniques for destruction, immobilization, and resource recovery; assessment of environmental impact of treatment process end products. Prereq., CVEN 4444 or equivalent.

**CVEN 5374-1. Graduate Environmental Research Seminar.** Lect. A seminar in environmental engineering research methods with emphasis on conducting studies and preparing presentations and publications. Prereq., graduate status in environmental engineering.

**CVEN 5414-4. Pilot Plant Laboratory.** Two lect. and two 3-hour labs per week. Advanced lab techniques for environmental engineering. Course work includes test operation of pilot-scale models of treatment processes applied to water and wastewater, extrapolation of experimental results to prototype design, sampling techniques, use of analytical instruments employed in water and wastewater characterization. Prereq., graduate standing or consent of instructor.

**CVEN 5424-3. Advanced Water Treatment.** Lect. Advanced studies on theory of treatment; design and operation of domestic and industrial water supplies. Prereq., graduate standing or consent of instructor.

**CVEN 5434-3. Advanced Wastewater Treatment.** Lect. Advanced analysis of wastewater treatment systems; design and operation of treatment process reactors; factors affecting performance of facilities used for physical separation, and chemical and biological conversion of wastewater compounds, including nitrogen and phosphorus. Prereq., graduate standing or consent of instructor.

**CVEN 5454-3. Simulation Methods in Environmental Engineering.** Lect. An introduction to the use of digital simulation in the analysis of water resources and environmental systems. Computer programs for the simulation of reservoir operations, watershed runoff, stream quality and lake quality are developed and existing software is utilized for the analysis of more complex problems. Prereqs., consent of instructor and computer background.

**CVEN 5464-3. Wastewater Treatment Systems for Small Communities.** Lect. Design and evaluation of wastewater treatment systems ranging from individual home systems to those for small communities. Prereq., graduate standing.

**CVEN 5474-3. Hazardous and Industrial Waste Management.** Lect. Evaluation of processes used for treatment of wastes requiring special handling and disposal: toxic organic chemicals, heavy metals, acidic, caustic, and radioactive waste material. Techniques for destruction, immobilization, and resource recovery; assessment of

environmental impact of treatment process end products. Prereq., graduate standing.

**CVEN 5484-3. Processing and Disposal of Wastewater Concentrates.** Lect. Principles and methods of stabilization dewatering and disposal of sludges generated from the removal of pollutants from water and wastewater treatment. Prereq., graduate standing or consent of instructor.

**CVEN 5494-3. Fate and Effects of Pollutants in the Environment.** Lect. A water quality management course in which the relationships among air, water, and land pollution, water quality, and beneficial uses are examined. The major objectives are to develop the ability to recognize the consequences and impacts of pollutants in the aquatic environment and to learn how to correct or minimize the unfavorable water quality conditions. Prereq., consent of instructor.

## Structures

**CVEN 3505-3. Structural Analysis.** Three lect. and one optional 2-hour computational lab per week. Principles of structural analysis applied to statically determinate and indeterminate structures. Emphasis is on the conventional virtual work, flexibility, and stiffness methods of analysis with introduction to matrix structural analysis. Prereq., CVEN 3121.

**CVEN 3515-3. Structural Design 1.** Three lect. and one optional 2-hour computational lab per week. Introduction to structural design: design philosophies and approaches, structural materials, loadings. Behavior of structural members and connections, and elementary applications to the design of members and systems. Prereq., CVEN 3505.

**CVEN 4525/5525-3. Matrix Structural Analysis.** Lect. Matrix formulation of the principles of structural analysis. Development of direct stiffness and flexibility methods for the analysis of frame and truss structures. Topics include support settlements, thermal loads, and energy formulations of force-displacement relationships. Prereq., CVEN 3505.

**CVEN 4545-3. Steel Design.** Two lect. and one 2-hour computation lab per week. Application of basic principles to the design of steel structures; design of tension members, columns, beams, beam-columns, and connections; continuous beams and frames; elastic and plastic design methods. Prereq., CVEN 3515.

**CVEN 4555-3. Reinforced Concrete Design.** Two lect. and one 2-hour computation lab per week. Applications to the design of reinforced concrete structures: design of beams, columns and slabs; prestressed concrete; footings; continuous beams and frames; buildings; and bridges. Prereq., CVEN 3515.

**CVEN 4565-2. Design of Timber Structures.** Lect. Design methods applied to beams, columns, trusses, and connections using timber. Use of glued laminated members. Prereq., CVEN 3505.

**CVEN 5575-3. Advanced Topics in Steel.** Lect. Advanced topics relating to design and analysis of steel structures. Includes plate girders, moment connections for beams,



design of multistory frames, and other topics determined by class interest. Prereq., CVEN 4545 or equivalent.

**CVEN 5585-3. Advanced Topics in Reinforced Concrete.** Lect. Advanced topics relating to design and analysis of reinforced concrete structures. Includes review of the current ACI design code, slabs, prestressed concrete, seismic design, folded plates and shells, finite element analysis, and other topics determined by class interest. Prereq., CVEN 4555 or equivalent.

**CVEN 6525-3. Finite Element Analysis of Structures.** Lect. Review of membrane, plate, and shell elements; displacement and mixed models; Kirchoff and Mindlin bending formulations; reduced integration techniques. Introduction to nonlinear problems. Application to buckling and vibration of structures. Prereqs., CVEN 4525 and consent of instructor, or CVEN 5511.

**CVEN 7545-3. Structural Optimization.** Lect. Fundamental propositions for the design of skeletal structures, automatic design of optimal structures, problem-oriented computer languages, linear and nonlinear programming methods for structural design. Prereq., CVEN 4525 or equivalent.

**CVEN 7555-3. Structural Reliability.** Lect. Students explore the principles and methods of structural reliability, and formulate the bases for design to insure adequate safety and performance of elements and structural systems. Prereq., CVEN 3515, 4525, or consent of instructor.

**CVEN 7565-3. Inelastic Theory of Structures.** Lect. Inelastic behavior of materials. Calculation of ultimate capacity of perfectly plastic structures by use of upper- and lower-bound theorems. Theories of inelastic action as applied to structural design in steel and concrete. Elements of theory of plasticity with applications in ultimate analysis of plates, shells, and continuous bodies. Prereq., CVEN 3505.

**CVEN 7595-3. Earthquake Engineering.** Three lect. per week. Analysis and design of structures for earthquake loadings. Earthquake ground motions, attenuation laws, and seismic hazard analysis. Numerical methods for time-domain and frequency-domain analysis. Response of linear and nonlinear structures. Elastic and inelastic response spectra, and construction of design spectra. Soil-structure interaction analysis. Seismic design methods and building code requirements. Prereq., CVEN 5111 or equivalent.

## Construction

**CVEN 1306-3. Introduction to Civil Engineering.** Lect. A survey of the broad subject of civil and architectural engineering and professional practice, emphasizing a study of construction methods including foundations, structural systems, building materials, and systems applications in building construction.

**CVEN 3246-3. Introduction to Construction.** Lect. A broad view of the concerns, activities, and objectives of the people involved in construction: the owner, architect/engineer, contractor, labor, and inspector. Interactive

gaming situation relates these people to the construction contract, plans/specifications, estimates/bids, scheduling, law, and financial management. Prereq., junior level standing or consent of instructor.

**CVEN 5236-3. Construction Planning and Scheduling.** A comprehensive study of construction management including the contractor's role in preconstruction activities; the construction contract; bonds and insurance; purchasing and subcontracts; contractor's central office and job organization; plant, tools, and equipment; methods engineering; value engineering; labor relations and hiring; and the particular application of CPM/PERT techniques to the planning, scheduling, and control of a construction project. Students are required to apply the techniques of the course to a term project. Prereq., AREN 4416 or equivalent.

**CVEN 5246-3. Engineering Contracts.** Lect. Applications of law in engineering practice; contracts, construction contract documents, construction specification writing, agency, partnership and property; types of construction contracts; legal responsibilities and ethical requirements of the professional engineer. Students are required to complete a comprehensive term paper on a course topic of their choice and present the paper. Prereq., graduate standing or consent of instructor.

**CVEN 5256-3. Construction Management.** Lect. The advanced study and analysis of construction top- and upper-middle management responsibilities, particularly relating to union craft labor, on- and off-site production and workmanship, construction financing, construction safety, inspection and quality control, and disputes and claims. Investigations to improve construction management efficiency and to lower construction costs are stressed. Prereqs., senior standing with AREN 4416, 4466, CVEN 4087, or consent of instructor.

**CVEN 5266-3. Industrialized Building Techniques and Systems.** Three lect.-rec. periods per week. Includes factory on-site inspections of industrialized building techniques and systems. The advanced study, investigations, and analysis to effect change and innovation in industrializing the construction process from product development through manufacture and transportation to assembly. Prereq., graduate standing or consent of instructor.

**CVEN 5286-3. Construction Engineering 1.** Lect. Introduction to the economics, utilization and limitations of large-scale horizontal construction methods. The advanced study of planning, analysis, and methods improvement techniques as applied to public works and energy facilities construction. Emphasis is placed on computer simulation of construction operations and time lapse analysis. Prereqs., graduate standing with CVEN 4147, CVEN 3708, or consent of instructor.

**CVEN 5296-3. Construction Engineering 2.** Lect. Continuation of CVEN 5286. Advanced study of the application and analysis of construction equipment and methods. Topics

include drilling, blasting, tunneling, dewatering foundations, formwork design, and construction aspects of Portland cement concrete. The course is applicable to both building and public works construction. Prereqs., graduate standing, AREN 4416, or equivalent.

## Miscellaneous

**CVEN 3207-2. City Planning.** Lect. Essential principles of city planning, with particular emphasis on the contribution that can be made by civil engineers. Includes detailed discussion of land use, land use boundaries, transportation, street systems, public buildings, parks and recreation, utility design, and zoning. Two or more problems in individual design included. Prereq., junior standing.

**CVEN 3217-3. Civil Engineering Systems.** Lect. An introduction to systems analysis concepts and applications in civil engineering with emphasis on quantitative optimization techniques. Specific topics include probability theory, decision analysis, network models, linear and dynamic programming, differential optimization, gradient search, deterministic and stochastic simulation. Prereqs., APPM 2360 and junior-level standing.

**CVEN 4087-3. Engineering Contracts.** (CVEN 5246.) Lect. Application of law in engineering practice: contracts, construction contract documents, construction specification writing, agency, partnership, and property; types of construction contract; legal responsibilities and ethical requirements of the professional engineer. Prereq., senior standing in civil or architectural engineering or permission of instructor.

**CVEN 4147-3. Engineering Economy.** Lect. Includes application of economic and financial principles to engineering alternatives; calculation of annual costs, present worth, and prospective rates of return on investment; depreciation and replacement studies; economic aspects of public works; and preparation of engineering reports on economy studies. Prereq., senior standing.

**CVEN 4537/5537-3. Numerical Methods in Civil Engineering.** Lect. Introduction to the use of numerical methods in the solution of civil engineering problems with emphasis on obtaining solutions with high-speed electronic computers. Applies methods to all types of civil engineering problems. Prereq., senior or graduate standing.

**CVEN 5367-2. Seminar: Urban Problems.** Lect. Topics of current interest in the field of urban development with particular emphasis on engineering aspects. Prereqs., CVEN 3207 and 4424.

## Geotechnical

**CVEN 3698-3. Engineering Geology.** Lect. Role of geology in engineering minerals; rocks; superficial deposits; rocks and soils as engineering materials; distribution of rocks at and below the surface; hydrologic influences; geologic exploration of engineering sites; mapping; geology of underground excavations, slopes, reservoirs, and dam sites. Includes a field trip.

**CVEN 3708-3. Geotechnical Engineering 1.** Lect. Basic characteristics of geological materials; soil and rock classifications; physical, mechanical, and hydraulic properties; the effective stress principle; soil and rock improvement; seepage, consolidation; stress distribution; settlement analysis. Prereq., CVEN 3121.

**CVEN 3718-3. Geotechnical Engineering 2.** Lect. Discussion of shear strength, bearing capacity of shallow and deep foundations, lateral earth pressures, retaining walls, slope stability, underground construction, and earth and rock structures. Prereq., CVEN 3708.

**CVEN 3728-2. Engineering Materials Laboratory—Geotechnical Engineering.** One lect. and one 3-hour lab per week. Physical characterization of unconsolidated geologic materials. Evaluation of constants and parameters used in the design and construction of earth structures. Sampling and testing of soils. Coreq., CVEN 3708 or consent of instructor.

**CVEN 5708-3. Soil Mechanics.** Lect. An advanced course in the principles of soil mechanics. Coverage includes topics in continuum mechanics; elasticity, viscoelasticity, and plasticity theories applied to soils; the effective stress principle; consolidation; shear strength; critical state concepts; and constitutive, numerical, and centrifuge modeling. Prereqs., CVEN 3708 and 3718.

**CVEN 5728-3. Foundation Engineering.** Lect. Geotechnical design of shallow and deep foundations including spread footing, mats, driven piles, and drilled piers. Coverage includes bearing capacity; settlement; group effects; and lateral load capacity of the various foundation types. Additional topics include subsurface exploration, construction of deep foundations, and analysis of pile behavior using wave equation and dynamic monitoring methods. Prereqs., CVEN 3708 and 3718, or consent of instructor.

**CVEN 5738-3. Applied Geotechnical Analysis.** Lect. Applications of limiting equilibrium and limit plasticity analysis methods to stability problems in geotechnical engineering, such as slopes, lateral earth pressures on retaining structures, and bearing capacities of foundations. Elastic and consolidation analyses of deformations in soil structures. Prereq., CVEN 5708 or consent of instructor.

**CVEN 5748-3. Design of Earth Structures.** Lect. Theory, design, and construction of earth embankments. Use of published data, field exploration, and laboratory tests on soils and rock in investigating foundations and construction materials. Principles of compaction and settlement. Slope stability analysis, landslide recognition and control, use of benches and beams. Prereq., CVEN 5708 or consent of instructor.

**CVEN 5768-3. Introduction to Rock Mechanics.** Lect. Nature of rocks and rock masses; index properties, rock and rock mass classifications, deformability and strength, rock hydraulics, mechanical behavior of planes of weakness in rock. Laboratory and in situ testing. Prereqs., CVEN 3708 and 3718, or consent of instructor.

**CVEN 5808-3. Offshore Engineering.** Lect. Analysis, design, and construction of offshore facilities. Types of offshore facilities; offshore environmental forces; marine geology; marine soil exploration; marine soil properties; pile foundations; gravity structures; tension leg platforms; guyed towers; sea bottom completion structures; pipe lines, anchors; gravel islands; dynamics of offshore structures; stability of marine slopes. Prereqs., CVEN 3708 and 3718, or consent of instructor.

**CVEN 7718-3. Engineering Properties of Soils.** Lect. Constitutive behavior of cohesive and cohesionless soils including stress-strain, strength, pore water pressure, and volume change behavior under drained and undrained loading conditions. Linear and nonlinear analysis techniques. Determination of constitutive properties in the laboratory. Prereq., CVEN 5708 or consent of instructor.

**CVEN 7758-3. Seepage and Consolidation.** Lect. Principles of steady and transient flow in geologic materials; problems of unconfined flow; analytical and numerical analysis of continued and uncontinued flow; one-dimensional nonlinear finite strain consolidation theory; the consolidation of loaded clay layers; the use of consolidation theory to analyze and interpret laboratory and field tests; the coupled theory of consolidation; the consolidation of partly saturated soils; thaw consolidation; application of principles to the analysis and design of constructed facilities and natural phenomena. Prereqs., CVEN 3708 and 3718, or consent of instructor.

**CVEN 7778-3. Applied Rock Mechanics.** Lect. In situ stresses in rocks and their measurement—application of rock mechanics to rock slope engineering, engineering for underground openings and foundation engineering; numerical methods in rock mechanics. Prereq., CVEN 5768.

**CVEN 7788-3. Soil Behavior.** Lect. Topics include soil mineralogy, formation of soils through sedimentary processes and weathering, determination of soil composition, soil water, colloidal phenomena in soils, fabric property relationships, analysis of mechanical behavior including compressibility, strength and deformation, and conduction phenomena in terms of physiochemical principles. Applications to stabilization and improvement of soils, and disposal of waste materials. Prereqs., CVEN 3708 and 3718, or consent of instructor.

**CVEN 7798-3. Dynamics of Soils and Foundations.** Lect. Behavior of soils and foundations subjected to self-excited vibrations and earthquake ground motions. Principles of wave propagation in geologic media; in situ and laboratory determination of engineering properties for dynamic analysis; applications of these principles and properties in design and analysis of foundations and earth structures subjected to dynamic loading. Prereqs., CVEN 5708 and 5718, or consent of instructor.

**CVEN 7928-3. Selected Topics in Analytical Soil Mechanics.** Lect. Selected advanced topics in soil mechanics and geotechnical engineering. Coverage depends upon the curriculum needs of that year. Such topics as

seepage, clay mineralogy, finite elements, analysis of geotechnical problems, rheology of soils, plasticity applied to soil mechanics, soil dynamics, and computational methods in geotechnical engineering are possible choices. May be taken more than once for additional credit. Prereq., CVEN 5708 or consent of instructor.

## Special Topics

**CVEN 4849 through 4879 (1-6). Independent Study.**

**CVEN 4889 through 4899-3. Senior Projects.** Entire semester is devoted to work on a project of the student's choice and the preparation of a report. Projects may include laboratory, analysis, or design efforts and may be done by individual students or by groups. The idea for the project can be generated by the student or suggested by a faculty member. A list of projects is available in the departmental office at preregistration. The student is not permitted to register for this course during the last semester in residence and the student must obtain registration approval for a particular project from the faculty director. Prereq., senior standing.

**CVEN 4909 (1-6). Special Topics for Seniors.** Supervised study of special topics of interest to students under guidance of instructor. Prereq., consent of instructor.

**CVEN 4919-1. Senior Seminar.** Lect. A series of lectures by outstanding university faculty members in the humanities, and eminent professional engineers in special fields of practice, particularly on subjects with new developments. Also emphasis on the EIT examination. Prereq., senior standing.

**CVEN 5849 through 5909 (1-6). Independent Study.** Available only through approval of graduate advisor. Subjects arranged to fit needs of the particular student.

**CVEN 6849 through 6909 (1-6). Independent Study.** Available only through the approval of the graduate advisor. Subjects arranged to fit needs of particular student.

**CVEN 8920 through 8929-3. Selected Topics.** Credit and subject matter to be arranged. Prereq., consent of instructor.

## COMPUTER SCIENCE

### General Computer Science

**CSCI 1010-2. Mind Tools.** Computer "literacy" and useful intellectual skills acquired through Macintosh-based tutorials, applied and extended by completion of projects in word processing and "desktop publishing"; spreadsheets; authored, structured and presentation graphics; relational object-oriented DBMS; project management; and dynamic system simulation. No programming.

**CSCI 1200-3. Introduction to Programming 1.** A course presenting good engineering practices for constructing, documenting, testing, and debugging computer programs. Provides an introduction to common algorithms and data structures and the major characteristics of modern computers. Programming projects use the department's principal teaching language. Prereq., three

years of high school mathematics, including trigonometry, or MATH 1100 or 1020, or consent of instructor.

**CSCI 1210-4. Introduction to Programming 2.** Emphasis on problems encountered in building larger, more complex programs. Experience is gained in using existing software modules as building blocks for larger programs. Prereq., CSCI 1200.

**CSCI 1300-4. Introduction to Computing for Majors.** An intensive first programming course. Students learn to analyze problems and synthesize programs for their solution, emphasizing good engineering practices for program construction, documentation, testing, and debugging. Programming projects give students experience with the department's principal teaching language. Prereq., admission as a major in computer science or consent of instructor.

**CSCI 1700-3. Introduction to Scientific Programming.** Intended for students whose primary interest in computing is the solution of numerical problems in science and engineering. Provides skills in designing, writing, and debugging Fortran programs of moderate complexity. Some common algorithms and data structures are introduced. Coreq., some calculus course or consent of instructor.

**CSCI 2250-3. Data Structures and Algorithms.** A study of data abstractions (e.g., stacks, queues, lists, trees) and representation techniques (e.g., linking, arrays). Also includes the distinction between abstract concerns and implementation concerns, memory management, sorting and searching, analysis of algorithms, and algorithm design techniques (e.g., divide-and-conquer). Prereqs., CSCI 1210 and 2204. (A discrete mathematics or switching theory course may substitute for CSCI 2204.)

**CSCI 2310-4. Fundamentals of Computer Science 1.** The first of two courses concerned with the application of computer science principles to the construction and analysis of algorithms and data structures. Topics include fundamental control and data structures including basic properties of trees and graphs, logic, formal specifications, correctness, and complexity analysis. Prereqs., CSCI 1300, current or prior enrollment in CSCI 1404, and admission as a major in computer science.

**CSCI 2320-4. Fundamentals of Computer Science 2.** The second of two courses concerned with the application of computer science principles to the construction and analysis of algorithms and data structures. Topics include models of computation, grammars, recursion, run-time representations for high-level languages, production systems, implementation of case studies, formal manipulation, and other computational problems. Prereqs., CSCI 2310 and admission as a major in computer science.

**CSCI 2890, 2900 (1-3). Lower-Division, Undergraduate-Level Independent Study.** Selected topics at the elementary level for students who have had little or no previous computing experience.

**CSCI 4890, 4900 (1-6). Upper-Division, Undergraduate-Level Independent Study.** Provides opportunities for independent

study, work on a small research problem, or tutoring of lower-division computer science students. Prereq., CSCI 1200, 1300, or 1700.

**CSCI 5000-2. Foundation Module in Data Structures.** An accelerated review of fundamental data structures and of algorithms processing such structures. Primarily intended for incoming graduate students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., consent of instructor.

**CSCI 5900 (1-6). Master's Level Independent Study.** Provides opportunities for independent study, work on a small research problem, or tutoring of lower-division computer science students.

**CSCI 6940-3. Master's Candidacy.** For students who need to be registered for the purpose of taking the Master's comprehensive exam and who are not otherwise registered. Credit does not count toward degree requirements. Graded on a Pass/Fail basis.

**CSCI 6950 (4-6). Master's Thesis.**

**CSCI 7000-3. Current Topics in Computer Science.** Covers research topics of current interest in computer science that do not fall into a standard subarea. Prereq., consent of instructor.

**CSCI 7900 (1-6). Doctoral-Level Independent Study.**

**CSCI 8990-variable credit. Doctoral Research.** An investigation in some specialized field of computer science. Approved and supervised by faculty members.

## Parallel Processing

**CSCI 5551-3. Parallel Processing.** (ECEN 5553.) Examines a range of topics involved in using parallel operations to improve computational performance. Parallel architectures, parallel algorithms, and parallel programming languages are discussed. Architectures, network computers, and data flow machines. Prereqs., background in computer organization, introduction to programming languages, and elementary numerical analysis.

**CSCI 7111-3. Topics in Parallel Processing.** Content varies, but subjects include parallel machine architecture, parallel algorithms, languages for parallel computation, and applications. Subject matter is taken from current research. Prereq., consent of instructor.

## Artificial Intelligence

**CSCI 3202-3. Introduction to Artificial Intelligence.** Survey of AI techniques of knowledge representation, search, learning, and natural language processing. Introduction to AI programming in Lisp. Prereqs., CSCI 2555 or 3245, and admission as a major in computer science or in computer applications, or consent of instructor.

**CSCI 5582-3. Artificial Intelligence.** (ECEN 5583.) Overview of AI methods, theories, and applications. Relationship between AI and psychology, linguistics, and philosophy.

Introduction to AI programming. Prereq., CSCI 3245 or equivalent.

**CSCI 5592-3. Advanced Artificial Intelligence Programming.** The role of programs in AI and cognitive science is discussed, as well as social implications. Further topics are the theory and practice of languages (including Lisp, object-oriented extensions, production systems, higher-level languages built on Lisp, logic programming, and Prolog) and algorithms (control strategies, graph search, theorem-proving, planning, rule-based systems). Prereq., CSCI 5582.

**CSCI 6582-3. Knowledge-Based Systems/Expert Systems.** An introduction to expert systems and other applications of knowledge-based technology. Prereq., CSCI 5582. Highly recommended coreq., CSCI 5592.

**CSCI 6592-3. Advanced Knowledge-Based Systems/Expert Systems Techniques.** Knowledge-based systems are studied in depth. Students are engaged in a major system-building effort. Prepares students for active research in artificial intelligence. Prereq., CSCI 6582.

**CSCI 7212-3. Topics in Symbolic Artificial Intelligence.** Topics vary from year to year. Possible topics include search; knowledge representation and natural language understanding; deduction, planning, problem solving, and automatic programming; instruction and cognitive models; vision and speech; learning, induction, and concept formation. Prereq., CSCI 5582 or consent of instructor. Highly recommended prereq., CSCI 5592.

**CSCI 7222-3. Topics in Nonsymbolic Artificial Intelligence.** Topics vary from year to year. Possible topics include massively parallel, connectionist AI systems for memory, learning, perception, problem-solving, language processing, sequential thought, and motor control; cognitive models; pattern recognition, image processing and machine vision, signal and speech processing; control theory and robotics; neural models. Prereq., CSCI 5582 or consent of instructor. Highly recommended prereq., CSCI 5592.

## Operating Systems and Hardware

**CSCI 3263-3. Computer Systems.** Applications-oriented introduction to the basic hardware and software components of a computer system and their interrelationships. Introduces hardware architecture, systems programs (compilers, etc.), and systems programming in high-level languages. Basic concepts and algorithms of operating systems. Prereq., CSCI 2250. Credit not granted to students who have taken CSCI 3753.

**CSCI 3753-3. Systems.** For Computer Science majors. Examines the software comprising computing systems as it builds upon the hardware to provide a programming environment. Structure and function of editors, compilers and assemblers, linkers, etc. Basic operating systems concepts and systems programming in high-level languages. Prereqs., CSCI 2555 and ECEN 2220. Credit not granted to students who have taken CSCI 3263.

**CSCI 4593-3. Computer Organization.** (ECEN 4593.) Concerned with computer arithmetic units, memory systems, control systems, and input-output systems. Emphasis is completely on logic structure rather than electronic circuitry. Prereqs., ECEN 1300/2570 and 2220.

**CSCI 5003-2. Foundation Module in Operating Systems.** An accelerated review of fundamental operating systems concepts. Primarily intended for incoming graduate students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., consent of instructor.

**CSCI 5513-3. Real-time Hardware-Software System Design.** (ECEN 5513.) Centers on the design and use of real-time computer systems. Special attention is given to the design, implementation, and testing of concurrent high-level language software in real-time applications. The design of computer-process interfacing systems is treated in the context of representative real-time applications. Concepts developed during the lecture portion of the class are reinforced with practical experience in the Real-time Computing Laboratory. Prereqs., CSCI 4593 and experience in sequential PASCAL programming.

**CSCI 5573-3. Operating Systems.** (ECEN 5573.) A study of the supervisory programs within a computer system which interact most closely with the hardware, and which allow efficient and shared access to the computer. Topics covered include processes (communication implementation, synchronization), memory management (storage allocation, virtual memory), and processor management (multiprogramming, time-sharing, scheduling).

**CSCI 5593-3. Advanced Computer Architecture.** (ECEN 5593.) A broad scope treatment of the important concepts in the structural design of computer systems. A large number of actual computers are studied in depth. Prereq., CSCI 4593 or consent of instructor.

**CSCI 5673-3. Advanced Operating Systems.** (ECEN 5673.) Topics covered are concurrent programming techniques and languages; performance analysis, testing, modeling, and verification of systems software; multiprocessor systems, distributed systems, and networks. Prereq., CSCI 5573.

**CSCI 7123-3. Topics in Operating Systems.** Topics to be selected by instructor. Possible topics are system design, measurement and evaluation, simulation, mathematical modeling, and parallelism. Prereq., CSCI 5573.

**CSCI 7143-3. Topics in Computer Systems.** Topics to be selected by instructor. Possible topics are on-line systems, multiprocessing, microprogramming, architecture, data communications, and computing networks.

## Theory of Computation

**CSCI 1404-2. Discrete Methods for Computer Science.** Introduces the basic abstractions and formal structures used in computer science, including elementary set theory, relations and functions, propositional and

predicate calculi, formal reasoning, mathematical induction, graph theory, combinatorics, enumeration, and recurrence relations. Applications are drawn from computer science. Prereqs., CSCI 1210 or 1300, and admission as a major in computer science.

**CSCI 2204-3. Discrete Structures 1.** The first of two courses preparing students for a fundamental understanding of computing. Set theory, Boolean algebra, relations, functions, graph theory, and techniques for formal reasoning including propositional and predicate calculus, proof techniques, induction, and program logics are studied. Prereq., college algebra or calculus; coreq., CSCI 1210.

**CSCI 2214-3. Discrete Structures 2.** The second of two courses preparing students for a fundamental understanding of computing. Combinatorics, enumeration, recurrence relations, complexity of algorithms, discrete probability, automata and languages, and computability are studied. Prereq., CSCI 2204.

**CSCI 3434-3. Computer Science Theory 1.** Introduces the foundations of formal language theory, computability, and complexity. The relationship between automata and various classes of languages is shown. Addresses the issue of which problems can be solved by computational means and studies the complexity of their solutions. Prereq., CSCI 2320 or 2250 (may be taken concurrently).

**CSCI 3444-3. Computer Science Theory 2.** A second course in theoretical computer science. The field is studied from the perspective of one of its branches. Possible topics include advanced algorithms, complexity theory, computability, formal language theory, and formal semantics. Prereq., CSCI 3434, or CSCI 2214 and 2250.

**CSCI 5004-2. Foundation Module in Discrete Structures.** An accelerated review of material in discrete mathematics and its applications in computer science. Primarily intended for incoming graduate students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., consent of instructor.

**CSCI 5444-3. Introduction to Theory of Computation.** Review of regular expressions and finite automata. Studies Turing machines and equivalent models of computation, the Chomsky hierarchy, context-free grammars, push-down automata, and computability. Prereq., CSCI 2214 or 3434.

**CSCI 5454-3. Design and Analysis of Algorithms.** Techniques for algorithm design, analysis of correctness and efficiency; divide and conquer, dynamic programming, etc. Advanced data structures, algorithms in graph theory, geometry, VLSI, linear algebra, etc. Lower bounds, NP-completeness, intractability. Prereqs., CSCI 2250 and 5444, or equivalent.

**CSCI 5654-3. Linear Programming.** Algorithms—simplex and modifications. Theory—duality, complementary slackness. Network flow algorithms. Introduction to integer programming. Prereq., linear algebra.

**CSCI 5714-3. Formal Languages.** Context-free languages; pumping lemma and variants, closure properties and decision properties. Parsing algorithms; general and special languages, e.g., LR. Additional topics chosen by instructor. Prereq., CSCI 5444 or consent of instructor.

**CSCI 6454-3. Advanced Algorithms.** Topics include matching and network flows, matroids, geometry and statistics, VLSI, database theory, distributed computation, parallel algorithms, cryptography, robotics, scheduling; probabilistic algorithms, approximation algorithms, average case and amortized analysis, time permitting. Prereq., CSCI 5454.

**CSCI 7154-3. Topics in Theory of Computation.** Selected topics of current interest in theory of computation. Prereq., consent of instructor.

## Programming Languages

**CSCI 2555-3. Principles of Programming Languages.** A systematic study of the fundamental principles of programming language design and implementation. Examples are drawn from common programming languages such as Fortran, Algol, Pascal, C, Ada, Modula II, Lisp, and Prolog. Practical experience with a small number of new languages. Prereqs., CSCI 2310 and admission as a major in computer science. Credit not granted to students who have taken CSCI 3245.

**CSCI 3245-3. Survey of Programming Languages.** A survey of currently popular programming languages such as Fortran, Algol, Pascal, C, Ada, Modula II, Lisp, and Prolog, with special attention to their application in computer problem solving. Practical experience with a small number of new languages. Prereq., CSCI 2250. Credit not granted to students who have taken CSCI 2555.

**CSCI 4555-3. Introduction to Compiler Construction.** (ECEN 4553.) An introduction to the basic techniques used in translating programming languages: scanning, parsing, definition table management, operator identification and coercion, code selection and register allocation, error recovery. Students build a complete compiler, by hand, for a simple language. Prereq., ECEN 2220.

**CSCI 5005-2. Foundation Module in Programming Languages.** An accelerated review of the fundamental principles of programming language design and implementation. Primarily intended for incoming graduate students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., consent of instructor.

**CSCI 5535-3. Fundamental Concepts of Programming Languages.** (ECEN 5533.) Introduction to syntax and semantics in the specification, design, use and implementation of programming languages. Heavy use of original sources, including language standards and journal articles. Prereqs., ECEN 2220 and CSCI 2555 or 3245, or consent of instructor.

**CSCI 5565-3. Translation of Programming Languages.** (ECEN 5563.) A study of practical techniques for translating text generated by humans into programs understood by

machines: lexical, syntactic and semantic analysis, code generation, assembly and optimization, error reporting and recovery. Prereqs., ECEN 2220 or CSCI 4588 and 5535, or consent of instructor.

**CSCI 7135-3. Topics in Programming Languages.** Topics to be selected by instructor. Possible topics are syntax, semantics, metacompilers, compiler design, and translator writing systems. Prereq., consent of instructor.

## Numerical Computation

**CSCI 3656-3. Numerical Computation 1.** Development, computer implementation, and analysis of numerical methods for applied mathematical problems are covered. Topics include floating point arithmetic, numerical solution of linear systems of equations, root finding, numerical interpolation, differentiation, and integration. Prereqs., two semesters of calculus, linear algebra, and one of the following: CSCI 1200, 1300, or 1700.

**CSCI 3666-3. Numerical Computation 2.** Continuation of CSCI 3656. Further development of the same topics and introduction of new topics, such as numerical solution of matrix eigenvalue, least squares, ordinary differential equations, and optimization problems. Prereq., CSCI 3656.

**CSCI 5006-2. Foundation Module in Numerical Computation.** An accelerated review of the mathematical and computational foundations of numerical computation. Primarily intended for incoming graduate students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., consent of instructor.

**CSCI 5546-3. Seminumerical Methods for Digital Computers.** (ECEN 5543.) A survey of topics in the borderline area between numerical analysis and computer systems programming and design. Knowledge of assembly language and some familiarity with computer architecture are necessary for the course. Some topics covered are computer round-off error, floating point arithmetic, and the generation of random numbers. Prereq., ECEN 2220.

**CSCI 5606-3. Principles of Numerical Computation.** Computer arithmetic, solution of linear systems, least-squares approximations, nonlinear algebraic equations, interpolation, and quadrature. Prereqs., CSCI 3656 and three semesters of calculus, or equivalent.

**CSCI 5626-3. Numerical Solution of Ordinary Differential Equations.** Multi-step and single-step methods for ODE. Two-point boundary value problems. Difference schemes for heat and wave equations. Applications. Prereq., CSCI 5606.

**CSCI 5636-3. Numerical Solution of Partial Differential Equations.** Finite difference solution for partial differential equations. Methods of SOR, ADI, conjugate gradients. Finite element method. Nonlinear problems. Applications. Prereq., CSCI 5606.

**CSCI 5646-3. Numerical Linear Algebra.** Direct and iterative solutions of linear systems. Eigenvalue and eigenvector calculations. Error analysis. Reduction by orthogonal transformation. Prereq., CSCI 3666 or 5606.

**CSCI 6676-3. Numerical Methods for Unconstrained Optimization.** Modern computational methods for the solution of unconstrained optimization problems, nonlinear least squares, and systems of nonlinear equations. Techniques for building algorithms to solve problems with special structure. Prereq., CSCI 5606.

**CSCI 6686-3. Numerical Methods for Constrained Optimization.** Covers computational methods for constrained optimization. Topics include basic theory; methods for quadratic programming; active set strategies for linear constraints; penalty and successive quadratic programming methods for nonlinearly constrained problems. Prereq., CSCI 5606.

**CSCI 7176-3. Topics in Numerical Computation.** Topics to be selected by instructor. Possible topics are numerical linear algebra, solution of differential equations, nonlinear algebra and optimization, data fitting, linear and nonlinear programming, and solution of large problems. Prereq., consent of instructor.

## Database Systems

**CSCI 3287-3. Database and Information Systems.** A survey course in data management, including file systems, database management systems design, physical data organizations, data models, query languages, concurrency, and database protection. Prereq., CSCI 2250 or 2320.

**CSCI 5817-3. Database Systems.** An advanced treatment of basic database concepts. Prereqs., CSCI 2250 and admission as a graduate student in computer science or electrical engineering. Recommended prereqs., CSCI 3287 and 3753.

**CSCI 5917-3. Database Practicum.** Practical issues in the implementation, modeling, and measurement of database systems are addressed. Centers around a significant software project. Prereqs., CSCI 5817 and significant software experience, or consent of instructor.

**CSCI 7717-3. Topics in Database Systems.** Topics such as distributed databases, database interfaces, data models, database theory, and performance measurement are studied in depth. Prereq., CSCI 5817 or consent of instructor.

## Software Engineering

**CSCI 4208-3, 4218-3. Senior Project 1 and 2.** An advanced practicum in computer science. Students design, implement, document, and test software systems for use in local industry or in university or government laboratories. They gain practical experience by working closely with project sponsors from these organizations who identify real needs in their organizations and review ongoing projects. CSCI 4208 may be taken as

a one-semester course or as part of a two-semester sequence with CSCI 4218. In the latter case a larger project, extending through both semesters, may be undertaken, or a separate software development or maintenance project can be carried out in the second semester. Prereqs., CSCI 3245, 3263, and admission as a Computer Applications major. CSCI 4208 is a prerequisite for CSCI 4218.

**CSCI 4588-3. Software Systems Development.** (ECEN 4583.) Lectures deal with techniques for design, documentation, coding, testing, debugging, performance evaluation and maintenance of medium-scale (2-3000 line) systems. Primary emphasis is on practical application of these techniques to a specified project. Students are required to code to detailed specifications initially, and receive progressively greater design responsibility during the semester. Teamwork is encouraged, and strict deadlines are maintained on all assignments. Prereq., ECEN 2220.

**CSCI 5828-3. Software Engineering.** First-hand study of some of the problems connected with the development of large programs. Students, either individually or in small groups, are involved in the actual design and development of modules for a large software system.

**CSCI 5918-3. Software Development Workshop.** In this software engineering practicum, student development teams perform specification, design, implementation and/or maintenance activities for some relatively complex software system.

**CSCI 6838-3. User Interface Design.** Techniques for creating and evaluating effective user interfaces for computing systems are covered. Introduces relevant findings and theory from psychology and human factors, as well as implementation methods. Prereq., graduate status or consent of instructor.

## ENGINEERING PHYSICS

See Physics for listing of courses.

## ELECTRICAL AND COMPUTER ENGINEERING

### General

**ECEN 1300-3. Introduction to Logic Circuits.** Application of mathematical techniques to the solution of a variety of problems from electrical engineering and related fields. Translation of engineering problems into mathematical models, and the engineering interrelation of the mathematical results. A study of Boolean algebra and its application to the synthesis of logic circuits from logic elements such as and-gates, or-gates, nand-gates, nor-gates, delay elements, and memory elements. No prerequisites.

**ECEN 1330-1. Logic Laboratory.** Provides laboratory experience in the design and construction of digital logic circuits. Experiments are performed in combinational, sequential, and register transfer logic. Instrumentation introduced in the laboratory includes the logic probe, the oscilloscope,

the logic analyzer, and a breadboarding system. Microcomputers are used to aid in the design and testing of circuits. Prereq., ECEN 1300.

**ECEN 1340-1. Technical Writing.** A writing course that should be taken in the freshman year. Prereq., freshman standing.

**ECEN 1840 through 1849 (1-3). Independent Study.** An opportunity for freshmen to do independent, creative work. Prereq., consent of instructor.

**ECEN 2150-4. Circuits/Electronics 1.** The basic techniques for DC, AC and transient analysis of RLC and op-amp circuits are developed. Emphasis is on quickly and accurately writing and solving circuit equations and on the physical behavior of this class of circuits. Coreqs., ECEN 2550 and APPM 2350.

**ECEN 2160-4. Circuits/Electronics 2.** Continues the basic circuit analysis of ECEN 2150 by introducing nonlinear circuit elements: pn Diode, BJT, JFET, MOSFET. Emphasis is on biasing, large and small signal (low frequency) operation and basic applications such as amplifications and switching. Concepts as they apply to the ideal transformer and to the self-inductance are developed. Three-phase circuits and Fourier series expansions are introduced. Prereqs., ECEN 2150 and ECEN 2550; coreq., ECEN 2560.

**ECEN 2220-3. Microcomputer Architecture and Programming.** Covers machine structure and assembly language programming of small computers; basic concepts of hardware and software engineering; processor architecture; interrupt handling; modular decomposition; and concurrency. Prereqs., ECEN 1300, ECEN 1330, and CSCI 1210.

**ECEN 2230-1. Microprocessor Laboratory.** Provides experience in programming, interfacing, and using microprocessor systems in electrical engineering applications. Students use microprocessor development stations to program and debug the systems they design. Applications are taken from signal processing, power, fields, as well as computer engineering. Programming is performed in Pascal and assembly language. Prereqs., ECEN 1300 and ECEN 2220.

**ECEN 2550-1. Circuits/Electronics Laboratory 1.** Concentrates on basic principles of electrical measurements using primarily the cathode ray oscilloscope. Coreq., ECEN 2150.

**ECEN 2560-1. Circuits/Electronics Laboratory 2.** For students majoring in electrical engineering. Covers basic electrical instruments, including oscilloscopes, electrical circuits, power measurements, transformers, integrated circuit operational amplifiers and transistors. Coreq., ECEN 2160.

**ECEN 2570-3. Logic Circuits.** A study of Boolean algebra and its application to the synthesis of logic circuits from logic elements such as and-gates, or-gates, not-gates, nand-gates, delay elements, and memory elements. Not open to anyone who has taken ECEN 1300. For Computer Science students and other nonmajors. No prerequisites.

**ECEN 2840 through 2849 (1-3). Independent Study.** An opportunity for sophomores

to do independent, creative work. Prereq., consent of instructor.

**ECEN 3020-3. Statistical Thermodynamics.** Covers a statistical approach to the understanding of thermodynamics; thermal and diffusive equilibrium; interactions of systems with external fields; thermal radiation; thermal vibrations; noise; electrons in metals; semiconductor statistics; heat engines and heat pumps; chemical reactions; and kinetic theory. Prereq., ECEN 3130; prereq. or coreq., ECEN 3810 or APPM 4810.

**ECEN 3030-3. Electronics and Electric Circuits.** For students not majoring in electrical engineering. Covers analysis of electric circuits by use of Ohm's law; network reduction; superposition; node and loop analysis; Thevenin's and Norton's theorems; sinusoidal signals; phasors; power in AC circuits; transient response of simple circuits; operational amplifiers; logic circuits; and flip-flops. Prereq., APPM 2350.

**ECEN 3130-3. Electromagnetic Fields and Waves.** Maxwell's equations postulated for free space and developed for material regions; boundary conditions. Vector algebra and calculus in three common coordinate systems developed as needed. Uniform plane waves in free space and lossy regions exemplify dynamic field problems. Static and quasi-static electric and magnetic fields and energy are considered in detail, with emphasis on the field theory view of capacitance, inductance, and resistance. Prereqs., ECEN 2150 and APPM 2350.

**ECEN 3140-3. Electromagnetic Waves and Transmission.** Reflected and transmitted plane waves in layered media. Poynting's theorem of electromagnetic power, hollow waveguides, and two-conductor transmission line theory and practice; Smith chart and impedance matching. Elements of antenna theory. Prereq., ECEN 3130.

**ECEN 3170-3. Energy Conversion 1.** The use of magnetic fields as the transfer medium for electric energy in transformers and for conversion of electrical energy to mechanical torque in rotating machines. The basic magnetism theory is applied to inductors, transformers, relays, stepper motors, AC and DC motors and generators. Prereqs., ECEN 2160 and ECEN 3130.

**ECEN 3230-3. Circuits/Electronics 3.** Includes frequency response of transistor amplifiers; basic analysis and design of feedback circuits; analog integrated circuits, including basic analysis and design of operational amplifiers; and filter and oscillator circuits, including switch capacitor design. Prereqs., ECEN 2150 and ECEN 2160; coreq., ECEN 3530.

**ECEN 3310-3. Linear Systems.** Characterization of linear systems in time and frequency domains. Impulse response and convolution, frequency response, and transfer functions. Both continuous and discrete time systems are covered using linear differential and difference equations and state variable descriptions. Transform methods include Z transforms, Fourier series, Fourier integral, and discrete Fourier transform. Applications to communication and control systems. Prereq., APPM 2360.

**ECEN 3320-3. Semiconductor Devices.** Fundamentals of semiconductor materials and devices. Topics include the electrical and optical properties of semiconductors and other materials, the theory of pn junctions, bipolar and field-effect transistors, and optoelectronic devices. Prereq., ECEN 3230.

**ECEN 3430-1. Electronics/Circuits Laboratory for Nonmajors.** Intended for students not majoring in electrical engineering. Covers basic electrical instruments including oscilloscopes, electrical circuits, power measurements, transformers, and integrated circuit operational amplifiers and transistors. Coreq., ECEN 3030.

**ECEN 3530-1. Circuits/Electronics Laboratory 3.** Extends the student's experience in the operating characteristics of components and integrated circuits, including the silicon controlled rectifier, the solar cell, and photodevices. The differential and high frequency amplifiers and a TTL integrated circuit are studied. This course is coupled closely with the parallel theory course. Prereq., ECEN 2560; coreq., ECEN 3230.

**ECEN 3810-3. Introduction to Probability Theory.** Covers the fundamentals of probability theory and then treats the random variables of greatest importance in electrical engineering. Provides a foundation for study of communication theory, control theory and reliability theory. Prereq., APPM 2350.

**ECEN 3840 through 3849 (1-3). Independent Study.** An opportunity for juniors to do independent, creative work. Prereq., consent of instructor.

**ECEN 4400-3. Reliability and Quality Control.** Concerned with the evaluation of the quality and reliability of electronic components and systems and with design procedures for enhancing those characteristics. Statistical sampling and analysis procedures for quality control in production studied in detail. Prereq., ECEN 3810 or APPM 4810.

**ECEN 4840 through 4849 (1-3). Independent Study.** An opportunity for seniors to do independent, creative work. Prereq., consent of instructor.

**ECEN 4900 through 4990. Selected Topics.** Credit and subject matter to be arranged. Prereqs. vary.

**ECEN 5000-0. Graduate Seminar.** Seminars presented by faculty members and visitors to discuss recent advances and developments in electrical and computer engineering.

**ECEN 5210-3. Analytical Processes in Engineering.** Designed to develop mathematical skills in areas of concern in engineering applications. Teaching is by example rather than by course content but includes such features as integration, differentiation, summation of series, approximations, and manipulation of trigonometrical expressions. Prereq., APPM 2350 or equivalent.

**ECEN 5840 through 5849 (1-6). Independent Study.** An opportunity for students to do independent, creative work at the master's level. Prereq., consent of advisor.

**ECEN 5900 through 5990 (0-3). Selected Topics.** Intermediate graduate-level courses of variable titles and variable credit, usually



offered once by guest lecturers. See current departmental notices for detail.

**ECEN 6940-3. Master's Degree Candidate.**

**ECEN 6950-variable credit. Master's Thesis.**

**ECEN 6960 (0-8). Master of Science Report.**

**ECEN 6970 (0-8). Master of Engineering Report.**

**ECEN 7210-3. Mathematical Functions for Engineering.** Derivation and exposition of important functional properties as required in engineering applications. Emphasis on those properties that have been found important in engineering. Functions examined include gamma, Bessel, Legendre, elliptic, hypergeometric, and others. Prereq., ECEN 5210.

**ECEN 7840 through 7849 (1-6). Independent Study.** Affords an opportunity for students to do independent, creative work at the doctoral level. Prereq., consent of advisor.

**ECEN 7900 through 7990 (0-3). Selected Topics.** Graduate courses of variable title and variable credit, usually offered on a one-time basis by guest lecturers. See current departmental notices for details.

**ECEN 8990 (16 to 24 maximum). Doctor's Thesis.**

## Bioengineering

**ECEN 4811/5811-3. (B) Neuroelectric Signals.** The biophysical bases of electrical signal generation and propagation in nerve cells and other excitable tissues. Topics include electrochemical equilibrium across cell membranes, resting and action transmembrane potentials, control of ionic conductance changes, pacemaker firing patterns, sensory transduction, synaptic transmission, and active transport processes. Of particular interest to students involved in biomedical engineering or neuroscience programs. Prereq., consent of the instructor.

**ECEN 4821/5821-3. (B) Neuroelectric Systems.** An extension of cellular neuroelectric concepts into the arena of integrative neurophysiology and neuroethology. Topics include synaptic modulation of neuronal firing patterns, interactions in dendritic trees, computer simulation of interactive neural nets, the command neuron concept, sensory information processing, and the generation of simple behaviors directly correlated with neural network organization. Of particular interest to students involved in biomedical engineering or neuroscience programs. Prereq., consent of the instructor.

**ECEN 4831/5831-3. (B) Brains, Minds, and Computers.** An introductory, integrative survey of brain science, cognitive science, artificial intelligence, and their interrelations. Central concepts and principles from each of these areas and the similarities and differences of brains, minds, computers, and robots are considered. Prereq., ECEN 2160, 3030, or consent of instructor.

**ECEN 5801-3. (B) Electrophysiological Measurements.** Lectures on, and demonstration of, the measurement and control of electrical

activity in the nervous system and other excitable tissue. Topics include use of microelectrode recording and stimulating techniques, voltage clamping, single- and multiple-unit recording in the intact brain, in vitro techniques for studying isolated neural subsystems, electroencephalography and evoked potential studies, electrocardiography and magnetocardiography, computer processing of neuroelectric data. Of particular interest to students involved in biomedical engineering or neuroscience programs. Prereq., consent of instructor.

## Communications

**ECEN 4242-3. (C) Communication Theory.** Modern digital and analog communication systems; Fourier analysis of signals and systems; signal transmission; amplitude modulation; angle modulation; digital communication systems, the behavior of communication systems in the presence of noise, including both analog and digital systems. Prereqs., ECEN 3310 and ECEN 3810 or APPM 4810.

**ECEN 4652-2. (C) Communication Laboratory.** Laboratory experiments demonstrating material taught in ECEN 4242. Use is made of spectrum analysis to study baseband signals and signal processors. Topics include noise, AM, FM, PM, sampling, quantizing/encoding, TDM, FDM, equalizers, and a complete communication system. Prereq. or coreq., ECEN 4242.

**ECEN 5612-3. (C) Noise and Random Processes.** Brief review of probability theory, sequences of random variables, specification of stochastic processes, stationarity, correlation functions, and power spectra. Markov chains, linear systems with random inputs, application to noise theory. Prereq., ECEN 3810 or APPM 4810.

**ECEN 5622-3. (C) Information Theory and Coding.** Information and entropy. Markov chains, combined systems, continuous systems, coding theory, channel capacity, modulation, applications to communication engineering. Prereq., ECEN 3810, APPM 4810, or consent of instructor.

**ECEN 5632-3. (C) Theory and Application of Digital Filtering.** Digital signal processing and its applications are of interest to a wide variety of scientists and engineers. Covers such topics as the characterization of linear discrete-time circuits by unit-pulse response, transfer functions, and difference equations, the use of z-transforms and Fourier analysis, the discrete-Fourier transform and fast algorithms (FFT), design of finite and infinite impulse response filters, frequency transformations, the study of least squares filters for deterministic and stochastic inputs. Prereq., ECEN 3310, ECEN 3810, or APPM 4810.

**ECEN 5642-3. (C) Modern Methods of Spectral Estimation.** The estimation of power spectra has long been an effective method for analyzing time series. Applications include speech processing, seismic data, and radar and sonar processing. This material is a study of Fourier methods, autoregressive models, joint-moving average-AR methods to the estimation of power spectra. Prereqs., ECEN 5612 and 5632.

**ECEN 5652-3. (C) Detection and Extraction of Signals from Noise.** An introduction to detection, estimation and time series analysis. Topics include hypothesis testing, detection of known form and random signals, least squares parameter estimation, maximum likelihood theory, minimum mean-squared error estimation, Kalman-Wiener filtering, and prediction in stationary time series. Applications include studies in communications, control, and experimental modeling. Prereq., ECEN 5612 or equivalent.

**ECEN 5662-3. (C) Optimal Signal Processing and Stochastic Systems.** Constrained optimization, Kuhn-Tucker conditions, convex programming, and near-point problems in Hilbert Space. Dynamic programming and Markov processes. Applications may include sequential decision theory, trajectory estimation, Wiener and Kalman filtering, data compression, pattern recognition, game theory, system identification. Prereqs., ECEN 3810 or APPM 4810, and ECEN 3310 or equivalent.

**ECEN 5672-3. (C) Digital Image Processing.** Covers the following topics: image formation and visual perception; digitization of images; transform coding, modelling, and image compression; image enhancement; filtering and image restoration; reconstruction and tomographic imaging. Prereq., ECEN 5612 or equivalent.

**ECEN 5682-3. (C) Advanced Information Theory and Coding.** Block codes and convolutional codes for reliable transmission of digital data over unreliable noisy channels. Characterization of cyclic codes like BCH codes and RS codes from an algebraic as well as from a digital signal processing point of view. Decoding algorithms for block codes and convolutional codes. Prereq., ECEN 5622 or consent of instructor.

**ECEN 5692-3. (C) Principles of Digital Communication.** Fundamental principles underlying the transmission of digital data over noisy waveform channels. Mathematical description of signal and noise waveforms. Digital waveform synthesis, optimum receiver principles, decision regions and error probability for different modulation schemes. Prereqs., ECEN 3310 and 5612.

**ECEN 7632-3. (C) Advanced Digital Signal Processing Methods.** Advanced digital signal processing methods to include descriptions for the internal structure of digital filters such as state variable descriptions, primitive signal flow graphs, factored state variable descriptions; optimization of finite register effects in digital filters; digital processing structures for efficient VLSI implementations; adaptive digital filters; array filtering. Prereq., ECEN 5632.

## Computer Systems and Digital

**ECEN 4553-3. (CP) Introduction to Compiler Construction.** (CSCI 4555.) An introduction to the basic techniques used in translating programming languages: scanning, parsing, definition table management, operator identification and coercion, code selection and register allocation, error recovery. Students build a complete compiler, by hand, for a simple language. Prereq., ECEN 2220; enrollment restricted to students

majoring in Computer Science, Computer Science and Business, Electrical and Computer Engineering, or Electrical Engineering and Computer Science.

**ECEN 4573-2. (CP) Microprocessor Systems Laboratory.** Use of microprocessor systems in measurement and control applications. Development of medium-sized systems based upon single-board microcomputers. Students spend one-half of the semester on an individual special project. Prereq., ECEN 2230.

**ECEN 4583-3. (CP) Software Systems Development.** (CSCI 4588.) Lectures deal with techniques for product requirements definition, project planning, coding, verification, validation, performance evaluation, and maintenance of medium-scale (2-3000 line) systems. Primary emphasis is on practical application of these techniques to a specified software project. Students work in teams to produce appropriate documents for each phase and are responsible for project completion according to specification and schedule. Course project is written in C on a UNIX look-alike system; prior knowledge of C or UNIX is not required. Prereq., ECEN 2220 and CSCI 1210.

**ECEN 4593-3. (CP) Computer Organization.** (CSCI 4593.) Concerned with computer arithmetic units, memory systems, control systems, and input-output systems. The emphasis is completely on logic structure rather than electronic circuitry. Prereqs., ECEN 1300 or 2570, and ECEN 2220.

**ECEN 4603-2. (CP) Computer Laboratory.** Provides laboratory experience both with digital computer subsystems and with complete computer systems. Students construct small subsystems and work with actual subsystems of a full digital computer. Prereqs., ECEN 1300 or 2570, ECEN 1330, and ECEN 4593.

**ECEN 4703-3. (CP) Switching and Finite Automata.** Lect. Upper-division course in switching and logical design, assuming a basic course in logic circuits. Emphasizes formal characterization of combinatorial functions and sequential machines. Covers fault diagnosis and finite state automata. Prereqs., ECEN 1300 or 2570, and APPM 2360.

**ECEN 5513-3. (CP) Real-time Hardware-Software System Design.** (CSCI 5513.) Centers on the design and use of real-time computer systems. Special attention is given to the design, implementation, and testing of concurrent high-level language software in real-time applications. The design of computer/process interfacing systems is treated in the context of representative real-time applications. Concepts developed during the lecture portion of the class are reinforced with practical experience in the Real-time Computing Laboratory. Prereqs., ECEN 4593 and experience in programming sequential PASCAL.

**ECEN 5533-3. (CP) Fundamental Concepts of Programming Languages.** (CSCI 5535.) Considers concepts common to a variety of programming languages: how they are described (both formally and informally) and how they are implemented. Provides a firm basis for comprehending new languages and gives insight into the relationship

between languages and machines. Prereqs., ECEN 2220, CSCI 3245, or consent of instructor.

**ECEN 5543-3. (CP) Seminumerical Methods for Digital Computers.** (CSCI 5546.) A survey of topics in the borderline area between numerical analysis and computer systems programming and design. A knowledge of assembly language and some familiarity with computer architecture are necessary for the course. Some topics covered are computer round-off error, floating point arithmetic, and the generation of random numbers. Prereq., ECEN 2220.

**ECEN 5553-3. (CP) Parallel Processing.** (CSCI 5551.) Examines a range of topics involved in using parallel operations to improve computational performance. Parallel architectures, parallel algorithms and parallel programming languages are discussed. Architectures network computers and data flow machines. Prereqs., background in computer organization, introduction to programming languages, and elementary numerical analysis.

**ECEN 5563-3. (CP) Translation of Programming Languages.** (CSCI 5565.) A study of practical techniques for translating text generated by humans into programs understood by machines: lexical, syntactic, and semantic analysis, code generation, assembly and optimization, error reporting and recovery. Prereqs., ECEN 2220 and ECEN 5533, or consent of instructor.

**ECEN 5573-3. (CP) Operating Systems.** (CSCI 5573.) A study of the supervisory programs within a computer system which interact most closely with the hardware, and which allow efficient and shared access to the computer. Topics covered include processes (communication implementation, synchronization), memory management (storage allocation, virtual memory), and processor management (multiprogramming, time sharing, scheduling). Prereqs., CSCI 2250 and 5535.

**ECEN 5583-3. (CP) Artificial Intelligence.** (CSCI 5582.) Overview of AI methods, theories, and applications. Relationship between AI and psychology, linguistics, and philosophy. Introduction to AI programming. Prereq., CSCI 3245 or equivalent.

**ECEN 5593-3. (CP) Advanced Computer Architecture.** (CSCI 5593.) A broad-scope treatment of the important concepts in the structural design of computer systems. A large number of actual computers are studied in depth. Prereq., ECEN 4593 or consent of instructor.

**ECEN 5673-3. (CP) Advanced Operating Systems.** (CSCI 5673.) Concurrent programming techniques and languages. Performance analysis, testing, modeling, and verification of systems software. Multiprocessor systems, distributed systems, and networks. Prereq., CSCI 5573 or ECEN 5573.

## Electromagnetics

**ECEN 4634-2. (F) Transmission Laboratory.** Includes experiments verifying and extending concepts learned in ECEN 3140,

study of UHF and SHF sources and power measurement; coaxial and waveguide slotted-line impedance measurements and matching; transmission line modeling using the artificial line; time-domain reflectometer applications, antenna pattern measurements. Prereq., ECEN 3140 or equivalent.

**ECEN 5104-3. (F) Computer-Aided Microwave Circuit Design.** Emphasizes the design of strip-line and microstrip circuits, using a CAD package. Design of impedance transformers, filters, switches, phase shifters, etc., are discussed. Assignments include design of typical circuits and their analysis using a microwave circuit analysis program. Laboratory includes measurements on various circuits, using a network analyzer facility. Prereq., ECEN 3140.

**ECEN 5114-3. (F) Waveguides and Transmission Lines.** An intermediate-level fields course dealing with guided-wave systems at HF, microwave, and optical frequencies. Modern waveguiding structures, including circular metallic waveguides, microstrip transmission lines, and optical waveguides are treated. Additional material may include waveguide losses, excitation of waveguides, microwave network theory, coupled-mode theory, resonators, Gaussian beams, pulse propagation in waveguides. Prereq., ECEN 3140 or equivalent.

**ECEN 5134-3. (F) Electromagnetic Radiation and Antennas.** The elementary antenna source, cylindrical wire antennas, loop antennas, radiation patterns and antenna gain, aperture sources such as horns and dishes, linear arrays, mutual effects, ray formulations, antenna noise and temperature, and transmission formulations. Prereq., ECEN 3140.

**ECEN 5144-3. (F) Electromagnetic Boundary Problems.** Mathematical theories and physical concepts related to Maxwell's equations. Potential representations, scalar and vector Green's functions, eigenfunction expansions, Green's theorem, reciprocity, equivalence principle and image theorem. The second part of the course involves applications such as radiation from apertures in cylindrical surfaces, scattering by cylinders and wedges, dipole radiation over a half-space, general mode theory of metallic and surface-wave waveguides, excitations, discontinuities, and bends in waveguides. Prereq., ECEN 5114 or ECEN 5134 or equivalent.

**ECEN 5254-3. (F) Radar and Remote Sensing.** Active and passive techniques of remote sensing. Wave propagation in the earth's atmosphere. The signal-to-noise ratio in radio and radar. MTI, pulse-doppler, FM-CW, chirp, and sidelooking radars. Applications of radar and radiometry to remote sensing of the atmosphere, sea, and land. Prereqs., ECEN 3130 and ECEN 3310, or consent of instructor.

**ECEN 5264-3. (F) Propagation Effects on Satellite and Deep-Space Telecommunications.** Role of propagation effects in the design of earth-space telecommunication systems. Effects dependent upon total electron content (TEC) along path, including

Faraday rotation and range delay. Ionospheric and interplanetary scintillation. Tropospheric clear-air effects, including refraction, ducting, and range delay. Absorption, scatter, and cross polarization due to precipitation and clouds. Effects of terrain and multipath propagation on mobile satellite operations. Radio noise of atmospheric, terrestrial, and extraterrestrial origin. Propagation effects on interference. Telecommunications and radio science for deep-space missions. Prereq., ECEN 3140 or equivalent.

**ECEN 5274-3. (F) Radar Science and Techniques.** Radar fundamentals. Scattering by precipitation and atmospheric turbulence. Long-wavelength radars and the dynamics of the middle and upper atmosphere. Design of meteorological and clear-air radars. Profiling tropospheric winds, temperature, and humidity by radar and radiometry. Ionospheric sounding using ionosondes and incoherent-scatter radars. Prereq., ECEN 5254 or equivalent experience.

## Materials

**ECEN 4045-3. (SS) Introduction to Optical Electronics.** An introduction to lasers, Gaussian optics, modulators, nonlinear optics, optical detectors, and other related devices. Prereq., ECEN 3140.

**ECEN 4345-3. (SS) Introduction to Solid State.** (PHYS 4340.) Introduction to crystallography, free electron theory, including AC and DC conductivity, energy band theory, semiconducting, dielectric, magnetic, optical and superconducting materials, processes, and devices. Prereqs., ECEN 3020 and ECEN 3130.

**ECEN 4375-3. (SS) Integrated Circuit Technology.** Lab. Offers experience in monolithic silicon integrated circuit fabrication techniques, including IC layout, pattern compiling and generation, mask making, oxidation, photolithography, diffusion, implantation, metallization, bonding, process analysis, testing. A design project is included. Prereq., ECEN 3320; coreq. or prereq., ECEN 3020.

**ECEN 5035-3. (SS) Physical Properties of Crystals.<sup>1</sup>** Macroscopic physical properties are related to the symmetries of crystals. The tensor and matrix methods required to represent the physical properties are developed. Topics and properties discussed include electric polarization, magnetic symmetry, electrical and thermal conductivity, pyroelectricity, piezoelectricity, elasticity, thermoelectricity, crystal optics, optical activity, Faraday rotation. Thermodynamic relations between properties are developed. Prereq., ECEN 4345 or equivalent or permission of instructor.

**ECEN 5045-3. (SS) Introduction to Optical Electronics.** An introduction to lasers, Gaussian optics, modulators, nonlinear optics, optical detectors, and other related devices. Prereq., ECEN 3140.

**ECEN 5055-3. (SS) Principles of Electronic Devices.** Relates performance and limitations of solid state devices to their structures and technology. Semiconductor physics and technology. PN-junction and MOS devices. Optoelectronic and bulk devices. For both advanced circuit and device engineers. Prereq., senior standing.

**ECEN 5065-3. (SS) Semiconductor Materials and Devices 1.** Includes an introduction to time-independent quantum mechanics and perturbation theory, tunneling, application to quantum-well electronic and optical devices, electrons in a crystalline solid, Bloch's theorem, energy bands and energy gaps, the effective mass approximation, a survey of energy bands for real crystals: Si, Ge, GaAs, InP,  $A^xGa^{1-x}As$ , etc., band structure engineering, and the electrical and optical properties of compound semiconductors. Prereqs., ECEN 3020 and 4345.

**ECEN 5075-3. (SS) Semiconductor Materials and Devices 2.** Includes principles of heterojunctions and superlattices, lattice vibrations and phonons, time-dependent quantum mechanics and perturbation theory, the dynamics of electrons in a crystal, the Boltzmann transport equation, current, electron scattering with impurities and phonons, mobility, low- and high-field effects, and applications to conventional and submicron devices. Prereqs., ECEN 5065 and its prerequisites, or consent of instructor.

**ECEN 5085-3. (SS) Advanced VLSI Processing and Scaling.** Processes and scaling theory for submicron silicon integrated circuit technology are developed. Topics covered include lithography, plasma processes, ion implantation, and metallization. Submicron scaling theory and two-dimensional process modeling are employed in design projects. Prereqs., ECEN 4345 and permission of instructor.

## Optics

**ECEN 5156-3. (O) Physical Optics.** A core course for the optics program. Covers the application of Maxwell's equations to optical waves and media. Topics include polarization, dispersion, geometrical optics, interference, partial coherence, and diffraction. Prereq., ECEN 3140 or equivalent.

**ECEN 5166-3. (C) Guided Wave Optics.** Builds up the concepts necessary to understand the guided wave optical systems of today and those proposed for the future. Topics covered include semiconductor lasers, fiber optics, integrated optics, and bistability. Prereqs., ECEN 5045 and ECEN 5156.

**ECEN 5606-3. (O) Optical Laboratory 1.** Consists of seven optical experiments covering spatial and temporal coherence, interferometry, diffraction, matched filtering and holography. Optical sources used in the laboratory range from lamps to dye lasers. Prereq., consent of instructor.

**ECEN 5616-3. (O) Optoelectronic System Design.** Treats optics, optical systems, and electro-optical devices with the goal of integrating optical and electro-optical devices into optoelectronic systems. System design

is covered with emphasis given to resolution, field of view, signal-to-noise ratio, speed of operation, and other system constraints. Prereqs., ECEN 3144, 4242, and 5606.

**ECEN 5686-3. (C) or (O) Optical Communication Systems.** Analysis and design of optical communication systems. Free-space, fiber-optic, and turbulent atmospheric channels; modal representation of random fields. Coherent and incoherent sources; modulation methods. Modeling and statistical analysis of photodetectors; poison and related processes; thermal and shot noise. Direct and heterodyne detection; analog and digital transmission; signal-to-noise ratios; error probabilities. System optimization. Prereqs., ECEN 3140 and 4242, or consent of instructor.

**ECEN 5696-3. (C) or (O) Fourier Optics and Optical Computing.** Topics covered include holography, Fourier transform properties of lenses, two-dimensional convolution and correlation functions, spatial filtering. Also covers coherent and incoherent imaging techniques, tomography and synthetic aperture radar. Prereqs., ECEN 3140 and 3310. Recommended prereq., ECEN 5606.

## Power

**ECEN 4167-3. (P) Energy Conversion 2.** Derivation of the dynamic equations of motion of electromechanical systems; e.g., relays, transducers, loudspeakers and microphones, linear and rotary motion machines based on variational principles and basic force laws (e.g., Newton's law, Kirchoff's laws, etc.). Equivalent circuits in abc and dqo coordinates for AC and DC machines. The conditions under which an electromagnetic torque can be produced are discussed. The theory is applied to the most important modes of steady-state and transient operation of electrical energy converters. Prereq., ECEN 3170 or equivalent.

**ECEN 4517-2. (P) Power Laboratory 1.** Basic concepts concerning electromagnetic energy conversion principles as related to practical devices. An overview of magnetics, transformers, and rotating machinery. Measurement techniques in power circuits are emphasized. Prereq. or coreq., ECEN 3170.

**ECEN 4527-2. (P) Power Laboratory 2.** Experimental investigations of the design and operating characteristics of synchronous machines, induction machines, transformers, power rectifiers, single-phase machines, and three-phase systems and measurements. Prereqs., ECEN 3170 and 4517.

**ECEN 4537-2. (P) Power Systems Laboratory.** Emphasis is placed upon analysis and operation of power systems and interactions of power equipment under dynamic conditions. Transient phenomena of rotating machines. Prereqs., ECEN 3170 and 4517.

**ECEN 5707-3. (P) The Nature of Polyphase Induction Machines.** Parameters of the equivalent circuit, operational behavior of induction machines, influence of design parameters on performance characteristics, space and time harmonics, effect of variable

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frequency supplies and application of inverter supplies to induction machines, noise production. Prereq., ECEN 3170.

**ECEN 5717-3. (P) Energy Systems Analysis**

1. Transmission line constants, including details of GMD methods, skin effect. Analysis of balanced and unbalanced line using distributed parameters, energy flow from circle diagram approach, traveling-wave phenomena, stability. Prereqs., ECEN 3130 or equivalent, and ECEN 3170 or equivalent.

**ECEN 5727-3. (P) Energy Systems Analysis**

2. Application of symmetrical components to faults on transmission systems, determination of system constants, introduction to modern methods of network analysis, measurement of sequence quantities, relaying philosophies, and power-flow studies. Prereq., ECEN 3170.

**ECEN 5747-3. (P) Synchronous Machines.**

Review of equivalent circuit of synchronous machines in abc and dqo coordinates; phasor diagram; steady-state, transient and subtransient operating conditions; calculation and physical interpretation of reactances; application of theory to various short circuits, synchronizing out-of-phase, damping torques, hunting, governor action, starting, etc.; discussion of standard test procedures. Prereq., ECEN 3170.

**ECEN 5757-3. (P) Energy Systems Stability**

1. Transient, dynamic and steady-state stability limits of energy transmission systems; dynamic models of synchronous machines; excitation systems; motor loads. Prereq., ECEN 4167, 5717, or consent of instructor.

**ECEN 5767-3. (P) Power Distribution Systems.**

Use of per unit methods to find transient voltage behavior of industrial power systems due to motor starting, spot welders, etc. System and device responses due to series and shunt capacitors and problems of subharmonic and over-excitation on induction motors. Prereqs., ECEN 2160 and 3170, or consent of instructor.

**ECEN 5777-3. (P) Power System Protection.**

Concepts of power system operation and the use of R-X diagrams in selection of protection needs. Comparison of electromechanical and static protection systems. Review of problem areas such as system stability, loss-of-excitation, and EHV line protection. Prereqs., ECEN 2160 and 3170, or consent of instructor.

**ECEN 5787-3. (P) Electromagnetic Fields in Electrical Devices.**

Topics include two- and three-dimensional finite difference and finite element formulations as applied to magnetic fields in nonlinear electric devices; discussion of nonlinear partial differential equations; representation of magnetization characteristics for isotropic and anisotropic steels; review of iterative and direct solution methods of the system of finite difference equations; and others. Prereq., ECEN 3170.

**ECEN 5797-3. (P) Power Electronics 1.**

An introduction to the use of repetitively-switched electronic circuits for the conversion and regulation of electrical power. The basic converters and their steady-state analysis. Dynamic modeling and analysis using

the state-space averaging method. Fundamentals of inductor, transformer, and semiconductor switch design. Prereqs., ECEN 3170, 3230, or consent of instructor.

**ECEN 5807-3. (P) Power Electronics 2.**

Advanced topics of current interest in the power electronics field: control of power converters, the current-programmed mode, the series and parallel resonant converters, resonant switch converters, and three-phase switched-mode converters. Prereq., ECEN 5797.

## Systems and Electronics

**ECEN 4138-3. (S) Control Systems Analysis.**

Modeling of dynamic systems for electrical, chemical, hydraulic, and mechanical systems using block diagrams and signal flow graphs. Comparison of open and closed-loop configurations. Stability studies using Nyquist, Bode, and root locus methods. Effects of simple networks on system response. Introduction of state variable techniques and digital computer solutions. Prereqs., senior standing with background of Laplace transforms, linear algebra, and ordinary differential equations; ECEN 2150, and ECEN 3310.

**ECEN 4228-3. (E) Electronics 4.** Includes D/A and A/D converters, analog filters, simulated elements such as gyrators, ladders, switched capacitor filters, characteristics of noise, and device noise. Prereq., ECEN 3230.

**ECEN 4458-2. (P) Process Control Laboratory.**

An on-line control scheme in real time for a DC generator is designed, built, and tested, first using analog controls, then an HP9845 computer. Effects of noise, derivative control, aliasing, logging, and A/D and D/A conversions are investigated. Prereqs., ECEN 3310 and senior standing.

**ECEN 4618-2. (E) Advanced Electronics Laboratory.**

Lab. Includes experimental work with logic gates, oscillators, operational amplifiers, phase-locked loops, A/D and D/A converters, and radio-frequency circuits. Several design projects are included. Prereqs., ECEN 3230 and 3530.

**ECEN 5418-3. (S) Automatic Control Systems 1.**

Centers around the analysis and synthesis of linear control systems. Covers issues of modeling, analysis, and design. The study of modeling includes state models and transfer functions. In analysis, the emphasis is on stability, sensitivity, transient performances, and computer-aided methods. Design issues occupy two-thirds of the course. They include lead-lag compensation and optimal regulator designs. Use of computers is emphasized. Prereqs., ECEN 3320 and 4138.

**ECEN 5438-3. (S) Nonlinear Control Systems 1.**

Analysis and synthesis of nonlinear control systems. Linearization and stability in the small-phase plane analysis, describing function. Stability in the large Lyapunov function and the Popov stability theory. Prereq., ECEN 4138.

**ECEN 5448-3. (S) Advanced Linear Systems.**

State space approach to analysis and synthesis of linear systems, state transition matrix, controllability and observability, system transformation, minimal realization,

state feedback and pole assignment, design of state observer, and analysis and synthesis of multi-input, multi-output systems. Prereqs., ECEN 3310 and 4138.

**ECEN 5458-3. (S) Sampled-Data and Digital Control Systems 1.**

Analysis and synthesis of discrete-time systems. Sampling theorem, and sampling process characterization, z-transform theory and z-transfer function, stability theory. Data converters (A/D & D/A). Dead-beat design, digital controller design. Prereqs., ECEN 3310 and 4138.

**ECEN 5468-3. (E) Network Synthesis 1.**

The complex frequency variable, one- and two-port network realization techniques using pole-zero approach to produce specified behavior as a function of frequency, approximation methods, use of the potential analog, introduction to active synthesis with particular emphasis on low sensitivity to element variance. Prereqs., APPM 2360 and ECEN 3230.

**ECEN 7418-3. Optimal Control Theory.**

Formulation of optimal control problems, performance index; the variational approach to optimal control problems; Pontryagin's maximum principle; Bellman's dynamic programming; the principle of optimality; the Hamilton-Jacobi equation; computational methods; the steepest descent method, variation of extremals, quasilinearization; and gradient projection., etc. Prereq., ECEN 5448.

**ECEN 7428-3. Learning and Adaptive Systems.<sup>1</sup>**

System identification theory; adaptive systems subject to deterministic and random inputs and disturbances, sensitivity analysis; parameter variation problems; learning systems. Prereq., ECEN 5448.

**ECEN 7438-3. Theory of Nonlinear Systems.<sup>1</sup>**

Similar to ECEN 5438 except at a more advanced level and with more topics covered: limit cycles, functional analysis approach to input-output stability, analysis and synthesis of time-varying systems, feedback linearization and its applications, bang-bang control. Prereqs., ECEN 5418 and 5448.

**ECEN 7458-3. Sampled-Data and Digital Control Systems 2.<sup>1</sup>**

An advanced study of the theory of discrete-time systems. Discrete-time control system stability and stochastic processes is treated in depth. Prereq., ECEN 5458.

## VLSI CAD Methods

**ECEN 4019-3. (V) Physical Design Automation for VLSI.**

Topics discussed include VLSI chip design methodologies (custom, gate arrays, standard cells, PLA's); and theory, use and limitations of design automation tools for synthesis, placement, and routing. Prereqs., competence in lower-level calculus and circuit theory, introductory programming, and permission of the instructor.

**ECEN 4029-3. (V) Functional Design Automation for VLSI.**

Topics discussed include the basic theory and use of simulation tools at the circuit, switch, timing (relaxation based), logic and functional levels. The course also presents the basic ideas behind

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test generation (including the D algorithm), and fault simulation (including concurrent fault simulation). Prereq., ECEN 2220.

**ECEN 5019-3. (V) VLSI Theory and Parallel Computation.** Topics include: (1) theory of VLSI computation, including VLSI models, synthesis layout techniques and fundamental tradeoffs and layout techniques; (2) parallel computation on fixed connection VLSI networks such as arrays, trees, hypercubes, etc.; and (3) related topics, such as design automation, design for testability and three-dimensional models. Prereq., CSCI 2250 or consent of instructor.

**ECEN 5029-3. (V) Simulation Tools for VLSI Systems.** The foundations of VLSI simulation—numerical analysis, linear algebra, data structures, language theory, and digital and analog circuits—are developed. Students, in teams, write simulation packages. Simulation from the switch level to the behavioral level, including fault simulation, is covered. Prereq., ECEN 4029, background in numerical analysis, linear algebra, programming, or consent of instructor.

**ECEN 5039-3. (V) Synthesis of VLSI Systems.** Covers two-level and multilevel minimization, optimization via expert systems, algebraic and Boolean decomposition, layout methodologies, state assignment, encoding and minimization, silicon compilation. Prereqs., general proficiency in discrete mathematics and programming and ECEN 4703.

## ENGINEERING MANAGEMENT

**EMEN 5010-3. Introduction to Engineering Management.** The first course in the new degree program in Engineering Management. Provides a base for assisting engineers in becoming more effective managers. Topics include the company as a business; management as a profession; strategic planning and marketing; research, development, and design; product life cycle; manufacturing as a strategic tool; planning, budgeting, and control; organization and personnel management; and leadership functions of the engineering manager.

**EMEN 5020-3. Financial Accounting for Engineers.** Designed to familiarize the engineer with the basic financial statements used in business. Investment analysis, modeling of the enterprise, and financial structures are discussed as are the effects of taxation and inflation.

**EMEN 5030-3. Project Management Systems.** Presents the basic tools required to manage a wide variety of programs—product development, software development, process development, and government projects. Systems engineering concepts and computer decision aids are included. Students apply tools to a representative project. Topics include production planning, scheduling and control techniques, work structures, CPM/PERT, resource allocation, cost control, and earned value systems.

**EMEN 5040-3. Productivity and Quality in Modern Manufacturing.** The fourth core EMEN course, which may apply to one of the technical engineering degrees. Provides

students with the background to understand the need for and application of the new concepts and techniques required in competitive, efficient manufacturing today. Topics include the development of manufacturing as a strategic resource (technology, vertical integration, German and Japanese approaches); manufacturing control (cost systems, product cost analysis); material requirements planning; Just-in-Time (JIT) systems; quality theory and implementation; reliability process variability; statistical quality control; information systems; and human and organizational aspects.

## ENGINEERING—NONDEPARTMENTAL COURSES

**GEEN 1010-2. Engineering Drawing.** Beginning engineering drawing; use of instruments, orthographic projection, pictorial drawing, sections, dimensioning, and working drawings.

**GEEN 1300-3. Introduction to Engineering Computing.** Introduction to the use of computers in engineering problem solving, processing of data, and presentation of information. Emphasis on use of personal computers. Use of BASIC, FORTRAN, and packaged software such as word processors, spreadsheets, and networking to host computers.

**GEEN 1710-1. Freshman Seminar 1.** A seminar in which new college freshmen are introduced to select faculty in an informal environment. Faculty introduce academic specialties, areas of research, and seminar topics of student interest. Only Pass/Fail grades are awarded.

**GEEN 1720-1. Freshman Seminar 2.** A continuation of the Freshman Seminar 1 program. Only Pass/Fail grades are awarded.

**GEEN 3160-2. Writing: A Basic Engineering Tool.** Instruction and practice in the process of writing. Emphasis on communication value of writing. Peer review and personal writing projects encouraged. Prereq., junior standing.

**GEEN 4050/5050-3. Science Communication Seminar.** Study and practice of public interest writing in science and technology. Presentation of research data to lay or non-specialist audiences. Practice through writing, oral presentations, and discussion with those engaged in public interest science.

## MECHANICAL ENGINEERING

### Math

**MCEN 1020-3. Analytical and Computational Tools.** Introduction to vector analysis and personal computers as engineering workstations. Students become familiar with operating systems, programming languages, word processing, and spreadsheets in order to solve engineering problems and write reports.

**MCEN 3020-4. Mathematical Methods.** Selected mathematical methods widely used in engineering. Cartesian tensors; Fourier series; Fourier and Laplace transforms; complex variables and contour integration; eigenvalue problems. Both theory and applications are addressed. Prereq., APPM 2360.

**MCEN 3040-3. Computational Methods.** Numerical techniques for the solution of commonly encountered engineering problems. Methods for solving algebraic, ordinary, and partial differential equations; curve fitting; numerical integration; optimization. Course involves extensive computer usage. Prereq., MCEN 3020.

**MCEN 4120-3. Engineering Statistics.** Probability and statistics with emphasis on engineering applications. Frequency distributions; statistical hypotheses and estimation; non-parametric, linear regression and correlation; nonlinear and multiple regression; analysis of variance; quality control. Prereq., APPM 2360.

**MCEN 5120-3. Methods of Engineering Analysis 1.** Selected topics from linear algebra, ordinary differential equations, and Fourier series. Computer exercises are assigned. Content is correlated with analysis topics in other Mechanical Engineering graduate courses, and emphasizes applications. Prereq., APPM 2360 or equivalent.

**MCEN 5130-3. Methods of Engineering Analysis 2.** Selected topics from the theory of complex variables, integral transform methods, partial differential equations, and variational methods. Computer exercises are assigned. Content is correlated with analysis topics in other Mechanical Engineering graduate courses, and emphasizes applications. Prereq., MCEN 5120 or equivalent.

**MCEN 5160-3. Operations Research.** Formulation of algorithms for linear programming and network problems. Sensitivity and duality; introduction to dynamic optimization models; applications to problems in production, manufacturing, and management. Prereq., MCEN 3030 or equivalent.

**MCEN 7120-3. Perturbation Methods.** Regular and singular perturbation methods for solving ordinary and partial differential equations and for evaluating integrals. Emphasis is placed on the formulation of mathematical models in fluid mechanics, combustion, heat transfer, dynamics, solid mechanics, and wave propagation. Prereqs., MCEN 5120 and 5130, or equivalent.

### Fluids

**MCEN 3021-3. Fluid Mechanics.** Fundamentals of fluid flow with application to engineering problems. Fluid statics and kinematics; conservation equations for mass, momentum, and energy; Bernoulli and Euler equations; potential flow; laminar and turbulent viscous boundary layers; laminar and turbulent pipe flow; compressible fluid flow. Prereq., APPM 2360; coreq., MCEN 3020.

**MCEN 4121-3. Fluid Mechanics Laboratory.** One lect. and 6 hours of lab work per week. Modern methods in fluid-flow visualization and measurement. Experiments cover low Reynolds number drag, pipe transition flow,

shock waves, fluid slashing, fluid spin-up, vortex rings, capillary waves, Taylor-Couette instabilities, and double diffusion. Prereq., MCEN 3021.

**MCEN 5121-3. Introduction to Fluid Dynamics.** (ASEN 5051.) Physical properties of gases and liquids, and kinematics of flow fields. Analysis of stress; viscous, heat-conducting Newtonian fluids; capillary effects and surface-tension-driven flow. Vorticity and circulation; ideal fluid flow theory in two and three dimensions; Schwartz-Christoffel transformations; free streamline theory; internal and free-surface waves. Coreq., MCEN 5120 or equivalent.

**MCEN 5141-3. Viscous Flow.** (ASEN 5021.) Exact solution of Navier-Stokes equations and fundamentals of rotating fluids. Low Reynolds number flow; similarity solutions; viscous boundary layers, jets, and wakes; unsteady viscous flow. Prereq., MCEN 5121 or equivalent.

**MCEN 5161-3. Compressible Flow.** Energy, continuity, and momentum principles applied to compressible flow. Normal and oblique shocks; Prandtl-Meyer expansion; methods of characteristics; one-, two-, and three-dimensional subsonic, supersonic, and hypersonic flows. Prereq., MCEN 5121 or equivalent.

## Thermal

**MCEN 2022-3. Engineering Thermodynamics 1.** Fundamental concepts and basic theory. First and second laws of thermodynamics; properties; states; thermodynamic functions; cycles; mixtures; chemical and phase equilibrium. Prereq., APPM 2350; coreq., APPM 2360.

**MCEN 3022-3. Heat Transfer.** Fundamentals of heat transfer by conduction, convection, and radiation. Applications to heat exchangers, solar panels, boiling and mass transfer. Numerical methods for solving heat transfer problems. Design of engineering equipment involving heat transfer processes. Prereq., MCEN 2022 and 3021.

**MCEN 4122-3. Engineering Thermodynamics 2.** Advanced topics and applications. Thermodynamics of state; entropy and probability; thermodynamic cycles; reacting and nonreacting mixtures. Application to engines and power generation by conventional and alternative energy technologies. Most assignments are design oriented. Prereq., MCEN 2022.

**MCEN 4132-3. Air Conditioning.** Principles of heating, ventilating, and air conditioning. Physical and thermodynamic properties of water vapor and air mixtures; determination of heating and cooling loads; examination of heating and cooling systems. Prereqs., MCEN 2022 and 3042.

**MCEN 4142-3. Refrigeration.** Principles of mechanical refrigeration. Absorption cycles; liquefaction of gases; properties of refrigerants. Thermodynamic analysis of refrigeration systems. Prereq., MCEN 2022 and 3042.

**MCEN 4162-3. Energy Conversion.** Common energy-conversion methods and devices. Power-cycle thermodynamics; turbocompressor and expander processes; combustion

systems; applications and limitations of direct energy-conversion systems. Prereq., MCEN 2022.

**MCEN 4182-3. Combustion Phenomena.** Application of multicomponent fluid equations of motion and chemical thermodynamics to a variety of combustion problems. Droplet combustion; premixed and diffusion flames; boundary layer combustion; detonation wave theory; topics related to internal combustion engines; liquid and solid rockets. Prereqs., MCEN 2022 and 3021.

**MCEN 4192-3. Nuclear Engineering.** (ASEN 4023.) Elements of atomic and nuclear processes. Basic concepts of reactor theory, design, and operation. Prereq., MCEN 2022; coreq., MCEN 4162.

**MCEN 5122-3. Macroscopic Thermodynamics.** (CHEN 5380.) Axiomatic presentation of the fundamentals of classical thermodynamics. Energy, work, and heat; the First Law; equilibrium; reversible and irreversible processes; entropy production and the Second Law. Applications to stability, phase equilibrium, electric and magnetic work. Irreversible thermodynamics and the Onsager reciprocal relations. Prereq., MCEN 2022 or equivalent.

**MCEN 5142-3. Statistical Thermodynamics.** (CHEN 5280.) Introduction to the molecular interpretation and calculation of the thermodynamic properties of matter. Thermodynamic probability; distribution functions; Schrödinger wave equation and solutions; ensemble theory. Applications to ideal and real gases, solids, liquids, radiation, conduction electrons, and chemical equilibrium. Prereq., MCEN 2022 or equivalent.

**MCEN 5162-3. Heat Transfer 1.** (CHEN 6270.) Development of the equations governing transport of heat by conduction and radiation. Analytical and numerical solution of boundary and initial value problems representative of heat conduction in solids. Radiation properties of solids, liquids, and gases; transport of heat by radiation. Prereq., MCEN 3042 or equivalent; coreq., MCEN 5120 or equivalent.

**MCEN 5172-3. Heat Transfer 2.** (CHEN 6280.) Development of the equations governing transport of heat in moving fluids. Description of heat transfer in free and forced convection, including laminar and turbulent flow. Investigation of parameters appearing in heat-transfer correlations. Analytical and numerical solution methods for internal and external heat-transfer problems. Prereq., MCEN 5121 or equivalent; coreq., MCEN 5130 or equivalent.

## Solids

**MCEN 2023-3. Mechanics of Particles.** Static and dynamic behavior of a single particle and a system of particles. Free-body diagrams; force and moment resultants; equilibrium states; kinematics and kinetics; momentum, impulse, energy, and work; friction, collision, and vibration. Both Newtonian and analytical mechanics are covered. Homework assignments include computer exercises documented by written reports. Coreq., APPM 2350.

**MCEN 2043-3. Mechanics of Rigid Bodies.** Static and dynamic behavior of rigid bodies. Free-body diagrams, distributed forces, area and mass moments of inertia, two- and three-dimensional kinematics and kinetics, momentum, impulse, energy, work, collision, and vibration; both Newtonian and analytical mechanics are covered. Homework assignments include computer exercises documented by written reports. Prereq., MCEN 2023; coreq., APPM 2360.

**MCEN 3023-4. Mechanics of Deformable Bodies.** Static and dynamic behavior of deformable bodies. Components of mechanics analysis; stress and strain; linear and nonlinear material behavior; statics of frames, trusses, cables, bars, shafts and beams; vibration of and wave propagation in slender members. Homework assignments include computer exercises and a design project. Prereqs., MCEN 2043 and 3020; coreq., MCEN 3030.

**MCEN 4123-3. Vibration Analysis.** Free and forced vibration of discrete and continuous systems. Lagrange's equation, Fourier series, and Laplace transforms; matrix and computational methods. Application to practical engineering problems. Prereq., MCEN 3030.

**MCEN 4143-4. Advanced Dynamics.** Kinematics and kinetics of a rigid body. Principal axes and moments of inertia; angular momentum. Conservative systems, non-conservative systems; Lagrange and Euler equations. Prereq., MCEN 2043.

**MCEN 5123-3. Introduction to Continuum Mechanics.** Fundamental concepts and basic theory. Cartesian tensor notation. Deformation, strain, strain rate, and compatibility. Fundamental balance laws of mass, momentum, energy, and entropy; invariance requirements. Constitutive equations for elastic, viscoelastic, and plastic materials; ideal, compressible, and viscous fluids. Beltrami-Mitchell and Navier-Stokes equations. Prereq., MCEN 3023 or equivalent; coreq., MCEN 5120 or equivalent.

**MCEN 5143-3. Theory of Elasticity.** Basic equations of the linear theory of elasticity. St. Venant torsion and flexure; plane strain, plane stress, and generalized plane stress. Application of conformal mapping; the Fourier transform; variational principles. Prereq., MCEN 5123 or equivalent.

**MCEN 5163-3. Dynamics.** Elements of vector analysis; particle motion; kinematics of a rigid body; rotating axes; rigid body motion; Euler's equations. Introduction to analytical mechanics; Hamilton's principle, Lagrange's equations for holonomic and nonholonomic systems. Prereq., MCEN 2043 or equivalent; coreq., MCEN 5120 or equivalent.

**MCEN 5183-3. Theory of Vibration.** Deterministic vibratory motion of mechanical systems. Free, forced-harmonic, forced-periodic, and forced-transient vibration of single-degree-of-freedom, multiple-degree-of-freedom, and continuous systems. Hamilton's principle and Lagrange's equation. Use of calculus of variations, matrix algebra, Fourier series, Fourier and Laplace transforms, and computational methods. Prereqs., MCEN 3023 and 5120, or equivalents; coreq., MCEN 5130 or equivalent.



**MCEN 7123-3. Advanced Theory of Elasticity.** Variational principles and three-dimensional solutions. Concentrated and line loads in complete and half spaces: problems of Kelvin, Boussinesq, and Mindlin. Transform techniques; contact stresses; anisotropic and nonlinear elasticity; thermoelastic problems. Prereq., MCEN 5133 or equivalent.

**MCEN 7163-3. Theoretical Dynamics.** Tractable problems of particle and rigid body dynamics. Dissipative and nonholonomic systems; the principle of least action; the Hamilton-Jacobi equation; geometric theory; Liapunov's method. Prereq., MCEN 5120, 5130, and 5173, or equivalents.

**MCEN 7183-3. Dynamics of Continuous Media.** (PHYS/GÉOL 6680.) Derivation of wave equations from the basic equations of dynamic elasticity. Propagation of elastic waves in infinite and partially bounded media; Rayleigh waves and Love waves; Pochhammer solution for a rod; waves in plates and in layered and anisotropic media. Prereqs., MCEN 5120, 5130, and 5133, or equivalents.

## Materials

**MCEN 3024-4. Introduction to Materials Science.** Structure, properties, and processing of metallic, polymeric, ceramic, and composite materials. Perfect and imperfect solids; phase equilibria; transformation; kinetics; mechanical behavior; material degradation. Approach incorporates both materials science and materials engineering components. Prereqs., MCEN 2022 and PHYS 2130.

**MCEN 4124-3. Mechanical Behavior of Materials.** Relationship between material structure and the fundamental processes of deformation, yield and fracture. Elements of elasticity theory; introduction to plasticity; formulation of failure criteria. Basic deformation processes in terms of dislocation mechanics and macroscopic mechanical behavior. Influence of compositional and processing strengthening mechanisms on mechanical properties. Prereqs., MCEN 3024 and 3023.

**MCEN 5114-3. Materials Science I: Principles.** Unified presentation of the scientific principles applicable to all materials systems. Concepts of material structure from localized interatomic bonding to short- and long-range order in crystalline and non-crystalline solids; the nature and consequences of imperfections in solids; phase equilibria; transformation kinetics. Metallic, polymeric, and ceramic materials are considered. Prereq., MCEN 3024 or equivalent.

**MCEN 5124-3. Materials Science 2: Behavior.** Application of the principles of materials science developed in MCEN 5114 to the study of the physical and mechanical behavior of metals, polymers, ceramics, and their composites. Structure-property relationships; use of primary and secondary processing steps to control material behavior; influence of environment on in-service performance. Prereq., MCEN 5114 or equivalent.

**MCEN 5134-3. Yield-Limited Behavior of Materials.** Analysis of material behavior

within the "elastic range," with emphasis on the phenomenon of yield and factors that influence it. Elements of elasticity theory; theory of dislocations; strengthening mechanisms in solids; time-dependent but reversible (inelastic) deformation. Presentation of engineering case studies to augment various topics. Prereq., MCEN 4124 or 5124, or equivalent.

**MCEN 5144-3. Plasticity and Creep.** Inelastic deformation of materials such as metals, alloys, glasses, composites, polymers, etc., from the phenomenological and structural point of view. The yield surface and associated flow laws; isotropic and kinematic work-hardening. Case studies of plastic and creep deformations in engineering materials. Prereq., MCEN 4124 or 5124, or equivalent.

**MCEN 5154-3. Theory of Inelastic Materials.** Mathematical theory of linear viscoelasticity; discrete element models; solutions of boundary-value problems in linear viscoelasticity; non-Newtonian flow. Selected topics in nonlinear material behavior. Prereq., MCEN 5123 or equivalent.

**MCEN 5164-3. Fracture.** Basic mechanisms controlling fracture in brittle materials. Reduction of capacity for plastic deformation in engineering materials used at high-strength levels. Selection of materials in terms of toughness as well as strength. Prereq., MCEN 4124 or 5124, or equivalent.

**MCEN 5184-3. Structure and Properties of Polymers.** Introduction to the fundamental aspects of polymer science. Relationship between molecular structure and polymeric properties. Polymer bonding; crystallinity; physical states and transitions; rubber elasticity; yield and fracture behavior; linear viscoelasticity. Prereq., MCEN 4124 or 5124, or equivalent.

## Design

**MCEN 1025-3. Computer-Aided Drawing and Fabrication.** Basic techniques in mechanical drawing and subsequent transformation into a product. Pictorial representation (orthographic projection, isometric views, dimensioning, work drawings); computer-aided drafting; computer-aided manufacturing. Design/manufacturing project involves the use of CAD software and a CNC machine. Prereq., MCEN 1020 or CSCI 1200 or CSCI 1700.

**MCEN 4025-3. Component Design.** Application of mechanics, thermal science, and materials science analysis to design. Detailed design of various machine components including shafts, bearings, gears, brakes, springs, and fasteners. Emphasis on application and open-ended design problems. Computers are extensively used. Prereq., MCEN 3043.

**MCEN 4045-3. Mechanical Design Project.** A capstone mechanical design experience. Problem definition and specifications; alternative design concepts; model development and analysis; production of engineering drawings on a CAD system; fabrication; testing and evaluation. Students make an oral presentation of the final design and prepare

a written report. Prereq., MCEN 4025; coreq., MCEN 4075.

**MCEN 4065-3. Design Estimating.** Economic aspects of design. Labor and material analysis; operation estimating; accounting and forecasting; product/project cost estimating. Computer-based optimization and design documentation. Students learn to estimate the merit of a design in both engineering and business terms. Project reports required. Coreq., MCEN 4035.

**MCEN 4125-3. Introduction to Computer-Aided Design.** Review of computer languages, programming, and special requirements. Linear and nonlinear programming; matrix methods and numerical techniques; constraints; simulation; graphical displays; optimization methods. Application to design of mechanical systems. Prereqs., MCEN 1020 or CSCI 1700, and APPM 2360.

**MCEN 4145-3. Computer-Aided Thermal Design.** Computational analysis of thermodynamic cycles; compressor, expander, and heat-exchanger component design; team design project in solar power, heating, or cooling system; oral and written reports required. Prereqs., MCEN 2022 and 3042.

**MCEN 4165-4. Mechanisms Design.** Analysis and synthesis of two- and three-dimensional kinematic systems. Planar motion; linear and angular velocity and acceleration; relative velocity; instantaneous centers; Kennedy theorem. Four-bar linkage, coupler curves. Three-dimensional motion; finite rotation; Chasles' theorem. Geometric and algebraic methods for generating specified motions. Prereq., MCEN 2043.

**MCEN 4185-3. Human Factors Engineering.** Limitations on the engineering design of products, machines, and man-machine systems and environments due to physiological and psychological factors. Man-machine relationships; motor activities; work and workplace design; occupational safety; human reliability. Prereq., senior standing.

## Manufacturing and Systems

**MCEN 3026-3. Control Systems.** (ASEN 3024.) Classical and state-space analysis of mechanical, electrical, fluid, and thermal systems. Mathematical models; linearization; transfer functions and vector inversion; signal flow graphs; root locus and Bode diagrams; stability and compensation; use of a simulation language. Prereq., MCEN 3020.

**MCEN 4026-4. Manufacturing Processes and Systems.** Manufacturing processes for metals, polymers, ceramics, and composites, as well as manufacturing systems that integrate these processes. Forming and cutting, joining and assembling; process integration; inventory control; information handling; system management; system simulation and optimization. Prereq., MCEN 1025, 3024, and 3026.

**MCEN 4146-3. Computers in Manufacturing.** Design, creation, testing, and operation of computer models for manufacturing, production, and management. Renewal processes; statistical validation and simulation; policy comparison and manufacturing;

optimization and decision making. Prereq., MCEN 1020 or CSCI 1200 or CSCI 1700.

**MCEN 4166-3. Robotics.** Design principles of robot manipulators. Grippers; control systems; sensing techniques; robot applications. Prereq., MCEN 2043.

**MCEN 4186-3. Production Automation Systems.** Fundamental concepts in modern manufacturing systems. Computer control of production machinery; automated vs. manual operations; process variability; cost analysis; risk assessment. Prereq., MCEN 1020 or CSCI 1200 or CSCI 1700.

## Miscellaneous

**MCEN 3027-3. Measurements Laboratory.** One lect. and 6 hours of lab work per week. Principles of engineering measurements. Methods and transducers for measuring various physical quantities such as temperature, pressure, flow rate, strain, and vibration. Analysis of experimental data; accuracy, error, and uncertainty. Prereqs., MCEN 2022, APPM 2360, and PHYS 2130; coreq., ECEN 3030.

**MCEN 4027-3. Mechanical Engineering Laboratory.** One lect. and 6 hours of lab work per week. Groups of students participate in laboratory projects that extend over several weeks. Experiments are taken from solid mechanics, fluid mechanics, thermal science, and materials science. Emphasis is on planning an experiment, applying sound experimental procedures, keeping proper records, and communicating results orally and in lab reports. Includes a library research project which is presented orally to the class. Prereqs., MCEN 2022, 3023, and 3027.

**MCEN 4147-3. Engineering Economy.** Application, by engineers, of economic and financial principles to capital investment. Emphasis is on life-cycle costing as a design criterion to minimize total cost of service in long-term projects. Calculation of annual costs, present worth, and prospective return on investment. Prereq., senior standing.

**MCEN 4167-3. Engineering Management.** Relationship of the engineer to functions and decisions of management. Design of organization systems; project administration; audit and evaluation for optimum use of resources; leadership; performance; innovation; decision making. Emphasis on case studies and individual development. Seminar format. Prereq., senior standing.

**MCEN 4187-2. Legal Aspects of Engineering Practice.** Professionalism in engineering and the canons of ethics. Legal system; law of contracts; torts; agency; property; sales; business associates; negotiable instruments; patent protection. Prereq., senior standing.

**MCEN 4197-1. Senior Seminar.** Presentation of a broad range of professional opportunities available to graduating seniors through discussions with practicing engineers. Prereq., senior standing.

**MCEN 5027-0. Graduate Seminar.** Weekly presentations by visiting speakers, faculty, and students.

**MCEN 5147-3. Advanced Engineering Economy.** Economic analysis incorporating probabilistic methods: present worth; return on investment; risk assessment; interdisciplinary aspects. Prereq., MCEN 4147.

## Special Topics

**MCEN 1208 through 1298 (1-3). Special Topics in Mechanical Engineering.** Subject matter to be selected from topics of current interest. Credit to be arranged. Prereq., consent of instructor.

**MCEN 2208 through 2298 (1-3). Special Topics in Mechanical Engineering.** Subject matter to be selected from topics of current interest. Credit to be arranged. Prereq., consent of instructor.

**MCEN 3208 through 3298 (1-3). Special Topics in Mechanical Engineering.** Subject matter to be selected from topics of current interest. Credit to be arranged. Prereq., consent of instructor.

**MCEN 4208 through 4298 (1-3). Special Topics in Mechanical Engineering.** Subject matter to be selected from topics of current interest. Credit to be arranged. Prereq., consent of instructor.

**MCEN 4848 through 4898 (1-6). Independent Study.** Subjects arranged in consultation with undergraduate advisor to fit the needs of the particular student. Prereq., senior standing.

**MCEN 5208 through 5298 (1-4). Selected Topics.** Credits and subject matter to be arranged.

**MCEN 5848 through 5898 (1-6). Independent Study.** Available only through approval of graduate advisor. Subjects arranged to fit the needs of the particular student. Prereq., graduate standing.

**MCEN 6208 through 6298 (1-4). Selected Topics.** Credits and subject matter to be arranged.

**MCEN 6848 through 6898 (1-6). Independent Study.** Available only through approval of graduate advisor. Subjects arranged to fit the needs of the particular student. Prereq., graduate standing.

**MCEN 7208 through 7298 (1-4). Selected Topics.** Credit and subject matter to be arranged.

**MCEN 7848 through 7898 (1-6). Independent Study.** Available only through approval of graduate advisor. Subjects arranged to fit needs of the particular student. Prereq., graduate standing.

## Thesis

**MCEN 6949-variable credit. Master's Degree Candidacy.**

**MCEN 6959-variable credit. Master's Thesis.**

**MCEN 8999-variable credit. (16-24 maximum.) Doctor's Thesis.**

## TELECOMMUNICATIONS

**TLEN 5040-3. Engineering Economy.** See MCEN 4147.

**TLEN 5110-3. Contemporary Issues in Telecommunications Policy.** Lectures, selected readings, and class discussions of major issues in telecommunications policy. A multidisciplinary approach is stressed and basic values and goals for telecommunications policy making are explored. The existing policy structure is reviewed briefly and critiqued. Topics are drawn from all areas of telecommunications policy—mass communications, common carrier, and spectrum management.

**TLEN 5200-3. Computers in Telecommunications.** The student learns basic computer architecture (software and hardware) of both general purpose computation machines as well as dedicated telephone switches. Focuses on today's generation of technology (microprocessors, memory subsystems, databases, data processing, communications, etc.) to see how it affects telecommunications systems, office automation, and personal computing. Emphasizes hands-on applications in the laboratory with microcomputers (IBM/PC-DOS) as well as mini-computers (AT&T/UNIX).

**TLEN 5300-3. Introduction to Communication Systems Theory.** Deals with certain fundamentals needed for the program. Required for all participants who do not have a good current grasp of basic concepts related to a range of topics including sine waves, attenuation, power, field strength, physical units, elementary probability, trigonometric functions, logarithms, indices, complex numbers, use of tables, elementary calculus, and geometry. Provides useful review material for engineers and an introductory course for those without a technical background.

**TLEN 5310-3. Telecommunications Systems.** The telecommunications systems currently in use and some of the basic technical concepts of their operation are analyzed. The first portion is also a survey of the system resources available to the telecommunications manager. Included are telephone systems—voice, data, and facsimile; coaxial cable; waveguide; microwave relay—surface and satellite; low-frequency radio—communication, instrumentation, and point-to-point communication; high-frequency radio broadcast, including FM and TV, and point-to-point, including troposcatter and meteor scatter, instrumentation and navigation; and radar.

**TLEN 5320-3. Telecommunications Laboratory.** Gives hands-on experience through individual experiments and demonstrations, including antenna patterns and gain, use of the oscilloscope, modulation methods, time and frequency multiplexing, noise and interference, queueing as simulated by a computer, and a meteorological satellite receiving system. The relevance of such concepts as bandwidth, noise, interference, channel capacity, signal power, etc. is demonstrated.

**TLEN 5330-3. Data Communications 1.** Introductory course in data communications. Defines large segments of terminologies, standards, design considerations and processes, models and systems. Subdivided

into four basic segments which support the interconnection and transmission of digital information. These segments include analog, digital, networks, and protocols. Prereq., one year of calculus and statistics.

**TLEN 5350-3. Trends in Satellite Communication Systems.** Fundamental concepts and parametric design parameters of communication systems. Emphasis is on system through-put, sensitivity and selection of satellite orbit, frequency bands, modulation, coding, multiple-access schemes, on-board switching and processing, anti-jam techniques, and user terminal characteristics. Current and planned commercial and military satellite communication systems are examined and compared to future needs and technologies. Aimed at a fundamental understanding of the design drivers of satellite communication system performance.

**TLEN 5360-3. Telephone Systems.** Gives students an understanding of the technological manifestations, marketplace, and regulatory arenas surrounding today's telephone industry. Switching and transmission system technologies are presented in moderate depth. Principles in traffic theory are explained and applied along with telephone system design and evaluation techniques. Key Systems, PBXs, and modern inside wiring schemes are presented.

**TLEN 5400-3. Traffic and Queuing Theory.** Concerned with analysis of equipment requirements for switched communication systems. Computational methods using tabular and graphical aids and computers are emphasized. Topics covered include traffic concepts, blocking theory, Erlang formulas, delay theory, computational procedures, and computer simulation of traffic problems.

**TLEN 5420-3. Fiber Optics.** Addresses the engineering and cost benefits of optical fiber systems. Discusses and defines the important engineering parameters and applies the parameters to typical systems. Attention is given to certain matters affecting trade and commerce. Limitations and capabilities of certain components are covered. Typical loss budgets and dispersion budgets are analyzed. Cost-benefit analysis is discussed. Some comparison to other communication systems is made.

**TLEN 5430-3. Data Communications 2.** Topics include local area networks, digital telephony, and additional topics of importance at the time such as cryptography and communications protection. For more technically inclined students. Normally follows TLEN 5330. Prereqs., TLEN 5300 and 5310 or equivalents, plus one year of calculus and statistics; programming experience is helpful.

**TLEN 5460-3. Telecommunications Switching Laboratory.** Enables students to study the switching functions and to measure transmission and traffic characteristics on models of the major business communications systems and carrier transmission facilities. Utilizes current commercial PBX equipment in a laboratory setting. This equipment includes an AT&T System-85, a Northern Telecom SL-1, and a Rolm CBX-II.

**TLEN 5470-3. Data and Computer Networks.** Maintains a real-world approach to

the subject of networking computers and other data communications devices that are in use today or have been used in the past. This emphasis is further strengthened through the use of guest speakers from Colorado companies who discuss the nature, history, rationale, and performance of networks used by their companies. Includes both transport networks and the processors and communications software that run with them; covers networks ranging from the simplest transport network to "application" networks like SNA, and deals with operational issues such as the performance monitoring and network management.

**TLEN 5500-2. Cable Television.** Although technical in nature, aimed at breadth rather than depth. Thus, pertinent FCC regulations, local franchising practices, and economic modeling are mentioned in introductory lectures. The bulk of the lectures treat TV signal distribution and interconnection, subscriber terminals, headends and central processors, local origination, and interactive systems (two-way). A term paper, in an applicable area suitable to the student's background, is required and is presented orally to the class.

**TLEN 5510-3. Defense Communications.** Provides an overview of U.S. communication systems and architecture philosophies that support the Department of Defense and the military departments. Topics covered include an overview of the Soviet infrastructure, nuclear effects on U.S. strategic and tactical communication systems, and electronic warfare on telecommunications systems (ECM and ECCM).

**TLEN 5520-2. Telecommunications Standards.** Familiarizes students with the domestic and international standards involved in telecommunications and information processing studies. The development, implementation, and importance of U.S. standards in general are presented, as well as the differences between standards and regulations in the United States. The impact of the information age and related technology on the development of international standards is considered. Special stress is placed on the CCITT and its work on the ISDN.

**TLEN 5600-1. Telecommunications Seminar.** A series of weekly lectures with questions and discussion. Many of the speakers are nationally known experts in telecommunications. The fall and spring seminars are for 1 credit hour each, and attendance is required of all students.

**TLEN 5830-3. Special Topics.** Engineering and business projects, commonly measured in terms of financial efficiency, will seldom achieve maximum success unless they are properly planned and operated with respect to technical, social, and financial requirements. The engineer, as the one most likely to understand the technical requirements, is frequently called on to study technical and financial details of a project and thus provide analysis for a sound managerial decision. Economic analyses primarily involving engineering and technical projects (engineering economy studies) generally include the time value of money (interest), decisions among alternatives, depreciation, capital

budgeting, break-even analysis, tax considerations, and the effects of risk and uncertainty.

**TLEN 5920. Independent Study.**

**TLEN 6940. Candidate for Degree.**

**TLEN 6950. Master's Thesis.**

**TLEN 6960. Telecommunications Project.**

## Cross-Listed Courses

**TLEN 5106-3. The Political System and Telecommunications.** See PSCI 5106.

# College of Environmental Design

## Architecture

**ARCH 4010-6. Architectural Appreciation and Design.** Introduction to basic processes and principles of architectural design to provide the student with a basis for understanding and evaluating architecture. Open to AREN seniors only.

**ARCH 4114-3. History of Environmental Design 1.** Survey of architecture, landscape architecture, urban design, and planning from circa 3000 B.C. to circa 1400 A.D., emphasizing developments in the Western world. Open to nonmajors.

**ARCH 4214-3. History of Environmental Design 2.** Survey of architecture, landscape architecture, urban design, and planning from circa 1400 A.D. to the present, emphasizing developments in the Western world. Open to nonmajors.

**AREN 4035-3, 4045-3. Architectural Structures 1 and 2.** Statics and strength of materials applied to basic structural systems in architecture.

**AREN 4050-3, 4060-3. Environmental Systems for Architecture 1 and 2.** Fundamental systems considerations of water supply management and treatment, wastewater treatment and reuse, power supply and consumption, transportation, land use planning.

## Design

**ENVD 1000-6. Environmental Design and Communication.** An introductory course designed for those intending to major in environmental design. Focuses on the graphic representation of the physical world, specifically of the constructed environment, and on the ability to think graphically as the core of environmental design. The course is based on the philosophy that intervention in the constructed environment is based on the ability to think graphically and nonverbally, i.e., on the ability to represent and manipulate representations of the constructed environment. Open to nonmajors.

**ENVD 2100-6. Environmental Design Studio.** Introduction to design determinants through problems which deal with actual cultural, technical, natural, and contextual influences on the built environment; built

form and site studies through cycles of analysis, programming, and conceptual design.

**ENVD 3200-6. Advanced Environmental Design Studio.** Design studio dealing with problems at an intermediate level of complexity; emphasis is on the interaction of form, use, and multiple values and technologies in conjunction with issues and techniques drawn from other content area courses of the curriculum.

**ENVD 4310-6, 4410-6. Architecture Studio 1 and 2.** A preprofessional studio in architectural design.

**ENVD 4320-6, 4420-6. Planning Studio 1 and 2.** A preprofessional studio in urban and regional planning.

**ENVD 4330-6, 4430-6. Interior Design Studio 1 and 2.** A preprofessional studio in interior design.

**ENVD 4340-6, 4440-6. Landscape Architecture Studio 1 and 2.** A preprofessional studio in landscape architecture.

**ENVD 4350-6. Urban Design Studio.** A preprofessional studio in urban design.

**ENVD 4360-6. Historic Preservation Studio.** A preprofessional studio in historic preservation design.

**ENVD 4910 (1-6). Research Assistant.** By special arrangement with instructor.

## Societal

**ENVD 2001-3. Introduction to Social Science Concepts and Theories.** Critical evaluation of built environments at both the building and the urban scale. Considers how social and individual behavior is reflected in and influenced by the built environment. Open to nonmajors.

**ENVD 3081-3. Human Nature and Environment.** Increases students' awareness of social science methodologies in environmental design by focusing on selected issues relating human nature to the constructed environment.

**ENVD 3091-3. Environment and Behavior.** An examination of the social and behavioral aspects of the relationships between people and the built environment. Special attention is given to antecedent factors (why we have the environments that we do), implications of given arrangements for special population groups, and responses to incongruent environments. Open to nonmajors.

**ENVD 3111-3. Research Issues and Programming for Architecture.** Further develops the student's critical capacity to evaluate environments. Students are introduced to selected methods from the social sciences that can be used in the programming and evaluation of designs.

**ENVD 3121-3. Research Issues and Methods for Planning.** Explores a number of topics of current interest at the community and regional levels. Looks at the development and social consequences of the neighborhood movement, forms of municipal and regional governments, regional settlement patterns, and new communities. Students are introduced to selected methods from the

social sciences that are used by planners and urban designers.

**ENVD 4001-3. Design and Planning Law.** The design process is largely governed by laws and planning is largely carried out by laws. The student learns how to research the various codes and to draft and pass laws. Environmental, water quality, property, and zoning and building codes and laws are covered.

**ENVD 4011-3. Imagination and Creativity.** A seminar on imagination and creativity in environmental design. Students research some aspect of a topic of interest to them and acceptable to the instructor and prepare a class presentation and research paper on that topic. Open to advanced undergraduates and graduate students, irrespective of major.

**ENVD 4021-4. Comparative European Environments.** A summer semester field seminar in Europe to inspect new towns, satellite cities, and other forms of human settlement and cities of antiquity. Preference given to students with a planning emphasis.

**ENVD 4091-3. Improving Imaging Ability.** An advanced societal course dealing with theories of imaging and methods of improving imaging in the design process.

## Media

**ENVD 2002-3. Environmental Design Media.** Development of graphics skills, emphasizing drawing as a means to design. Includes investigation of drawing types and methods; diagramming of ideas and systems; information, exploratory, and developmental sketching.

**ENVD 3022-3. Photography for Visual Communications.** Designed to introduce the student to the technical and practical aspects of making photographic images: the workings of the camera, the lens, principles of depth of field, black and white film processing, printing, and basic darkroom procedures. Lectures present a survey of historical and philosophical background of photography. Two hours lab time per week to be arranged.

**ENVD 3112-3. Advanced Environmental Design Media.** Emphasis on advanced presentation techniques and the use of graphics as a problem-solving tool. Recommended for planners.

**ENVD 3152-3. Introduction to Computer Graphics Applications.** Principles and use of computer graphics in design: creation and modification of complex two- and three-dimensional objects; orthographic and perspective views; use of color; input using mouse and digitizer; output using screen, plotter, matrix printer, and slides; automated aids for form generation and manipulation; and analysis of current and future trends of computer usage for design.

**ENVD 3212-3. Color Theory.** Color media technique and application and landscape/built-environment drawing preparation, composition, and presentation.

**ENVD 4112-3. Architectural Graphics 1.** Techniques of graphic communication and presentation for architectural design.

Includes advanced delineation and use of color.

**ENVD 4122-3. Advanced Photography for Visual Communications.** The structure of this course is thematic, offering the student the opportunity to work at an advanced level with theoretical, contextual, and practical issues. Lectures emphasize problematic concerns in picturing the built/natural environment and the social and political spectrum of the landscape. Students choose a particular issue and work extensively with it to incorporate information and contextual and photographic concerns.

**ENVD 4152-3. Computer Graphic Applications.** An introductory course which teaches the mechanics of entering 2-D images and 3-D objects into the computer. Once entered, they may be interactively rotated in space, walked through, and repeatedly displayed in perspective from any position. The mechanics of how to use other computer programs that allow additional manipulation of the images and objects is also covered.

**ENVD 4212-3. Architectural Graphics 2.** Development of an architectural set of construction documents combined with job administration, field observation, and guest speakers from related construction/architectural disciplines.

## Natural Science and Technology

**ENVD 2003-4. Introduction to Natural Science/Technology in Environmental Design.** An introduction to basic NST principles and techniques requisite to an understanding of pertinent natural phenomena and the impacts of modern technology upon the natural and built environments. Lab sessions are used to supplement lectures. Open to nonmajors.

**ENVD 3013-3. Historic Preservation Technology.** An introduction to methods for the identification of historic structures and an evaluation of their materials. Considers techniques for preservation and restoration, and legal options for promoting preservation efforts.

**ENVD 3113-4. Introduction to Site and Building Materials Systems.** A survey of methods and materials viewed as a means of realizing design intentions at site and building level. Lab sessions are used to supplement lectures.

**ENVD 3123-4. Introduction to Resource Management and Environmental Design.** A survey of current and future impacts of human settlements on natural resources including water, air, wildlife, minerals, and land viewed from regional, national, and global perspectives. Lab sessions are used to supplement lectures.

**ENVD 4013-3. Building Assemblies and Interfaces.** A detailed view of building assembly situations; emphasis on study of systemic aspects of assemblies; design problems at a detailed level with performance criteria and coordination between multiple actors and systems.

**ENVD 4023-3. Environmental Impact Assessment.** A field-oriented seminar in current environmental impact controversies. Attention is given to the history, theory, and application of impact analysis at state levels for designers, land-use planners, and others involved in resource decisions.

**ENVD 4033-3. Solar Technology.** Introduces students to aspects of solar technology relevant to the environmental design professions, through readings and lectures on the nature of energy limitations, energy needs, and the potential role of solar energy in meeting these needs.

**ENVD 4113-4. Introduction to Structural Systems and Behavior.** A survey of basic structural systems and their behavior under the actions of loads and deformations with an introduction to methods of static structural analysis. Lab sessions are used to supplement lectures.

## History and Theory

**ENVD 1014-3. Environmental Design Perspectives.** A survey of the principles and concepts of creating the constructed environment: comparison and discussion of the theories of design, including the nature of design problems, issues confronting the designer of future physical environments, a historical review and analysis of the interaction of the design professions, and potential career options and opportunities. Open to nonmajors.

**ENVD 3094-3. Design Theory and Methods.** The nature of design and systematic methods for improving design are covered. Topics include the nature of design problems, structure of design process, theory of form, problem definition, generating solution ideas, evaluation, and roles of form and functions. Students use computers without having to learn to program. Open to nonmajors by instructor consent.

**ENVD 4114-3. History of American Architecture and Urbanism.** Survey of architecture, landscape architecture, urban design, and planning in the United States from circa 1600 to the present. Prereq., ENVD 3094, ARCH 4214, or equivalent, or instructor consent.

Also see: ENVD 4346, ENVD 4746, ARCH 4114, AND ARCH 4214.

## Computers

**ENVD 3015-3. Introduction to Computer Methods in Environmental Design.** A survey of existing and emerging computer methods used in the environmental design professions with an introduction to computer programming. Open to nonmajors.

**ENVD 3025-3. Computer Graphic Applications.** An introductory computer programming course designed to teach the capabilities of a computer in providing graphic representations of environments including buildings. Open to nonmajors.

**ENVD 4125-3. Advanced Computer Graphics Programming.** Concepts underlying two- and three-dimensional graphics in the Pascal programming language: perspective, object

hierarchies, viewing and modeling transforms, symmetry transformations, form grammars, fractals, windowing, and graphic data bases.

## Special

**ENVD 4306 (3-6). Special Topics: Design.** An advanced studio or seminar course which explores new and emerging themes in design.

**ENVD 4316-3. Special Topics: International Housing Policies and Practices.** A seminar providing students with a descriptive knowledge and analytical understanding of the use and development of residential settings in different political economies, globally divided into advanced capitalist nations, collectivist economies, and the Third World. Advanced standing required. Open to nonmajors.

**ENVD 4326-3. Special Topics: Graphics.** Advanced seminar in special issues in design communications, such as portfolio design, photographic and video media, reproduction processes, and three-dimensional simulation modelling.

**ENVD 4336-3. Special Topics: Natural Science and Technology.** Includes such topics as appropriate technology, practicum in appropriate technology, practicum in solar technology, public policy and natural hazards, organization of the design/build process and long span and exotic structures.

**ENVD 4346/5346-3. Special Topics: History and Historiography of Environmental Design.** Advanced seminar on issues in history and historiography of environmental design. Prereq., ARCH 4214 or equivalent, or instructor consent. May be repeated for credit by petition.

**ENVD 4356-3. Special Topics: Computer Methods.** Includes such topics as animation and environmental simulation, computational methods of technical evaluation and optimization, and computational mapping and analysis.

**ENVD 4366-3. Special Topics: Emerging Issues in Design and Planning.** An advanced seminar dealing with emerging cross disciplinary issues in design and planning.

**ENVD 4746/5746-3. Special Topics: Theory and Criticism in Environmental Design.** Advanced seminar on issues of theory and criticism of environmental design. Prereq., ARCH 4214 or equivalent, or instructor consent. May be repeated for credit by petition.

**ENVD 4796-3. Special Topics: Senior Capstone Seminar.** An exit seminar synthesizing the undergraduate experience in environmental design. Students prepare and present for discussion topical research theses synthesizing their emphasis areas. Open to seniors only by instructor consent.

**ENVD 3909, 4909 (1-6). Independent Study.** By special arrangement with instructor.

**ENVD 3919, 4919 (1-6). Teaching Assistant.** By special arrangement with instructor.

**ENVD 4939 (1-6). Internship.** By special arrangement with College of Environmental Design.

# School of Journalism and Mass Communication

## Core Curriculum and General Electives

**JOUR 1001-3. Contemporary Mass Media.** Examines the mass media and their interaction with society, looking at journalism and the mass media in historical, intellectual, economic, political, and social contexts.

**JOUR 2001-3. Mass Media Writing.** Provides an introduction to information gathering and writing techniques appropriate for the mass media. Emphasizes basic skills in grammar, organization, and information collection in both lecture and laboratory formats.

**JOUR 3001-3. Reporting of Public Affairs.** Problems and practice in reporting news of government, politics, the courts, industry, business, science, and other areas involving public issues.

**JOUR 3471-3. Advertising Research.** Introduces students to applied research methods and provides practice in using research in marketing and advertising decision making.

**JOUR 3511-3. Reporting of Public Affairs—Graduate Level.** Problems and practice in reporting news of government, politics, the courts, and industry, business, science, and other areas involving public issues. For graduate students only.

**JOUR 3771-3. History of Journalism.** Major trends in the development of contemporary American journalism, its role in United States history, famous journalists, and foundations and evolution of freedom of the press.

**JOUR 4201-3. International Mass Communication.** Mass media in the international system, including comparative examinations of national and international press organizations, methods, and content. The role of mass media in developed and developing countries and the international flow of news and opinion.

**JOUR 4561-3. Electronic Publishing.** Study of emerging information dissemination techniques variously called teletext, videotext, etc. Participation in writing, editing, advertising, and promotion of school-operated cable television text-on screen system.

**JOUR 4651-3. Mass Communication Law.** Study of state and federal laws and court decisions that affect mass communication in order to develop knowledge of mass media rights and responsibilities and an understanding of the legal system.

**JOUR 4661/5661-3. Newspaper Management.** Covers management and organization of newspapers, including an understanding of daily management considerations and

what is involved in being an employee in today's newspaper environment.

**JOUR 4791/5791-3. Mass Communication and Public Opinion.** Topics include opinion-shaping role of the mass media, theories of public opinion and propaganda, polling, communications effects, and communication theories.

**JOUR 4831/5831-3. Publication Design and Production.** Editorial and production aspects of magazines, both general and specialized, including company publications, industrial journals, and other types of limited-audience publications.

**JOUR 4841 (1-3). Undergraduate Independent Study.**

**JOUR 4871 (1-3). Special Projects.**

**JOUR 4931 (1-3). Internship.**

**JOUR 5001 (1-4). Research in Journalism.** Students participate in research projects with faculty members or pursue their own primary research interests.

**JOUR 5841 (1-3). Graduate Independent Study.**

**JOUR 5851 (1-3). Graduate Professional Project.**

**JOUR 5931 (1-3). Internship.**

**JOUR 6011-1. Proseminar in Journalism.** New graduate students are introduced to the University of Colorado, the School's graduate program, Journalism graduate faculty, and opportunities for graduate study.

**JOUR 6051-3. Theories of Mass Communication.** Study of theories and perspectives of mass communication and exploration of the role of mass media in society.

**JOUR 6061-3. Methods of Mass Communication Research.** Continuation of JOUR 6051 with emphasis on experimental and survey research methods.

**JOUR 6201-3. Readings in International Mass Communication.** Mass communication within the international system, including similarities and differences in functions, facilities, and content; social theories of the press; and the international flow of mass communication.

**JOUR 6211-3. New Media and Development.** Study and analysis of communications technologies and techniques used in addressing social problems in developing countries.

**JOUR 6651-3. Press and the Constitution.** Graduate seminar in communications law. Study of changing law and applied legal research techniques.

**JOUR 6661-3. Media Ethics and Responsibility.** Development of a theoretical framework with which to recognize and analyze ethical issues as they arise in the mass media.

**JOUR 6711-3. Mass Communications and the Arts.** Inquiry into relationship of the arts and the mass media, including study of critics, their function, and their works.

**JOUR 6771-3. Readings in the History of Mass Communication.** Intensive examination of specialized areas in the history of mass communication.

**JOUR 6781-3. Economic and Political Aspects of Mass Communication.** Economic problems and political issues relevant to newspapers, magazines, broadcasting, and CATV. Problems of telecommunications and the impact of future technology on mass communication.

**JOUR 6940-3. Master's Degree Candidacy.**

**JOUR 6951 (1-6). Master's Thesis.**

## News Editorial/Public Relations

**JOUR 3102-3. Press Photography.** The camera as a reporting tool; training in the use of cameras; composition; darkroom procedures.

**JOUR 3552-3. News Editing.** Principles and practice in copy editing and writing headlines for local and wire stories. Practice in page makeup, picture editing, and electronic editing.

**JOUR 3902 (1-3). Newspaper Practicum.** News work on *Campus Press*.

**JOUR 4002-3. Reporting 2.** In-depth reporting and writing resulting from investigation, analysis, and critical thought.

**JOUR 4102/5102-3. Advanced Photography.** Advanced camera and darkroom techniques, the picture story, picture editing, trends in pictorial journalism, and individual projects.

**JOUR 4272/5272-3. Public Relations.** Survey of public relations in America. Case studies and individual projects.

**JOUR 4282/5282-3. Public Relations Programs.** Development and application of public relations programs from identification of the problem through execution of the public relations techniques.

**JOUR 4292/5292-3. Public Relations Practice.** Seminar for students intending to enter the public relations field. Examines specific tools and activities of the field.

**JOUR 4502/5502-3. Advanced Reporting.** Writing news and features about actual events for publication under deadline pressure.

**JOUR 4552-3. Advanced Editing.** Copy editing, headline writing, page designing, and news evaluating. Day-to-day newsroom operations are emphasized in a newsroom environment. Students edit the *Campus Press* using Compugraphic computer equipment.

**JOUR 4602/5602-3. Editorial and Opinion Writing.** Concentration on several of the subjective areas of journalism. Emphasis is on editorial writing, editorial pages, critics, and criticism of the performing arts.

**JOUR 4702/5702-3. Critical Writing for the Journalist.** Analysis of the entertainment area, especially as it pertains to the print media; emphasis is on the composition of criticism and the attitudes and writing techniques of individual critics.

**JOUR 4802/5802-3. Magazine Article Writing.** Practice in writing freelance articles; consideration of types, sources, methods, titles, illustrations, and marketing.

**JOUR 5812-3. Science Writing.** (PHYS/GEEN 5050.) Exploration of ways to improve the public understanding of science and technology. Study and analysis of communications problems in several technical disciplines.

## Advertising

**JOUR 3403-3. Principles of Advertising.** Basic principles of publication and radio and television advertising; analysis of consumers, markets, and media; organization of advertising departments and agencies.

**JOUR 3453-3. Advertising Copy and Layout.** Creation of advertising copy and layout, analysis of consumer and product appeals. Preparing copy for various media: newspapers, magazines, radio, and television.

**JOUR 3463-3. Advertising Media.** Study of media, markets, and audiences and their relationships to advertising messages.

**JOUR 3913 (1-3). Advertising Practicum.** Advertising work on *Campus Press*.

**JOUR 4403/5403-4. Advertising Campaigns.** Advanced copy and layout. Emphasis on planning integrated advertising campaigns for national and regional audiences.

**JOUR 4443-3. Senior Colloquium in Advertising.** Focuses on current issues affecting advertising and public relations practice. Class sessions are conducted by members of the Denver advertising community at their various places of business.

**JOUR 4453/5453-3. Advertising and Society.** Examination of criticisms and contributions of advertising in society and the economy.

## Broadcast

**JOUR 3604-3. Radio and Television News.** Principles and techniques involved in the preparation of news for broadcasting.

**JOUR 3614-3. Radio Programming and Production.** Introduction to audio console, microphones, turntables, tape recorders, tape editing, timing, and combo operation. Emphasis on applying the basic principles to professional production of radio programs.

**JOUR 3644-3. Principles of Broadcast Production.** Introduction to the use of television equipment. Emphasis is on applying the basic principles to professional program production.

**JOUR 3674-3. Television Production 2.** Studio productions for "News Team 27—The Boulder Report" and for "Boulder Soap." Students also do porta-pak projects to sharpen their writing, video production, and editing skills.

**JOUR 4614 (1-3). Advanced Radio Practices.** Application of the theory of radio programming and production. Assignments include producing radio programming for radio stations in Colorado and weekly discussion-critique sessions.



**JOUR 4624/5624-3. Advanced Radio-TV News.** Emphasis on visualization. Special advantages and limitations of broadcasting news and public affairs. Students also participate in "News Team 27—The Boulder Report" by preparing newscasts for Boulder Cable Channel 27.

**JOUR 4634/5634-3. Broadcast News Projects.** Interpretation, preparation, and reporting of public affairs for broadcast media; preparation of radio and film documentaries.

**JOUR 4644/5644-3. Radio-TV Station Organization and Operation.** Analysis of station operations, public relations, personnel, financing, labor relations, and laws and regulations as well as the manager's ethical and social responsibilities.

**JOUR 4674 (1-4). Television Production 3.** In-depth experience in one facet of a complex television production; e.g., directing, producing, writing, sports, commercials.

## School of Law

### International

**LAWS 6200-2. Comparative Law.** Considers foreign solutions to certain key legal problems. The goal is to understand the legal process in a wide variety of foreign systems, and thereby shed light on our own approach to law. To accomplish this goal, the focus is on issues of "procedure," broadly defined, including the roles of lawyers, judges, and others in the legal system; attorneys' fees, legal aid, and other issues of access; judicial review, *stare decisis*, and other aspects of the relationship between courts and legislatures; dispute resolution, both civil and criminal, including problems of evidence; and concepts of "rights" and "duties." Not concerned with substantive rules in particular foreign legal systems.

**LAWS 6400-3. Public International Law.** Examination of the principles of public international law as developed and applied by all participants in the international legal process, including national and international tribunals, governmental bodies, international organizations, and others. Particular attention is given to the role of international law in recent events, natural resources development, environmental protection, and with respect to less-developed countries.

**LAWS 9410-2. International Economic Development Policy and Law.** Focuses on the relation between economic development and law. The areas of policy formulation, foreign assistance, and the role of law and lawyers in development are examined, as are the issues of population, rural development, agriculture, and natural resources.

### Business

**LAWS 5101-3, 5111-3. Contracts 1 and 2.** Basic principles of contract liability, offer, acceptance and consideration, statute of frauds, contract remedies, and the parol evidence rule. Performance of contracts, conditions, effect of changed circumstances,

third-party beneficiaries, assignment, and specific performance.

**LAWS 6001-4. Commercial Transactions.** Examination of the methodology of the Uniform Commercial Code and a study of legal devices and substantive principles thereunder relating to financing transactions in personal property and to negotiable instruments, bank deposits, and collections. Some attention to documentary transactions in the sale and shipment of goods.

**LAWS 6201-3. Agency-Partnership.** Covers the rights and liabilities of the principal, the agent, and third parties with respect to each other, including the concepts of vicarious tort liability, apparent authority, ratification, imputation of knowledge and the undisclosed principal, as well as the partnership form of doing business.

**LAWS 6251-4. Corporations.** Topics include the formation of corporations and their management, the relations between shareholders and officers and directors, the impact of federal legislation on directors' duties, and the special problems of closed corporations.

**LAWS 6281-3. Legal Accounting.** Study of accounting problems in the form they are placed before the lawyer, including a succinct study of basic bookkeeping, in-depth legal analysis of the major current problems of financial accounting, and consideration of the conduct of financial affairs of business.

**LAWS 6501-3. Labor Law.** Decisions and statutes relating to rights of workers to act in concert, including legal aspects of strikes, picketing, and boycotts; representation proceedings; establishment of collective bargaining; and administration of the collective agreement.

**LAWS 7001-3. Creditors and Bankruptcy: A Survey.** The first one-third of the course examines state enforcement procedures (execution of judgments, creditors' bills, execution and foreclosure sales, etc.), judgment liens, mechanics' liens, attorneys' liens, federal tax liens, exemptions, and fraudulent conveyance law. The remaining two-thirds of the course cover bankruptcy. The concentration is on Chapter 7 (liquidation proceedings) and Chapter 13 (consumer bankruptcy), but Chapter 11 (business reorganization) is examined briefly. Students prepare the documents necessary for taking a debtor through both a Chapter 7 and a Chapter 13 proceeding.

**LAWS 7011-3. Creditors' Remedies and Debtors' Protection.** Examines typical state rights and procedures for the enforcement of claims and federal and state law limitations providing protection to debtors in the process. Included are a treatment of prejudgment attachment and garnishment; statutory and equitable remedies; fraudulent conveyance principles; and exemptions and other judicial protections afforded debtors. Also provides an introduction to nonbankruptcy adjustment of claims proceedings and to the federal Bankruptcy Code (Title 11 U.S.C.). Principles of bankruptcy law are treated primarily as they arise in liquidating bankruptcy proceedings (Chapter 7). Brief attention is given to proceedings for the

adjustment of debts of individuals with regular income (Chapter 13 of the Code).

**LAWS 7021-3. Bankruptcy.** Examines nonbankruptcy business rehabilitation devices and business reorganizations under Chapter 11 of the Code. Some attention is also given to proceedings for the adjustment of debts of individuals with regular income under Chapter 13 of the Code. It is recommended that LAWS 6001 and 7011 be taken before this course.

**LAWS 7051-2. Commercial Drafting.** The primary purpose is to expose the third-year law student to legal drafting techniques that will be useful in the private practice of law. The course emphasizes adversarial drafting of commercial and real estate contracts and other nonlitigation legal documentation.

**LAWS 7201-3. Antitrust.** Concerned with the law developed from the Sherman, Clayton, and Federal Trade Commission Acts. It is recommended that LAWS 6251 be taken before this course.

**LAWS 7211-3. Business Planning.** Focuses on the development and use of concepts derived from a number of legal areas in the context of business planning and counseling. Topics such as formation of business entities, sale of a business, recapitalization, division, reorganization, and dissolution are considered.

**LAWS 7301-2. Copyright and Unfair Competition.** An examination of state and federal laws relating to the protection of literary, artistic, and musical works. The 1976 Copyright Act is studied in detail. State laws are considered, such as interference with contractual relations, passing off trade secrets, misrepresentation, protection of ideas, and misappropriation of trade values, all of which supplement federal copyright.

**LAWS 7311-2. Patent and Trademark Law.** An introductory course covering selected topics such as patentability, utilization of patent rights, definition of trademarks, and comparisons of marks with tradename and copyright protection. Practice and procedure of the Patent Office and Trademark Office are also covered.

**LAWS 7321-2. Entertainment Law.** Covers the following major topics in the field of entertainment law: motion pictures, music, television, publishing, sports, and legitimate theater. The major portion is devoted to research and drafting of the relevant legal and/or business documents.

**LAWS 7401-3. Securities Regulation.** Concerned with the various federal statutes regulating the issue of corporate securities and the cases and regulations that have arisen out of those statutes; stress on statutory interpretation.

**LAWS 7541-2. Employment Discrimination.** Examines constitutional, statutory, and regulatory proscriptions of race, gender, handicap, and age discrimination in private and public employment.

**LAWS 7611-2. International Business Transactions.** A problem-oriented study of the legal and quasi-legal questions concerning international trade and investment, with

particular attention to the problems of trade with, and investment in, developing nations.

**LAWS 9251-2. Seminar: Advanced Corporate Law.** Explores the American Law Institute's Corporate Governance Study and the 1984 revisions to the Model Business Corporations Act and their impact on corporate law.

**LAWS 9411-2. Seminar: Mergers and Acquisitions.** Covers state and federal law concerning acquisition by tender offer, proxy contest and friendly acquisition by conventional mergers, and purchase of assets. All aspects of these transactions are considered.

**LAWS 9501-2. Seminar: Labor Arbitration.** A study of arbitration procedures and techniques, including standards used for interpreting labor contract language. Students are assigned problems in important areas of arbitration.

## Natural Resources

**LAWS 6002-3. Public Land Law.** Deals with the legal status and management of federal lands. Federal law, policy, and agency practice affecting the use of mineral, timber, range, water, wildlife, and wilderness resources on public lands are explored.

**LAWS 6302-3. Water Resources.** Analysis of regional and national water problems, including the legal methods by which water supplies are allocated, and an examination of the problems involved in water resource planning.

**LAWS 7102-3. Oil and Gas.** Deals with the legal problems associated with private arrangements for the ownership and development of oil and gas: deeds and leases to oil and gas rights, trespass, adverse possession, implied covenants in leases, conveyances of fractional interests, and the interaction of private rights and conservation regulation.

**LAWS 7202-3. Environmental Law.** Examination and analysis of important federal pollution control statutes, including the National Environmental Policy Act, the Clean Air Act and Clean Water Act. Related economic theory and policy issues are considered.

**LAWS 9112-2. Seminar: Advanced Natural Resources.** For students with a strong interest in natural resources issues in the American West. Coverage is based upon biological and geographical classifications where numerous resource issues converge. Begins with a study of historical, literary, and scientific materials and then moves to an analysis of current problems relating to matters such as federal public lands, wildlife habitat, water quantity, ocean and coastal law, land use planning, pollution control, Indian law, and state federal authority as they implicate the topic of the seminar.

**LAWS 9122-2. Seminar: Mining Law.** Addresses advanced legal problems regarding the development of mineral resources on the public lands. The major mineral disposal laws such as the 1872 Mining Law and the 1920 Mineral Leasing Act are considered as are the conflicts between mineral development and other uses of the public lands.

**LAWS 9302-2. Seminar: Advanced Problems in Water Resource Management.** Begins where traditional water law leaves off. Offers an in-depth exploration into the tension between historic water allocation schemes and emerging environmental protection concerns. Topics covered include state water law reform, federal water rights, endangered species, hydroelectric licensing, wild and scenic rivers, the public trust, takings, and the commerce clause.

**LAWS 9502-2. Seminar: Wildlife Management Law.** Covers the development of American wildlife law and policy from early English precedents through the cases recognizing a wide realm of state ownership and control of wildlife, to the present era, beginning in the 1970s, of extensive federal control and management. Readings and discussions explore the legal and philosophical bases for wildlife management laws that protect endangered species or particular types of fish and wildlife (e.g., migratory birds, marine mammals, wild burros), that control certain conduct (e.g., export or import of products, hunting), that implement international treaties, and that call for protective wildlife management on the public lands. Examines a range of resource conflicts involving major water projects, oil and gas exploration, mining, subdivisions and other developments that are proposed in areas of important wildlife habitat.

## Practice and Procedure

**LAWS 5213-1. Appellate Court Advocacy.** Preparation of an appellate brief and delivery of an oral argument before a three-judge court composed of faculty and upper-class students.

**LAWS 5303-3, 5313-3. Civil Procedure 1 and 2.** Brief survey of common law and code pleading; major emphasis on trial and appellate practice under Federal and Colorado Rules of Civil Procedure, including jurisdiction, venue, parties, commencement, pretrial, pleadings, and jury trial; federal jurisdiction, federal and state court organization.

**LAWS 5503-4. Criminal Law.** Statutory and common law of crimes and defenses, the procedures by which the law makes judgments as to criminality of conduct, the purposes of the criminal law, and the constitutional limits upon it.

**LAWS 6103-2. Professional Responsibility.** The legal profession as an institution, its history and traditions, and the ethics of the bar with particular emphasis on the professional responsibilities of the lawyer.

**LAWS 6353-3. Evidence.** Basic methods and forms of proof in the adjudicative process, responsibility for proof, judicial notice, examination and competence of lay and expert witnesses, privileged communications, relevancy, opinion and scientific evidence, real proof, writings, and hearsay.

**LAWS 7003-3. Federal Courts.** Structure and jurisdiction of the federal courts, with particular emphasis on problems of federalism and separation of powers and their relationship to resolution of substantive disputes.

**LAWS 7303-3. Complex Civil Litigation.** Focuses on class actions and other joinder devices and on problems of jurisdiction, appeal, collateral estoppel, and res judicata in the context of multiparty civil litigation.

**LAWS 7433-3. Remedies.** A problem-solving course examining the types of relief available to vindicate various rights. Damages, specific performance, injunctions, and restitution are covered. Emphasis is on the planning aspect of enforcement, in view of the limitations and problems of proof associated with specific remedies.

**LAWS 7603-2. Law Firm Practice.** Writing course designed to familiarize students with legal problems they will encounter early in their legal careers. Approximately ten short problems are assigned to students involving accounting, business, estate, ethics, fiduciary, and real estate matters. A great deal of class time is devoted to writing techniques and the preparation of legal opinion letters.

**LAWS 9613-2. Seminar: Civil Liberties Litigation.** A study of issues unique to the prosecution and defense of civil liberties lawsuits. Litigation under U.S.C. 1983 is emphasized. Students discuss litigation strategies with reference to several lawsuits currently pending in the federal courts.

**LAWS 9713-2. Seminar: Alternatives to the Adversary System.** Provides students with an opportunity to study various forms and methods of dispute resolution available in our own or other legal systems, apart from the adversary process, such as peer pressure, mediation, arbitration, and nonadversarial judicial intervention. Interdisciplinary as well as comparative sources and materials are used.

## Property

**LAWS 5624-3, 5634-3. Property 1 and 2.** Topics include personal property, estates and interests in land, landlord-tenant, basic land conveyancing, and private land use controls.

**LAWS 6004-3. Real Property Security and Conveyancing.** Brokers' duties and commissions, contracts for sale of land, remedies for breaches, deeds, escrows, mortgages, recording systems, title examination, and title insurance.

**LAWS 6104-3. Wills and Trusts.** Covers intestate succession; family protection; execution of wills; revocation and revival; will contracts and will substitutes; creation of trusts; modification and termination; charitable trusts; fiduciary administration, including probate and contest of wills; constructional problems in estate distribution.

**LAWS 7024-3. Real Estate Planning.** Consideration of the various contemporary legal problems involved in the ownership, use, development, and operation of real estate. Particular emphasis on the income tax and financing aspects of commercial and residential use and development such as shopping plazas and apartment buildings.

**LAWS 7154-3. Land Use Planning.** Examines public control of private land uses through the judicially created doctrine of

nuisance and the legislatively created techniques of zoning, subdivision regulations, and "master" planning, including consideration of the typical constitutional and statutory limitations on such legislatively created techniques.

**LAWS 9254-2. Seminar: Problems in Local Government and Land Use Planning.**

Focuses primarily on selected problems in local government and in land use planning as they are affected by intergovernmental relations—state and federal, state and local, federal and local, and interlocal governmental. Addresses such issues as federal regulation of local governmental activities, local governmental regulation or taxation of private activities on federal or state land, state supervision of local land use planning, and local regulation of federal, state, and local governmental activities.

**Public**

**LAWS 5425-4, 5435-2. Torts 1 and 2.** Study of the nonconsensual allocation of losses for civil wrongs, focusing primarily on the concepts of negligence and strict liability.

**LAWS 6005-4. Constitutional Law.** A basic exposure to the full panorama of constitutional law problems. Survey of the legal problems posed by the federal system and protections afforded individual rights.

**LAWS 6045-3. Criminal Procedure.** Focuses primarily on the constitutional limitations applicable to such police investigative techniques as arrest, search, seizure, electronic surveillance, interrogation, and line-up identification.

**LAWS 7015-3. First Amendment.** Examines speech and religion clauses of the First Amendment. Includes the philosophical foundations of free expression; analytical problems in First Amendment jurisprudence; direct and indirect restraints on speech content; prior restraints; symbolic speech; freedom of thought and association; First Amendment rights of access; speech forums; academic freedom; and vagueness and overbreadth.

**LAWS 7045-3. Criminal Procedure: Adjudicative Process.** Focuses primarily on criminal procedure at and after trial. Treats such topics as bail, prosecutorial discretion, discovery, plea bargaining, speedy trial, jury trial, the right to counsel at trial, double jeopardy, appeal, and federal habeas corpus.

**LAWS 7055-2. Education Law.** Examines elementary and secondary education from two perspectives. The initial focus is the power of the state to compel a child to attend school and the constitutional and statutory framework within which the state regulates schooling. The course then examines the educational opportunities an individual is entitled to receive from the state as embodied in federal and state constitutions and statutes. Various concepts of equal educational opportunity—equal resources; equal treatment regardless of race, sex, or handicap; equal outcomes—are analyzed. The uses and misuses of social science research in shaping legal outcomes are also examined.

**LAWS 7065-3. Immigration Law.** Covers legal issues pertaining to noncitizens of the United States, especially their right to enter and remain in this country as immigrants and nonimmigrants. Discussion of both the substantive law and the procedure through which it is applied. Some of the more specific topics include admission and exclusion, deportation, judicial review, refugees and political asylum, enforcement and administration of the immigration laws, and citizenship.

**LAWS 7105-3. Domestic Relations.** Examines the nature of marriage, actions for annulment and divorce, problems of alimony and property division, separation agreements, and custody of children. Consideration also of illegitimacy, abortion, contraception, the status of the married woman at common law and under modern statutes, and relations of parent and child.

**LAWS 7205-3. Administrative Law.** Practices and procedures of administrative agencies and limitations thereon including the Federal Administrative Procedure Act; the relationship between courts and agencies.

**LAWS 7255-3. Local Government.** State legislative and judicial control of the activities, powers, and duties of local governmental units, including home rule cities and counties; some problems of federal, state, and local intergovernmental relations; and some typical state and federal constitutional and statutory limitations on governmental powers when exercised by local governmental units (the powers to regulate private activities, tax, spend, borrow money, and condemn private property for public uses).

**LAWS 7705-2. Legislative Drafting.** Focuses on legislative drafting techniques and includes an introduction to the legislative process, the role of the drafter in the legislative process, and the use of legislation in solving client problems.

**LAWS 7725-3. American Indian Law.** Investigation of the federal statutory, decisional, and constitutional law which bears upon American Indians, and Indian reservation transactions.

**LAWS 9005-2. Seminar: Equal Protection.** An historical and jurisprudential examination of the American constitutional principle of legal equality.

**LAWS 9015-3. Seminar: Constitutional Theory.** An examination of the role of the courts and the other branches of government in defining and enforcing constitutional values. Attention is given to separation of powers and federalism. Relevant readings are from philosophy, social sciences, and legal scholarship, as well as cases. It is recommended that LAWS 6005 be taken before this course.

**LAWS 9025-2. Seminar: First Amendment.** Advanced and detailed study of the Supreme Court decisions and resulting legal doctrines dealing with the political and religious freedoms secured by the First Amendment, the theories underlying those freedoms and their social and political functions. Prereq., LAWS 6005.

**LAWS 9045-2. Seminar: Law of Corrections.** A study of cases defining the rights of prisoners. Emphasis is on constitutional and institutional issues.

**LAWS 9055-2. Seminar: Church and State Relations.** Explores Religion Clause issues on both a theoretical and a practical level. After initially considering themes or ideals which courts and commentators have thought pertinent to doctrine in this area—themes such as neutrality, separation of church and state, and voluntarism—students apply this theoretical analysis to recurring practical controversies that the courts have had to address. The controversies considered include the role of religion in public schools, state aid to parochial schools, public sponsorship of religious symbols, special privileges conferred on the basis of religious belief, and similar issues.

**LAWS 9415-2. Seminar: Products Liability.** Analyzes the evolution of products liability law, with case studies of current developments drawn from such areas as asbestos and drug litigation.

**LAWS 9425-2. Seminar: Law and Medicine.** A discussion of selected topics in bioethics and associated legal problems, including control over mind and behavior, genetics, reproduction, death and dying, and organ transplantation. Considers such specific topics as regulating abortion, artificial insemination, and surrogate mothering, euthanasia and discontinuance of medical treatment, and the sale or gift of human organs. Discusses decision-making mechanisms relating to these topics, possible regulatory approaches, and appropriate criteria and social and medical goals which affect the resolution of issues in these areas.

**LAWS 9525-2. Seminar: Social Legislation.** A study of governmental efforts to combat poverty and maintain income. Examines welfare programs, Social Security, unemployment and workmen's compensation, fair labor standards, occupational safety and health, employment discrimination, and Title VII.

**LAWS 9715-2. Seminar: Law and Mental Health.** Examines the uses of psychiatry in the law and the constraints that law imposes on institutional psychiatry. Possible topics include civil commitment, competency to stand trial, the insanity defense, the right to treatment, the privilege to refuse treatment, guardianship, and liability of mental health professionals.

**Research and Writing**

**LAWS 5226-2. Legal Writing.** Materials and methods of legal research and writing. After intensive consideration of the types of law books and their functions, students prepare written material of various kinds designed to develop both research technique and writing style.

**LAWS 7106-1. Rothgerber Moot Court Competition.** Intensive involvement in legal research, appellate brief writing, and oral arguments in a competitive context. Student finalists may continue involvement in regional and national competitions.

**LAWS 7406-1. International Moot Court Competition.** Open only to students who actively participate in the seminar preparing for the Competition, in the preparation of memorials for the Competition, and in the practice oral arguments or regional oral arguments.

**LAWS 7846-1, 7856-2. Independent Legal Research.** (Two semester hours maximum.) Independent study and preparation of a thesis under supervision of a faculty member. Specific permission of the supervising faculty member is required before registering.

**LAWS 7896-1, 7906-2. Independent Legal Research: Law Review.** Participation in the research, writing, and editing activities involved in publishing the *Colorado Law Review*. Standards for the awarding of credit are set and applied by the faculty.

## Taxation

**LAWS 6007-4. Income Taxation.** Basic course in taxation with major emphasis on the fundamentals of the federal income tax system. Generally approached from the standpoint of the impact of the federal income tax system on the individual.

**LAWS 6107-3. Advanced Taxation.** Considers the impact of the federal income tax system on the business enterprise. The major emphasis is in the partnership and corporate area. Based on a series of problems involving the taxation of partnerships and corporations and the participants in these forms of business entity.

**LAWS 6157-3. Corporate Taxation.** Covers traditional corporations. Discusses formation and distributions lightly, then focuses on reorganizations (mergers, divisions, recapitalizations), liquidations, sales of interests in corporations, and carryover of tax attributes. May cover problems of international and interstate corporate taxation.

**LAWS 7207-3. Federal Estate and Gift Tax.** Analysis of federal estate and gift taxation of inter vivos and testamentary transfers; introduction to the income taxation of estates and trusts; elementary estate planning.

**LAWS 7217-2. Advanced Estate Planning.** Discussion of problems and solutions for owners of various-sized estates and different types of assets including jointly-held property, stock in closely-held corporations and farms; analysis of federal taxation of generation-skipping transfers in trust; post-mortem estate planning; drafting of trusts and wills. It is recommended that students take LAWS 6104 and 7207 before enrolling in this course.

**LAWS 7307-3. Taxation of Natural Resources.** Consideration of the federal income tax aspects applicable to the exploration for, the development of, and the operation of natural resources, as well as the financing thereof. The natural resources considered include oil and gas, hard minerals, and timber and water. It is recommended that LAWS 6007 be taken before this course.

**LAWS 7607-3. Taxation of Foreign Source Income.** Covers basic aspects of the income

taxation of international business transactions, including the implications of income tax treaties.

**LAWS 9407-2. Seminar: Tax Policy.** Focuses on the federal income tax, while also considering other taxes and other governments. The first part of the seminar is a general study of the equity, efficiency, and societal impacts of different taxes. The remainder of the semester involves studies of particular problems based on student papers.

## Jurisprudence

**LAWS 6118-3. Legal Process.** The study of law as a purposive process and the functions and interrelationships of the various public and private institutions through which the process is carried on. Gives a general view of the American legal system as a framework to help in organizing knowledge about the various elements of the system.

**LAWS 6308-3. Economic Analysis of Law.** Provides an introduction to the basic elements of price theory and to their application to legal problems. On the theoretical side, emphasis is placed upon the explication of those concepts that have been most frequently employed in law and economics literature, including demand and utility, cost, and optimality. The majority of the legal applications are drawn from first-year courses.

**LAWS 6318-2. Law and Economics.** An introduction to the basic elements of price theory and to their application to legal problems. On the theoretical side, emphasis is placed upon the explication of those concepts that have been most frequently employed in law and economics literature, including demand and utility, cost, and optimality. Also covers the historical evolution of the law and its impact on the economy, and a comparison of legal and economic institutions in different societies.

**LAWS 7058-3. Conflict of Laws.** The general approach to conflicts, problems, jurisdiction of courts in conflicts cases, foreign judgments, choice of law rules, constitutional limitations on choice of law rules, and law applied in the federal courts in conflicts cases.

**LAWS 7128-3. Jurisprudence.** Relationship of law and logic is presented in the form of a survey of efforts that have been made to view precepts of the legal system in whole or in part as a logically self-consistent system; law and its relationship to justice, in terms of theories of justice and of dominant ideals that have been advanced as those to which the legal order ought to conform; and law as a social reality, including a study of the actual effects of the law upon attitudes and behaviors.

**LAWS 7218-2. Legal History.** Focuses on understanding and interpreting developments in Anglo-American legal history, including the development of common law; the origins of equity courts; the reception of English law in America; and thereafter, the development of American law and the American legal profession.

**LAWS 9118-2. Seminar: Experiments in the Legal Process.** Explores the processes of lawmaking and interpretation, using a game invented by a lawyer-philosopher as a model. The game, called "Nomic," consists of a series of initial rules, some more easily modified than others. A "move" in the game consists of proposing and submitting to a vote of the players a change in the initial rules. Since rules may conflict, or their applications may not be clear, sometimes it is necessary for the rules to be interpreted. The initial rules provide a procedure for securing such interpretations from the players. This procedure, along with any other provision of the rules, is subject to modification by vote of the players. The parallels to the legal processes of legislation and adjudication are obvious (although certain similarities may be deceptive, and others may be hidden). In addition to playing the game, students keep journals in which they record and reflect on the play of the game and its implications for the real-world legal process.

**LAWS 9318-2. Seminar: Problems in Law and Economics.** Examination of one or more current problems for which economic analysis has been offered as a means of solution. Topics include one or more of the following: catastrophic accidents/personal injuries, the right to privacy, eminent domain, federalism, and theory of contract. Attention is not limited to the "economic approach," but considers alternative analyses as well.

**LAWS 9418-2. Seminar: Legal Imagination.** Advanced reading and writing for law students. Varied literary and other works are read. The course may be of interest to the student concerned with the question: Does my choice to become a lawyer mean the sacrifice of any ambitions to be a serious writer (or person)?

**LAWS 9518-2. Seminar: Public Choice and Theories of Justice.** Examines several recent theories about the normative foundations of legal decision making. Among the theories examined are those of Rawls, Posner, Nozick, and Buchanan. Papers center on the application of the theories studied to real, concrete legal problems.

## Practice—Clinical

**LAWS 6009-4, 6019-3. Legal Aid: Civil Practice 1 and 2.** Emphasizes procedural and practical remedies and defenses available in civil litigation. Students are assigned civil cases related to the course material. Develops working knowledge of courtroom skills. A separate per-semester fee for malpractice insurance is charged for this course. Prereq. or coreq., LAWS 6353.

**LAWS 6029-4, 6039-3. Legal Aid: Criminal Practice 1 and 2.** Thorough grounding in problems of criminal defense. Students defend indigent misdemeanors in Boulder courts. Develops working knowledge of courtroom skills. A separate per-semester fee for malpractice insurance is charged for this course. Prereq. or coreq., LAWS 6353.

**LAWS 7109-2. Trial Advocacy.** Offered in both weekly and intensive formats. Student exercises simulating trial events: jury voir dire, opening statement, direct and

cross examination of witnesses, and closing argument.

**LAWS 7159-2. Advanced Trial Advocacy.** An advanced course covering trial practice elements. Open only to students who have taken LAWS 7109.

**LAWS 7209-3. Natural Resources Litigation Clinic.** Offers hands-on experience in the practice of natural resources law in the Rocky Mountain Region to a select number of clinic students. The Clinic's docket of active cases focusing on land and water use conflicts in the West affords an inside view into both complex environmental litigation as well as alternative dispute resolution. Students participate in projects which test the full range of lawyering skills including traditional litigation, administrative advocacy, legislative drafting, and the conduct of complex negotiations and settlements.

**LAWS 7409-3. Legal Negotiation and Dispute Resolution.** Explores the fundamentals of effective negotiation techniques and policies for lawyers. Students engage in mock negotiations of several legal disputes. Examines a variety of dispute resolution processes such as mediation, arbitration, mini-trials, and court-annexed settlement procedures as alternatives to traditional court adjudication.

**LAWS 7509-1. Trial Competition.** Student teams further develop trial and advocacy skills in a competitive mock trial format involving two or more rounds of trials. Preparation of trial briefs and drafting of other court pleadings and documents is required. Credit is limited to the top two teams (six students). Student finalists may continue involvement in regional and national competitions.

## College of Music

### APPLIED MUSIC: INDIVIDUAL AND CLASS INSTRUCTION

Courses in composition and vocal or instrumental technique and interpretation may be found under the PMUS section of the *Schedule of Courses*. For individual applied music instruction, the equivalent of one hour of individual recitation (lesson) and one hour of literature class are required. Undergraduate performance majors carry 4 credit hours per semester; music education majors, 3 hours per semester (1 hour recitation); Bachelor of Arts in Music majors, 2 or 4 hours per semester; minors, 2 hours (<12 hour recitation) per semester. Graduate performance majors normally carry 4 hours per semester; minors, 2 hours per semester.

### Courses Open to Nonmusic Majors

**MUSC 1080-3. Basic Music Theory.** Introduction to tools used in notating, performing, creating, and listening to music. For nonmusic majors only who have little or no previous schooling in the subject.

**MUSC 1830-3. Appreciation of Music.** Basic knowledge of music literature and development of discriminating listening habits. In addition, each section emphasizes a different aspect— aesthetics, history, concert attendance. For nonmusic majors only.

**MUSC 1840-3. American Musical Theatre.** An overview of the role of musical theatre in U.S. culture, with emphasis on the twentieth-century Broadway musical.

**MUSC 1850-3. Music of the Rock Era.** A history of music in the U.S., concentrating on music after 1950. Includes consideration of precursor styles (e.g., black music tradition, rock and roll, folk), discussion of stylistic changes, and evolution in current popular styles. For nonmusic majors only.

**MUSC 2750-3. History of United States Folk and Popular Music.** A stylistic and historical examination of trends which have influenced present-day American music.

**MUSC 2760-3. Music and Drama.** Techniques used in combining music and dramatic arts through examples from musical and dramatic literature of the West from circa 1000 to the present.

**MUSC 2770-3. World Music.** Musics outside Western art tradition, using current ethnomusicological materials.

**MUSC 3080-3. American Popular Music.** Historical survey with focus on the popular song literature of 1920-present, including the role of peripheral influences such as jazz, folk, country, etc.

**MUSC 3640-3. History of Jazz.** Study of origins, development, and current trends.

**MUSC 3650-3. Music of the Twenty-First Century.** Explores the contemporary trends of the art of music to discern which paths the future may take. Experimental learning through the use of synthesizers and global musical ensembles will be featured as well as the study of the future as history. For nonmusic majors.

**MUSC 3820-3. Music Literature 1.** Study of music literature from choral, orchestra, chamber music, and operatic repertoire. For nonmusic majors only.

**MUSC 3830-3. Music Literature 2.** Continuation of MUSC 3820.

**MUSC 4750-3. Women Composers.** A survey of Western music through works composed by women, with emphasis on eighteenth through twentieth centuries.

**MUSC 4890-3. Latin American Music.** Music of cultures south of the United States—Mexico, Peru, Brazil, Cuba, and other countries having substantial musical heritage—with emphasis on relationship of folk, popular, and art styles.

**MUSC 8000 (1-10). Ph.D. Dissertation.**

**MUSC 8970-3. Repertoire Project.**

### Theory and Composition

**MUSC 1001/1011-3. Theory 1.** An integrated course in the various elements of music theory, including composition, structural analysis, and principles of two-voice, three-voice, and four-voice writing.

**MUSC 1021/1031-1. Theory and Ear Training Laboratory 1.** Practice in rhythmic, melodic, harmonic, and contrapuntal sight singing and ear training.

**MUSC 1091-1. Rudiments of Music Laboratory.** Elementary training and sight singing for music majors only. Credit may not be used toward a degree in music.

**MUSC 2001-3. Theory 2.** Continuation of Theory 1.

**MUSC 2021-1. Theory and Ear Training Laboratory 2.** Continuation of Ear Training Laboratory 1.

**MUSC 2071-2. Instrumentation.** Introductory study of the instruments of the orchestra, and problems of scoring for the diverse choirs and full orchestra.

**MUSC 3051-2. Elementary Composition.** A course for noncomposition majors. An introduction to the craft of musical composition with analysis and writing in various styles.

**MUSC 3071-3. Jazz Improvisation.** Offers assistance and guidance for the student acquiring necessary skills and gaining insights for achieving creative musical results.

**MUSC 4001-3. Contemporary Theory.** Study of established theoretical principles applied to advanced and recent idioms. Creative work included.

**MUSC 4011-2. Sixteenth-Century Counterpoint.** A study of the style of Palestrina and his contemporaries through analysis and written examples.

**MUSC 4021-2. Eighteenth-Century Counterpoint.** Stylistic study of the main contrapuntal forms of the period including invention, suite, and fugue. Analysis and written examples are stressed.

**MUSC 4031-2. Scoring and Arranging.** Practical problems, creative arranging, and scoring for various choral and instrumental groups.

**MUSC 4041-2. Orchestration.** A study of advanced orchestration techniques through score analysis and student projects.

**MUSC 4061-2. Analysis 1.** Selected works through the eighteenth century.

**MUSC 4071. Analysis 2.** Selected works of the nineteenth and early twentieth centuries.

**MUSC 4081-2. Electronic Music.** Practical approach to composition of electronic music, exploring methods of sound generation, alteration, and combination; emphasizes development of skill in use of synthesizers and recording equipment.

**MUSC 5001-3. Contemporary Theory.** Study of established theoretical principles applied to advanced and recent idioms. Creative work included.

**MUSC 5021-2. Seminar in Twelve-Tone and Serial Music.** Music of such composers as Schoenberg, Webern, Babbitt, Nono, Stockhausen. Composition exercises using principles derived from analysis of representative works.

**MUSC 5051-3. History of Theory.** A study of important theoretical writings from ancient Greece to the present.

**MUSC 5061/5071-3. Advanced Analysis 1, 2.**

**MUSC 5081-2. Electronic Music.** Practical approach to composition of electronic music, exploring methods of sound generation, alteration, and combination; emphasizes development of skill in use of synthesizers and recording equipment.

**MUSC 5501-1. Theory Teaching Practicum.** Experience in planning, teaching, and evaluating undergraduate theory-composition courses.

**MUSC 6951-2. Master's Thesis 1.**

**MUSC 7801-3. Doctoral Seminar in Music Theory.** Advanced studies in theory will be undertaken. Each student will present results of research on individually chosen topics or aspects of a topic central to the class. A major paper or project will be required.

**MUSC 8971-1. Performance-Related Research Document.**

## History and Literature of Music

**MUSC 1802-3. Introduction to Music 1.** An introduction to the study of music including bibliographic, listening, score-reading, critical reading, and writing skills; music terminology; a survey of selected music genres (symphonic and chamber music); and building of general music repertory.

**MUSC 1812-3. Introduction to Music 2.** Continuation of MUSC 1802 with further emphasis on developing critical reading and writing skills, enlarging the general repertory, and beginning new areas of study; American music, world musics, and music aesthetics.

**MUSC 3802/3812-3. History of Music.** Survey of Western art music with stylistic analysis of representative works from all major periods.

**MUSC 4712-3. Renaissance Music.** Repertory and analysis of polyphonic music circa 1400-1600.

**MUSC 4762-3. History of Choral Literature.** A survey of ensemble vocal music from chant to the present.

**MUSC 4772-3. History of Opera.** Survey of operatic literature from early Baroque to contemporary productions.

**MUSC 4792-3. Twentieth-Century Music.** Major trends and developments are explored while focusing on specific compositions of important composers.

**MUSC 4812-3. Symphonic Literature.** Study of literature for orchestra, band, and other symphonic ensembles: preclassic, classic, romantic, and twentieth century.

**MUSC 4822 (2-3). Ancient and Medieval Music.** Survey from early times to circa 1400. History majors and others desiring extended study in this epoch should enroll for 3 hours credit.

**MUSC 4832-3. Studies in American Music.** Intensified work in folk, popular, and art music of the United States.

**MUSC 4842-3. Music Aesthetics.** Survey of various philosophies of music in writings of

philosophers, psychologists, sociologists, composers, critics, and historians.

**MUSC 4852-3. Seventeenth- and Early Eighteenth-Century Music.** Style and repertory of music from 1580 to 1750.

**MUSC 5712 (3-4). Renaissance Music.** Seminar in white mensural notation and problems of editing. Those wishing review of repertory and analysis may enroll for 4 hours of credit.

**MUSC 5742-3. Performance Practice of Early Music.** Examination of performance practices of sixteenth-, seventeenth-, and eighteenth-century music.

**MUSC 5762 (2-4). History of Choral Literature.** Seminar in analysis of musical style, chant to present. Those wishing review of literature and repertory may enroll for 4 hours credit.

**MUSC 5772-3. History of Opera.** Survey of operatic literature from early Baroque to contemporary productions.

**MUSC 5792-3. Twentieth-Century Music.** Major trends and developments are explored while focusing on specific compositions of important composers.

**MUSC 5802-3. History of Vernacular Music in the U.S.**

**MUSC 5812-3. Symphonic Literature.** Study of literature for orchestra, band, and other symphonic ensembles: preclassic, classic, romantic, and twentieth century.

**MUSC 5822 (3-4). Ancient and Medieval Music.** Survey from early times to circa 1400. Two regular class meetings per week, plus seminar for variable credit. Those wishing to study black mensural notation in seminar should enroll for 4 hours credit.

**MUSC 5832-3. Studies in American Music.** Intensified work in folk, popular, and art music of the United States.

**MUSC 5842-3. Music Aesthetics.** A survey of various philosophies of music in writings of philosophers, psychologists, sociologists, composers, critics, and historians.

**MUSC 5852 (2-4). Seventeenth- and Early Eighteenth-Century Music.** Seminar in analysis of pitch, rhythm, and structure of music, 1570-1750. Those wishing review of repertory and history may enroll for 4 hours of credit.

**MUSC 5872-3. Late Eighteenth- and Nineteenth-Century Music.** Music and documents of Classic and Romantic periods, 1750-1900, are examined extensively, with a concentration on representative musical works and theoretical writings that contributed to the formulation of significant aesthetic and compositional principles.

**MUSC 5882-3. Seminar: Studies in Late Eighteenth- and Nineteenth-Century Music.** Meeting as a seminar, class examines selected topics in Classic and Romantic music, 1750-1900, which vary from year to year.

**MUSC 5892-3. Latin American Music.** Music of cultures south of the U.S.—Mexico, Peru, Brazil, Cuba, and other countries having substantial musical heritage—with emphasis on relationship of folk, popular, and art styles.

**MUSC 5902-3. Seminar: Women in Music.** Meeting as a seminar, this class examines recent research in selected topics in the history of women's contributions as composers, performers, and critics. Topics vary from year to year.

**MUSC 6952-2. Master's Thesis 2.**

**MUSC 7822/7832-3. Seminar in Musicology.** Required of all musicology majors prior to completion of comprehensive examinations. A different research area is designated each semester. Periodic reports to Musicology Colloquium required.

**MUSC 8972-1. Performance-Related Research Document.**

## Music Education

**MUSC 2103-3. The School Music Curriculum.** Music education within aesthetic education is the principal focus of study. Patterns of music curricula in schools will be explored through class study, school observation, and participation. Special consideration given to methods and materials in general music.

**MUSC 3103-3. Teaching General Music.** In-depth study of general music teaching at all levels through development of philosophy of music within aesthetic education; musical structure as content; child and adolescent development objectives; methods and approaches: Orff, Kodaly, Dalcroze, MMCP, eclectic approaches; evaluation.

**MUSC 3113-3. Introduction to the Arts.** Survey of the arts in Western culture, including architecture, painting, sculpture, poetry, prose, music, dance, comedy, tragedy, and film, along with a presentation of various approaches to relating the arts.

**MUSC 3123-3. Teaching Choral Music.** Music materials, pedagogical techniques and administrative procedures used in choral music programs for junior and senior high school students.

**MUSC 3133-1. Classroom Instrument Laboratory: Guitar.** Basic strums and accompanying patterns are covered.

**MUSC 3143-3. Teaching Instrumental Music.** Basic course covering broad principles for organizing, administering, and teaching instrumental music programs in the public schools.

**MUSC 3153-3. Teaching Woodwind Instruments.** Instruction in playing and teaching all woodwind instruments. Playing experiences will be in heterogeneous and homogeneous groupings.

**MUSC 3163-3. Teaching String Instruments.** Instruction in playing and teaching all string instruments. Playing experiences will be in heterogeneous and homogeneous groupings.

**MUSC 3193 (1-2). Vocal Pedagogy and Literature for Young Voices.** Presents an overview of how the singing voice functions. Additional areas of study include health care of the voice, group teaching techniques, and corrective ideas for vocal problems commonly encountered in the studio and choral rehearsal. Both solo and ensemble repertoire for junior and senior high school singers are



explored. Provides instrumentalists with the knowledge and skills they need to work with singers in both the private studio and public school choral setting.

**MUSC 3203-2. Music for the Classroom Teacher.** A new approach to giving elementary teachers the knowledge and skills they need to meet the letter of the certification requirement; designed to develop minimum knowledge and skills.

**MUSC 3223-3. Teaching Brass Instruments.** Instruction in playing and teaching all brass instruments. Playing experiences will be in heterogeneous and homogeneous groupings.

**MUSC 4103-1. Introduction to Student Teaching.** Instructional aide experiences in the schools. First half of the professional year.

**MUSC 4123-3, 4133-3. Student Teaching Practicum.** Practice teaching of music under the tutelage of a master music teacher.

**MUSC 4153-1. Percussion Class and Pedagogy.**

**MUSC 4193-1. Student Teaching Seminar.** Required of all students while student teaching.

**MUSC 5103-3. Teaching General Music.** For graduate music education majors whose emphasis is general music.

**MUSC 5123-3. Choral Music Techniques and Materials.** For graduate music education majors whose emphasis is choral music.

**MUSC 5143-2. Developing Children's Choirs.** Areas include children's vocal development, music learning through performance, organization of children's choirs, and literature for young voices.

**MUSC 5183-2. Research in Teaching Music.** Critical analysis of published research in music. Topics include approaches, data gathering, planning for survey and experimental studies, sampling, techniques for correlation, analysis of variance and covariance.

**MUSC 5203-3. Topics in Music Education.** Preparation of individual topics in a seminar setting. The final project will be the major research document for master's degree students in music education.

**MUSC 6113-3. Foundations of Music Education.** Survey of historical, philosophical, psychological, and aesthetic bases of contemporary music education.

**MUSC 6133-4. Comprehensive Musicianship for Teachers.** Application of structural and analytical principles of music to teaching, conducting, and performing music for musician-teachers in the schools.

**MUSC 6143-2. Teaching Music through Performance: The Conductor as an Educator.**

**MUSC 6153-3. Seminar in Elementary/Secondary/General Classroom Music.** Investigation of theoretical bases for deriving objectives in general and classroom music in elementary and secondary schools; current curricula, methods, and materials focused on objectives; evaluative measures in music.

**MUSC 6173-2. Directions of Contemporary Aesthetic Education.**

**MUSC 6183-3. History of Music Teaching.** An historical understanding of music teaching from the Middle Ages to the present. Students will explore methods, materials, and philosophies from the past and study how these factors have evolved and influenced today's pedagogy.

**MUSC 6193-1. Selected Studies in Music Education.** May be repeated for additional credit. Consent of instructor and chairman of the music education faculty.

**MUSC 6953 (2-4). Master's Composition Thesis 1.**

**MUSC 7103-3. Research Literature and Techniques 1 (Historical and Philosophical).**

**MUSC 7113-3. Research Literature and Techniques 2 (Survey and Experimental).**

**MUSC 7123-2. Research Practicum.**

**MUSC 8973-1. Performance-Related Research Document.**

## Choral Music

**MUSC 3174/3184-2. Conducting 1 and 2.** Introduction to conducting and rehearsal techniques.

**MUSC 5134-2. Advanced Choral Conducting.** Advanced work in conducting.

**MUSC 5154-2. Symposium in Choral Music.** Advanced conducting and analytical study. Required of all choral graduate students for three semesters.

## Voice

**MUSC 1444-2. Italian Diction and Repertoire.** Phonetics of Italian and coaching classic arias.

**MUSC 1454-2. English Diction and Repertoire.** English phonetics and coaching of art songs.

**MUSC 3484-1. Music Theatre Stage Lab.** A practical laboratory for learning aspects of technical theatre in actual performances.

**MUSC 4464-3. French Diction and Repertoire.** French phonetics and coaching in art songs. Open to singers and pianists.

**MUSC 4474-3. German Diction and Repertoire.** German diction and coaching in Lieder. Open to singers and pianists.

**MUSC 5404-2. Words and Music.** A discussion of the development of art song in Western civilization. Performance practices, texts, and musical styles are discussed.

**MUSC 5434-2. Russian Song Repertoire.** Russian phonetics and coaching of art songs.

**MUSC 5444-2. Vocal Pedagogy.**

**MUSC 5454-2. Pedagogy 2: Repertoire for Young Voices.**

**MUSC 5484-2. Graduate Seminar in Vocal Pedagogy.** Comparison methodology and supervised teaching.

**MUSC 6954-2. Master's Composition Thesis 2.**

**MUSC 8974-1. Performance-Related Research Document.**

## Organ and Church Music

**MUSC 2265-2. Service Playing Techniques.** Methodology of playing for a church service including directing from the console, modulation, accompanying, and hymn playing.

**MUSC 4245/4255-3. Church Music.** Comprehensive study of the philosophy of church music, with an evaluation of both fixed and free liturgies. Practical study of church choral literature, chanting, hymnology, and music in the church school.

**MUSC 4265/5265, 4275/5275-2. Improvisation.**

**MUSC 4285/5285, 4295/5295-3. Organ Survey.** Historical survey of organ music and organ construction, studying both forms of composition and types of organ for which the music was originally written. Trips to various churches in area will give the student an opportunity for first-hand observation.

**MUSC 5235 (2-8). Church Music Research.**

**MUSC 5255-2. Service Playing Techniques.** A thorough study of the music of the liturgies of the Lutheran and Anglican services. Techniques of hymn playing, modulation, transposition and accompanying and directing from the console are included in the course.

## Piano

**MUSC 2325-2. Applied Harmony for the Keyboard.** This course is an intensive study and application of the harmonic structure of music in a variety of keyboard skills: figured bass realization, chord progressions, transposition, on-sight harmonic analysis, and playing by ear.

**MUSC 2365-2. Introduction to Accompanying.** Includes chamber music for pianists and music-making potentials. Performance required in a variety of accompanying roles; critiqued and coached by class and instructor.

**MUSC 3345-2. Piano Pedagogy 1.** Discussion of teaching philosophies, objectives, and procedures. Examination and evaluation of methods and materials. Practical aspects with which the private teacher is concerned.

**MUSC 3355-2. Piano Pedagogy 2.** Learning theories, student teaching, examination and evaluation of materials for intermediate and early advanced piano students, developing artistry, approaches to technique, sight-reading, memorizing, the independent studio teacher in the business and professional world.

**MUSC 4325-2. Piano Literature.** Survey from eighteenth century to present.

**MUSC 4345-2. Piano Pedagogy 3.** Organization and guidance of piano groups (studio-performance instruction). Supervised teaching in children's laboratory.

**MUSC 4365-2. Piano Accompanying.** Discussion and performance of selected art songs and sonata literature with emphasis on performance and preparation procedures. Special projects. May be repeated for additional credit.

**MUSC 5305-3. Piano Pedagogy: Process of Group Environments.** Organization and guidance of piano groups (studio-performance instruction) and classes (keyboard skills instruction). Supervised teaching in college class program.

**MUSC 5325-2. Seminar: Piano Literature.** Keyboard music from earliest known examples through Debussy.

**MUSC 5335-2. Piano Music of the Twentieth Century.** Study of specific contributions to piano literature by such composers as Schoenberg, Webern, Bartok, Stravinsky, Dallapiccola, Boulez, Stockhausen, Berio, Copland, Crumb, Martirano, and others.

**MUSC 5345/5355-2. Research: Piano Literature and Pedagogy.** Individual or group research related to piano pedagogy or literature for piano.

**MUSC 5365-2. Piano Accompanying.** Continuation of MUSC 4365. May be repeated for additional credit.

**MUSC 6345/6355-3. Group Process.** Student participation in groups with two to four individuals (studio-performance instruction); classes with five to twelve individuals (keyboard-skills instruction).

**MUSC 6365/6375-3. Practicum.** In-depth experiences in organizing, teaching, and critiquing all phases of the group-environments program. Registration is required until the following are completed: a performance examination consisting of all keyboard skills, Dissertation Project PMUS 8975, and comprehensive examination for candidacy.

**MUSC 6385-3. Group/Class Piano in College.** Educational and musical issues; organization and guidance of groups (studio-performance instruction) and classes (keyboard-skills instruction). Supervised teaching in children's laboratory and college class program.

**MUSC 6955 (2-4). Master's Music Education Thesis.**

**MUSC 8975 (2-6). Major Document.** For pedagogy majors.

## Instrumental

**MUSC 3176/3186-2. Conducting 1, 2.** Introduction to conducting and rehearsal techniques.

**MUSC 4666/5666-2. Chamber Music Literature: Winds and Percussion.** Stylistic-historical survey in various genres from Baroque era to present.

**MUSC 5136-2. Advanced Conducting.** Advanced work in conducting.

**MUSC 5526/5536-2. Suzuki String Pedagogy.** A study of the history, philosophy, methodology, and repertoire of the Suzuki method of teaching violin and its adaptation to American music education.

**MUSC 8976-6. Major Composition.** For composition majors.

## Bachelor of Arts in Music

**MUSC 3987-1. Bachelor of Arts in Music Research Seminar.** Concentration on conceptual aspects of research, the psychology and ordering of a library search that leads to formal paper. Applies student's interests and curricular goals to specific topics; includes preparation of a prospectus for senior thesis.

**MUSC 4107-2. Arts Management Techniques.** Includes marketing, fund raising, budget, personnel management, contracts, and other facets of arts management.

## Graduate Interdepartmental Courses

**MUSC 5708 (2-3). Introduction to Music Bibliography and Research.** Basic informational sources about music and musicians and a study of bibliographic forms, research, and writing techniques employed in music research papers, theses, and dissertations. Required in all master's degree programs.

**MUSC 6198-3. Psychology of Music Learning.** Concerns musical behaviors and their development. Examination of aspects of creativity, performance, and musical response. Recommended for all pedagogy degrees.

**MUSC 6948. Candidate for Master's Degree.** For use only during the semester of graduation if no other courses are taken.

**MUSC 7138-2. Contemporary Issues in College Teaching.**

**MUSC 7928-3. Doctoral Seminar: Music Materials and Methods.** Focuses on helping doctoral students define and prepare for the general music component of their degree program. Includes both oral and written presentations, music analyses, book reports, and investigation into various areas of music literature, history, and theory.

**MUSC 8978-1. Precandidacy for D.Mus.A.**

## Special Studies

**MUSC 3842-3849 (1-3). Special Studies.** Advanced studies in specific areas or special projects in selected areas. For undergraduate majors only. See current *Schedule of Courses* for specific course number. May be repeated for additional credit.

**MUSC 5842-5849 (1-3). Special Studies.** Graduate studies in specific areas or special projects in selected areas. For master's degree students only. See current *Schedule of Courses* for specific course number. May be repeated for additional credit.

**MUSC 7842-7849 (1-3). Special Studies.** Advanced graduate studies in specific areas or special projects in selected areas. For doctoral degree students only. See current *Schedule of Courses* for specific course number. May be repeated for additional credit.

**MUSC 8979-1. Candidacy for D.Mus.A.**

## Recitals and Theses (PMUS Classes)

**PMUS 3919-1. Junior Recital.**

**PMUS 4919-1. Senior Recital.**

**PMUS 6951-2. Master's Performance Thesis 1.**

**PMUS 6952-2. Master's Performance Thesis 2.**

## Doctor of Musical Arts Dissertation Projects (PMUS Classes)

**PMUS 8971-3. Dissertation Project 1 (Solo Recital, Choral Concert, Composition).**

**PMUS 8972-3. Dissertation Project 2 (Solo Recital, Choral Concert, Composition, Vocal Pedagogy Project).**

**PMUS 8973-3. Dissertation Project 3 (Chamber Music Recital, Vocal Pedagogy Project, Choral Project, Composition Recital).**

**PMUS 8974-3. Dissertation Project 4 (Chamber Music Recital, Choral Project, Composition Recital, Wind/Percussion Practicum).**

**PMUS 8975-3. Dissertation Project 5 (Research Lecture).**

**PMUS 8976-3. Dissertation Project 6 (Research Lecture).**

## Performing Organizations and Ensembles

A variety of both large and small ensembles is offered both Fall and Spring Semesters for 1 semester hour of credit. Many are open to all University students. Assignment in these organizations is by audition.

**Bands:** Concert Band, Court Players, Marching Band (fall only), Symphonic Band, Wind Ensemble.

**Choirs:** Collegiate Chorale, Silver and Gold, University Choir, University Singers, Women's Chorus.

**Orchestras:** Chamber Orchestra, Symphony Orchestra.

**Ensembles:** Bell, Collegium Musicum, Guitar, Jazz, New Music, Percussion.

**Chamber Music:** Brass, Piano, String, Woodwind.

**Opera:** Opera Practicum, Opera Theatre.

## School of Pharmacy

### Biopharmacy

**BIPH 3080-4. Drug Action.** An introduction to chemical, pharmacodynamic, pharmacokinetic, and biopharmaceutical concepts fundamental to the understanding of interactions between drugs and living organisms. Prereqs., PHCH 3700 and EPOB 2430.

**BIPH 3900/7390-3. Molecular and Cellular Pathology.** Covers the topics of cell and tissue injury, inflammation and repair, neoplasia, genetic diseases, immunopathology, and lung disease. Prereq., third-year standing or instructor consent.

**BIPH 3901/7391-2. Pathophysiology.** Examines the common disease processes in specific organ systems—cardiovascular, renal, gastrointestinal, reproductive tract, endocrine, musculoskeletal, and central nervous system. Prereq., third-year standing.

**BIPH 4500-3. Infectious Disease.** Survey of diseases resulting from microbial and viral infections. Principles of immunological and drug therapy. Prereq., CHEM 4611, BIPH 3900, and BIPH 3901.

**BIPH 4840 (1-3). Independent Study in Biopharmacy.** Study involving library, laboratory, and a report. Prereq., instructor consent.

**BIPH 5540-3. Cancer: Experimental and Medical Aspects.** Lect. Divided into two parts. The first is a biochemical and morphological description of tumors, tumor behavior such as metastasis and angiogenesis, and tumor development; the second concerns carcinogenesis: mechanisms, modulation, testing and epidemiology, and chemotherapy. Prereqs., CHEM 4611 or 4711 and 4731, or MCDB 1050 and 1060, or instructor consent.

**BIPH 7840 (1-3). Independent Study in Biopharmacy.** Research techniques, methods, and reporting. Prereqs., graduate standing and instructor consent.

## Clinical Pharmacy

Prereq. for all Clinical Pharmacy courses is fifth-year status unless otherwise indicated. **CNLP 4210-6. Clinical Pharmacy and Therapeutics.** Lect. Provides information on the appropriate use of pharmacotherapeutic principles in the treatment of selected disease states with particular attention to adverse drug reactions, drug-drug interactions, drug-disease interactions, and rationale pharmacotherapeutics.

**CNLP 4220-3. Therapeutic Aspects of Nonprescription Products.** Lect. Provides information on the use of nonprescription products in selected disease states with particular attention to the areas of product selection, symptomatology, and patient consultation.

**CNLP 4230-2. Institutional Pharmacy Practice.** Lect. An introduction to the principles of institutional pharmacy practice with consideration given to purchasing, basic management skills, and protocols to be observed in a hospital pharmacy practice.

**CNLP 4240-2. Communicative and Psychosocial Aspects of Pharmacy Practice.** Lect. and discussion. Designed to acquaint the student with aspects of both interpersonal communication relative to patient care and social issues in pharmacy practice. Prereqs. PHAD 4860 and fifth-year status.

**CNLP 4250-2. Drug Literature Evaluation.** Designed to introduce the student to concepts important in critically evaluating the drug literature. Sources of drug information and their proper utilization are also emphasized.

**CNLP 4460-1. Principles of Antibiotic Therapy.** Lect. Designed to provide advanced information on the rational use of antibiotic

agents. Information on general concepts of antibiotic therapy and various classes of antibiotic/antimicrobial medications are presented.

**CNLP 4470-2. Drug Therapy in the Geriatric Patient.** Lect. Designed to provide health care students with a background in the aging process, appropriate drug therapy in the elderly, and pharmacy service in skilled nursing facilities and long-term care facilities.

**CNLP 4490/7449-3. Clinical Pharmacokinetics.** Lect. Application of pharmacokinetic principles to therapeutic management of patients. Prereq., fifth-year status or instructor consent.

**CNLP 4840 (1-3). Independent Study in Clinical Pharmacy.** Study involving library and a report.

**CNLP 4910-4. Community Pharmacy Externship 1.** Designed to familiarize the student with the practice of community pharmacy.

**CNLP 4911-4. Community Pharmacy Externship 2.** An experiential course to familiarize the student with clinical approaches in the area of community pharmacy practice with particular emphasis on patient consultation.

**CNLP 4912-4. Institutional Pharmacy Externship 1.** An experiential course designed to acquaint the student with basic procedures in hospital pharmacy practice.

**CNLP 4913-4. Institutional Pharmacy Externship 2.** An experiential course designed to acquaint the student with experience in clinical aspects of hospital pharmacy practice.

**CNLP 4914-4. Rural Pharmacy Externship 1.** An experiential course designed to provide the student with an opportunity for experience in pharmacy practice in rural areas of Colorado.

**CNLP 4915-4. Rural Pharmacy Externship 2.** An extension of CNLP 4914, in which the student is allowed an opportunity to practice clinical pharmacy in a second rural pharmacy practice site in Colorado.

**CNLP 4916-4. Industrial Pharmacy Externship.** An experiential course designed to acquaint the student with principles of pharmacy practice in the area of pharmacy manufacturing.

**CNLP 4917-4. Radiopharmacy Externship.** An experiential course involving practical application of principles of nuclear pharmacy practice.

**CNLP 4918-4. Administrative Pharmacy Externship.** An experiential course designed to provide the student with insight into the social-government and administrative aspects of pharmacy practice.

**CNLP 4919-4. Special Projects Rotation.** Advanced opportunities for students to participate in a selected area of pharmacy practice such as pharmaceutical product distribution, pharmaceutical sales representation, or clinical research.

**CNLP 4930-4. Ambulatory Care Pharmacy Clerkship.** An experiential course providing an opportunity for the student to gain

clinical pharmacy experience in the area of ambulatory care.

**CNLP 4931-4. Inpatient Pharmacy Clerkship.** An experiential course designed to give the student an opportunity for clinical pharmacy practice in the area of inpatient therapeutics.

**CNLP 4932-4. Drug Information Clerkship.** A discussion-experiential course in which the student gains experience in the use of both computerized and noncomputerized systems utilized in the process of drug information retrieval.

**CNLP 4933-4. Geriatric Pharmacy Clerkship.** An experiential course designed to provide the student with information on the unique aspects of clinical pharmacy practice in the nursing home and long-term care setting.

**CNLP 4934-4. Pediatric Pharmacy Clerkship.** An experiential course involving principles of pharmacotherapeutics as applied to patient care interactions in pediatric patients.

**CNLP 4935-4. Psychiatric Pharmacy Clerkship.** An experiential course stressing the case of the mentally ill patient, utilization of drug therapy in mental illness, social aspects of mental illness, and the role which the pharmacist plays in the care of the mentally ill patient.

**CNLP 4936-4. Special Clinical Clerkships.** Lect. An experiential course designed to give the student an opportunity for clinical pharmacy experience in a specific area of interest, e.g., oncology, dermatology, cardiology, or respiratory disease.

**CNLP 4937-4. Veterinary Pharmacy Practice.** Lect. An experiential course designed to provide the student with basic knowledge in drug preparation, distribution and use in veterinary medicine.

## Pharmacology

**PCOL 4520/7452-5. Mechanisms of Drug Action 1.** Lect. Mechanisms of action and effects of drugs that act on the autonomic, peripheral, and central nervous systems and the cardiovascular/renal system. Prereqs., EPOB 2430 and CHEM 4611.

**PCOL 4530/7453-5. Mechanisms of Drug Action 2.** Lect. Mechanisms of action and effects of drugs that are used in the treatment of endocrine disorders, hematopoietic disorders, infectious disease, and cancer. Prereq., PCOL 4520.

**PCOL 4740-2. Toxicology.** Lect. Current concepts of clinical, environmental, and forensic toxicology. Factors which influence toxicity as well as therapy. Prereq., PCOL 4520.

**PCOL 4840 (1-3). Independent Study in Pharmacology.** Spring. Study involving library, laboratory, and a report. Prereq., instructor consent.

**PCOL 7553-1. Seminar in Pharmaceutical Sciences.** Conference. Discussions concerned with current literature and research in the pharmaceutical sciences. Required of all graduate students. Prereq., graduate standing.

**PCOL 7557-2. Behavioral Pharmacogenetics.** Lect. Selected topics are considered and may include behavioral and biochemical genetics, pharmacogenetics, and neurochemistry. Course may be repeated to include different topics. Prereq., graduate standing or instructor consent.

**PCOL 7560-2. Molecular and Environmental Toxicology.** Introduction to toxicology and discussion of the toxicology of specific chemicals with emphasis on environmental exposure and mechanisms of toxicity. Broader areas of toxicology such as genetic, neuro- and immunotoxicology are also introduced. Prereq., graduate standing or instructor consent.

**PCOL 7654 (1-3). Advanced Topics in Pharmacology.** Conference. A special topic of current interest in pharmacology is considered each semester and the course may be repeated for credit with instructor's consent. Prereqs., graduate standing and instructor consent.

**PCOL 7840 (1-3). Independent Study in Pharmacology.** Research techniques, methods, and reporting. Prereqs., graduate standing and instructor consent.

## Pharmacy Administration

**PHAD 3810-3. Laws of Pharmacy.** Lect. and rec. State and federal statutes and regulatory decisions governing the practice of pharmacy with emphasis on the common law principles and ethics of the profession.

**PHAD 3830-3. Pharmacy Financial Management.** Lect. and rec. The application of accounting principles and financial analysis to the management of a pharmacy.

**PHAD 4840 (1-3). Independent Study in Pharmacy Administration.** Study involving library research and a report. Prereq., instructor consent.

**PHAD 4860-3. Pharmacy Management.** Lect. and rec. Management, marketing, and merchandising problems that must be considered in the successful operation of a pharmacy. Prereqs., PHAD 3810 and 3830.

## Pharmacy-Pharmaceutics

**PHAR 2010-2. Psychosocial Aspects of Drug Abuse 1.** Familiarizes students with the psychological, social, and scientific concepts necessary for peer education. Drug use patterns are covered in detail. Prereq., instructor consent.

**PHAR 2020-2. Psychosocial Aspects of Drug Abuse 2.** A continuation of PHAR 2010. Prereq., instructor consent.

**PHAR 3040-1. Pharmacy Orientation.** Lect. and rec. Introduction to pharmacy profession with emphasis on curriculum, organization of the profession, and the pharmacist's role in health care delivery. Prereq., third-year standing.

**PHAR 3050-1. Pharmaceutical Calculations.** Lect. and rec. A study of the various systems of weights and measures (apothecary, avoirdupois, and metric) used in the practice of pharmacy and their relationship to pharmaceutical preparations. Topics also

include the calculation of doses, electrolyte solutions, isotonic solutions, proof strength, thermometry, and units of potency. Prereq., third-year standing.

**PHAR 3060-1. Pharmacy Practice.** Conference. An applied course in pharmacy practice conducted at the Wardenburg Student Health Service. The student is introduced to the professional practice of pharmacy with emphasis on interpretation and clinical evaluation of medication orders. The student also is introduced to the utilization of computer technology in pharmacy practice. Prereq., third-year standing.

**PHAR 4100-4. Pharmaceutics 1.** Lect. and lab. Continuation of PHAR 3060 with emphasis on the official and modern common dosage forms. Prereqs., PHAR 3050 and PHCH 3700.

**PHAR 4110-4. Pharmaceutics 2.** Lect. and lab. Continuation of PHAR 4100. Theoretical and practical techniques related to the formulation, preparation, and dispensing of modern pharmaceuticals. Prereq., PHAR 4100.

**PHAR 4120-0. Industrial Tours.** All students in the School of Pharmacy are required to participate in the field trip to visit pharmaceutical industries. Transportation is the only expense to the student.

**PHAR 4160-2. Intercultural Drug Use.** Conference. Cultural variations in health practices and attitudes with emphasis on pharmacist-patient communication. Prereq., instructor consent.

**PHAR 4840 (1-3). Independent Study in Pharmaceutics.** Study involving library, laboratory, and a report. Prereq., instructor consent.

**PHAR 7512-2. Advanced Pharmacokinetics.** Derivation and application of classical mathematical models characterizing drug absorption, distribution, metabolism, and excretion. Emphasis is directed toward interpretation of pharmacokinetic information and design of dosage regimens for pharmacologic/toxicologic research. Prereq., graduate standing or instructor consent.

**PHAR 7518-1. Seminar in Pharmaceutical Sciences.** Conference. Discussions concerned with current literature and research in the pharmaceutical sciences. Required of all graduate students. Prereq., graduate standing.

**PHAR 7654 (1-3). Advanced Topics in Pharmacokinetics.** Lect. and conference. Special topics of current interest in pharmacokinetics are discussed; course may be repeated with consent of instructor. Prereq., graduate standing or instructor consent.

**PHAR 7840 (1-3). Independent Study in Pharmaceutics.** Research problems involving dosage form design, biopharmaceutics, and pharmacokinetics. Prereq., graduate standing and/or instructor consent.

## Pharmaceutical Chemistry

**PHCH 3700-3. Pharmaceutical Chemistry.** A study of physicochemical principles and

their application to pharmaceutical chemistry and pharmaceutics. Prereq., third-year standing.

**PHCH 3750-3. Physiological and Clinical Chemistry.** Lect. Course is divided into three parts: regulation of metabolism with emphasis on hormonal mechanisms, the physiological roles of vitamins and minerals, and current diagnostic tests for biochemical abnormalities. Prereq., CHEM 4611 or 4711.

**PHCH 4720/7472-3. Medicinal Chemistry 1.** Lect. Relationships between the chemical structures of drugs and their absorption, distribution, metabolism, excretion, and pharmacologic effects. Prereqs., BIPH 3080 and PHCH 3700.

**PHCH 4730/7473-3. Medicinal Chemistry 2.** Lect. Continuation of PHCH 4720/7472. Prereq., PHCH 4720.

**PHCH 4840 (1-3). Independent Study in Pharmaceutical Chemistry.** Study involving library, laboratory, and a report. Prereq., instructor consent.

**PHCH 7540-2. Principles of Drug Design.** Lect. A survey of techniques in rational drug design illustrated with examples from current literature. Topics include quantitative structure-activity relationships, conformational analysis, pro-drug design, and directed structural modification to control drug absorption, distribution, metabolism, and elimination. Prereqs., graduate standing and one year of organic chemistry, or instructor consent.

**PHCH 7562-3. Instrumental Methods of Drug Analysis.** Lect. and lab. A survey of the major chromatographic and spectroscopic methods used in organic chemical analysis with emphasis on their applications to the qualitative and quantitative analysis of drugs. Prereq., graduate standing or instructor consent.

**PHCH 7565-2. Advanced Topics in Medicinal Chemistry 1.** Lect. and discussion. A review of topics of current interest in medicinal chemistry. Prereq., graduate standing or instructor consent.

**PHCH 7566-2. Advanced Topics in Medicinal Chemistry 2.** Lect. and discussion. Continuation of PHCH 7565. Prereqs., graduate standing and PHCH 7565, or instructor consent.

**PHCH 7568-1. Seminar in Pharmaceutical Sciences.** Conference. Discussions concerned with current literature and research in the pharmaceutical sciences. Required of all graduate students. Prereq., graduate standing.

**PHCH 7654 (1-3). Advanced Topics in Pharmaceutical Chemistry.** Conference. A special topic of current interest in pharmaceutical chemistry is considered. Course may be repeated for credit with instructor's consent. Prereq., graduate standing or instructor consent.

**PHCH 7840 (1-3). Independent Study in Pharmaceutical Chemistry.** Research techniques, methods, and reporting. Prereq., graduate standing or instructor consent.

## Reserve Officers Training Corps

### AIR FORCE ROTC

**AIRR 1010-1. Development of Air Power 1.** One 1-hour lect.-rec. and one 1-hour lab per week. Introduction to the development of air power, management, and use of aerospace power today, and use of future manned aircraft and spacecraft. Laboratory involves a study of Air Force customs and courtesies, drill and ceremonies, career opportunities, and life and work of an Air Force junior officer.

**AIRR 1020-1. Development of Air Power 2.** Continuation of AIRR 1010. One 1-hour lect.-rec. and one 1-hour lab per week.

**AIRR 2010-1. The Air Force Today 1.** One 1-hour lect.-rec. and one 1-hour lab per week. A survey course describing strategic offensive/defensive, general purpose, and aerospace support functions of U.S. military forces. Laboratory introduces the student to leadership experiences in a practical, supervised training environment.

**AIRR 2020-1. The Air Force Today 2.** Continuation of AIRR 2010. One 1-hour lect.-rec. and one 1-hour lab per week.

**AIRR 3010-3. Air Force Management and Leadership 1.** Two 1½-hour seminars plus one 1-hour lab per week. Individual motivation and behavioral processes, leadership, communication, and group dynamics are studied and applied in actual case studies. Communicative skills development is stressed. Laboratory provides opportunity for application and testing of management/leadership training.

**AIRR 3020-3. Air Force Management and Leadership 2.** Continuation of AIRR 3010. Two 1½-hour seminars and 1-hour lab per week. Basic managerial processes are emphasized, while group discussions, case studies, and role playing as learning devices are employed. Emphasis on communicative and counseling skills development is continued.

**AIRR 4010-3. National Security Forces in Contemporary American Society 1.** Two 1½-hour seminars and one 1-hour lab per week. Focuses on the armed forces as an integral part of society. Special themes include societal attitudes, professionalism, U.S. defense strategy, and military foreign policy decision making, with emphasis on the communicative skills.

**AIRR 4020-3. National Security Forces in Contemporary American Society 2.** Continuation of AIRR 4010. Two 1½-hour seminars and a 1-hour lab per week. Special themes include defense strategy and conflict management, formulation/implementation of U.S. defense policy and organizational factors and case studies in policy making, international laws of warfare, and the Uniform Code of Military Justice.

### MILITARY SCIENCE (U.S. ARMY)

The Army ROTC course curriculum cuts across traditional subject boundaries. It involves elements of various disciplines with the goal of encouraging students to integrate their academic training with the problem solving and decision making they will encounter as junior officers in the Army. Additionally, the formal curriculum is supplemented by field trips, guest speakers, and specialized military training during summer months. The goal is to involve superior academic students in activities emphasizing the responsibilities and challenges of junior officers in an Army undergoing the greatest leadership and technological changes in its history.

**MILR 1011-2. History and Evolution of the United States Army 1.** A survey and analysis of the origin and development of the Army as an American Institution from its origins through the conclusion of World War I. Term paper and oral presentation required.

**MILR 1021-2. History and Evolution of the United States Army 2.** Continues the survey and analysis of the United States Army's history from the conclusion of World War I through the present. Term paper and oral presentation required.

**MILR 2031-3. Methods of Leadership and Management 1.** A comprehensive review of contemporary leadership and management concepts including motivation, attitudes, communication skills, problem solving, human needs and behavior, and leadership self-development.

**MILR 2041-3. Methods of Leadership and Management 2.** A continuation of MILR 2031 stressing practical application of the concepts learned in MILR 2031 through the use of management simulation. Students are required to make an oral presentation and write a term paper.

**MILR 3052-3. Military Operations and Training 1.** Examines the structure and organization of the Army, and the roles of officers and noncommissioned officers. Various leadership styles and techniques are reviewed along with methods of small unit leadership. Basic military skills are introduced and reinforced.

**MILR 3062-3. Military Operations and Training 2.** Exposes the student to basic tactical functions of small unit leadership in a variety of operational environments. Covers operations and tactics, operations orders, and small unit weapons systems.

**MILR 4072-3. Officer Leadership and Development.** Examines management and leadership functions within organizations of the Department of Defense. Focuses on variables such as information flow, leadership, morale, decision-making processes, correspondence formats, and presentations.

**MILR 4082-3. Officer Leadership and Development.** Examines the characteristics of a

profession, the historical evolution of a profession, ethical reasoning and decision-making. Personal and professional values and value conflicts are also examined. Students are also introduced to the military justice system.

**Leadership Laboratories.** These ninety-minute periods are an integral part of all Military Science courses. The laboratory periods concentrate on tasks which provide cadets with practical training and assessments needed in the Army. Diagnostic evaluations are administered during laboratory periods.

**Professional Military Education (PME).** This program provides the cadets with an academic foundation to support continued intellectual growth. It is required of all officers. Requirements include receipt of the baccalaureate degree and completion of one course in written communications, human behavior, and military history. Courses in management and national security studies are strongly recommended but not required. A list of courses that meet these requirements is available from the instructor upon request.

**Foreign Language.** All scholarship cadets are required to take one semester of a modern foreign language. Advanced placement that indicates proficiency at the first semester level can be substituted.

**Cross-Enrollment Program.** Nursing students at the University of Colorado Health Sciences Center in Denver can enroll in the Army ROTC at the Boulder Campus.

### NAVAL SCIENCE

**NAVR 1010-2. Introduction to Naval Science.** Introduction to the structure missions and functions of the United States Navy and Marine Corps. Additional introductions to military law, naval history, and concepts of sea power.

**NAVR 1020-3. Naval Ship Systems.** A detailed study of ship propulsion and related auxiliary systems. Emphasis placed on fossil fuel and nuclear steam and gas turbine systems. Design constraints imposed by unique marine environment stressed.

**NAVR 2010-3. Weapons and Systems Analysis.** An introduction to the theoretical concepts upon which modern naval weapons systems are designed and constructed. Specific areas of study include the physics of underwater sound propagation, pulse radar theory, automatic tracking principles, and fundamentals of missile guidance.

**NAVR 2020-3. Seapower and Maritime Affairs.** A study of the importance of seapower in history including naval, maritime, and other commercial uses of the sea. Includes in-depth study of Soviet foreign affairs. Additionally, Soviet naval history, hardware, and strategy are examined.

**NAVR 3010-3. Navigation and Naval Operations.** Theory and practical application in the art of navigation: charts, publications, piloting, dead reckoning, navigation aids and instruments, time, celestial coordinate systems, sextant use, complete sight reduction methods, electronic fixing, and voyage planning.



**NAVR 3020-3. Navigation and Naval Operations 2.** Thorough examination of the Inland and International Rules of the Nautical Road, including court interpretations, principles of relative motion and vector analysis with the maneuvering board, shiphandling procedures, weather, communications, and tactical operations.

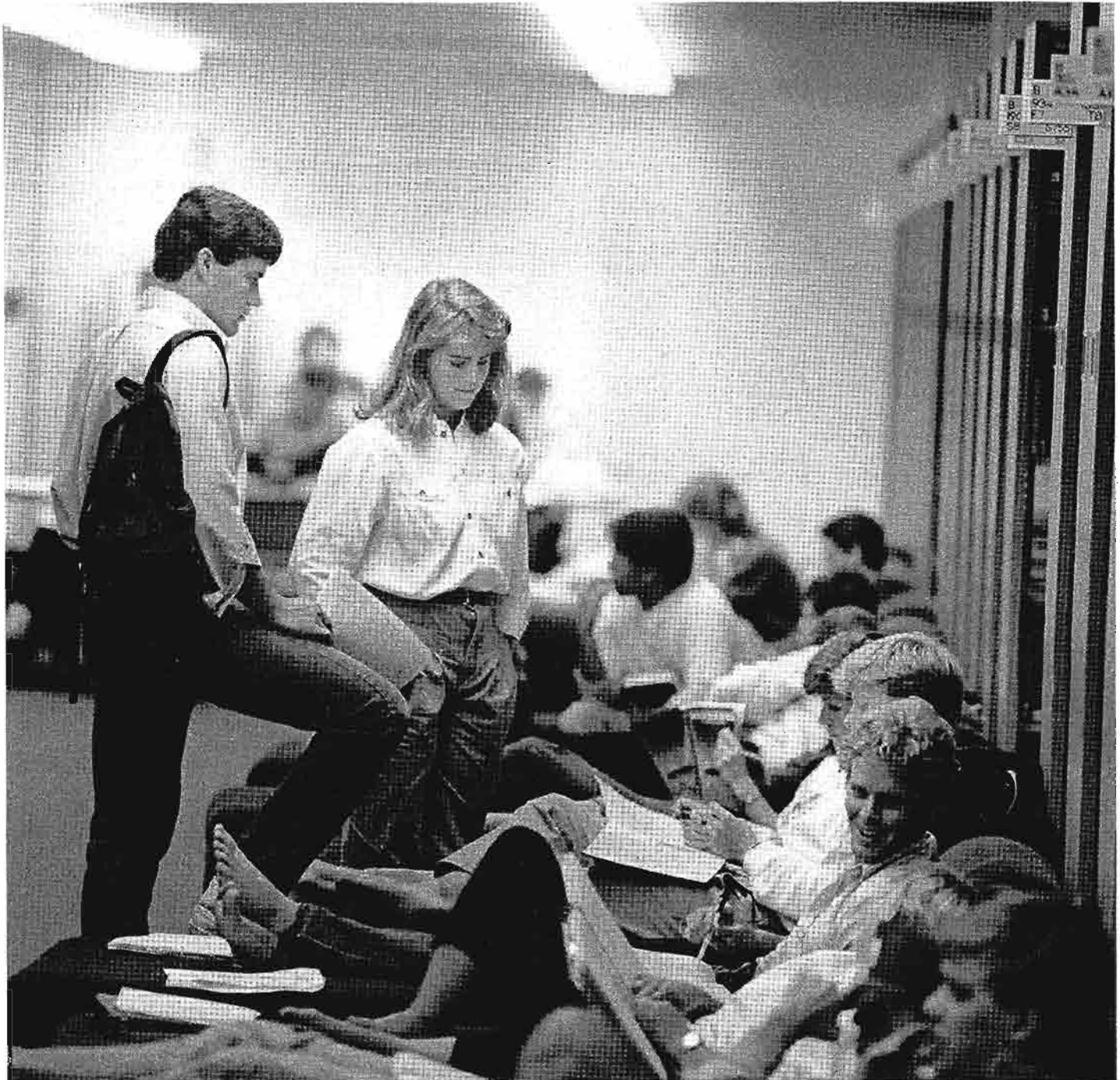
**NAVR 4010-3. Leadership and Management 1.** A comprehensive study of organizational behavior and management in the context of the naval organization. Topics include planning, organizing, and controlling; individual and group behavior; motivation and leadership; decision making, communication, responsibility, authority, and accountability,

**NAVR 4020-3. Leadership and Management 2.** Study of junior naval officer responsibilities in naval administration. Includes counseling methods, military justice, human resources management, directives, and correspondence, personnel administration, material management, and maintenance and supply systems.

**NAVR 3101-3. Evolution of Warfare.** Traces the development of warfare, focusing on the impact of military theorists and technical

developments. The student acquires a sense of strategy, develops an understanding of military alternatives, and sees the impact of historical precedent on military actions.

**NAVR 4101-3. Amphibious Warfare.** A survey of the development of amphibious doctrine. Emphasis is placed on the evolution of amphibious warfare in the twentieth century. Present-day potential and limitations on amphibious operations, including the rapid deployment force concept, are explored.





# Directory

To obtain further information concerning CU-Boulder programs, services, and facilities, call or write the offices listed in this Directory. For campus telephone numbers not listed, call the University switchboard at (303)

492-0111. Written inquiries require the name of the specific office, the complete 9-digit zip code, and should be mailed to:

University of Colorado at Boulder  
Boulder, Colorado

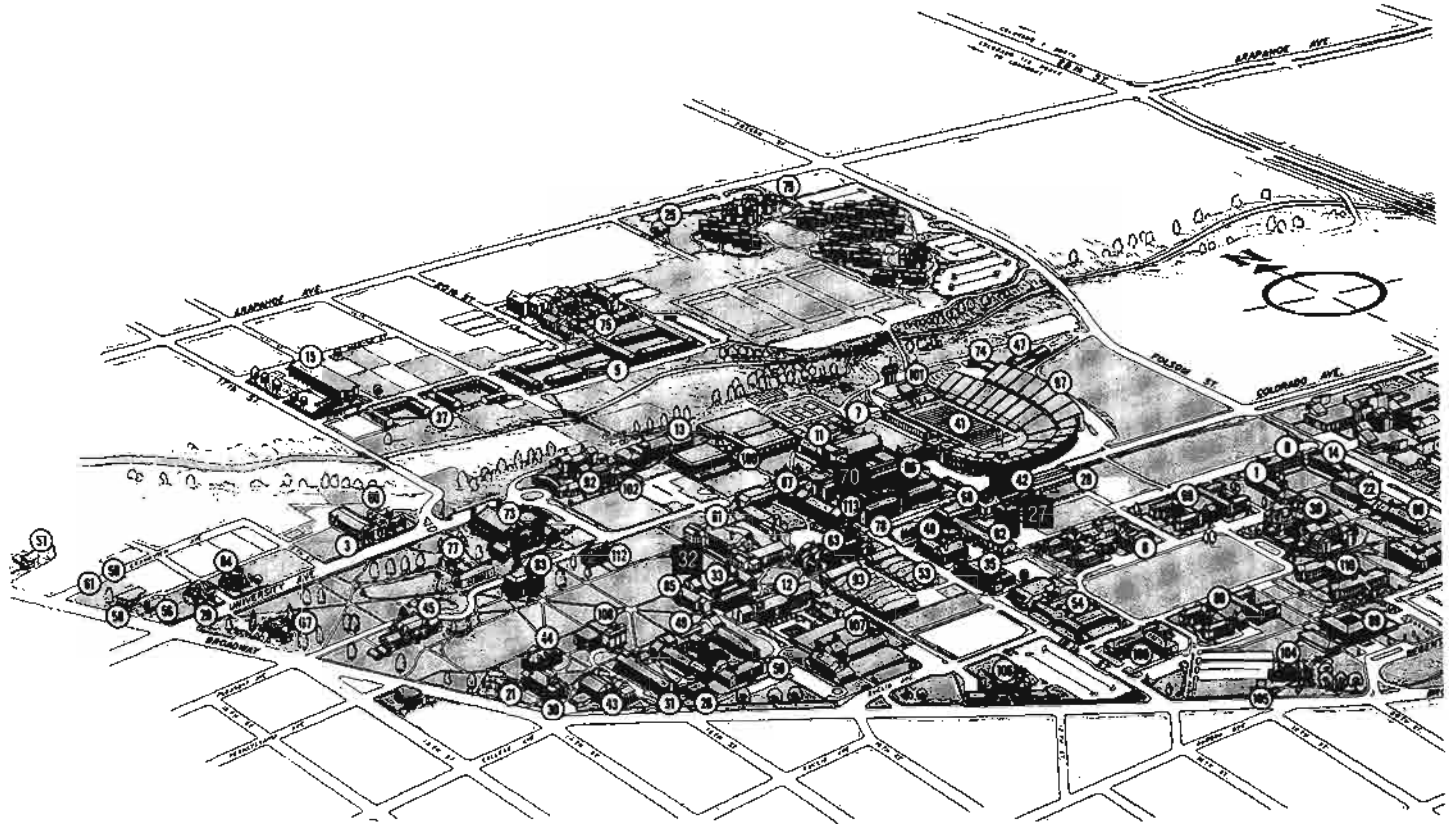
Administrative offices are generally open 8:00 a.m. to 12:00 p.m. and 1:00 to 5:00 during the academic year; during the summer, all offices open one-half hour earlier in the morning and close one-half hour earlier in the afternoon.

Administrative Offices	Zip Code (includes campus box)	Telephone Number (303)	Academic Offices	Zip Code (includes campus box)	Telephone Number (303)
Admissions	80309-0007	492-6301	Biology—Environmental, Popu- lation, and Organismic	80309-0334	492-8981
CU Opportunity Program	80309-0141	492-8316	Biology—Molecular, Cellular, and Developmental	80309-0347	492-7230
Foreign Student Admissions	80309-0124	492-6665	Black Studies	80309-0294	492-8189
Summer Session Catalog	80309-0007	492-2456	Central and East European Studies	80309-0333	492-7542
Alumni Relations	80309-0459	492-8484	Chemistry and Biochemistry	80309-0215	492-8950
Athletics, Intercollegiate	80309-0368	492-8337	Chicano Studies	80309-0217	492-8852
Bookstore (University Book Center)	80309-0036	492-6411	Classics	80309-0248	492-6257
Bursar (Tuition and Fees)	80309-0043	492-5381	Communication	80309-0270	492-7306
Continuing Education	80309-0178	492-5148	Communication Disorders and Speech Science	80309-0409	492-6445
Counseling Center (MCCCD)	80309-0103	492-6766	Comparative Literature	80309-0292	492-7376
Disabled Student Services	80309-0133	492-8671	Conflict and Peace Studies	80309-0331	492-7719
Learning Disabilities Program	80309-0133	492-5611	Distributed Studies Program	80309-0275	492-7885
Educational and Career Transi- tion (Women's Center)	80309-0103	492-6766	Economics	80309-0256	492-6394
Financial Aid and Scholarships	80309-0106	492-5091	English	80309-0226	492-7381
Housing			Environmental Conservation	80309-0260	492-8311
Assistant Director	80310-0154	492-7260	Film Studies	80309-0316	492-1531
Reservation Center (Residence Halls)	80310-0158	492-6673	Fine Arts	80309-0318	492-6504
Family Housing	80309-0061	492-6384	French and Italian	80309-0238	492-7226
Off-Campus	80309-0206	492-7053	Geography	80309-0260	492-8310
News Media Relations	80309-0009	492-6431	Geology	80309-0250	492-8141
Nontraditional Student Center	80309-0207	492-1536	Geophysics	80309-0250	492-8141
Police, University	80309-0002	492-6666	Germanic Languages and Literatures	80309-0276	492-7404
Records, Academic	80309-0068	492-6170	History	80309-0234	492-6683
Recreation Center	80309-0355	492-6561	History and Philosophy of Science	80309-0390	492-8610
Registrations	80309-0007	492-6970	Honors	80309-0184	492-6617
Residency Classification	80309-0068	492-6868	Humanities	80309-0331	492-6246
Student Health Service, Wardenburg	80309-0119	492-5101	International Affairs	80309-0333	492-7295
Summer Registration	80309-0007	492-2456	Kinesiology	80309-0354	492-7333
Tuition and Fees (Bursar)	80309-0043	492-5381	Latin American Studies	80309-0278	492-5066
University Memorial Center (UMC)	80309-0207	492-6161	Linguistics	80309-0295	492-8041
Veterans Affairs	80309-0139	492-7322	Mathematics	80309-0426	492-7664
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<b>Arts and Sciences, College of</b>	80309-0275	492-7885	Museum	80309-0218	492-6165
American Studies	80309-0325	492-8923	Natural Science	80309-0331	492-6246
Anthropology	80309-0233	492-7947	Oriental Languages and Literatures	80309-0279	492-6639
Asian Studies	80309-0217	492-2110	Philosophy	80309-0232	492-6132
Astrophysical, Planetary, and Atmospheric Sciences	80309-0391	492-8913	Physical Education	80309-0354	492-7333
Bibliography	80309-0184	492-8302	Physics	80309-0390	492-6952

<b>Academic Offices</b>	<b>Zip Code (includes campus box)</b>	<b>Telephone Number (303)</b>	<b>Academic Offices</b>	<b>Zip Code (includes campus box)</b>	<b>Telephone Number (303)</b>
Political Science	80309-0333	492-7871	Computer Science	80309-0430	492-7514
Psychology	80309-0345	492-8662	Electrical and Computer Engineering	80309-0425	492-6702
Religious Studies	80309-0292	492-8455	Engineering Physics	80309-0390	492-7772
Slavic Languages and Literatures	80309-0279	492-6639	Mechanical Engineering	80309-0427	492-7151
Sociology	80309-0327	492-6427	<b>Environmental Design, College of</b>	80309-0314	492-7711
Spanish and Portuguese	80309-0278	492-7308	<b>Graduate School</b>	80309-0026	492-7401
Theatre and Dance	80309-0261	492-7355	<b>Journalism and Mass Commu- nication, School of</b>	80309-0287	492-5007
University Writing Program	80309-0359	492-8188	<b>Law, School of</b>	80309-0401	492-8047
Women Studies	80309-0325	492-8923	<b>Music, College of</b>	80309-0301	492-6352
<b>Business and Administration, College of</b>	80309-0419	492-1807	<b>Pharmacy, School of</b>	80309-0297	492-6278
<b>Education, School of</b>	80309-0249	492-6937	<b>ROTC</b>		
<b>Engineering and Applied Science, College of</b>	80309-0422	492-5071	Air Force	80309-0371	492-8351
Aerospace Engineering	80309-0429	492-6416	Army	80309-0370	492-6495
Applied Mathematics	80309-0426	492-7664	Navy/Marine	80309-0374	492-8287
Chemical Engineering	80309-0424	492-7471			
Civil, Environmental, and Architectural Engineering	80309-0428	492-7315			

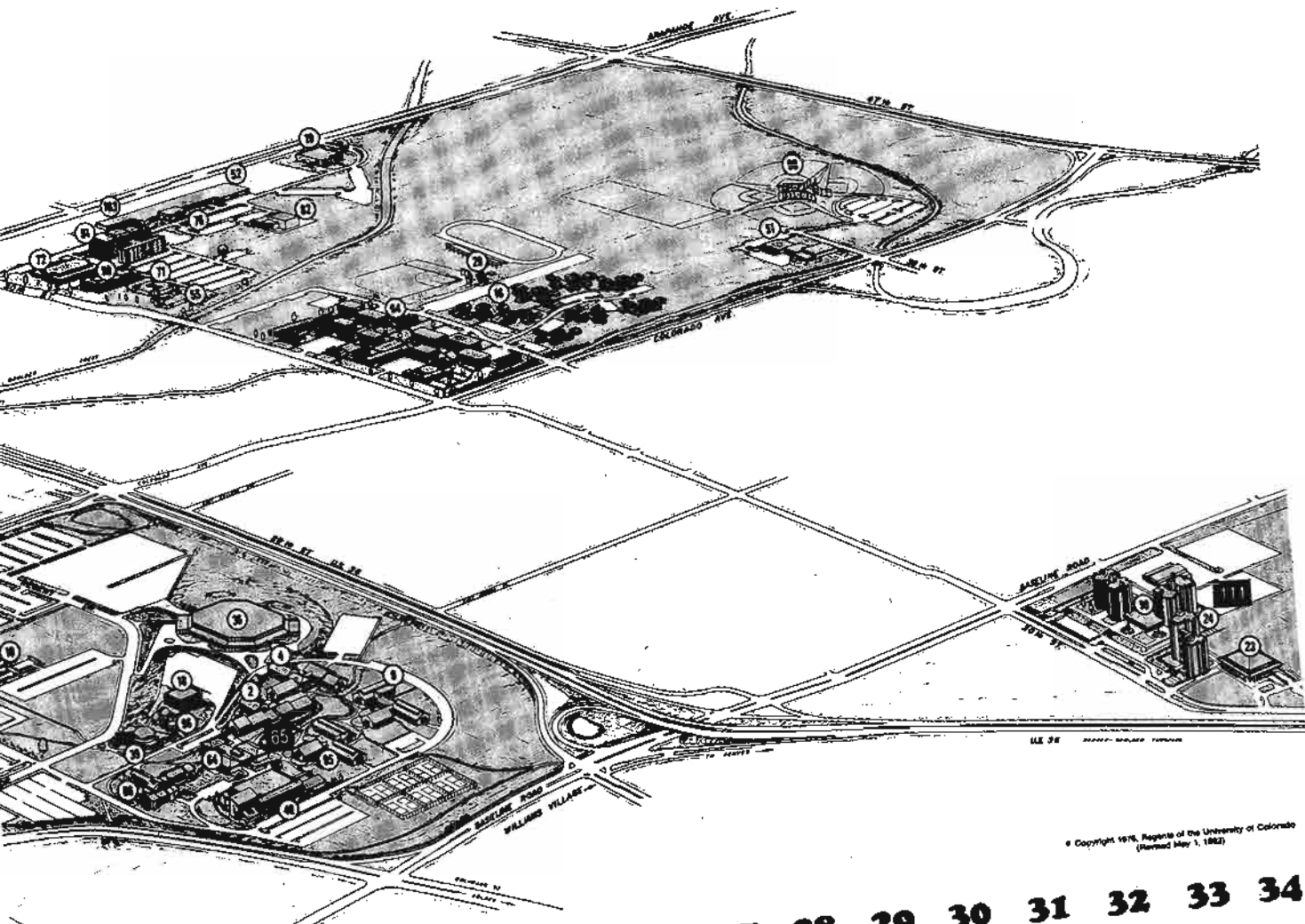


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