University of Colorado Catalog

Boulder

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The University of Colorado

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 43,500 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 quality of its programs, courses, students, faculty, and facilities. The Boulder campus is recognized as the leading comprehensive research university in the Rocky Mountain region. The University of Colorado at Colorado Springs, situated on a 420-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, provides 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. In addition to housing the Schools of Medicine, Dentistry, Nursing, and Pharmacy, the Health Sciences Center includes the University Hospital and Colorado Psychiatric Hospital. Eight renowned research institutes are also affiliated with the center.

CU ranks 19th among all universities in the country, both public and private, in gaining federal research support, according to the National Science Foundation. Sponsored research within the University system represents annual awards amounting to almost $186 million. Various agencies of the federal government are the principal sources of these funds for research and training contracts and grants. 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 the Boulder campus, the chancellor is the chief academic and administrative officer and is responsible for conducting campus affairs in accordance with Regental policy. The vice chancellor for academic affairs is responsible for planning and implementing all academic and research activities. The vice chancellor for academic services is responsible for providing direct academic support programs, for student administrative support of academic programs, and for the support of student life on campus. The vice chancellor for administration is responsible for campuswide activities that provide administrative assistance, goods, and services to persons and organizations engaged in instruction, research, and public service on campus.

Faculty participation in campus governance takes place through the Faculty Senate and the Faculty Assembly. Students participate through the University of Colorado Student Union (UCSU) and the United Government of Graduate Students (UGGS).

Campuses of the University

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

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
Graduate School
Graduate School of Business Administration
Graduate School of Public Affairs
School of the Arts
School of Education

Health Sciences Center

Graduate School
School of Dentistry
School of Medicine
School of Nursing
School of Pharmacy

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 bac-

calaureate 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 offers more than 4,000 courses in over 140 fields of study. There are approximately 90 academic programs available at the bachelor's level, 60 at the master's level, and 40 at the doctoral level. These programs represent a full range of disciplines in the humanities, the social sciences, the physical and biological sciences, the fine and performing arts, 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 the University of Colorado became a member of the Association of American Universities (AAU). AAU membership consists of 58 leading graduate and research-oriented institutions of higher education in the United States and Canada. The University of Colorado is the only AAU institution in the Rocky Mountain region.

Research conducted at Boulder is supplemented by research institutes devoted both to the advancement of knowledge in particular areas and to graduate training. Many of these institutes have developed international reputations. Included among them 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.

To enhance its research capabilities and provide collaborative opportunities with government and business, CU-Boulder has developed a 200-acre research park east of the main campus. The research park provides expanded room for research agencies that work closely with University researchers, including the cornerstone tenant of the park, the Advanced Technologies division of US West Inc.

The University's relationships with national agencies and laboratories located in Boulder are also exceptionally productive. 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 Institute of Standards and Technology (NIST), 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 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 of 16 weeks each and a 10-week summer session.

With a total enrollment of approximately 25,150 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 80 foreign countries. Many different ethnic, religious, academic, and social backgrounds are represented, fostering the development of a multicultural academic community that enriches each student's educational experience.

Full-time instructional faculty members number over 970, and more than 90 percent hold doctorates or appropriate terminal degrees. The faculty includes nationally and internationally recognized scholars with many academic honors and awards, including the 1989 Nobel Prize in chemistry. Twelve of the faculty are members of the National Academy of Sciences; seven are members of the National Academy of Engineering; and nine 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 instructional programs.

Undergraduate Enrollment and Graduation Rates

CU-Boulder's fall 1991 entering freshman class numbered about 3,400. Of these, 52 percent were males, 58 percent residents of Colorado, and 12 percent members of underrepresented minority groups (Blacks, Hispanics, and Native Americans). Seventy percent enrolled in the College of Arts and Sciences, 14 percent in the College of Engineering and Applied Science, 11 percent in the College of Business and Administration, and fewer than 5 percent combined enrolled in the College of Environmental Design and the College of Music. Almost one of every five freshmen who eventually graduates changes college or school before graduation.

Of the most recent group of students available for study (freshmen who entered CU-Boulder between 1985 and 1987), 35 percent graduated within four years; 55 to 60 percent graduated within five years; and just over 60 percent graduated within six years. Eighty-three percent of students who entered in fall 1990 returned for their second fall semester, and 72 percent of those who entered in fall 1989 remained enrolled into their third year. Both graduation rates and second-year persistence rates have increased steadily since 1981.

CU-Boulder Academic Programs

B—Bachelor's Degree JD—Juris Doctor
C—Certificate D—Doctoral Degree
M—Master's Degree

College of Arts and Sciences

Afroamerican Studies	B		
American Studies	B		
Anthropology	B	M	D
Applied Mathematics		M	D
Art Education		M*	
Art History		M	
Asian Studies	B		
Astrophysical, Planetary, and Atmospheric Sciences		M	D
Basic Science		M	
Biochemistry	B		
Centtal and East European Studies	B		
Chemical Physics			D
Chemistry	B	M	D
Chinese	B	M	
Classics	B	M	D
Communication	B	M	D
Communication Disorders and Speech Science	B	M	D
Comparative Literature		M	D
Dance	B	M	
Distributed Studies	B		
Economics	B	M	D
English	B	M	D
Environmental Conservation	B		
Environmental, Population, and Organismic Biology	B	M	D
Film Studies	B		
Fine Arts	B	M	
French	B	M	D
Geography	B	M	D
Geology	B	M	D
Geophysics			D
Germanic Studies	B		
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
Molecular, Cellular, and Developmental Biology	B	M	D
Philosophy	B	M	D
Physics	B	M	D
Political Science	B	M	D
Psychology	B	M	D
Religious Studies	B	M	
Russian	B		
Sociology	B	M	D
Spanish	B	M	D
Theatre	B	M	D

College of Business and Administration

Business Administration	B	M	D

School of Education

Education	C		
Educational/Psychological Studies		M	D
Instruction and Curriculum		M	D
Research and Evaluation Methodology			D
Social and Multicultural Bilingual Foundations		M	D

College of Engineering and Applied Science

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 and Computer Engineering	B		
Electrical Engineering	B	M	D
Engineering		M	
Engineering Physics	B		
Mechanical Engineering	B	M	D
Telecommunications		M	

College of Environmental Design

Environmental Design	B		

School of Journalism and Mass Communication

Journalism and Mass Communication	B	M	

School of Law

Law		JD	

College of Music

Arts in Music	B		
Music	B	M	D
Music Education	B	M	
Musical Arts			D

* The master of arts in art education is still officially offered on the Boulder campus, although the program is being phased out for entering students.

The College of Business and Administration offers the bachelor of science degree in business administration. Areas of emphasis within the degree program include accounting, entrepreneurship and small business management, finance, information systems, international business, marketing, operations management, organization management, personnel—human resource management, real estate, tourism and recreation, and transportation and distribution management. Areas of emphasis within the Graduate School of Business Administration for the Master of Science degree include accounting, finance, management science, marketing, and organization management.

The bachelor of environmental design degree is offered through the College of Environmental Design. Options available within the degree include architecture and planning.

Within the School of Journalism and Mass Communication, sequences are offered at the bachelor's level in advertising, news-editorial, broadcast news, and broadcast production management. The Ph.D. in journalism and mass communication is awarded as a Ph.D. in communication.

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.

The Campus Setting

The University of Colorado at Boulder is located at the foot of the Rocky Mountains, at an altitude of 5,400 feet. The Flatirons, a range of towering rock formations, are visible from nearly everywhere on campus. The climate is temperate, with pleasant days and cool evenings. On the average, the area enjoys about 340 sunny or partly sunny days each year. The campus covers 600 acres and includes over 160 buildings constructed of rough-cut Colorado 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, is listed in the State and National Register of Historic 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 about 83,000 people, is committed to preserving its beautiful natural environment and is surrounded by 20,000 acres of protected 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, business people, and professionals, as well as writers, artists, and crafts people. Consequently, the city is a center of high technology enterprise, scientific research, and cultural activity.

Denver, the state's capital city, is 30 miles from Boulder. Denver offers the attractions and resources of a metropolitan area 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.

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 500 courses, allowing progress toward a degree in almost every area of study.

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

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 repertory 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 Student Recreation Center.

To order a summer catalog, write the Office of Admissions, Campus Box 30, CU-Boulder, Boulder, CO 80309-0030, or call (303) 492-2456. The summer catalog is usually available by mid-February.

Young Scholars Summer Session

The Young Scholars Summer Session (YSSS) is a program designed for college-bound high school honor students between their junior and senior years. YSSS provides a stimulating and rewarding introduction to college by offering university-level courses limited to 20 students per class conducted by faculty with a reputation for excellent teaching. Students select one course and earn 3 semester hours of college credit. YSSS students live and study together in a residence hall near the center of campus, and can participate in the numerous recreational and cultural activities available during the Colorado summer.

For further information, write to the Young Scholars Summer Session, Campus Box 73, CU-Boulder, Boulder, CO 80309-0073, or call (303) 492-5421.

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, guided correspondence study, individualized instruction, audioconferencing, 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, commercial design, management, computer applications, and real estate.

For more information, write the Division of Continuing Education, 1221 University Avenue, Campus Box 178,CU-Boulder, Boulder, CO 80309-0178, or call (303) 492-5148 (toll free in Colorado, 1-800-332-5839; out of state, 1-800-331-2801).

CAMPUS FACILITIES AND RESOURCES

Advising Resource Center

Opened to the University community in the spring of 1990, the Advising Resource Center in Willard 400 seeks to provide comprehensive advising services to students who are undecided about their major or are thinking of changing their major to another college or school. Advisors in the center work closely with the colleges and schools and with individual departments across campus to provide up-to-date information about curriculum and core requirements. Informational flyers on the different majors are in production, and training is available to assist advisors across campus. The center is also home to the campus-wide preprofessional advisor, for those students who are preparing for study in medicine, law, or other professional fields (see the section titled Preprofessional Advising). For further information, or to make an appointment, call (303) 492-8811.

Anderson Language Technology Center

The Anderson Language Technology Center (ALTEC) is a state-of-the-art facility supporting the study of foreign languages and cultures at the University. A large library of materials offers videotapes, videodiscs, computer programs, audiotapes, and reference books.

Computing facilities consist of an interactive video lab and a computer classroom for foreign language word processing, tutorial programs, and an international communication network.

The audiovisual area has carrels for independent study of video and audiotapes, as well as rapid duplicators for audiotapes. In addition, there are viewing rooms for small groups, equipment for viewing foreign videotapes, a media classroom with a large-screen video projector, and video and audio production facilities. The center receives live satellite broadcasting from around the world.

Located in newly remodeled quarters in Hellems Hall and under the direction of the College of Arts and Sciences, ALTEC is open to the entire University community.

CU Art Galleries and Colorado Collection

The CU Art Galleries, located in the Sibell-Wolle Fine Arts building, present an active exhibition program. Shows are varied and feature quality contemporary and historic artwork. The galleries are also home to the Colorado Collection, a valuable resource for the people of Colorado. The collection includes approximately 3,000 works of art, including works by Durer, Rembrandt, Tiepolo, Hogarth, Rouault, Hiroshige, Dubuffet, Matisse, and Picasso. The galleries are open daily except Sundays; admission is free.

During the academic year, the Department of Fine Arts also hosts a visiting artist program. This acclaimed series brings 12 to 15 internationally-known contemporary artists to campus for lectures, performances, and shows in the galleries. These events are free and open to the public.

Computing Resources

Computing and Network Services (CNS) maintains a universitywide network of computing facilities in support of administration, teaching, and research.

Major computing resources include a cluster of Digital Equipment Corporation VAX minicomputers, an IBM RS/6000 minicomputer, a Digital DECsystem 5500, and a Sequent Balance parallel processor. These computers are available for interactive processing through remote sites located in buildings across campus, through data communications networks, and via dial-up ports.

CNS also maintains 36 computing laboratories equipped with personal computers, scientific workstations, and specialized software. These facilities are generally available for both classes and individual use. Facili-ties include Macintosh labs, a statistics lab, a graphics lab, and several instructional labs with SUNs, NeXT, Digit, and Apollo machines. The DISC Center (Demonstrations and Information on Small Computers) in the lower level of the Environmental Design building maintains an array of the newest equipment and software for review and evaluation. In addition to the resources that CNS provides, a large number of departments support their own extensive computing facilities for administration and special research and instruction.

CNS is responsible for the major data-communications networks on campus (Information Systems Network and Ethernet), which provide communications within the campus and gateways to national computing facilities. These networks allow Boulder faculty, staff, and students to access a host of computing resources, including the University Libraries' bibliographic and information systems; to exchange electronic mail with other faculty, staff, and students on the campus or around the world; and to gain access to national resources such as supercomputing centers, databases, and

research institutes. CNS participates in a number of state and regional networking activities, including Colorado Supernet, WESTNET, and NSFnet. CNS also works with campus departments in designing and developing local area networks.

The Administrative Systems Group of CNS provides a full range of support for administrative computing at CU-Boulder, including systems development and maintenance, computing site management, and office consulting.

CNS offers a wide range of computing support services, including student and professional advisors, seminars and workshops, documentation, and articles in the CNS newsletter, *Digit.*

Coors Events/Conference Center

The Coors Events/Conference Center is a multipurpose facility 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 center seats between 8,500 and 12,000, depending on event configuration. The conference level offers six air-conditioned, carpeted rooms, which can seat from 40 to 200 persons.

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 and Science Center

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 starprojector 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 Heritage Center, located in the oldest building on campus, is a museum that reflects the 116-year history of the University of Colorado. Exhibits tell the CU story in seven galleries, from the early history of student life as portrayed in a complete set of *Coloradan* yearbooks to the engineering flag and CU football carried by alumnus Ellison Onizuka on the ill-fated flight of the space shuttle Challenger. Other exhibits include the University's 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. The Heritage Center is open Tuesday through Friday from 10:00 a.m. until 4:00 p.m., and before and after every home football game. Special tours can be arranged by calling 492-6329.

Libraries

The University Libraries are central to teaching, study, and research at CU-Boulder. The Libraries system includes a main library (Norlin) 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). The combined collections contain more than two million printed volumes and more than three million items in other formats. The libraries subscribe to more than 20,000 periodicals, journals, and serials.

The central library (Norlin) contains collections in the humanities, social sciences, life sciences, and general reference; special collections; interlibrary loan and access (circulation) services; and the card catalog and public access catalog (PAC) terminals. The reference department collection includes major print and computerized indices and other reference materials. The department provides a variety of services, including free and fee-based computer searches.

The government publications department collects documents from state, federal, and other governments. It has been a depository for United States government publications since 1879 and is also a regional United Nations depository. The department's technical report center has more than one million government-sponsored research reports from such agencies as the Department of Defense, the Department of Energy, the National Aeronautics and Space Administration, and the National Technical Information Service.

The special collections department has approximately 35,000 volumes, including papyrus documents, medieval manuscripts, some of the earliest printed books from fifteenth-century Europe, volumes from eighteenth- and nineteenth-century England and the United States, and one of the finest mountaineering collections in North America. The western history/University archives department has extensive manuscript and photographic collections.

The interlibrary loan department extends the services of the 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 an international research collection available to campus borrowers.

Macky Auditorium Concert Hall

Originally built in 1912, Macky Auditorium Concert Hall is one of Colorado's premiere concert halls. The 2,047-seat venue features classical and popular musical concerts, dance performances, lectures, and films. It is home to the Artist Series, the Boulder Philharmonic Orchestra, the Macky Auditorium Travel Film Series, and College of Music ensembles. For information on all events, call the box office at (303) 492-6309.

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. A program of foreign and domestic specimen and information exchange 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, plant systematics, malacol-ogy, entomology, and vertebrate paleon- tology. Participation in museum-related research is encouraged by financial support to selected, qualified students through the Walker Van Riper and William Henry Burt Funds.

The exhibit halls are open daily to the public. The Hall of Earth contains minerals, rocks, and fossils, and focuses on local geology. The Hall of Life shows animals of Colorado and the Rocky Mountain region. The Hall of Humanity contains prehistoric native American southwestern textiles. The museum's gallery presents four or five special exhibitions each year.

Music

Offering over 400 public concerts annually, the College of Music is a 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 smaller performing organizations on the Boulder campus such as the Jazz Ensemble and 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 Capecchi, 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.

Preprofessional Advising

Preprofessional work can be completed on the Boulder campus, where preprofessional advising is available from faculty members and from the Office of Preprofessional Advising in the Advising Resource Center, Willard 400, (303) 492-8811.

Pre-Health 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. Lists of required courses for preprofessional health sciences programs are available in the Preprofessional Advising Office. Most University of Colorado professional health programs are offered at the Health Sciences Center in Denver.

Most students in certain fields (physical therapy, health administration, medicine) complete an undergraduate degree before entering the professional program. Other fields (e.g., child health associate, dentistry, dental hygiene, medical technology, nursing, pharmacy) do not require an undergraduate degree.

Students must recognize that admission to a preprofessional program on the Boulder campus does nor guarantee later admission to a professional program.

Pre-Law

Students who plan to apply to law school 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.

Advising and support services are available in Office of Preprofessional Advising.

Sommers-Bausch Observatory

Located on the Boulder campus, the Sommers-Bausch Observatory has 16-, 18- and 24-inch aperture Cassegrain telescopes for introductory astronomy classes and for graduate student research. Ancillary instrumentation is available for direct imaging and spectroscopy and includes an advanced technology CCD camera. The observatory is also open to the public on Friday evenings for viewing of the planets, stars, and nebulae, as weather permits.

Student Recreation Center

Funded largely by student fees, the Student Recreation Center is one of the finest facilities of its rype in the country. The center includes an Olympic-sized swimming pool with a diving well, a patio for sunbathing, an ice arena used for hockey, broomball, and skating, handball/racquetball, squash, and tennis courts, a multi-use gymnasium, dry heat saunas, a free weight room, a dance/aerobics room, three regulation-sized basketball courts with a one-tenth mile running track suspended overhead, and a fitness systems room with Cybex and cardiovascular equipment. Current fee-paying students, their guests, and other members may take advantage of the facilities by showing their student ID or membership card. A variety of sports equipment, including volleyball sets, tents, sleeping bags, backpacks, snowshoes, and cross-country skis, can be checked out overnight for a nominal fee.

Members may also participate in a wide range of team sports including ice hockey, rugby, swimming and diving, speed skating, figure skating, lacrosse, soccer, and baseball through the club sports program. The outdoor program offers students the opportunity to learn about the outdoors through special trips featuring rock climbing, backpacking, rafting, hiking, cross-country skiing, snowshoeing, and scuba diving, in addition to educational presentations. Through the instruction program, members may participate in noncredit classes at various levels of instruction in aquatics, aerobics, skating, tennis, fitness, CPR and first aid, martial arts, advanced lifesaving, yoga, and dance. The intramural program offers leagues, tournaments, and special events in basketball, soccer, broomball, tennis, handball, squash, touch football, badminton, softball, and other sports.

Theatre and Dance

Newly remodeled facilities for theatrical and dance presentations include the University Theatre, the beautiful outdoor Mary Rippon Theatre, the Loft Theatre, and the Charlotte York Irey Dance Studio.

The Department of Theatre and Dance presents 8 to 10 major productions each academic year. The 1991 season included the musical *Pippin,* Tennessee Willliams' *A Streetcar Named Desire,* and *Top Girls,* as well as other comedies and dramas.

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 34 years of distinguished history, and features the most advanced students in the CU-Boulder theatre and dance program. Recent guest artists have included directors Robert Benedetti, Libby Appel, and Robert Cohen, and actors Tony Church of the Royal Shakespeare Company, Val Kilmer, and Jimmy Smits.

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 12,000 meetings each year, is a forum for a variety of speakers, seminars, concerts, films, and special events. The UMC is the home of the University of Colorado Student Union (UCSU) and its many operations, as well as the United Government of Graduate Students (UGGS). It also provides office space for more than 80 student organizations. The Dennis Small Third World Center, the Off-Campus Housing Office, and the Environmental Center are located in the UMC.

The facilities include a reception desk for campus information, the University Book Center, meeting rooms, a copy center, a computerized ticket service, banking and check cashing facilities, a flower shop, a travel agency, an art gallery, music listening rooms, and a games area. Also located in the UMC are two 450-seat dining areas and a kiosk-style cafeteria that includes a basic grill, a deli, full-meal service, a pizza parlour, a bakery, Mexican food, ice cream, and a salad, fruit, and soup bar. The UMC also furnishes a complete catering service.

University Policies, Programs, and Services

ACADEMIC ADVISING

Academic advising is an integral part of undergraduate education. The goal of all academic advising is to assist students in making responsible decisions as they develop educational plans compatible with their potential and with their career and life goals. Advising is more than the sharing of information about academic courses and programs; it includes encouraging students to formulate important questions about the nature and direction of their education and working with them to find answers to those questions. Advisors will confer with students about alternative course schedules and other educational experiences, but students themselves are responsible for selecting the content of their academic program and making progress toward an academic degree.

As students progress through their academic program, their questions and concerns change. The University of Colorado at Boulder provides a system of faculty, staff, and student academic advisors to address these ongoing and multifaceted concerns. It is expected that students, with their own unique needs and interests, will each require the help of several different types of academic advisors before they graduate.

All students should have a primary advisor in their academic department. These departmental advisors are generally faculty members who understand the nature of the academic program and can work with students on how it can best address individual interests and goals. Other advisors in departments, dean's offices, and across campus are also there to help. Staff advisors can be counted on to maintain up-to-date information on academic policies, procedures, and deadlines. Student peer advisors provide valuable perspectives on what courses to take when. Support offices such as the Advising Resource Center and Counseling and Career Services help students refine academic interests and career goals.

Students should refer to college, school, and departmental advising materials for specific details on their advising programs.

Within the advising system on the Boulder campus, both students and advisors have responsibilities.

Students are responsible for:

a. knowing the requirements of their particular academic program, selecting courses that meet those requirements in an appropriate time frame, and monitoring their progress toward graduation;

b. consulting with appropriate advisors designated to handle the kind of questions or concerns they have;

c. scheduling and keeping academic advising appointments in a timely manner throughout their academic career, so as to avoid seeking advising only during busy registration periods; and

d. being prepared for advising sessions (for example, by bringing in a list of questions or concerns, having a tentative schedule in mind, and/or being prepared to discuss interests and goals with their advisor).

Advisors are collectively responsible for:

a. helping students clarify their values, goals, and potential, and to understand themselves better;

b. helping students understand the nature and purposes of a college education;

c. providing accurate information about educational options, requirements, policies, and procedures;

d. helping students plan educational programs consistent with the requirements of their degree program and with their own goals, interests, and abilities;

e. assisting students in the continual monitoring and evaluation of their educational progress; and

f. helping students locate and integrate the many resources of the University to meet their unique educational needs and aspirations.

ACADEMIC RECORDS

Class Level

Class level is based on 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 for most undergraduate students is 15 to 17 credit hours a semester.

Course Load

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 this catalog. Students who receive financial aid or veterans benefits or who live 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 and spring semesters.

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.

Good Academic Standing

Good academic standing in most undergraduate colleges and schools requires a 2.00 grade point average (GPA). Students should consult their 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. Each instructor is responsible for determining the requirements for a

course and for assigning grades on the basis of those requirements.

Standard Grade	*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

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

*** = class grades were not submitted when final grades were processed, or student is currently enrolled in the course

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 course instructor and/or the academic dean's office.

Students must ask for an incomplete grade. An *IF* or *IW* is given only when students, for reasons beyond their control, have been unable to complete course requirements. 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 under which the course work can be completed and the time limit for its completion. The student is expected to complete the requirements within the established deadline and not retake the entire course.

It is the instructor's and/or the student's decision whether a course should be retaken. If a course is retaken, it must be completed on the Boulder campus or in Boulder evening classes. 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 are 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: the credit hours and the credit points are totaled for all courses; then the total credit points are divided by the total hours attempted. Courses with grade symbols of *P, NC, *** (blank grade), 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 grade period.

Grades Earned	*Credit Points per Hour*		*Credit Hours*		=	*Credit Points in Course*
A	4.0	x	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			44
			Credit Hours			Points

$$\frac{44}{15} = 2.93 \text{ GPA}$$

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

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 students' local mailing addresses. At the end of spring semester and summer session, grade reports are mailed to students' permanent addresses.

In-State and Out-of-State Tuition Classification

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.

New students are classified as in-state or out-of-state residents for tuition purposes on the basis of information provided on their application for admission and other relevant information. Applicants may be required to submit evidence substantiating their claim of in-state eligibility.

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 105, Campus Box 68, CU-Boulder, Boulder, CO 80309-0068, telephone (303) 492-6868.

Basic Requirements for Establishing Colorado Residency

The age of majority in Colorado for tuition-classification purposes is 21.

Unemancipated students less than 21 years of age have the same legal residence as their parents. Therefore, the parents of such students become applicants and have to meet legal requirements established by the state of Colorado for in-state residency classification.

To be eligible for in-state classification, applicants must show 1) intent to establish permanent domicile in Colorado, and 2) after the establishment of such intent, applicants must maintain legal residence in Colorado for the 12 months preceding the term for which in-state status is being applied.

Evidence of Domicile

Evidence of Colorado domicile includes actions that would normally be expected of any permanent resident. Factors that constitute proof of domicile are:

- Payment of Colorado state income tax
- Colorado driver's license
- Colorado vehicle registration
- Voter registration in Colorado
- Permanent employment or acceptance of future permanent employment in Colorado. (Note: Employment offered by the University to students is not considered permanent.)
- Ownership and permanent occupancy of residential real property in Colorado

Graduation from a Colorado high school
Continued permanent residence in Colorado

Note: By meeting the above listed criteria for in-state residency classification, students are not necessarily qualified for residency status. For further information and a determination of residency status, please contact the Tuition Classification Coordinator.

No single factor constitutes conclusive proof of domicile. All factors, positive and negative, are considered. All of the listed factors are not necessary, but individuals should take actions on those factors that are appropriate in their circumstances.

Unemancipated Minors

Students who are not yet 21 years old and depend on their parents for financial support are considered "unemancipated minors." As such, they qualify for in-state tuition if either of their parents, regardless of custody, has been domiciled in Colorado for 12 consecutive months preceding the first day of class in a given semester, even if the students reside elsewhere. Unmarried students whose parents move to Colorado between their twentieth and twenty-first birthdays must establish legal residence in Colorado by age 21 to be eligible for in-state status (effective one year after their parents' move to the state). Unmarried students whose parents move to Colorado prior to their twentieth birthday are entitled to in-state status if they (the students) move to the state by age 22.

Students lose eligibility for in-state tuition if they (or their parents, if the students are unemancipated minors) maintain domicile outside Colorado for one year or more, unless the parents have lived in Colorado at least four years and meet other requirements.

Classification Notes

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.

Students who 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.

Residents of participating western states enrolled in graduate programs approved by the Western Regional Graduate Program are entitled to in-state tuition rates. Students should call or write the tuition classification office or their academic department for further information.

Active-duty members of the armed forces of the United States or Canada 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.

Official Transcripts

The official transcript includes the complete undergraduate and graduate academic record of courses taken at all campus locations or divisions of the University of Colorado. It contains the signature of the registrar 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 may be ordered in person, by phone, or by mail from the Office of the Registrar, Transcript Section, Regent Administrative Center 105, Campus Box 68, CU-Boulder, Boulder, CO 80309-0068, (303) 492-8987

Students may request a complete transcript from the registrar of any University of Colorado campus. If students attend more than one campus, it is not necessary to request a transcript from each campus. Requests should include the following:

1. Student's full name (former and current names, if applicable)
2. Student number
3. Birth date
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 three working days to process. However, a rush transcript are processed within one day for a $3 fee per transcript. A FAX rush transcript is available for an additional fee. A student having financial obligations to the University that are due and unpaid cannot be granted a transcript. Transcripts sent to students are labeled "issued to student." Copies of transcripts from other institutions cannot be furnished.

Official transcripts that include end-of-term grades are available approximately one week after final examinations. A transcript that is to have a degree recorded will be available approximately six weeks after graduation.

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 offices on campus and within offices at other University of Colorado campuses. Unofficial transcripts do not carry the embossed seal of the University. Copies are available at the Office of the Registrar in the foyer of Regent Administrative Center 105 at a cost of $1.00.

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. Information on participating colleges and schools and an application for credit by examination may be obtained from the Office of the Registrar in Regent Administrative Center 105. The application specifies procedures to be followed and provides spaces for the signatures required for approval: 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. 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 credit hours for the current semester. Fees are payable in advance and are nonrefundable.

Stops

A scholastic, dean's, financial, or miscellaneous stop may be placed on 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 student should remove each stop as quickly as possible by contacting the campus office that placed the stop. General inquiries may be addressed to the Office of the Registrar.

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 the Registrar.

The registrar has 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 Registrar.* 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: financial information submitted by their parents, confidential letters that they have waived their rights to review, or 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, and date and place of birth. Such information may be disclosed by the institution for any purpose, at its discretion.

No other information regarding a student's education records may be disclosed to anyone without the written consent of the student, *except* to personnel within the institution, to officials of other institutions in which the student seeks to enroll, to persons or organizations providing the student with financial aid (this includes the parents upon whom the student is financially dependent; however, the University requests that parents who would like a transcript have the student obtain one for them), to accrediting agencies carrying out their accreditation functions, and to persons in an emergency to protect the health or safety of the student 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 registrar's office before the eleventh day of classes in a term. Once requested, the nondisclosure will remain in effect until the student is no longer enrolled or requests that the nondisclosure request be discontinued. 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 the Registrar, Regent Administrative Center 105.

CAMPUS POLICIES

Academic Integrity

A university's intellectual reputation depends on the maintenance of the highest standards of intellectual honesty. 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 may be defined as using unauthorized materials or giving or receiving unauthorized assistance during an examination or other academic exercise. Examples of cheating may include: copying the work of another student during an examination or other academic exercise, or permitting another student to copy one's work; taking an examination for another student, or allowing another student to take one's examination; possessing unauthorized notes, study sheets, or other materials during an examination or other academic exercise; collaborating with another student during an academic exercise without the instructor's consent; and/or falsifying examination results.

Plagiarism

Plagiarism may be defined as the use of another's ideas or words without acknowledgment. Examples of plagiarism may include: failing to use quotation marks when quoting from a source; failing to document distinctive ideas from a source; and/or fabricating or inventing sources.

Unauthorized Possession or Disposition of Academic Materials

Unauthorized possession or disposition of academic materials may include: selling or purchasing examinations or other academic work; taking another student's academic work without permission; possessing examinations or other assignments not formally released by an instructor; and/or submitting the same paper for two different classes without specific authorization.

Sanctions

Breaches of academic honesty will result in disciplinary measures that may include: a failing grade for a particular assignment; a failing grade for a particular course; and/or suspension for various lengths of time or permanent expulsion from the University.

Procedures

Each college and school has developed procedures to enforce its statement or code of academic honesty. The procedures generally contain a requirement that a student accused of academic dishonesty be notified of the specific charges of academic dishonesty, that the student be given an opportunity to respond to the charges before an unbiased individual or panel, and that the student be notified in writing of the decision or recommendation made by the individual or panel reviewing the charges. If a student wishes to appeal a case, the student should request a listing of the procedures used by his or her school or college and follow the requirements therein.

Breaches of academic honesty are under the purview of each college and school pursuant to the *Laws 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

In order to create the best possible environment for teaching and learning, the University of Colorado at Boulder affirms its support for a responsible alcohol and illegal drug policy for the campus. It is the responsibility of the University community to create a positive environment in which all students, faculty, and staff can flourish.

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

The University's drug and alcohol education committee, composed of students, faculty, and staff, is an active organization that develops and sponsors drug and alcohol education programs. In addition, Wardenburg Student Health Center 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 Department of Housing, (303) 492-6580; and for information on campus substance abuse programs, call Wardenburg Student Health Center, (303) 492-5654.

Environmental Health and Safety

At CU-Boulder, the safety of students, faculty, staff, and the public is considered to be of paramount importance, and every person is urged to cooperate fully to ensure that campus facilities, procedures, activities, and practices are safe. The Boulder campus Department of Environmental Health and Safety was established to implement a safety program that includes but is not limited to occupational safety, radiation safety, hazardous materials and waste management, teams for emergency response and asbestos abatement, waste water monitoring, laboratory safety and industrial hygiene, fire protection, review and approval of plans for remodeling, renovation, and construction projects, facility safety, sanitation, general campus premises safety, accident investigation and prevention, and safety training seminars.

Contact the Department of Environmental Health and Safety 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 *Registration Handbook and 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 the exception is based on good and sufficient reasons (such as religious observances), and 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 are 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 are 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 academic freedom and the learning process in an environment characterized by civility and respect for others. Harassment of an individual or a group interferes with the freedom to pursue academic goals and is inconsistent with the mission of the University. The University is concerned with all forms of harassing behavior, ranging from verbal abuse to physical assault, and is committed to creating a safe environment conducive to personal and academic growth.

Students, faculty, and staff have the responsibility to refrain from, prevent, and report behavior that threatens or harms their colleagues and to assist victims. 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.

Specific efforts to promote safety on campus include the provision of adequate lighting, police protection, educational programs, and special prevention programs, such as the Nightride and Nightwalk escort services. Emergency telephones have been located on campus to provide 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.

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

Sexual Harassment

It is the policy of the University of Colorado at Boulder to maintain the University community as a place of work, study, and residence free of sexual harassment or exploitation of students, faculty, staff, and administrators. Sexual harassment is prohibited on campus and in University programs. The University is committed to taking appropriate action against those who violate the University's policy prohibiting sexual harassment.

No reprisal or retaliation of any kind shall be taken against any individual for complaining about sexual harassment or for participating in any procedure to redress a complaint of sexual harassment. However, the University's policy prohibiting retaliation of reprisal against individuals complaining of sexual harassment shall not be construed as precluding disciplinary actions against individuals who are found to have made intentionally false and malicious complaints.

Sexual harassment is defined as conduct that is unwelcome and consists of sexual advances, requests for sexual favors, and other verbal or physical conduct of a sexual nature when 1) submission to such conduct is made either explicitly or implicitly a term or condition of an individual's employment or academic work, 2) submission to or rejection of such conduct by an individual is used as the basis for employment or academic decisions affecting that individual, or 3) such conduct has the purpose, or effect, of interfering with that individual's work or academic performance by creating an intimidating, hostile, or offensive working or educational environment. Sexual harassment may occur between persons of the same gender or of different genders.

For information on procedures regarding sexual harassment, contact the Ombudsman Office at (303) 492-5077.

Smoking Policies

Campuswide smoking regulations are not intended to deny smokers their prerogatives, but rather to limit the potential adverse effects of smoking in closed and restricted spaces in University facilities.

Smoking is prohibited in 1) all buildings and offices affiliated with the Boulder campus, except those specifically identified as designated smoking areas; 2) all areas that are identified by "No Open Flame" warning signs; 3) any University facility used as a meeting room unless the person conducting the meeting announces that smoking will be permitted; and 4) the high-risk buildings of Old Main, Woodbury, Fiske Planetarium, TB No. 9, and Hunter.

Designated smoking areas include private offices with permanent floor-to-ceiling walls and a door, shared offices (with the agreement of all residents), and other designated hallways and lounges in campus buildings.

For more information on the campus smoking policy, please refer to the *General Procedures Manual* or the Office of the Vice Chancellor of Administration.

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 for upholding not only University standards but civil and criminal laws 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.

One of the important aspects of administrative due process is the provision of a statement regarding the kinds of conduct that may lead to University action. While the specific intent to commit an act is an important consideration in determining whether a standard of conduct has been violated and in deciding upon appropriate sanctions, students are responsible for their actions when these actions are due to negligence. Prohibited conduct for which a student is subject to discipline is as follows:

1. Obstruction, disruption, or interference with teaching, research, disciplinary proceedings, emergency responses, or other University activities, including public service functions or other authorized activities on University premises. This includes interfering with the freedom of expression of others on University premises or failing 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 on University premises.

3. Prohibited entry to or use of University facilities, defined as unauthorized entry or use of University property or facilities for illegal purposes or purposes detrimental to the University. This includes violation of federal, state, or local laws or of University policies or regulations while on University premises.

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

5. Theft or damage to University property or the private property of students, school officials, employees, and invited guests when such property is located upon University premises This includes the unauthorized copying and distribution of software licensed to the University. This also includes possession of known stolen property.

6. Possession of firearms, explosives, or other dangerous weapons within or upon University premises. This policy does 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 a designee of the chief.

A dangerous weapon is defined as any object or substance designed to inflict a wound, cause injury, or incapacitate. Weapons may include, but are not limited to, BB guns, pellet 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 used for sporting purposes can be stored with the UCPD.

7. Harassment and/or hazing in all forms (including ethnic or sexual), including but not limited to striking, laying hands upon, treating with violence, or threatening to do bodily harm to another person, or other treatment of an abusive, taunting, or alarming nature.

8. Inflicting sexual contact or sexual intrusion upon or engaging in sexual penetration with any person without that person's consent. Such conduct is "without consent" when no clear consent is given; when inflicted through force, threat of force, or coercion; or when inflicted upon a person who is unconscious or otherwise without the physical or mental capacity to consent, *e.g.*, when someone is under the influence of alcohol or drugs.

9. Conduct on University premises that threatens or endangers the health or safety of any person, including but not limited to physical abuse, physical restriction, or coercion. This includes tampering with, impairing, disabling, or misusing fire protection systems such as fire detectors, sprinklers, alarms, and extinguishers.

10. Possession, use, manufacture, distribution, or sale of alcoholic bevetages on University premises contrary to law and/or University policy. Being under the influence of alcohol is not viewed by the University as an excuse for student misconduct.

11. Possession, use, manufacture, distribution, or sale of illegal drugs upon University premises. Being under the influence of illegal drugs is not viewed by the University as an excuse for student misconduct.

12. Off-campus: physical abuse, physical restriction, coercion, or harassment of any person including sexual harassment or sexual assault; significant theft; distribution, sale, or manufacture of illegal drugs (including the possession of a sufficient quantity to indicate intent to sell); damage, theft, or unauthorized possession of University property; forgery, falsification, alteration, or use of University documents to gain any unentitled advantage; or violation of any criminal law that indicates the student is a threat to the safety or security of the University and members of the University community.

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, students are encour-

aged to contact the Office of Student Conduct, Willard Administrative Center 223, CU-Boulder, Boulder, CO 80309-0132, (303) 492-5550.

EXPENSES

Estimated Expenses

Expenses for students attending the University of Colorado at Boulder vary, depending on whether they live on or off campus, their 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 full-time undergraduate arts and sciences students living on the Boulder campus in 1991-92. The Board of Regents reserves the right to change the costs for tuition and fees and room and board at any time, and it should be expected that costs will be higher for 1992-93.

	In-state	*Out-of-state*
Tuition and fees	$2,420	$10,350
Room and board (on campus)	$3,540-4,095	$3,540-4,095
Total	$5,960-6,515	$13,890-14,445

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 the Registrar in mid-February. Additional costs would include books, supplies, special residential academic program fees, transportation, 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 *Registration Handbook and Schedule of Courses* for notation of special fees.

1991-92 Tuition Rates Per Semester

Tuition and fees for 1992-93 were not set when this catalog went to press in early 1992. The tuition rates *per semester* for the 1991-92 school year are listed below. Note that a surcharge is assessed for each semester credit hour over 18 hours. 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.

Undergraduate In-State Tuition

Semester Credit Hours	*Business*	*Engin.*	*Journalism/ Music*	*Other*
1-3	414	420	360	357
4	552	560	480	476
5	690	700	600	595
6	828	840	720	714
7	966	980	840	833
8	1,104	1,120	960	952
9-18	1,144	1,166	995	986
Each hour over 18	$138	$140	$120	$119

Undergraduate Out-of-State Tuition

Semester Credit Hours	*Business/ Engineering*	*Journalism/ Music*	*Other*
1-3	5,157	4,995	4,950
4	5,157	4,995	4,950
5	5,157	4,995	4,950
6	5,157	4,995	4,950
7	5,157	4,995	4,950
8	5,157	4,995	4,950
9-18	5,157	4,995	4,950
Each hour over 18	$573	$555	$550

Graduate In-State Tuition

Semester Credit Hours	*Business/ Engineering*	*Law*	*Other*
1-3	471	513	420
4	628	684	560
5	785	855	700
6	942	1,026	840
7	1,099	1,197	980
8	1,256	1,368	1,120
9-18	1,413	1,539	1,260
Each hour over 18	$157	$171	$140

Graduate Out-of-State Tuition

Semester Credit Hours	*Business/ Engineering*	*Law*	*Other*
1-3	1,650	1,680	1,602
4	2,200	2,240	2,136
5	2,750	2,800	2,670
6	3,300	3,360	3,204
7	3,850	3,920	3,738
8	4,400	4,480	4,272
9-18	4,950	5,040	4,806
Each hour over 18	$550	$560	$534

Students simultaneously enrolled in programs leading to two different degrees will be assessed tuition for the college or school with the *higher* tuition rate, according to the above schedule.

Mandatory Fees Per Semester

Fees for 1992-93 were not set at the time this catalog went to press. Mandatory fees charged per semester for 1991-92 are listed below.

Student Activity Fee (assessed by UCSU)

One class of 5 or fewer credit hours	$ 33.18
One class of more than 5 credit hours	168.35
More than one class (any amount of hours)	168.35

Athletic Fee

Credit hours of 3 or fewer	$ 0.00
Credit hours of 4 or more	33.00

Student Computing Fee

Credit hours of 6 or fewer	$ 5.00
Credit hours of 7 or more	10.00

RTD Fee *

All students	$ 10.00

Student Information System (SIS) Fee

All students	$ 4.00

* The student RTD bus pass program was implemented during the 1991-92 academic year at the rate of $10 per semester. This fee entitles students free unlimited ridership on local and express bus routes. Regional routes are available to student riders for an extra $1.00 each ride.

Miscellaneous Fees

Student Health Insurance

All Boulder campus students are encouraged to maintain adequate health insurance. Students who are taking more than one class and/or enrolled for more than 5 credit hours will automatically be charged for the University of Colorado Student Union (UCSU) health insurance plan. In order to waive the insurance, students *must* complete and submit a waiver form to Wardenburg Student Health Center (WSHC) by the published deadline. Waiver forms are available at WSHC. Please see the Wardenburg Student Health Center section of this catalog for further information, or call the WSHC Insurance Office at (303) 492-5107.

Approved doctoral candidate students who desire to purchase the UCSU health insurance plan may do so without paying additional student fees. However, those doctoral students who choose to waive the additional student fees will not be eligible for the reduced student rate at WSHC

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 and covers adding and dropping courses and official transcript orders. Nondegree students who are admitted to degree status are assessed the $15 matriculation fee at the time of their first registration as degree students.

Late Registration Fee

A late registration fee may be charged to 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.

Enrollment Deposit

All new students must confirm their enrollment at the University by returning a completed confirmation form and an enrollment deposit of $200 (both in-state and out-of-state students). The deposit is nontransferable and must be paid by all students, regardless of financial aid awards. Students who have paid the deposit and who decide not to attend CU-Boulder forfeit their deposit. Deposits received after enrollment levels have been reached will be returned.

The enrollment deposit is *not* credited towards tuition and fees. Instead, it is refunded when a student graduates or officially withdraws from CU-Boulder within established dates and guidelines, after paying any outstanding University obligations.

Tuition and Fee Regulations

Drop/Add Tuition Adjustment

Adjustment of tuition and fees is made on drop/add changes as published in the *Registration Handbook and Schedule of Courses.*

Tuition Classification

Students are classified as in-state or out-of-state residents for tuition purposes on the basis of information provided on their application for admission and other relevant information. For more information, see the Academic Records section of this catalog, page 10.

Students Registered on More Than One Campus

Students registering for courses on more than one campus of the University during a single term pay tuition and fees to each campus at the rate appropriate to the number of credits for which they are registered on that campus. Boulder campus students qualified to use the concurrent registration option pay Boulder campus rates for the total hours enrolled at all campuses.

Nondegree Students

Nondegree students with a prior baccalaureate degree are assessed tuition at the graduate student rate. Nondegree students without any prior baccalaureate degree are assessed tuition at the undergraduate rate.

University Employees

Any permanent employee may enroll for not more than 6 free 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) 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 appointed for less than full time are not eligible for release time during assigned hours. For details, call the student billing 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 students will pay for 3 semester hours at the graduate in-state rate.

Approved Doctoral Candidates

A student admitted as an approved doctoral candidate is registered for 7 dissertation hours.

Students not making use of campus facilities may petition the Graduate School for 3-credit-hour status. Consult the Graduate School for petition deadlines. Continuous registration for dissertation hours during fall and spring semesters is required until completion of the dissertation defense. Doctoral dissertation rates are 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.

Payment of Tuition and Fees

University Bills

Students enrolled at the University of Colorado at Boulder are responsible for full payment of all tuition, fees, and University residence hall charges (when applicable) noted on their schedule/bill. The bill also includes financial aid awards, credits, and teaching assistant tuition adjustments. *Housing deposits are not applied to the schedule/bill until spring semester.*

Failure to receive an official University schedule/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 withdrawal from future terms, tuition and fees must be paid by the deadline published in the *Registration Handbook and Schedule of Courses.* Subsequent bills will reflect adjustments and additional charges made throughout the semester. For further information, call the student billing department in the Bursar's Office.

Deferred Payment Plan

Students may apply for a deferred tuition payment plan by filling out a tuition deferment agreement. The agreement must be completed and submitted to the Bursar's Office by the tuition payment deadline each semester. Students should consult the *Registration Handbook and Schedule of Courses* for specific instructions relating to deferred tuition policies and deadlines.

This plan allows students to pay tuition and fees in two installments. At least one-half of the obligation must be paid in the first installment. The deferred balance is subject to a finance charge of 1 percent per month (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 is subject to late and/or service charges, and the student may be subject to withdrawal from future terms. The Board of Regents reserves the right to revise or eliminate this program at any time. Tuition and fee 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 withdrawn for all future terms at CU-Boulder and must apply for readmission.
2. No transcripts, diplomas, or certification materials are issued for the student until the bill is paid in full.

3. The student will still be responsible for full tuition and fees, as well as a service charge (1 percent per month) and a late charge according to the following schedule:

Balance Due	*Late Charge*
$ 10.00-99.99	$ 5.00
$100.00-299.99	$10.00
$300.00-499.99	$20.00
$500.00-699.99	$30.00
$700.00-899.99	$40.00
$900.00 and over	$50.00

4. The student will become ineligible for all University services.

All outstanding financial obligations must be paid before a student can reapply to the University or attempt to re-register.

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 $17 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 the Colorado Criminal Statutes. 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 in the Bursar's Office.

Withdrawal Policy Regarding Tuition and Fees

Students who pay their $200 enrollment deposit and register for classes for any given semester are obligated to pay full tuition and fees for that semester, unless they officially withdraw from the University.

Tuition and fee obligations for withdrawing students are as follows:

a. If students withdraw on or before the third Friday of instruction, the full amount of their enrollment deposit is retained by the University.

b. After the third Friday of instruction through the fifth Friday of instruction, 40 percent of full tuition and mandatory fees is assessed.

c. After the fifth Friday of instruction through the seventh Friday of instruction, 60 percent of full tuition and mandatory fees is charged.

d. After the seventh Friday of instruction, 100 percent of full tuition and fees is due the University.

Students should refer to the current *Registration Handbook and Schedule of Courses* for any changes, as the Board of Regents reserves the right to revise this schedule at any time. 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 special services fees removed at the time of withdrawal. Otherwise, these fees become a financial obligation.

Students who do not pay the full amount due the University at the time of withdrawal must make arrangements for payment with the student debt management department in the Bursar's Office. All withdrawals are handled through the Office of the Registrar, Regent Administrative Center 105.

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, spring, or summer term 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 billing 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. 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 the Registrar does not keep any record of courses audited; therefore, credit for these courses cannot be established. See Grading System and Drop/Add.

FINANCIAL AID

Approximately 50 percent of CU-Boulder students annually receive financial aid from federal, state, University, and private sources. In most cases, grants are supplemented by long-term loans and/or part-time employment (work-study) to meet students' financial eligibility.

The Office of Financial Aid, located in the Environmental Design Building, is open from 9:00 a.m. to 4:00 p.m., Monday through Friday. During office hours, aid counselors are available on an appointment basis to talk with prospective students and their parents about how to finance an education at CU-Boulder. Students who are unable to visit the office may call (303) 492-5091 for assistance.

Applying for Financial Aid

Students who wish to apply for financial aid should submit a SingleFile Form from United Student Aid (USA) Funds. Applications should be available through local high school counselors or the Boulder Office of Financial Aid around mid-December of each year. The Office of Financial Aid at Boulder recommends that students use the SingleFile Form as the main application for financial aid, as it is free and shorter than other aid applications. However, the office will accept other applications, such as the Family Financial Statement (FFS) from American College Testing, the Financial Aid Form (FAF) provided by the College Scholarship Service, or the Application for Federal Student Aid (AFSA) from the federal government. Only one need-analysis application should be sent to CU-Boulder.

Students are encouraged to submit their application as soon as possible after January 1. Awards are made in early April, so all financial information must be on file in order to be considered for funds. Financial aid is awarded as long as funds are available. Please note that students must be admitted to the University before their financial aid application can be considered. However, prospective students should not wait for formal acceptance to Boulder before applying for financial aid. In addition, the Office of Financial Aid will require students and/or parents to submit copies of federal tax returns.

The Office of Financial Aid will send an official award offer and acceptance agreement once each application has been received and the information has been verified, and as long as the student has been accepted to the University in a degree-granting academic program. Funds awarded by CU-Boulder are limited and are made to students on the basis of their demonstrated financial eligibility.

Students who apply for financial aid at Boulder are responsible for knowing and complying with the reasonable academic progress policy. Briefly, the policy requires students to maintain a 2.00 grade point average and to successfully complete at least 65 percent of the hours they attempt. In addition, students are subject to a maximum number of credit hours they can attempt to complete their degree. Students are encouraged to read the complete policy, published in a fact sheet available in the Office of Financial Aid.

Financial Aid Programs

The **Pell Grant** program provides grant assistance to undergraduate students who have no previous baccalaureate degree. Eligibility is based on financial need and is determined by the government.

The **Supplemental Educational Opportunity Grant (SEOG)** provides grant assistance to undergraduate students with no previous degree who demonstrate high need. Preference for this grant is given to students who also receive a Pell Grant.

The **Colorado Student Grant** is a state-funded grant program that awards funds to Colorado resident undergraduate students. Like any other grant, it does not have to be repaid.

The **Colorado Student Incentive Grant** is partly funded by the federal government and partly by the state of Colorado. Funds are awarded to Colorado resident undergraduate students with high need.

The **Perkins Loan** is a loan program with 5% interest that is awarded to undergraduate students who demonstrate financial eligibility. CU-Boulder awards Perkins Loans primarily from its own funds, which are generated from former students repaying these loans. Repayment of the loan begins six months after students leave school or cease to be enrolled on at least a half-time basis. Students have up to ten years to repay the loan.

The **Stafford Loan** (formerly Guaranteed Student Loan) program offers a federally subsidized, low-interest loan to undergraduate and graduate students who demonstrate financial eligibility. This 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 college attendance, depending on their need level. Repayment of the loan begins six months after students leave school or cease to be enrolled on at least a half-time basis.

The **PLUS Loan** is a loan for parents of dependent students. The PLUS has a slightly higher interest rate than the Stafford Loan, and repayment begins 60 days after disbursement of the loan. The maximum amount that can be borrowed each year is $4,000. Parents do not have to qualify based on financial eligibility for this loan, but may have to undergo a credit check.

The **Supplemental Loan for Students (SLS)** is a loan similar to 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. Students are required to complete a financial aid application.

The **Work-Study** program provides employment opportunities for both graduate and undergraduate students. Work-study is a need-based program and students must qualify for this source of assistance through the aid application process. Students awarded work-study will need to review the job opportunities posted outside the Office of Financial Aid and obtain their own job. Students are advised that work-study does not appear on their bill; they are paid every other week during the academic year in accordance with the number of hours worked.

The Office of Financial Aid also assists students in obtaining part-time employment when they are not awarded work-study. 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.

CU scholarships and grants are awarded on the basis of merit and/or need. These types of assistance do not have to be repaid. Institutional scholarships are funded by donations to the University. Grants given by CU-Boulder are funded either by the University or by various sponsoring groups on campus. Students seeking information about merit and need-based scholarships administered by CU-Boulder are encouraged to obtain a free copy of the publication entitled *Guide to Institutional Scholarships 1991-93*. The publication can be obtained in the Office of Financial Aid, Environmental Design Building, Room 2.

HOUSING

Residence Halls

Living on campus in a University residence hall is considered an important part of student life. Twenty-one residence halls accommodate almost 6,000 students in single rooms, double rooms, multiple occupancy rooms, and apartments. All halls are coeducational, but specific wings and floors house occupants of the same sex.

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, all freshmen 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 and have permission to commute. Requests for permission to reside off campus for other reasons are considered on their merits, taking into account individual circumstances.

The residence halls provide a range of services and programs designed to support the intellectual, social, and personal growth of single student residents. All residence halls, for example, have tutoring services available to residents at little or no cost. Some halls offer special facilities, such as a dark room, computer room, an academic skills lab, or music room. Further, mini-courses are offered on subjects such as photography and cardiopulmonary resuscitation, and a variety of academic and social programs are sponsored by residence hall and other University staff.

The residence hall dining service 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, CU-Boulder, Boulder, CO 80310.

Farrand and Sewall Residential Academic Programs

Two residence halls, Farrand and Sewall, house 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. For information, write the Academic Program Director, Farrand Hall, Boulder, CO 80310, or call (303) 492-8848.

The Sewall residential academic program is open to freshmen in all colleges who would like to be part of a cohesive, coeducational living/learning community. Sewall is designed for 330 students who expect and want Sewall to be their major focus. At the heart of the Sewall living/learning experience, the academic program requires that students take a special class taught each semester in Sewall. Classes are usually for 3 semester credit hours and may either satisfy a particular core requirement or count as

elective credit. Most classes are taught by regular CU-Boulder faculty. For information, write the Program Director, Sewall Residential Academic Program, CU-Boulder, Boulder, CO 80310, or call (303) 492-6004.

During the 1991-92 academic year, both Farrand and Sewall charged $500 in additional fees for their academic program. For more detailed information on the Farrand and Sewall programs, consult the College of Arts and Sciences section of this catalog.

Kittredge Honors Program

The major goal of the Kittredge Honors Program (KHP) is to build a sense of community among a small group of honors students who live near one another, but are not isolated from the rest of the Kittredge community. KHP students interact with other high-ability students and, because honors courses are offered in Kittredge, have the opportunity to take a course in their residence hall. Students also have the opportunity to plan special programs and events and to develop the program itself.

Freshmen and sophomores become eligible to participate in KHP through the Arts and Sciences Honors Program. Upper-division students may maintain involvement in the program through non-residential activities.

For additional information, students should write to the Honors Center, Campus Box 184, CU-Boulder, Boulder, CO 80309-0184, or call (303) 492-3695.

Engineering and Science Residential Program

Freshmen and sophomores studying engineering and natural science who live in Aden, Brackert, Cockerell, and Crosman Halls may participate in this coeducational program. Sponsored by the College of Engineering and Applied Science and the Department of Housing, and supported by the College of Arts and Sciences, this program offers residents specialized tutoring, extensive computer-system access, and professional counseling and advising. An additional *estimated* fee of $60-70 per semester covers the support activities.

Other Academic Programs in the Residence Halls

In the spring of 1987, the Council on Academic Programs in the Residence Halls (CAPRH) 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 Cheyenne Arapaho Hall; a preceptor program, primarily for business students; a faculty luncheon program in the halls; and special arts and sciences core curriculum courses that are presented directly in the halls. All programs facilitate greater interaction between faculty and students, and 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 Per Semester

Residence hall room and board rates per person, per semester, for the 1991-92 academic year have been established as follows. A modest rate increase should be expected for the 1992-93 academic year. Rates are higher for the Sewall and Farrand residential academic programs. As noted, there is also an additional fee for the Engineering and Science Residential Program.

Board and single room	$2,048
Board and double room	$1,770

Application for Residence Hall Housing

New freshman and transfer students receive housing application materials from the Department of Housing after they have confirmed their intent to attend the University. The packet includes a housing brochure, the residence halls application, two copies of the residence halls agreement, and a return envelope. The housing forms should be returned directly to the Residence Halls Reservation Center. The earlier these forms are received, the better chance students have of being assigned to the residence hall of their choice.

Space for the fall term can normally be assured for all freshmen who apply for housing by early May. However, due to heavy demand for limited hall space, the University cannot always guarantee that freshmen who apply for housing late (usually after mid- to late May for the fall term) will find space available in the residence halls. If this is the case, students are so advised and are given appropriate instructions regarding wait lists and/or assistance in securing off-campus housing.

Application for 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 Undergraduate Admission section of this catalog.

An advance payment ($100 in 1991-92), which is 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 a residence hall during the period of the agreement.

Family Housing

The University offers a variety of studio, 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. Family housing residents have first priority. For information, write the Family Housing Office, 1350 Twentieth Street, CU-Boulder, Boulder, CO 80302.

Off-Campus Housing

The Off-Campus Housing Office (a service of UCSU) maintains listings of rooms, houses, and apartments for rent in the Boulder community as well as lists of students looking for roommates. Students may come to the office, located in UMC 336, to obtain a set of computerized rental listings (available for a small fee), to use the free telephones in their rental or roommate search, and to talk with assistants about the Boulder area.

Office assistants also advise students about leases, security deposits, effective shared rooming techniques, and ways to avoid landlord/tenant problems. The office sells Boulder maps for $1.50 and provides free copies of the *Boulder Tenants' Guide,* an easy-to understand summary of tenants' rights and responsibilities; the Boulder model lease; the *Roommate Survival Guide,* a pamphlet describing communication techniques and other tips for successful rooming techniques; and handouts on furniture rental, moving tips, local banking services, and other off-campus housing-related matters. Each spring the office sponsors an off-campus housing fair where landlords, property managers, and related businesses offer their services to students in a trade-show fashion.

For rental listing forms and additional information, students may write to the Off-Campus Housing Office, Campus Box 206, CU-Boulder, Boulder, CO 80309-0206 or call (303) 492-7053. Office hours are 9:00 a.m. to 4:00 p.m., Monday through Friday. During July and August, the office is also open on Saturdays from 10:00 a.m. to 2:00 p.m.

PROGRAMS

Alumni Association

The CU-Boulder Alumni Association, housed in the Koenig Alumni Center, sponsors a wide range of activities and programs to benefit students, former students, graduates, parents, and the University. By fostering loyalty among CU-Boulder alumni and providing opportunities for involvement, the Alumni Association creates a foundation for life-long support of the University.

Working with local alumni chapters and the Parents Association, the association raises money each year for scholarships and is involved in admissions assistance, including minority student recruitment. The association also conducts numerous educational programs for alumni and the community.

The Alumni Association has an active membership program offering numerous benefits to those who join, including access to certain University facilities, special rates for various sports, theatre, and cultural events, and association publications such as *Colorado Alumnus*, *Summit* magazine, and the annual report and calendar. Other benefits include invitations to local alumni events, world travel, lifelong learning programs, and reunions. Access to the alumni information service helps alumni keep in touch with friends and former classmates worldwide.

Dues for alumni in the first five years after graduation and for those over 65 are $20 for individuals and $25 for couples. Dues for other alumni, friends, and parents are $30 for individuals and $35 for couples.

For additional information, call (303) 492-8484.

Artist Series

This seven-concert series in the beautifully renovated Macky Auditorium Concert Hall features artists of world renown in performances of music, dance, and theatre. Branford Marsalis, Vladimir Ashkenazy, Urban Bush Women, DanceBrazil, Ballet Hispanico, Yo-Yo Ma, and the Berlin Symphony Orchestra are just a few of the outstanding performers who have appeared in recent Artist Series events. Ticket subscriptions to the seven-concert series are available, with special rates for students. Call (303) 492-8008 for a free brochure.

Clubs and Organizations

Clubs and organizations of almost every description are available on the Boulder campus and include over 200 different academic, political, social, religious, and recreational groups. The Animal Rights Group, Ski Club, Interfraternity Council, United Campus Ministries, Student Ambassadors, Program Council, and the Residence Hall Representative Council are examples of student-sponsored groups that offer a variety of opportunities for individuals to become involved with others on campus.

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*, which can be found in UMC 333, their associate dean's office, an academic advisor, UMC bulletin boards, and student offices.

Colorado Space Grant College

The Colorado Space Grant College provides undergraduate and graduate students with hands-on experience in building, flying, and operating space experiments, as well as in analyzing data from engineering and scientific research efforts. Students in a variety of disciplines are trained to carry NASA and the U.S. space program into the twenty-first century. Because Space Grant College students receive at least two years of actual research experience in space science and engineering before they graduate, they have exciting opportunities to apply their classroom learning and are especially attractive to prospective employers.

Scholarships, research assistantships, and/or independent research credit is awarded to select students who complete the course entitled Introduction to Space Experimentation (APAS 3060 or ASEN 3060). This course is the gateway to the space track and provides a broad perspective on space experimentation. It surveys the scientific and technical research that can be accomplished from space, and the engineering principles and tools needed to make that research possible. A space seminar series associated with the course provides additional perspective on the technical, social, and political aspects of space exploration.

Research Opportunities

Space grant students gain valuable hands-on experience in space science and engineering projects by participating in one of several research efforts. The Get-Away-Special payload flown on the space shuttle is one of a series of student-run research projects to be flown with the ATLAS shuttle missions.

Other space grant students, with students from colleges and universities throughout Colorado, are working on the Colorado Student Ozone Atmospheric Rocket (CSOAR), scheduled for launch in fall 1992. The CSOAR payload, designed to examine atmospheric ozone, will be launched on an Orion series sub-orbital rocket from the NASA Wallops Island Flight Facility in Virginia.

For further information, contact the Colorado Space Grant College, Campus Box 520, CU-Boulder, Boulder, CO 80309-0520, (303) 492-3141.

CU Opportunity Program

The CU Opportunity Program (CUOP) provides access and educational opportunity to students from ethnic minority backgrounds (e.g., American Indian, Asian American, Black, and Hispanic), migrant backgrounds, and educationally or economically 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; the University Learning Center; and Counseling and Career Services: A Multicultural Center.

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 and are assisted in the application process. Because all students have not had equal opportunities to prepare for university work, additional 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.

The center also gives precollegiate academic assistance to ethnic minority youth in

Colorado and the Rocky Mountain region. It reaches out to high school and junior high school students, providing them with a chance to succeed in a structured academic environment and offering them access to Boulder's educational opportunities. Current projects include the American Indian Upward Bound Program, the Precollegiate Development Program, and the Academic Excellence Program.

Counseling and Career Services: A Multicultural Center

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 young adults who are in the process of defining their academic and personal lives.

Fraternities and Sororities

Over 3,500 students currently participate in CU-Boulder's 42 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. Information about Black Greek organizations may be obtained by calling the Black Student Alliance office, (303) 492-1863; Latino organizations can be reached through the United Mexican American Students office, (303) 492-6571.

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.

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), and Pi Kappa Lambda (music). 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 Conference and sponsors teams in a variety of intercollegiate sports. Competing at the national level, the Colorado Buffaloes pride themselves on many individual and team championships. During the 1990-91 academic year, CU-Boulder claimed national championships in both football and skiing.

Men's varsity sports include football, basketball, 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 51,463-seat stadium, serves as the home of the Colorado Buffalo football team. The basketball team practices and competes in the Coors Events/Conference Center, a facility that seats 11,199 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, including its home mountain, Lake Eldora. The women's volleyball team uses both the Coors Events/Conference 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.

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 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 also houses the International Research and Education Center, which promotes the international interdisciplinary activities of Boulder's faculty through fellowships, and encourages linkages between CU-Boulder and foreign institutions for faculty and collaborative research.

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 passes are also available through the office.

Study Abroad Programs

The Office of International Education offers over 35 different study abroad programs around the globe. Traditional junior-year-abroad programs, in which a student is placed directly in a foreign university for a full academic year, are available at the American University in Cairo, Egypt; the University of Lancaster, England; the Universities of Bordeaux and Grenoble, France; and the Universities of Regensburg and Tübingen, Germany. Programs where students may directly enroll in a foreign university for either a semester or an academic year include the Nova Scotia College of Art and Design, Canada; the University of Costa Rica in San Jose; the Instituto Tecnologico y de Estudios Superiores de Monterrey, Mexico; the Hebrew University in Jerusalem, Israel; the University of Wollongong, Australia; and the University of East Anglia, England. CU-Boulder is also a member of the International Student Exchange Program, in order to encourage semester and full-year exchange programs with the developing nations of the world in Africa, Asia, and Latin America.

Generally, students must have completed a minimum of two years of college-level work with a *B* average or better and have studied at least two years of the appropriate language to qualify for these programs.

Qualified students not interested in being fully integrated in a foreign university system may elect special programs for foreigners abroad. These students may study central and east European studies in Czechoslovakia, Hungary, or Poland; architecture and design, international business, or liberal arts

in Copenhagen at Denmark's International Study Program; humanities, area studies, social sciences, and Spanish language courses in the Dominican Republic, Guadalajara, and Alicante, Granada, or Madrid, Spain; French language and civilization in Rennes, France; Chinese language at Tunghai University in Taiwan; and Japanese language and area studies in Osaka or Tokyo. All of these programs, except in Osaka, Japan, offer semester-long study abroad opportunities. Many also offer a full-year option. The language requirement for these programs varies. On some programs all of the instruction is in English; on others it is in the language of the host country.

Students who wish to spend a summer abroad studying language may choose from programs in Annecy, France; Kassel, Germany; or Guadalajara, Mexico. Area studies and language courses are available at the Hebrew University in Jerusalem, Israel. Specialized short-term summer and winter interim programs are offered in conjunction with specific academic departments. Students may study art history in Italy, comparative European architecture and planning in western Europe, theatre and music in London, or international finance in London.

All participants in University of Colorado study abroad programs remain enrolled at the University and all credit earned while abroad is considered earned in residence. 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, Campus Box 123, CU-Boulder, Boulder, CO 80309-0123, (303) 492-7741.

Foreign Student and Scholar Services

The University of Colorado has welcomed foreign students and scholars for many years. Currently more than 1,000 foreign students and over 300 postdoctoral scholars and visiting faculty members from more than 80 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 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. Classes are offered in eight-week sessions at six 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 and elsewhere in the United States. At advanced proficiency levels, IEC students are permitted to enroll concurrently in selected academic 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.

As a unit of CU's Division of Continuing Education, the IEC also offers non-intensive classes in English as a second language for non-English-speaking visitors or local residents.

Full information may be obtained from the International English Center by mail (Campus Box 63), in person at the IEC offices at 1333 Grandview Avenue, by telephone, (303) 492-5547, or by facsimile (FAX), (303) 492-5515.

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 college requirements, student services, and campus activities. Because each college has its own unique orientation program, students should call or write their respective college for more information. Some colleges require attendance; most colleges include parents in their orientation programs.

In addition, each fall entering freshman, transfer, and graduate students are invited to participate in new student welcome week, a program of events specially 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.

Rocky Mountain Film Center

The Rocky Mountain Film Center (RMFC) is perhaps best known for presenting the International Film Series, which celebrated its fiftieth anniversary during the 1991-92 season. A special program within the IFS is the First Person Cinema, an avant-garde series featuring personal appearances by internationally famous artists in both video and film. This program is the world's longest-running continuous forum for alternative cinema.

In addition to providing a venue for current foreign films, independent domestic cinema, and classic motion pictures, RMFC serves as a resource to both the university and the larger community for practical, theoretical, and critical issues concerning film. Fulfilling this capacity, RMFC offers instruction on video equipment and computer graphics, holds video production workshops, and operates an equipment desk for the rental of filmmaking and video gear. RMFC also hosts numerous special events and programs, including national solicitations for grants, fellowships, and foundation projects; the Academy of Motion Picture Arts and Sciences Student Academy Awards; and regional programs such as the Colorado Film Network, a film series presented in fourteen small towns throughout Colorado.

Housed in the CU Film Studies Department, the Rocky Mountain Film Center is a media arts center serving the Boulder/Denver community and the Rocky Mountain region with film and video access, screenings, information, and education. On campus, it performs a valuable service as a vehicle for multicultural awareness.

For further information or schedules, call (303) 492-1531 anytime.

Semester at Sea

In fall 1990, an agreement was signed with the University of Pittsburgh's Institute for Shipboard Education encouraging CU-Boulder undergraduate students, faculty, and staff to participate in the Semester at Sea program. Designed to be a "global" experience, students live and learn aboard the S.S. Universe on a 100-day voyage around the world. Students enroll for at least 12 hours of course credit during the

semester and participate in traditional class work as well as international field work. Credits earned are transferable back to CU-Boulder.

The shipboard curriculum provides students with a series of insights into various societies and allows them to analyze and discuss what they observe. Students not only develop the ability to understand new cultures as they are encountered, but also gain the intellectual tools that allow them to relate past experiences to future situations. Similarly, they are called upon to examine crisis issues of global concern, such as those relating to the environment, population, foreign policy interrelationships, and economics, in the context of the nations they visit. During the semester, the ship truly becomes a campus and the world a laboratory for study.

For information on courses, itineraries, and costs, contact the Semester at Sea office in UMC 313, (303) 492-5351.

Senior Auditor Program

During the 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's libraries. For information, call (303) 492-8484.

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.

College of Arts and Sciences Honors Program

Students in the program have the opportunity to collaborate with faculty on research and creative projects 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, depend- ing 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.

Independent Study

Independent study course work provides students the opportunity to become involved in projects 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 their associate dean's office about any special provisions.

Undergraduate Research Opportunities Program

The Undergraduate Research Opportunities Program, or 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. Students are awarded up to $750 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. UROP also publishes *Ascent: The Journal of Undergraduate Research.* For information concerning opportunities for undergraduate research, contact the UROP office in Norlin M400H, (303) 492-2596.

United Government of Graduate Students

In 1973, the Graduate Student Advisory Council (GSAC) was formed to represent the concerns of graduate students at CU-Boulder such as teaching assistant funding, work conditions, faculty-student relations, and administration-student relations. GSAC also served to represent graduate students on the UCSU Legislative Council.

In the spring of 1990, members of the GSAC and the Law School's Student Bar Association formed a coalition, the United Government of Graduate Students, or UGGS. CU-Boulder students voted to fund UGGS with a tax of 30 cents per semester. This funding allows UGGS to research and improve the graduate student experience.

Graduate student issues directly affect the entire campus. Older students share the need for day care, parking, and housing facilities with nontraditional students. All students are faced with incredible increases in health care costs. Graduate instructors are also concerned about teaching effectiveness in large classrooms. UGGS' focus on graduate concerns bring about positive changes for the University community as a whole.

For more information about UGGS or GSAC, call 492-5068.

University of Colorado Student Union

Through the University of Colorado Student Union (UCSU), students make policies and control many Boulder campus facilities and programs. Based on its budget of $16.1 million, half of which comes from student fees and the other half from student revenues, UCSU is the nation's second-largest student government and is exceeded only by the student government at the University of California, Berkeley. UCSU operates facilities such as the Wardenburg Student Health Center, the University Memorial Center (UMC), the Student 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 executive, legislative, and judicial branches. 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 is composed of a 20-member council. Ten seats are occupied by representatives of the colleges and schools; the remaining 10 seats are occupied by elected representatives-at-large. The joint boards on which council members serve include the environmental, recreation, health, finance, cultural events, UMC, and KUCB Access in Radio boards.

The appellate court is UCSU's judicial branch. The seven students appointed by the executive branch to serve on the appellate court are responsible for interpreting

the UCSU constitution and ruling on specific appeals brought before them.

For more information regarding UCSU, please call 492-7473.

Veterans' Affairs

The Veterans' Affairs Office is part of the Office of Financial Aid and helps eligible students apply to the Department of Veterans' Affairs for 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.

A *certified copy of Copy 4 of the DD-214* is required in order to apply for educational benefits as a veteran; this form is available from local county clerk and recorders' offices without charge. The certified copy must have the raised seal of the county clerk. If the veteran has used educational benefits any time since discharge from active duty, a certified copy of Copy 4 of the DD-214 is not necessary. Persons on active duty who wish to take advantage of their educational benefits under any of these programs should contact their base education officer for eligibility requirements.

CU-Boulder is approved for veterans benefits under the following programs.

Veterans' Educational Assistance Program (VEAP), Chapter 32. Students must have entered active duty on or after January 1, 1977, and before July 1, 1985, and have participated in this program while in the service.

New GI Bill, Chapter 30. Students must have entered active duty on or after July 1, 1985 and participated in the program while in the service. Also eligible are those veterans who entered active duty before January 1, 1977, and who served continuously on active duty through June 30, 1988 (or June 30, 1987, with at least a four-year obligation to the 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 due to the death of a parent in active military service or a parent's service-connected disability should establish their eligibility with the local Department of Veterans' Affairs regional office.

Children and spouses of 100-percent-disabled veterans may also qualify. Applicants must provide 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 Restored Entitlement Program for Survivors (REPS) should contact the Veterans' Affairs Office or the local Department of Veterans' Affairs regional office.

Selected Reserve Educational Assistance Program, Chapter 106. Students may be eligible if they enlisted, reenlisted, or extended an enlistment in the Selected Reserve or National Guard for a period of six years beginning on or after July 1, 1985. Each student must provide the Veterans' Affairs Office with a Notice of Basic Eligibility, DD-2384, from the reserve or guard unit.

Disabled Veterans, Chapter 31. Veterans may be entitled to vocational rehabilitation benefits of tuition, fees, books, and a monthly stipend if they meet the following conditions: they were discharged from the service under other-than-dishonorable conditions; they have a service-connected disability for which they are receiving or could elect to receive VA compensation; and the Department of Veterans' Affairs determines they need rehabilitation services and assistance to overcome an employment handicap or to improve their capacity for independent living in their family and community. Applications are available in the Veterans' Affairs Office. Interested persons should contact the Department of Veterans' Affairs Vocational Rehabilitation at (303) 980-2777.

Payment. Students may request advance payment by completing the proper forms at the Veterans' Affairs Office at least 60 days before the start of a term (they must not have used the benefits in the 30 days preceding the term). The advance paycheck for the first month (or partial month) and the succeeding month is delivered to the Veterans' Affairs Office. The next educational benefit check and subsequent checks are sent to the student's address for that enrollment period.

The office has a counselor on staff to assist students with planning academic schedules in relation to VA regulations. Financial aid counseling is also available. The office is located in the University Memorial Center, Room 165. For further information, call (303) 492-7322.

REGISTRATION

Students should refer to the academic calendar and each semester's *Registration Handbook and Schedule of Courses* or *Summer Session Catalog* for specific dates and deadlines that apply to the registration process. Students should also consult college and school sections of this catalog and their individual dean's office for additional information on special requirements and procedures. The following registration policies are intended to serve as general guidelines.

Registration generally involves three steps: registering for courses, obtaining a combined schedule/bill before classes begin, and dropping and adding classes during schedule adjustment periods if needed.

Registering for Courses

All CU-Boulder students register for courses via CU Connect, the campus telephone registration system. CU Connect is accessible via touch-tone phone, both locally and from long distance.

Registration instructions are sent to new freshman, new transfer, new graduate, and readmitted students when they have confirmed their intent to enroll. Continuing students are notified each semester of times, places, and requirements for registration.

Schedule/Bill Distribution

Combined schedule/bills are distributed each semester. Exact times and locations are listed in each semester's *Registration Handbook and Schedule of Courses.*

Schedule Adjustment

Students are able to adjust their schedules by dropping and adding classes via CU Connect during registration. Once the semester begins, terminals are available on campus for schedule adjustment activities. To avoid excessive strain on the system, drop/add activity takes place by time assignment only during the first few days of the semester. After that, the system is available to all students, both by terminal and by telephone, during the schedule adjustment period.

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

Enrollment Deposit

The enrollment deposit is a new enrollment procedure, implemented in spring 1991, that resulted from a student initiative and was approved by the Boulder campus administration. All degree students pay a one-time-only $200 enrollment deposit that allows them to enroll without paying the registration deposit that was previously required every term.

Enrollment deposits are refunded to students upon graduation or official withdrawal from CU-Boulder within established dates and guidelines. All refunds are reduced by any outstanding financial obligations. Refunds are issued no more than eight weeks after graduation or two weeks

after official withdrawal.

The $200 deposit is required of *all* degree students. New students are required to pay the deposit when they first confirm their intent to enroll at CU-Boulder, and are not permitted to register until the enrollment deposit is paid.

The registrar's office is responsible for administering this policy and for overseeing an appeals procedure. All questions should be directed to the Office of the Registrar, Regent 105, (303) 492-6970.

Credit/No Credit

Students who wish to take course work for no credit should indicate this at the time they register for courses or during the final schedule adjustment period; changes in credit registration are not permitted after this time. Tuition is the same whether or not credit is received in a course.

Drop/Add

Specific drop/add deadlines for each fall and spring semester are announced in that semester's *Registration Handbook and Schedule of Courses.* Summer deadlines are published in the *Summer Session Catalog.*

1. Students are allowed to drop and add courses during the final schedule adjustment period with no signatures required, unless enrollment levels are reached earlier. There are no adds allowed after the final schedule adjustment period. Students may drop classes during the schedule adjustment period without being assessed tuition and fees for them. Individual colleges and schools may have further restrictions.

2. After final schedule adjustment, the instructor's signature is required to drop a course. The signature indicates that the student is passing the course; students who are failing the course are not permitted to drop. Courses dropped after the deadline noted in the *Registration Handbook and Schedule of Courses* appear on the transcript with a grade of *W* and no tuition adjustment is made.

3. Six weeks after classes begin in a fall or spring semester, 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 are not approved after this date.

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

Pass/Fail (*P/F*)

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

Students who wish to register for a course on a pass/fail basis should do so at the time they register or during the schedule adjustment period. Changes to or from a pass/fail basis may be made only during those times.

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 the Registrar, those courses that require a *P/F* designation are automatically converted. Grades of *D-* and above convert to grades of *P.* A grade of *F* remains an *F.*

Exceptions to the pass/fail regulations are permitted for certain courses that are offered only on a pass/fail basis.

Variable Credit

All independent study courses and, occasionally, 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 *Registration Handbook and Schedule of Courses* for variable credit hour ranges for particular courses.

Time Out Program

The Time Out Program (TOP) is a planned leave program for currently enrolled Boulder students who are in good standing in their college or school and whose dean approves their leave. Students on TOP may leave for one semester or one year to pursue academic or nonacademic interests, and they do not need to reapply to the University. 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. In addition, students may apply for transfer to a different college or school upon returning to CU-Boulder, provided they observe all policies, procedures, and deadlines. Certain restrictions do apply, however, for some colleges and schools. Students are informed of registration procedures by mail.

Additional information and a TOP application can be obtained from the Office of the Registrar in Regent Administrative Center 105. A nonrefundable $30 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 Procedures

Before classes start, students may withdraw by dropping all of their classes via CU Connect, by filling out a withdrawal form in the Office of the Registrar, Regent Administrative Center 105, or by sending a letter of withdrawal to the Office of the Registrar, Campus Box 20, CU-Boulder, Boulder, CO 80309-0020.

Once classes begin in a fall or spring semester, students must complete a withdrawal interview in the registrar's office. During the summer, students may withdraw by dropping their last class or by filling out a withdrawal form in the registrar's office. In any term, students are not permitted to withdraw after the last day of classes.

Failure to withdraw officially will result in a failing grade being recorded for every course taken in a term and makes a student liable for the full amount of tuition and fees for that term. See the withdrawal policy regarding tuition and fees on page 17 for further information on charges and refunds.

Rules for withdrawing may vary with each college and school. Students anticipating a withdrawal should consult with their dean's office and with the *Registration Handbook and Schedule of Courses* or *Summer Session Catalog* for specific withdrawal procedures. More information is available in the Office of the Registrar, Regent Administrative Center 105, (303) 492-8673.

Students who withdraw from a fall or spring semester and then wish to return to the University must reapply for admission. Reapplication is not necessary for those students on leave through the Time Out Program.

Other Registrations

Concurrent Registration

Boulder campus students who are unable to obtain courses required for their degree program 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. This option is only available during the academic year, and not during summer session. The course work must be required for their degree program, they must have their dean's permission, they must be enrolled for at

least one course on the Boulder campus, and enrollment levels must not have been reached on the other 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; business students who are two semesters from graduating and who cannot obtain a course necessary to complete a 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 Office of the Registrar in Regent Administrative Center 105, between 9:00 a.m. and 4:00 p.m., after the drop/add period has begun at the other campus.

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, excepr in the summer.

Late Registration

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

Students who fail to complete registration during their assigned registration period are subject to a late registration fee if late registration is held for their category.

Graduate students registering as candidates 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.

Registration for Faculty and Staff

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 Bursar's Office, Regent 150. New nondegree students, and nondegree students who have taken a break from course work, must turn in a nondegree student application (available in the Bursar's Office) as well as their current PAF.

Faculty and staff members 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 Bursar's Office. After one semester, new degree students will become continuing students and are automatically set up to register for each semester, although application for any of the remaining 1-6 free credit hours must be made each semester.

To take advantage of the free semester credit hours, faculty and staff must wait until after schedule/bill distribution to register. However, the PAF should be submitted by the deadline published in the *Registration Handbook and Schedule of Courses* or *Summer Session Catalog;* registration materials are issued when the PAF is received. Faculty and staff who have used their free credit hours for the year may register early with their appropriate registration group and pay applicable tuition and fees for the course(s).

Faculty and staff should refer to the current *Registration Handbook and Schedule of Courses* or call the Bursar's Office at (303) 492-5381 for registration dates and additional information.

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 Coors Events/Conference Center on campus. At each commencement, the president of the University and the chancellor of the Boulder campus 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 the Registrar approximately two and one-half months after the ceremony. Diplomas not picked up at that time are mailed to students at the address provided on the diploma address card they return to the Commencement Office.

SERVICES

Academic Media Services

Dedicated to helping make learning interesting, meaningful, and memorable, Academic Media Services (AMS) supplies the campus with films, video- and audiotapes, slides, transparencies, computer graphics, and a variety of audiovisual equipment. Staff members, assisted by a cadre of student employees, work closely with faculty in 44 self-service media-equipped classrooms and 9 operator-assisted, media-equipped lecture halls.

Video programs are produced on campus, shown on the campus TV network, and broadcast to sites along the Front Range. Repair of personal computers, peripherals, and AV equipment is offered by qualified AMS technicians. Camcorders, VCRs, and projectors are available at the AMS rental center. AMS is located in Folsom Stadium, Room 360 (Gate 7, 9, or 11); phone (303) 492-8282.

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 primarily serves 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 provides a complete range of speech, language, and hearing services to students, faculty, and members of the community. Services include evaluation and treatment programs for hearing, articulation, voice, and stuttering problems. Programs for children and adults with language problems related to learning disabilities, strokes, head injury, developmental delays, and other concerns are available on an individual and group basis. The clinic also houses a parent/infant/toddler program, integrated

preschool classrooms, and various adult programs including a stuttering group, a pragmatics group, and a Parkinson's group. The clinic dispenses and services hearing aids and offers instruction on using aids and on speech reading. For more information about the clinic's programs and services, call (303) 492-5375.

Counseling and Career Services: A Multicultural Center

The center offers programs and activities for all members of the University, including students, faculty, and staff of all ethnic and sociocultural backgrounds.

Counseling Services

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, and from making career decisions and resolving interpersonal conflicts to participating in an individualized 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 college work at CU-Boulder.

Cross-Cultural Consultation. Training and consultation services that develop effective and positive responses to the diversity within the University community are available to students, faculty, and staff. In addition, assistance is available in the areas of cross-cultural communication and counseling skills.

Ethnic Student Support Programs. Career, academic, and personal counseling are available for ethnic minority students as they pursue their education at the Univetsity. Students work with counselors and peer counselors to develop educational plans that will help them achieve their academic, career, and personal goals.

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 Interest Inventory, Colorado Educational Interest Inventory, Harrington-O'Shea Career Interest Inventory, Myers-Briggs Type Indicator, and the Michigan Test of English Language Proficiency.

Contacting Counseling. Center resources and services may be requested by visiting Willard Administrative Center 134 anytime between 8:00 a.m. and 5:00 p.m., Monday through Friday, or by calling (303) 492-6766 or 492-5667 for an appointment. 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.

Career-Related Services

The center also offers career planning, cooperative education/internship programming, and career placement assistance. Career development should be an integral part of a student's higher education, and students are encouraged to use these services throughout their University experience. Located on the ground floor of Willard Administrative Center, the Career Services office is open year-round and serves University alumni as well as students. Fees are charged for co-op and placement services. Telephone (303) 492-6541.

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 have the opportunity to develop skills and techniques useful in interviews for employment or graduate or professional school admissions. A videotaped mock interview, in which a 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 this library. Many other career-related books and resources are available, including job vacancies, job market studies, employer directories, job search literature, and employer information (recruiting brochures, annual reports, etc.). Two computer packages are available: *Discover* is a computerized career counseling system with information on 425 occupations, graduate schools, self assessment, career decision-making, and job strategies; and *Major-Minor Finder* is a computerized software program that helps students select a major and acquire information about required courses, employment opportunities, related careers, and additional information. 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, and career planning. Students are encouraged to attend an 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 resource 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 proce-

dures are also taken care of by the counselors. All students are required to attend a one-hour orientation session to familiarize themselves with co-op philosophy and procedures.

The co-op office coordinates on-campus interview schedules with ptospective co-op candidates. Students who apply to employers not interviewing on campus learn of opportunities through the career resource 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 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 students at more advanced grade levels 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.

CU Career Connection. This phone bulletin board enables students to access current job vacancies in business, education, government, and nonprofit organizations 24 hours a day. The listings are professional positions requiring college degrees. CU Career Connection is available to students as early as three months prior to graduation as well as after graduation.

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

National Testing

Qualifying tests are periodically given through the Counseling and Career Services office for undergraduate and graduate school admission. These tests include MCAT, LSAT, GRE, GMAT, SAT, UGFLT, and the ACT Residual. College-Level Examination Program (CLEP) tests are given in biology, general chemistry, general psychology, introductory macroeconomics, introductoty microeconomics, introductory sociology, and calculus with elementary functions. Call (303) 492-5254 for more information.

Disabled Student 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, 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 Program, another service of OSDS, is structured around a diagnostic prescriptive model, and assists students with learning disabilities so they can better adapt to the academic environment.

For further information about services to disabled students, call (303) 492-8671 or write OSDS, Willard Administrative Center 316, Campus Box 107, CU-Boulder, Boulder, CO 80309-0107.

Faculty Teaching Excellence

For further information on either of the programs described below, please call (303) 492-4985.

Faculty Teaching Excellence Program

The Faculty Teaching Excellence Program strives to improve undergraduate education through faculty development. The program supports all faculty members on the Boulder campus who wish to enhance their teaching strategies. This support comes in the form of observation and videotape consultations, in-class surveys of student feedback, and workshops and symposia on teaching and learning. Recently developed services include a teaching portfolio consultation to assist faculty in creating their own dossier documenting their personal performance as teachers; a series of events assisting new faculty with their teaching titled "Being a Teacher"; and the diversity survey, which seeks to identify ways in which excellent teaching incorporates ethnic and gender difference as affirmative learning components.

The program has published two volumes of essays on pedagogical topics titled *On Teaching,* as well as *A Compendium of Good Teaching Ideas,* and regularly distributes reprints of research articles in the series *Memo to the Faculty.*

President's Teaching Scholars Program

The President's Teaching Scholars Program aims to produce a sustaining group of skilled faculty who are advocates of and consultants for teaching excellence at the University. Faculty selected for the program design and develop projects aimed at strengthening confidence in the art and craft of teaching, by mentoring junior faculty or by establishing communities of faculty colleagues interested in specific teaching pedagogy. In addition, the scholars are asked to share their teaching acumen outside the University community and to exemplify the skills, talents, and characteristics of superior teachers.

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; serving as a neutral mediator in problem solving and conflict resolution; helping to identify and evaluate options with all parties; and conducting workshops on conflict management.

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 Services

Parking availability at CU-Boulder is limited. Parking in a campus lot requires a permit, which may be purchased from Parking Services at 1050 Regent Drive in the Police-Parking Building.

Two new parking structures were recently completed to help with parking availability. Development of a computer-based, mail-in application system for student parking permits is under way. Call the permit information line at (303) 492-3550 or Parking Services at (303) 492-7384 for permit sales information.

Students buying a permit must present their photo ID and current vehicle registra-

tion at the time of purchase. Student permit fees range from $60 to $100 per semester for fall 1992 and spring 1993. Most permits are sold at the Coors Events/Conference Center during schedule/bill distribution at the start of each semester. Student permit fees may be paid at the Bursar's Office.

Faculty/staff permit fees range from $15 to $25 per month through June 30, 1993. They are available by cash payment or payroll deduction. Please call (303) 492-7384 for faculty/staff permit information.

Visitor parking is available in the Euclid Autopark located on the northwest corner of 18th and Euclid. Visitors may also park at any of the more than 600 parking meters on campus. A limited number of temporary parking permits are available for special needs. Visitor parking locations are highlighted on the campus parking map.

Bicycles parked on campus must be registered with Parking Services at a cost of $5 for four years. Bicycles bearing valid registrations from other jurisdictions may be registered with Parking Services at no charge. Unregistered bicycles parked on campus may be impounded. Bicycle registrations are sold at the bicycle registration booth southeast of the music building. Please call (303) 492-2322 for bicycle parking and registration information.

Campus parking regulations are revised annually, and are strictly enforced. Vehicles in violation of campus parking regulations may be ticketed or towed. Copies of parking regulations, including complete parking and traffic information, may be obtained at Parking Services, 1050 Regent Drive, Boulder, CO 80309-0502. Call (303) 492-7384 for additional information.

Photo ID Cards

All students must show their photo ID to obtain student services such as those provided by the University Libraries, Wardenburg Student Health Center, and the Student 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 in UMC 25 from 11:00 a.m. to 4:00 p.m., Monday through Friday. While the initial photo ID card for degree students is free, there is a charge for replacement cards. Students need to have cards validated for each semester at schedule/bill distribution. (Meal stickers placed on ID cards are provided by residence hall dining rooms.)

Research and Information

The Office of Research and Information is located on the second floor of Willard Administrative Center. The office handles information needs for all units within the Division of Student Affairs, including publications and institutional research on recruitment and retention of students. The office also administers the faculty course questionnaire (FCQ), which gives students the opportunity evaluate their courses and instructors. For further information, call (303) 492-7067.

University Learning Center

The University Learning Center (ULC) offers academic support services designed to assist students in improving their learning potential.

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.

Academic Skills Program. The academic skills program offers all students free one-hour workshops on time management, note taking and listening, critical reading, concentration, procrastination and motivation, and writing processes. A computerized self-paced speed-reading course is also available.

Academic Excellence Program. The Academic Excellence Program, located in room 305 of the University Memorial Center, offers qualified low-income and disadvantaged students special support services that include advising, counseling, and tutoring.

Fall Institute Program. As part of the ULC, this program offers freshman courses in writing and self-paced algebra, English as a second language, and labs for ULC writing and math courses to a selected group of freshman students who have been provisionally admitted to CU-Boulder.

Location. The ULC administrative office and tutorial services are located in Willard 309, (303) 492-5474. Other ULC facilities are located in Norlin Library, lower level, room E1B-36, (303) 492-1416.

Victim Assistance

The Office of Victim Assistance has been created to provide the Boulder campus community with one centrally located office to assist people who are victims of crimes, accidents, sexual assaults, or other traumas. Many excellent services are available on campus and in the Boulder community to help victims, but until recently these services have not been coordinated. The Office of Victim Assistance facilitates access to all of these services.

In some cases, persons who need assistance are simply directed to appropriate offices or agencies in the community. When people have suffered severe trauma, however, or are having difficulty coping, the office can make direct contact on their behalf, with their permission. Examples of direct contact include escorting people to receive medical attention or counseling services; calling parents, spouses, or significant others; and intervening with professors, the housing department, or business offices on campus.

Students, faculty, and staff members on campus can visit the office in Wardenburg Student Health Center, Room 235, 8:00 a.m. to 12:00 p.m., or call (303) 492-8855 anytime.

Wardenburg Student Health Center

Wardenburg Student Health Center (WSHC) is a fully accredited health clinic staffed by board-certified physicians in internal medicine, family practice, and psychiatry, as well as other board-certified and eligible health care practioners. WSHC is accredited by the Joint Commission on Accreditation of Healthcare Organizations. As a service to the University of Colorado Student Union (UCSU) and the Joint Health Board, WSHC is committed to providing quality health care at a reasonable cost. Services are available to care for eligible patients during illness and injury, and to help maintain or improve physical and mental health.

The following persons may use WSHC: all students (as well as spouses, continuing education, and SAVE students who pay a user fee); University faculty and staff (through workers' compensation and other University-sponsored benefit programs); and campus visitors who do not live or work in the Boulder area (i.e., conference participants, parents, and visiting faculty) on an urgent-care basis. Faculty and staff are also eligible to use WSHC for immunization shots (flu, travel, measles). A user fee is required for summer session students and students who were enrolled in the previous spring semester and will be enrolled in the coming fall semester.

Confidentiality

A personal health record is established at the time of the patient's first visit to WSHC. A complete medical history form is required. The record is maintained at WSHC for

seven years after the date of the last visit. Following this seven-year period, the record is destroyed. Patients may obtain the original health record after the required retention period by providing a written request. The Medical Record Department can be contacted for specific procedures.

Medical records are not part of the University record system and are not included in educational records. Medical information can be released only with the patient's written authorization, upon court order, or to meet the requirements of local, state, or federal statutes.

Hours

Clinic

Fall and Spring Semesters

Monday-Friday	8:00 a.m.-6:00 p.m.
Saturday	10:00 a.m.-2:00 p.m.

Summer Session

Monday-Friday	7:30 a.m.-4:30 p.m.
Saturday	10:00 a.m.-2:00 p.m.

Semester Breaks & Holidays

Coincide with campus hours (or as posted)

After-Hours Urgent Care

Available during the fall and spring semesters after regular clinic hours: Monday through Friday until 10:00 p.m.; from 2:00 p.m. until 10:00 p.m. on Saturday; and 10:00 a.m. to 10:00 p.m. on Sunday, with the exception of semester breaks and holidays. (Services and hours of operation may change without prior notice.)

General Telephone Numbers

General Information	(303) 492-5101
Medical Clinic Appointments	(303) 492-5432
Billing Information	(303) 492-4196
Insurance Office	(303) 492-5107
Immunization Office	(303) 492-2005

Most patients are seen through scheduled appointments. However, if patients cannot wait for an appointment due to the nature of the injury or illness, they may be seen immediately in the WSHC Acute Care Clinic. For after-hours care, the entrance is located near the southwest parking lot. Students should bring their student ID card for eligibility verification.

Available Services (in alphabetical order)

Allergy Clinic (492-5432). Complete allergy evaluations, testing, and injections are available through the WSHC board-certified allergist. Patients' own allergen may be administered through the clinic. Nurses will set up regular injection schedules.

Cold Clinic (492-5101). This self-care program is designed to help patients recognize minor cold symptoms. A nurse will obtain a throat culture, and treatment information is provided. No appointment is required.

Community Health Education (492-2937). This service addresses public health issues and provides health education within the campus community. Workshops and presentations address such topics as birth control, sexually transmitted diseases, AIDS, stop smoking programs, blood pressure, sexual assault, foods and moods, nutrition and sports, wellness, and health fairs. Professional staff or student peer educators facilitate the presentations.

Dental Clinic (492-2030). The Dental Clinic provides routine services and acute care. Extensive and complicated dental problems are referred to local specialists.

Drug and Alcohol Abuse Program (492-5654). Services include treatment programs, confidential professional counseling, and education.

General Medical Clinic (492-5432). Services are available by appointment with health care providers. The Acute Care Clinic is available without an appointment for injuries and sudden illnesses.

Immunizations (492-2005). Immunizations are available on a walk-in basis, 8:00 a.m.-4:30 p.m., Monday through Friday. At the direction of the Colorado State Health Department, the University of Colorado requires students to show proof of immunity to rubeola (measles), rubella (German measles), and mumps. An immunization form, mailed to the permanent address of all new students, must be completed and returned to WSHC. Students who need vaccinations may receive them at WSHC for a fee. Failure to comply with this policy will result in a medical hold on a student's registration for the following semester. Students who prefer to sign a waiver for medical, religious, or personal reasons may be subject to quarantine during a measles or mumps outbreak, or as determined by public health officials.

Laboratory (492-5101). ASCP-certified technologists provide comprehensive diagnostic testing in the WSHC laboratory. This department is fully accredited by the College of American Pathology.

Nutritional Counseling (492-5432). A registered dietitian is available by appointment for students in need of counseling for weight control, eating disorders, sports nutrition, special diets, and basic nutrition.

Pharmacy (492-8553). A pharmaceutical service operated by the University of Colorado School of Pharmacy is available at WSHC. Prescriptions and over-the-counter medications may be purchased at competitive prices.

Physical Therapy (492-2043). Registered physical therapists offer treatment with a physician's referral for injuries, postural disorders, and other musculoskeletal problems. Modern exercise and testing equipment enhance the sports medicine program.

Psychiatry Clinic (492-5654). Psychiatrists, psychologists, clinical social workers, and other professional mental health counselors staff the Psychiatry Clinic. Available services include crisis intervention and short-term psychotherapy for individuals, couples, and groups. All medical/psychiatric records are strictly confidential.

Radiology Department (492-5101). X-rays ordered by physicians can be taken through the Radiology Department. Services offered include basic X-ray examinations of the chest, abdomen, bones, and soft tissues.

Sexual Health Services (492-5654). Sexual health counseling and education are offered to individuals, couples, and groups through the Psychiatric Department (fall and spring semesters only).

Specialty Clinics (492-5432). In addition to the services presented above, other clinics include neurology, orthopedics, and dermatology. Board-certified specialists from the Boulder community and University of Colorado Health Sciences Center are available on a referral basis for consultation and treatment follow-up.

Sports Medicine Clinic (492-2043). A professional health care team comprised of orthopedists and physical therapists work with patients in the treatment of sports-related injuries. Although the Sports Medicine Clinic is designed for students participating in club sports, other students are eligible to use this service with a referral by a WSHC health care provider.

Stress Management and Biofeedback (492-5654). This program offers stress management training for the prevention and treatment of physical symptoms that are stress-related.

Surgery Clinic (492-5432). A surgeon is available for consultation and minor outpatient surgery.

Travel Clinic (492-5101). Individuals planning to visit foreign countries have the opportunity to discuss health risks and obtain required immunizations. Advice on mountaineering and high altitude issues is also available. Appointments are required.

Victim Assistance Program (492-8855). Students who have been involved in a crime or accident often don't know where to go for assistance. The University now has one central place that coordinates services available to victims.

Volunteer Program (492-2073). The volunteer program provides on-campus opportunities for students and nonstudents to work in a medical atmosphere with professional staff. There are several departments where volunteers can gain experience. Time commitment varies, but may be as little as two hours per week for a full semester. Call the Volunteer Coordinator for more information.

Women's Health Clinic (492-2030). Physicians and nurse practitioners perform annual exams, prescribe contraceptives, order pregnancy tests, and treat infections and other health problems.

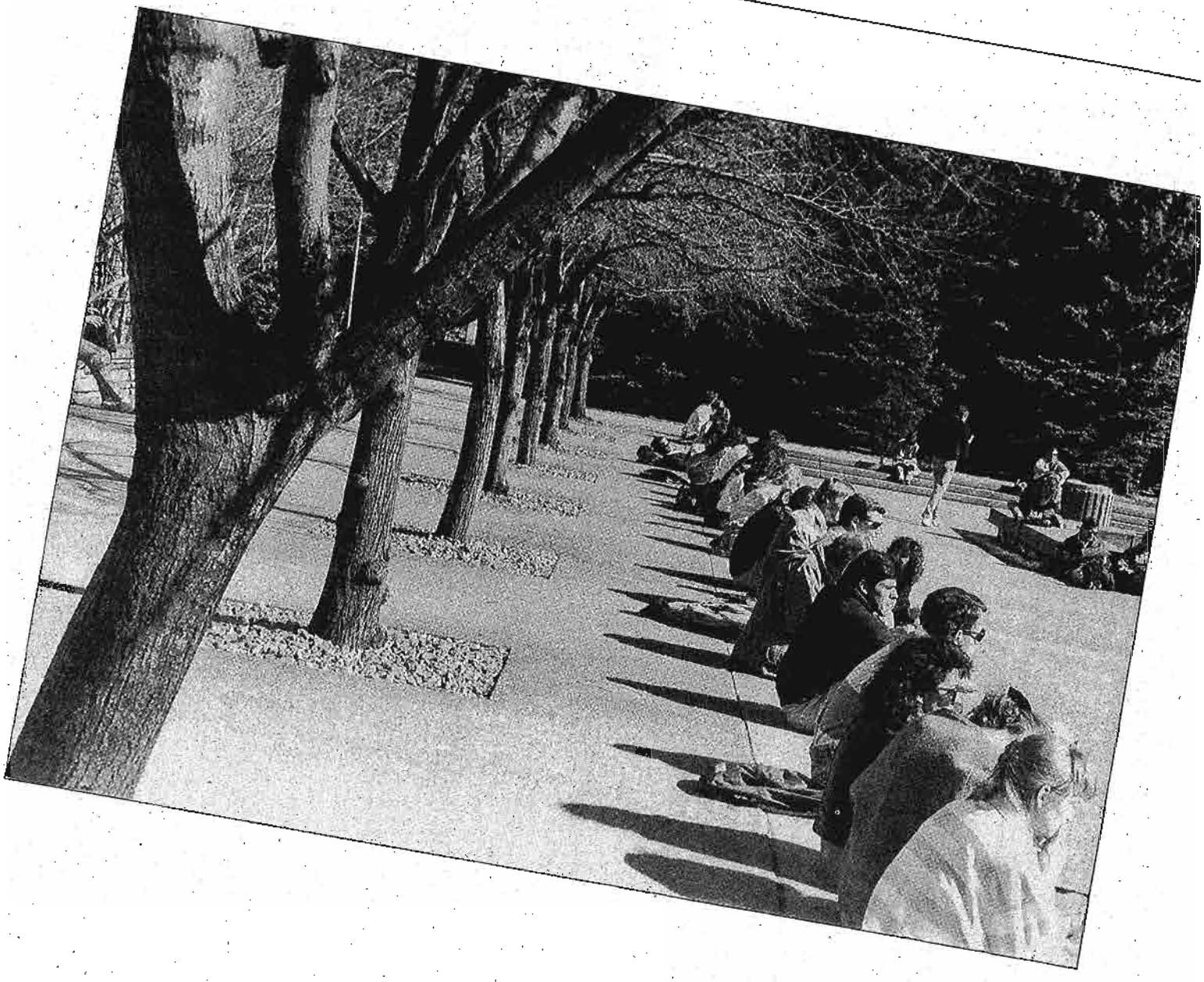
Health Insurance and Fee Information

The University, through a reputable insurance carrier, offers health insurance coverage for students and spouses at a competitive rate. The University-sponsored health insurance plan pays 100% of most medical expenses incurred at WSHC for the treatment of sickness or injury. Eligible patients who are not insured through this plan may still receive services at a reduced cost. A summary fee schedule is available upon request.

Business office personnel are available to answer questions and accept payments. WSHC mails a statement to each patient approximately once each month. These itemized statements can be used for filing claims with insurance companies. Payment for services should be made to the University of Colorado, in care of the WSHC Business Office, (303) 492-4196.

All medications received or prescribed by WSHC incur a charge that is not covered by student fees or by the University-sponsored student health insurance plan.

When WSHC is closed, care may be received at Boulder Community Hospital or at another health care facility. Payment for such services, however, is the patient's responsibility.



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 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 evaluation of work taken in high school and at other educational institutions. In addition, 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 30
University of Colorado at Boulder
Boulder, CO 80309-0030
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 office at any time, Monday through Friday, from 9:00 a.m. to 4:00 p.m. Because of the large number of applicants, personal interviews are not part of the admission process and are not provided.

Walking tours of the campus guided by Boulder students leave from the Regent Administrative Center second floor lobby each weekday at 10:30 a.m. and 2:30 p.m. Information sessions with admissions representatives are offered each weekday at 1:20 p.m. Students attending an information session should come to the admissions reception area on the first floor of Regent before 1:00 p.m. to arrange for parking and to obtain location information. Saturday tours are available from early October through mid-November and from early March through late April, and begin at 10:30 a.m. Reservations for Saturday tours are required at least one week in advance. To inquire about dates and to make arrangements, call the Office of Admissions at (303) 492-6301.

Visitation Programs

An excellent way to become acquainted with the campus is to participate in one of the campus visitation programs specially designed for prospective students. 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 on selected Wednesdays and Fridays.

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. Programs are usually planned for March, July, and November.

For the student who aspires to a career in engineering, the *Engineering Open House* is held once in the fall. Students and their parents have the opportunity to meet the dean, tour engineering facilities, explore engineering career options, and have lunch in a residence hall.

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

POLICY ON DIVERSITY

An environment supportive of diversity is one that benefits all. It is an environment that challenges stereotypes, provides role models and support groups, enhances maximum interaction between individuals, and promotes a sensitivity toward others.

–From *Challenging the Summit,* Strategic Plan, University of Colorado at Boulder, 1987.

Admission policies of the University are designed, first and foremost, to assure that admitted students are well prepared to handle demanding academic expectations. Admission is competitive; there are more fully qualified applicants than can be offered admission. Therefore, students with the best qualifications are selected.

However, in selecting from the group of qualified applicants, additional consideration is given to prospective students whose presence will add to the diversity of the community. The educational experiences of all students are thereby enhanced, as is the academic environment, which fosters a diversity of ideas.

Applicants from parts of the state of Colorado, the nation, and the world that are not well represented in this community; applicants from nonwhite ethnic backgrounds; applicants from families with little or no experience of higher education; and applicants who have special talents and experiences are examples of students who receive additional consideration for admission.

CU Opportunity Program

The CU Opportunity Program (CUOP) provides access and educational opportunity to students from ethnic minority backgrounds (e.g., American Indian, Asian American, Black, Hispanic), migrant backgrounds, and educationally or economically 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 Office of Admissions, the University Learning Center, and Counseling and Career Services: A Multicultural Center.

The Office of Admissions 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 and are assisted in the application process. Because

all students have not had equal opportunities to prepare for university work, additional admission consideration is available.

ALL APPLICANTS

Application and Admission Notification

Applications for fall, spring, and summer terms may be submitted starting the previous September. Applicants are notified of admission decisions on a rolling basis beginning October 1 for spring and November 1 for summer and fall.

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

APPROXIMATE DATES FOR EQUAL CONSIDERATION OF APPLICATIONS

(Exact deadline dates are available from the Office of Admissions)

	Fall and Summer	Spring
Freshmen	February 15	November 1
All Others	April 1	November 1

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

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.

Confirmation Procedures

All admitted students 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 required enrollment deposit of $200.

Confirmation forms and deposits received by the dates listed below, or by later dates assigned by the Office of Admissions, are accepted. *After these dates, confirmations can be accepted only if space is still available.*

Students who have paid the deposit and who decide not to attend CU-Boulder forfeit their deposit. Deposits received after enrollment levels have been reached are returned.

After students have attended CU-Boulder, their deposits are refunded upon graduation or official withdrawal from the University within established dates and guidelines. Refunds are reduced by any outstanding University obligations.

APPROXIMATE DATES FOR ASSURED ACCEPTANCE OF CONFIRMATIONS

(Exact deadline dates are available from the Office of Admissions)

	Fall and Summer	Spring
Freshmen	May 1	December 15
All Others	May 15	December 15

Credentials

To be considered for admission, applicants must submit complete and official credentials as required by their desired program of study. Students may not disregard any part of their previous educational background. *Failure to submit transcripts from all institutions previously attended is 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.

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. Preprofessional programs are not themselves degree programs.

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, and nursing) 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.

Normally, CU-Boulder students who are not Colorado residents can take 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 pre-health 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. Teacher certification programs are also available in art and music for grades kindergarten through 12.

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 Nondegree 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, CU-Boulder, Boulder, CO 80309-0249, for application and deadline information.

FRESHMAN STUDENTS

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, class rank, and the results of either the SAT or the ACT. Admission officers 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. Among qualified applicants, some preference is given to students who will add to the diversity of the community.

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.

Minimum Academic Preparation Standards (MAPS)

Effective with students who graduated from high school in 1988 or later, CU expects new freshman and transfer students to have completed courses that meet certain minimum academic preparation standards (MAPS). The MAPS for specific CU-Boulder colleges are listed on page 39. Prospective students who have not completed all the suggested courses may be admitted on an individual basis.

MAPS requirements not met in high school may be met through equivalent college-level course work before or after enrollment at CU-Boulder. A semester course completed at the college level substitutes for a year in high school.

How to Apply

1. Obtain a *Guide to Admission and Application* from the Office of Admissions, Regent Administrative Center 125, Campus Box 30, CU-Boulder, Boulder, CO 80309-0030, telephone (303) 492-2456. Colorado residents may also obtain an application packet from their high school counselor. (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:

a. the application for admission;

b. a nonrefundable $40 application fee (check or money order, not cash, made payable to the University of Colorado);

c. a transcript of all high school work completed, including rank-in-class information and a list of courses in progress for the entire year;

d. 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;

e. required SAT or ACT test scores (the only applicants who are exempt from submitting test scores are those who are applying to the College of Arts and Sciences or the College of Music who have completed more than 30 semester hours of college work and those who are applying to the School of Education or the School of Journalism and Mass Communication; and

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

Applicants who are currently attending high school should give their completed application to their counselor. Their application must include the nonrefundable $40 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 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 should take a college entrance test at the end of their junior year or early in their senior year. *The University of Colorado accepts either the SAT or the ACT for admission.* Students who are not satisfied with the scores on their first test are urged to retest at the earliest possible date. For admission purposes, the University will consider the highest scores. *Achievement tests are not required;* however, scores may be submitted if they are taken.

For exact testing dates and 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 ATP (SAT)
P. O. Box 6200
Princeton, NJ 08541-6200

ACT Registration (ACT)
P.O. Box 414
Iowa City, IA 52243

Advanced Placement Program

The University participates in the Advanced Placement program of the College Board. 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 40.

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 (24-30 semester credit hours) of college-level course work at another college or university, giving special attention to courses that will provide sound academic preparation for future transfer to the University of Colorado at Boulder. These courses should include any minimum academic preparation standards (MAPS) not met in high school. See the MAPS requirements on page 39.

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 nondegree students at the Boulder campus), full-time or part-time, since graduating 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.

Transfer applicants who have completed less than one year of college-level work by the time they plan to enroll at CU-Boulder are considered for admission on the basis of freshman criteria, including minimum academic preparation standards (MAPS) as listed on page 39. In addition, all transfer applicants who graduated from high school in 1988 or later are expected to have completed MAPS before enrolling at CU-Boulder.

Assured Transfer Opportunities

Colorado community or junior college students may qualify for assured transfer opportunities at CU-Boulder. Prospective students should be aware that academic criteria are established by the faculty of each Boulder college and school and vary according to discipline and year of proposed transfer.

Transfer guides are available in Colorado community college advising offices. These guides provide information on CU-Boulder admission requirements, graduation requirements, and course equivalencies.

The Colorado community college core curriculum agreement as signed by CU-Boulder assures that students entering the College of Arts and Sciences who complete the core at their community college will receive credit equivalent to the lower-division degree requirements of the college. If students have not completed the core, they will have courses evaluated on a course-by-course basis. Normally, a maximum of 60 semester credit hours can transfer from community or junior colleges into the College of Arts and Sciences.

Students transferring to a program outside of the College of Arts and Sciences need to work with advisors and use the transfer guide to assure that appropriate courses are taken prior to transfer. Students wishing to enter the College of Engineering and Applied Science or the College of Environmental Design should be aware that because of the structure of the curriculum, transfer may be encouraged as early as the beginning of the sophomore year. Academic programs vary in terms of the maximum number of hours that may be transferred from the community or junior college.

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 need to submit SAT or ACT scores, except those who are applying to the College of Arts and Sciences or the College of Music who have completed more than 30 semester hours of college work, and those students who are applying to the School of Education or the School of Journalism and Mass Communication.

All students must submit a high school transcript. Students who are not high school graduates must submit copies of a certificate of high school equivalency and GED scores in addition to the above documents. Courses in progress are not considered in computing the cumulative grade point average.

College of Arts and Sciences

Transfer students with a cumulative college grade point average of 2.50 or better are considered for admission on an individual basis.

College of Business and Administration

Transfer students with a cumulative college grade point average of 2.75 or better are considered for admission on an individual basis. Preference is given to those applicants who will have completed courses (including calculus) equivalent to those taken by CU-Boulder business students. These courses are listed in the model degree program in the College of Business and Administration section of this catalog.

School of Education

Programs for elementary and secondary teacher certification are available through the School of Education. All persons seeking teacher certification must apply to the teacher certification program through the School of Education. Teacher certification is awarded in addition to a regular bachelor's degree; all teacher certification candidates at the undergraduate level must be working toward a bachelor's degree in another CU-Boulder college or school.

To be considered for admission to the School of Education, a grade point average of 2.50 or better and the completion of 56 semester hours (or 84 quarter hours) of course work is required. A personal interview may also be required.

During the first semester of enrollment in education courses, students must pass competency tests covering spelling, English language, and mathematics, provide written verification of successful experience with youth, and meet an oral competency requirement.

College of Engineering and Applied Science

Transfer students with a cumulative college grade point average of 2.75 or better are 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 required to have completed at least one year of college-level calculus and at least one semester each of calculus-based physics and general college chemistry before they enroll at Boulder. Chemical engineering students should have completed two semesters of general college chemistry before enrolling at CU-Boulder.

College of Environmental Design

Transfer students with a cumulative college grade point average of 2.75 or better are considered for admission on an individual basis. Admission preference is given to students who have taken college-level courses in architecture, planning, or environmental studies. Secondarily, preference is given to students with college-level course work in related fields of social science, natural science, fine arts, or humanities.

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. Applicants must also have an overall grade point average of at least 2.50 and an average of 2.50 in at least 6 semester hours of journalism course prerequisites (CU-Boulder course equivalents are Contemporary Mass Media and Mass Media Writing). Applicants with fewer than the required hours or without journalism course work must apply to the College of Arts and Sciences as a pre-journalism and mass communication major.

College of Music

Transfer students with a cumulative college grade point average of 2.00 or better are considered for admission on an individual basis. The College of Music also requires an audition. Further information may be found in the College of Music section of this catalog.

Minimum Academic Preparation Standards (MAPS)

Effective with students who graduated from high school in 1988 or later, CU expects all new freshman and transfer students to have completed courses that meet certain minimum academic preparation standards (MAPS). The MAPS for specific CU-Boulder colleges are listed on page 39. MAPS requirements not met in high school may be met through equivalent college-level course work before or after transfer to CU-Boulder. A semester course completed at the college level substitutes for a year in high school.

How to Apply

1. Obtain a *Guide to Admission and Application* from the Office of Admissions.
2. A complete application must include the following required credentials:

a. the application for admission;

b. a nonrefundable $40 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. 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;

e. required SAT or ACT test scores (the only applicants who are exempt from submitting test scores are those who are applying to the College of Arts and Sciences or the College of Music who have completed more than 30 semester hours of college work and those who are applying to the School of Education or the School of Journalism and Mass Communication; and

f. an official transcript from each college or university attended (except the University of Colorado).

Note: Former degree students who have attended CU-Boulder within the last four years and 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. However, if they have attended another college or university since last attending CU-Boulder, those additional transcripts must be submitted.

Transfer of College-Level Credit

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

The evaluation is made using the official transcripts sent directly to the University from each one of the applicant's previous colleges. Official transcripts exhibit the official seal and signature of the registrar. Ttanscripts that are marked "student copy," "issued to student," or "unofficial" are not accepted as official.

The initial evaluation may list course work in progress at the time of confirmation as "pending." In order to complete the admission and transfer of credit process, *all* ttanscripts of attempted work must be

received by the Office of Admissions as soon as possible. Transfer students should arrange to have their final official transcript sent directly to the Office of Admissions after they complete their last term and before they enroll at CU-Boulder.

After an evaluation of transfer credit has been completed, an evaluation report is mailed 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 are 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 in each college and school.

Credits for Correspondence Work

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

College-Level Work Taken During High School

College-level work taken during high school is evaluated in accordance with general guidelines for transfer credit at CU-Boulder. College-level work taken concurrently with a high school program may be used to satisfy MAPS requirements.

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. For further information, refer to the chart on page 40.

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 is 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) can be awarded credit. This work, however, is transferred and recorded at the lower-division level. Foreign language credit taken through the State Department, Department of Defense, or Defense Language Institute is 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 the Registrar, Regent Administrative Center 125, Campus Box 68, CU-Boulder, Boulder, CO 80309-0068, telephone (303) 492-6907. 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 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.
5. Credits earned in physical education activity courses.

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 x 2/3 = 2.67 or 2.7 semester hours of credit. Or, 3 quarter hours x 2/3 = 2 semester hours of credit.

Intrauniversity Transfer Students

Students wishing to change colleges or schools within the CU-Boulder campus 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 (IUT) 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 during the summer; interested students should consult with an academic advisor in 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 1000 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 Student 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 a full-time program of study at the undergraduate or graduate level should write or call the Office of Admissions, Regent Administrative Center 125, Campus Box 65, CU-Boulder, Boulder, CO 80309-0065, telephone (303) 492-2446, to obtain a foreign student application form 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, CU-Boulder, Boulder, CO 80309. Consult the catalog directory for departmental telephone numbers and addresses.

Foreign Nondegree Students

Students who hold temporary nonimmigrant visas or 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, CU-Boulder, Boulder, CO 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 on 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 withdrew from CU-Boulder during the fall or spring semestet must reapply for admission. Degree students who withdrew from CU-Boulder during summer session need not reapply to continue into the fall semester.

A nonrefundable $40 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 is 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 completed the approval process in 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. If students have been denied regular undergraduate admission, they may not enroll as nondegree students in the space-available (SAVE) program offered through the Division of Continuing Education for the term for which they sought admission. Nondegree student admission does not guarantee future admission to any degree program.

In the fall and spring semesters, permission to register for regularly scheduled Boulder campus courses is contingent on 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 on a pass/fail basis are counted in the hours of pass/fail course work 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 register through the Division of Continuing Education. Further information may be obtained by writing or calling the Division of Continuing Education, Campus Box 178, CU-Boulder, Boulder, CO 80309-0178, telephone (303) 492-5148.

Prospective nondegree students for summer session may obtain further information from the Office of Admissions, Campus Box 30, CU-Boulder, Boulder, CO 80309-0030, 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. Also, the Young Scholars Summer Session is a specially designed program for high school students between their junior and senior years. For more information, see page 6.

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 nondegree students 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 $40 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, ACT or SAT scores, and an official transcript from all colleges and schools attended (outside the University of Colorado system) must be sent directly to the Office of Admissions.

A degree-seeking applicant may transfer a maximum of 12 semester hours taken as a nondegree student on any University of Colorado campus. There are opportunities for advising at mandatory orientation programs. It is 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 once they have been accepted into a degree program.

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 a second undergraduate degree 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 cannot be considered.

c. Credit hours earned as a nondegree 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 an undergraduate degree in any area cannot be considered for a second undergraduate degree in business. They are strongly encouraged to investigate graduate study.

e. Second undergraduate degree applicants in environmental design are encouraged to investigate graduate programs.

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, or the 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, and an official transcript from each college or university attended (outside the University of Colorado system) to the Office of Admissions. Some admission preference is shown to applicants transferring from degree programs at other campuses of the University of Colorado.

MINIMUM ACADEMIC PREPARATION STANDARDS—MAPS

One unit equals one year of high school study or one semester of college course work.

Arts and Sciences

16 units: 4 of English (includes 2 of composition); 3 of mathematics; 3 of natural science (includes 2 of laboratory science, 1 of which must be either chemistry or physics); 3 of social science (includes 1 of U.S. or world history and 1 of geography—if U.S. history is used to meet the history requirement, then the geography requirement may be met with 1/2 unit of geography and 1/2 unit of world history); and 3 of a single foreign language.

Business and Administration

16 units: 4 of English (includes 2 of composition); 4 of mathematics; 3 of natural science (includes 2 of laboratory science) 2 of social science; 2 of a single foreign language; and 1 academic elective (oral communication courses, such as speech, debate, and theatre, are recommended—does not include high school business courses).

Engineering and Applied Science

16 units: 4 of English; 4 of mathematics (includes at least 2 of algebra, 1 of geometry, and 1 of college preparatory mathematics such as trigonometry, analytic geometry, or elementary functions); 3 of natural science (includes 1 of chemistry and 1 of physics); 2 of social science; 2 of a single foreign language; and 1 academic elective.

Environmental Design

16 units: 4 of English; 3 of mathematics; 3 of natural science (includes physics and/or biology); 3 of social science; 2 of a single foreign language; and 1 academic elective.

Music

15 units: 4 of English; 3 of mathematics; 3 of natural science; 2 of social science; 2 of a single foreign language; and 1 in the arts.

Note: The college faculties strongly encourage all students to include courses or activities in the fine and performing arts such as music, dance, theatre, and the visual arts.

Policies Concerning MAPS Deficiencies

Students who graduated from high school in the spring of 1988 and later are required to complete in secondary school the minimum academic preparation standards (MAPS) of the CU-Boulder college to which they apply. In some cases, students who are otherwise admissible may be admitted even though they have not met the MAPS. In those instances, students are required to complete the appropriate MAPS courses through courses taken at other institutions of higher education, 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.

1. All missing MAPS course work is included in the hours for graduation.
2. All course work toward fulfillment of the MAPS must be taken for a letter grade.
3. 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.
4. All students who first enroll in one academic unit at CU-Boulder and who subsequently transfer to another unit are required to meet the MAPS specified for the new unit, irrespective of their completion of MAPS units in their previous college or school.
5. Students in double-degree programs must meet MAPS requirements of both degree-granting units.
6. Students must consult with a CU-Boulder academic advisor (or read their college's academic survival guide) to determine which specific courses may be used to meet a MAPS requirement.

ADVANCED PLACEMENT (AP) CREDIT

Advanced Placement Examination Title	Examination Score	CU-Boulder Course Equivalent	Semester Hours	Arts & Sciences	Business Administration	Engineering & Applied Science	Environmental Design	Journalism	Music
BIOLOGY									
Biology	5, 4	EPOB 1210, 1220 1230, and 1240	8	*	*	a	*	*	*
CHEMISTRY									
Chemistry	5, 4	CHEM 1111 and 1131	10	*	*	b	*	*	*
	3	CHEM 1111	5	*	*	*	*	*	*
CLASSICS									
Latin-Vergil	5, 4	CLAS 2114 and 2124	8	*	*	*	*	*	*
	3	CLAS 2114	4	*	*	*	*	*	*
Latin–Catullus-Horace	5,4	CLAS 2114 and 3124	7	*	*	*	*	*	*
	3	CLAS 2114	4	*	*	*	*	*	*
COMPUTER SCIENCE									
Computer Science	5, 4	CSCI 1200	3	*	*	*	*	*	*
ECONOMICS									
Economics: Micro	5, 4	ECON 2010	4	*	*	*	*	*	*
Economics: Macro	5, 4	ECON 2020	4	*	*	*	*	*	*
ENGLISH									
English Literature	5, 4	ENGL 1200 and 1500	6	*	*	*	*	*	*
and Composition	3	ENGL 1200	3	*	*	*	*	*	*
English Language	5, 4	UWRP 1150 and 1250	6	*	*	c	*	*	*
and Composition	3	UWRP 1150	3	*	*	c	*	*	*
FINE ARTS									
Studio Art									
(General and Drawing)	5, 4, 3	FINE 1012 and 2002	6	*	*	d	*	*	*
Art History	5, 4, 3	FINE 1109 and 1209	6	*	*	*	*	*	*
FOREIGN LANGUAGE									
French Language	5, 4	FREN 2120 and 3020	5	*	*	c	*	*	*
	3	FREN 2120	3	*	*	c	*	*	*
French Literature	5,4	FREN 3110 and 3120	6	*	*	c	*	*	*
	3	FREN 3120	3	*	*	c	*	*	*
German Language	5	GRMN 3010 and 3020	6	*	*	c	*	*	*
	4	GRMN 2020	4	*	*	c	*	*	*
	3	GRMN 2010	4	*	*	c	*	*	*
Spanish Language	5	SPAN 3000	5	*	*	c	*	*	*
	4	SPAN 2110 and 2120	6	*	*	c	*	*	*
	3	SPAN 2110	3	*	*	c	*	*	*
GOVERNMENT									
American Government	5, 4	PSCI 1101	3	*	*	*	*	*	*
HISTORY									
U.S. History	5, 4	HIST 1015 and 1025	6	*	*	*	*	*	*
European History	5, 4	HIST 1020	3	*	*	*	*	*	*
MATHEMATICS									
Math–Calculus AB	5, 4	MATH 1300 or APPM 1350 (Engineering)	5 4	* c	* c	c *	* c	* c	* c
Math–Calculus BC	5, 4	MATH 1300 and 2300 or APPM 1350 and 1360 (Engineering)	10 8	* c	* c	c *	* c	* c	* c
	3	MATH 1300 or APPM 1350 (Engineering)	5 4	* c	* c	c *	* c	* c	* c
MUSIC									
Music Listening	5	EMUS 1832 and 2752	6	*	*	*	*	*	*
and Literature	4, 3	EMUS 1832	3	*	*	*	*	*	*
Music Theory	5	MUSC 1001 and 1011	6	*	*	c	*	*	*
	4, 3	MUSC 1001	3	*	*	c	*	*	*
PHYSICS									
Physics–B	5, 4, 3	PHYS 2010	5	*	*	d	*	*	*
Physics C–Mechanics	5, 4, 3	PHYS 1110	4	*	*	*	*	*	*
Physics C–Electricity and Magnetism	5, 4	PHYS 1120	4	*	*	*	*	*	*

* Credits may apply to graduation in the specific college or school.

[a] Does not apply. Computer science majors, bio-engineering, and premedical option students check with faculty advisor.

[b] CHEM 1111 fulfills departmental requirements in all areas. CHEM 1131 fulfills chemical engineering and computer science requirements.

[c] Check with faculty advisor in major department.

[d] Does not apply.

College of Arts and Sciences

Charles R. Middleton, Dean

The College of Arts and Sciences is the oldest academic division of the University, dating from 1892. 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 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, however, is more than courses and academic proficiency. 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 a student's experience in the College of Arts and Sciences.

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 Old Main Building.

Graduation with Honors

The award of honors at graduation—*cum laude, magna cum laude,* or *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. Interested students should consult the Honors Program listing in this catalog or contact the Honors Program in 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, both at the University of Colorado and for all collegiate work completed, is 3.75 or higher. The average includes all grades except *P.*

Phi Beta Kappa

Phi Beta Kappa 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; students do *not* apply for Phi Beta Kappa membership.

ACADEMIC STANDARDS

Probation

Good academic standing in the college requires a grade point average of 2.00 *(C)* in 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 includes courses taken at Metropolitan State College on the Denver campus). However, grades earned in another school or college *within the University of Colorado* are used in determining a 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 in the calendar year, excluding summers, 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 at the end of the summer term.

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 are placed on probation again at the end of the semester in which they return if their cumulative grade point average remains below 2.00.

Scholastic Dismissal

Students who still have a cumulative average below 2.00 after 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 are eligible for readmission when they have achieved a cumulative 2.00 average by virtue of work done during the University of Colorado's summer term (any of the three campuses) and/or through the 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.* These transfer grades are used only for the purpose of readmission and do not remain in the University of Colorado grade point average). Dismissed students pursuing this option have two semesters after readmission to bring their University of Colorado grade point average up to 2.00 or they are 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.

Appeals and Petitions

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 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.

ADMISSION AND ENROLLMENT POLICIES

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. Failure to attend regularly may result in receipt of an *F* in a course. Students who, for illness or other legitimate 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 receipt of an *F* in the course.

Credit Policies

Advanced Placement Program

See the Undergraduate 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 the minimum academic preparation standards (MAPS) for admission to the University. 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.

CLEP tests are administered through the Counseling and Career Services office, (303) 492-5254.

Cooperative Education

Students in the College of Arts and Sciences may receive up to 6 semester hours of credit for a department-sponsored cooperative education program or internship. Each internship project must be approved by the dean of the college before the student enrolls 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. Most internships are graded on a pass/fail basis only. Participation in an internship does not affect the total semester hours of pass/fail a student may apply toward a degree.

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. These courses may be taken during the last 30 hours before graduation.

Credit/No Credit

Credit/no credit changes must occur during the schedule adjustment periods.

Credit Taken as a Nondegree Student

A student may apply a maximum of 12 hours of course work taken at any University of Colorado campus while registered as a nondegree student toward the total required for graduation. Once a student has been admitted to a degree program, credits from the Division of Continuing Education such as SAVE, Boulder evening credit courses, and CU-Boulder correspondence classes are eligible to be applied toward the degree, subject to other limitations stated in the catalog.

Credit Hours Taken Outside the College of Arts and Sciences

Students may count a total of 30 semester hours from business, engineering, and the other professional colleges and schools as well as specified ROTC courses toward the fulfillment of requirements for the B.A. and B.F.A. degrees. Within these 30 total hours, up to 8 semester hours in activities courses (applied music and ensembles) may be used.

Cross-Listed Courses

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

Independent Study

With departmental approval, students may register for independent study during the schedule adjustment periods for each semester. Students may not register for more than 6 semester hours of independent study credit during any term. No more than 8 hours of independent study may be taken in a single department or program. A maximum of 16 hours of independent study may count toward the degree.

A student may not use independent study projects to fulfill the college's area, core, or general education requirements.

Limitations on Course Work

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

a. Students who enrolled in any institution of higher education in the summer of 1988 and thereafter may exceed the 45-hour limitation in the major by 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.

Pass/Fail

Students in the College of Arts and Sciences may not use the pass/fail option for courses taken to fulfill the area, core, 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.

Students who entered any institution of higher education for the first time in summer 1988 and thereafter may take two elective courses pass/fail, to a maximum of 6 hours. While courses with pass/fail grading are open to all students, *only juniors and seniors may elect* the pass/fail option, with a limit of one course per semester. The pass/fail option may be used *only* for elective credit.

Students who entered any institution of higher education for the first time 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. These students may take a maximum of 6 hours on a pass/fail basis each semester. Courses that are offered only on a pass/fail basis are not counted toward the maximum allowed.

Repetition of Courses

If a student takes a course for credit more than once, all grades are calculated into the grade point average. However, the course is only counted toward graduation once, unless a course description specifically states that it can be taken more than once for credit.

ROTC Credit

The ROTC courses listed below have been certified as acceptable college-level course work by the faculty of the College of Arts and Sciences or by other colleges and schools on the Boulder campus. These courses are counted as elective credit in the college, subject to the 30-semester-hour limitation on course work taken outside the college for students in the B.A. and B.F.A. programs. Courses that do not appear on this list do not count toward any degree requirements.

AIRR 3010-3020 (students may not receive credit for either course if they have credit in MGMT 3000)
AIRR 4010-4020 (students may not receive credit for either course if they have credit in PSCI 4191)
MILR 1011-1021
MILR 2031-2041 (students may not receive credit for either course if they have credit in MGMT 3000)
MILR 4072-4082
NAVR 2020
NAVR 3030
NAVR 3040
NAVR 3101
NAVR 4010-4020
NAVR 4030
NAVR 4101

Transfer Credit

Work from another accredited institution of higher education that has been completed with a grade of *C-* (1.70) or better may be transferred to the University of Colorado.

For students who entered an institution of higher education for the first time in the summer of 1988 and thereafter, no courses taken at a junior or community college are credited toward graduation at the University of Colorado after the students have completed a total of 60 semester hours (or 90 quarter hours) of course work at all institutions.

For students who enrolled in an institution of higher education prior to summer 1988, no courses taken at a junior or community college can be credited toward graduation at the University of Colorado after the students have completed a total of 72 semester hours (or 108 quarter hours) of course work at all institutions.

Note: Course work transferred from Colorado junior or community colleges is subject to the articulation agreement specified in the appropriate transfer guide between each institution and the University of Colorado at Boulder. *All courses transferred from junior and community colleges carry lower-division credit. Courses transferred from four-year institutions carry credit at the level they were taught at the previous institution.*

Withdrawal

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

Students in the College of Arts and Sciences who withdraw after the sixth week of classes in a fall or spring semester are not 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 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.

RESIDENTIAL ACADEMIC PROGRAMS

Farrand Residential Academic Program

The Farrand program combines the advantages of a small liberal arts college with the benefits of a major research university for its 400 freshman and sophomore residents. Small classes offered in the residence hall, informal contact with faculty, extensive academic advising and personal counseling services, and special programs generated from student interests make Farrand an intellectual as well as a residential community. In addition, optional outreach activities help those in need beyond the University, while strengthening the Farrand community.

Each semester every Farrand student takes a core Farrand course that provides a shared academic experience. During the freshman year the Farrand curriculum develops basic skills of writing and critical analysis, while providing a comprehensive survey of western art and culture through HUMN 1010 and 1020, Introduction to the Humanities. Contemporaty subjects, such as global ecology, film, and ethics, along with traditional disciplines, make up the second-year courses, which also fulfill arts and sciences core curriculum requirements.

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

Farrand offers a strong academic program with some of the best teachers at the University, along with community outreach opportunities and the chance to participate in many student-sponsored activities, such as an unusually active student governing board, the Farrand Improv nights (amateur talent shows), and special film and lecture series. One-credit-hour classes provide a context for small-group discussion of contemporary issues as well.

The program is sponsored jointly by the College of Arts and Sciences and the Department of Housing and is designed for students in arts and sciences. It is jointly administered by an academic director selected from the faculty and a hall director experienced in the operation of a large residence hall.

There is a charge for the program 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, CO 80310-0180, telephone (303) 492-8848.

Sewall Residential Academic Program

The Sewall Hall Residential Academic Program in American Culture and Society provides qualified academically committed freshmen and sophomores 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 Hall are required to take one class in the hall each semester. Freshmen are required to take either AMST 2000 or AMST 2010 (Themes in American Culture). Other core and elective courses are also available to freshmen and sophomores. The classes are usually limited to 20 students, carry 3 semester hours of credit, count toward a degree, and satisfy core curriculum requirements in the College of Arts and Sciences as well as general education requirements in the Colleges of Business and Engineering. In addition to the seminars, many of the large lecture classes at the University offer special laboratory or 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, choosing courses, and 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 concerns.

Participants in Sewall 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 is on participation—in classes, in student government, and in special programs and performances. Faculty, administrators, and staff enjoy close working relationships with the Sewall residents.

All entering freshmen and sophomores in good academic standing at CU-Boulder are eligible to apply for the residential academic program. Applications are included in the housing materials sent to all freshmen upon admission. Freshmen applicants are selected on the basis of their high school record. Students with a serious interest in American culture and society and who are motivated to make an investment in a liberal education are encouraged to apply. 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, CO 80309-0353, telephone (303) 492-6004.

UNDERGRADUATE DEGREE REQUIREMENTS

Academic Advising and Orientation

Students in the college are expected to assume responsibility for planning their academic program in accordance with college rules and policies and with departmental major requirements. All new students are required to attend a special orientation and advising program on campus before enrolling. Freshman and sophomore students who have declared a major are assigned a core advisor; open option students receive advising assistance from the Advising Resource Center.

Students are urged to consult regularly with advisors in the Office of the Dean and their major department concerning academic progress and objectives. The arts and sciences college advisors hold regularly scheduled workshops for undergraduates to review college policies and degree requirements, the college list and core curriculum, the foreign language requirement, transfer credit, grade point averages, academic standing, academic probation and dismissal, intrauniversity transfer, and preparation for graduation. Workshop schedules are available outside Old Main 1B-85.

Following these workshops, students with special problems can schedule individual appointments with advisors within approximately ten days. Freshmen and sophomores seeking advice may see peer counselors in addition to their core advisors. Students may schedule appointments in Old Main 1B-85 or by calling (303) 492-7885.

All students are responsible for knowing and following the academic rules and policies set forth in this catalog. Any questions concerning these provisions are to be directed to the Office of the College of Arts and Sciences, Old Main 1B-85. The college cannot assume responsibility for problems resulting from students failing to follow the policies stated in the catalog or from misadvice given by someone other than an appropriate staff member of the college.

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 at the time they declare a major.

There are currently two sets of degree requirements. One, the "core curriculum," is required for students who began their undergraduate study at any institution of higher education in the summer of 1988 or thereafter. The other is 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 Those Who Began Their Undergraduate Study in the Summer of 1988 and Thereafter

Arts and sciences students who began their undergraduate study *in the summer of 1988 and thereafter* must fulfill the following requirements for graduation:

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).
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 College courses) in the *summer only* count toward resident credit. Courses taken while on CU-Boulder study abroad programs, through CU-Boulder continuing education, or CU-Boulder correspondence courses are considered to be in residence.
5. For the bachelor of arts degree, students may take a maximum of 45 hours from one department. Students may exceed the 45-hour limitation by 6 hours (for a total of 51 hours), provided that all of the excess hours are taken in designated departmental courses and/or in honors thesis credit.
6. For the bachelor of fine arts degree, students may take a maximum of 67 hours in their major department.
7. Completion of a major. Students are subject to the major requirements in force when they declare a major. See Majors and Major Requirements below.
8. Completion of the general education requirements (college core curriculum) with the following limitations:

a. Students may not use courses taken to complete a minimum academic preparation standards (MAPS) deficiency to fulfill any area of the college core curriculum, with the exception of foreign language.

b. Although a single course may be listed in several areas, a student may use it to meet only one area requirement.

c. Students may use courses from a single department to meet at most two content areas of study.

d. Neither independent study nor pass/fail courses may be used to meet MAPS deficiencies or core requirements.

e. Students must complete at least 15 semester hours of course work at the upper-division level as part of the core curriculum, except for specified majors. A maximum of 6 of these hours may be in a single department. Note that all courses transferred from junior or community colleges carry lower-division credit.

Exemptions: Selected majors are exempt from portions of the core curriculum, as core course work is considered equivalent to course work in the major. Students may choose to take the exemption or to waive the exemption by selecting from the specific courses listed in the core brochure.

Students who major in a field dealing in depth with literature and arts (classics, English, fine arts, French and Italian, Germanic languages and literatures, humanities, Oriental languages and literatures, Slavic languages and literature, Spanish and Portuguese, or theatre) are exempt from the literature and arts core curriculum requirement and 3 of the 15

required upper-division hours. These majors still must complete 12 upper-division hours in courses outside of the literature and arts content area.

Students who major in the natural sciences (chemistry, EPO biology, geology, MCD biology, or physics) are exempt from the natural sciences core curriculum requirement and 6 of the 15 upper-division hours. These majors still must complete 9 upper-division hours in courses outside the natural sciences content area.

Students who major in a social science department or program (anthropology, economics, international affairs, political science, psychology, or sociology) are exempt from the contemporary societies core curriculum requirement and 3 of the 15 required upper-division hours. These majors still must complete 12 upper-division hours in the core curriculum outside the contemporary societies content area.

Updated requirements and lists of approved core courses can be obtained in the dean's office (Old Main 1B-85) and at registration.

Skills Acquisition (College Core Curriculum)

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. All students are required to demonstrate, while in high school, third-level proficiency in a single modern or classical foreign language. Students who have not met this requirement at the time of matriculation will have a MAPS deficiency. They may make up the deficiency only by completing an appropriate third-semester college course or by passing a CU-Boulder approved equivalency examination.

Students who are under the core curriculum, but not subject to MAPS, must complete the foreign language requirement to meet degree requirements.

Questions about placement should be referred to the appropriate foreign language department. Once a foreign language course has been passed, a student cannot receive credit for a course at a lower level in that same 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.

2. Quantitative Reasoning and Mathematical Skills (QRMS). Students are required to demonstrate minimum competence in quantitative reasoning and mathematical skills by the end of their sophomore year. The requirement may be fulfilled either by passing the CU-Boulder QRMS proficiency examination or by passing one or more of the specifically designated core curriculum courses.

3. Written Communication. The college requires each student to demonstrate competency in written communication. In the second semester of the sophomore year, a student may elect to take the written communication proficiency examination. Students whose writing is judged to be adequate are exempt from the writing requirement. Students whose writing is judged to be inadequate in content, form, and/or style must pass an upper-division writing course, UWRP 3020 Topics in Writing, during their junior or senior year.

4. Critical Thinking. Students must take 3 hours of specified course work at the upper-division level that requires them to practice sustained critical thinking and to demonstrate such thinking in both written form and oral discussion. Some of these courses may take the form of a senior capstone experience seminar.

Content Areas of Study (College Core Curriculum)

The content areas of study are designed to assure that all students acquire a broad general education. A list of requirements and designated courses is published each term.

1. Historical Context (6 semester hours). Courses fulfilling this requirement enable students to study historical problems or questions in the context of European experience in order to develop an awareness of how many of our ideas, institutions, and cultures are derived from European civilization.

2. Cultural and Gender Diversity (3 semester hours). Courses fulfilling this requirement increase students' understanding of the world's diversity and pluralism through the study of two broad and interrelated areas: the nature and meaning of the categories of women, race, ethnicity, and gender; and cultures other than those of Europe and the United States. This requirement explicitly identifies an awareness and understanding of pluralism as essential to a liberal education.

3. United States Context (6 semester hours). Courses fulfilling this requirement explore important aspects of American culture and society. They stimulate critical thinking and an awareness of the place of the United States in the world by promoting an understanding of the particular world views that the diversity, environment, culture, history, values, and expression of the United States have fostered. Courses familiarize students with the United States and enable them to evaluate it critically.

4. Literature and the Arts (6 semester hours, 3 of which must be upper-division). The goal of this requirement is to enhance students' ability to read critically, to understand the elements of art, and to grasp something of the complex relations between artist and public and between art work and cultural matrix. Courses fulfilling this requirement emphasize works which are generally recognized as central to and significant for cultural literacy and thereby enhance students' understanding of our literary and artistic heritage.

5. Natural Science (13 semester hours). Completion of this requirement enables students to understand the current state of knowledge in at least one scientific discipline, with specific reference to important past discoveries and the directions of current development; to gain experience in scientific observations and measurement, in organizing and quantifying results, in drawing conclusions from data, and in understanding the uncertainties and limitations of the results; and to acquire sufficient general scientific vocabulary and methodology to find additional information about issues, to evaluate it critically, and to make informed decisions.

6. Contemporary Societies (6 semester hours, 3 of which must be upper-division). These courses, which treat societies of the twentieth century, study an individual society or compare several societies. All explicitly attempt to deepen students' understanding of the cultural, political, economic, or social contexts that shape people's lives. Their scope may be global or specific, but all courses fulfilling this requirement treat social processes, institutions, values, forces, and beliefs.

7. Ideals and Values (3 semester hours). Courses meeting this requirement explore a specific sphere of human values (moral, religious, intellectual, aesthetic, environmental, etc.). In these courses, students are encouraged to reflect upon their own and others' fundamental ideals and values and the sources from which those value orientations are derived.

General Requirements for Those Who Began Their Undergraduate Study Before Summer 1988

Arts and sciences students who began their undergraduate study *before summer 1988* must fulfill the following requirements for graduation:

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 College courses) in the summer count toward resident credit. Courses taken while on CU-Boulder study abroad programs, through CU-Boulder continuing education, or CU-Boulder correspondence courses are considered to be in residence.
5. Not more than 45 semester hours in a single department for the B.A. degree, not more than 67 hours in a single department for the B.F.A. degree, and not more than 50 semester hours in a single department for the B.S. degree.
6. Completion of a major (see Majors and Major Requirements below).
7. Completion of the college list requirements (see below).

College List 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 who began undergraduate study before summer 1988 are required to complete the requirements listed below.

These students must present two, two-semester course combinations in the areas of the humanities, natural sciences, and social sciences.

The faculty of the College of Arts and Sciences has authorized a set list of courses to be used in fulfilling these college area requirements, known as the "college list." Students may obtain a college list at Old Main 1B-85.

Students may satisfy the requirements in each of the three areas 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.

Students may not use the independent study or pass/fail option for courses taken to fulfill the College of Arts and Sciences requirements, including courses taken to complete the foreign language requirement.

Foreign Language Requirement. Completion of a third-level 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:

1. By completing an appropriate third-semester course in a single foreign language at this University.
2. By demonstrating third-semester proficiency or its equivalent through examination in any foreign language.

Questions about placement should be referred to the appropriate foreign language department. Once a foreign language course has been passed, a student cannot receive credit for a course at a lower level in that same language.

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.

General Requirements for All Students (Regardless of When They Began Their Undergraduate Study)

Majors

All arts and sciences students pursuing a bachelor's degree must declare a major by the end of their sophomore year (i.e., the semester in which they are completing their 60th semester hour of work, including transfer work). See pages 4 and 5 for a listing of bachelor's programs. 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 those students' major programs for graduation. The college can assume no responsibility for difficulties arising out of a student's failure to establish and maintain contact with the major department or program.

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. Eighteen semester hours of upper-division courses in the major, all with grades of *C-* (1.70) or higher.
4. A 2.00 *(C)* overall grade point average in all major work attempted.
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 they formally declare a major.

Minors

Beginning in the fall semester of the 1991-92 academic year, departments in the college were authorized to offer minors. Although the actual structure of departmental minors may differ, all must meet the following minimum requirements:

1. Participation in the minor program is optional on the part of the student.
2. Departments and programs within the college are free to elect whether or not they wish to offer a minor in their discipline. Departments with approved minor programs include astrophysical, planetary, and atmospheric sciences; chemistry and biochemistry; linguistics; and religious studies. Participating departments and programs are responsible for defining their minor consistent with the specifications below.
3. A minimum of 18 credit hours must be taken in the minor area, including a minimum of 9 upper-division hours.
4. All course work applied to the minor must be completed with a grade of *C-* or better (no pass/fail work may be applied). The grade point average for all minor degree course work must be equal to 2.00 *C)* or higher.
5. Students pursuing an individually structured major, or a major in distributed studies, are not eligible to earn a minor.
6. Students are allowed to apply no more than 9 credit hours, including 6 upper-division credit hours, of transfer work towards a minor.
7. Students may earn no more than one minor.

8. Course work applied to a minor may also be applied towards general education (core curriculum or college list) and major requirements.

Areas of Interest

The college also sponsors programs—but not undergraduate majors—in the following areas of interest. Course work in these general areas is open to all interested students:

American Indian studies
Asian-American studies
Astrophysical, planetary, and atmospheric sciences (APAS)
Bibliography
British studies
Chicano studies
Conflict and peace studies
History and philosophy of science
Honors
Medieval studies
Museum

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, much of the courses taken during the freshman and sophomore years can be applied toward the area, core, or general education requirements of the college. Open option students must declare a major by the end of their sophomore year.

Double Majors

Students pursuing either the B.A. or B.F.A. degree may graduate with more than one major within the degree (e.g., economics and French) 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 different degrees (i.e., a B.A. and B.S., or B.A. and B.F.A. from the College of Arts and Sciences, or two degrees from different schools or colleges) 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 general education and major requirements of the College of Arts and Sciences.
6. Both degrees must be awarded at the same time.

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 for the degree to be awarded by the College of Arts and Sciences (including the area, core, or general education requirements) have been met.
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 do not count in these minimum requirements.

Graduate Study

Curricula leading to advanced degrees are offered by most of the departments in the College of Arts and Sciences (see page 311). 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 information about enrollment in graduate course work while still an undergraduate, see Seniors at the University of Colorado in the Graduate School portion of this catalog.

AFROAMERICAN STUDIES

See Center for Studies of Ethnicity and Race in America (CSERA), Afroamerican Studies.

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 track in women studies (see the Women Studies program listing).

The following areas of knowledge are central to the undergraduate degree in American studies:

- knowledge of the main topics in the cultural history of the United States, from its origins to the present;
- knowledge of at least three disciplinary approaches to the cultural study of the United States; and
- comparative knowledge of at least one non-American culture.

In addition, students completing the degree in American studies are expected to acquire:

- research skills sufficient to determine the boundaries of an investigation by consulting appropriate works and developing a bibliography of primary and secondary sources, including documents, periodical articles, and monographs;
- analytic skills sufficient to read primary sources closely, to base an exposition of general patterns in particular pieces of evidence, to analyze arguments and interpretations presented in scholarly sources, and to recognize and analyze conflicts of interpretation; and
- writing skills sufficient to write an essay that is coherent, cogent, and grammatically correct.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
Two semesters of introductory American studies courses (or equivalent) AMST 2000 Themes in American Culture: 1600-1900 AMST 2010 Themes in American Culture: 1865 to present	6
Completion of one of the tracks listed below consisting of five upper-division courses and representing at least two different departments	15
One upper-division course drawn from the course offerings under "Diversity"*	3
One upper-division course drawn from the course offerings under "Regional Studies"*	3
Two senior seminars in American studies (AMST 4950 and 4960, or AMST 4500, or equivalent)	6
One upper-division course in the language, culture, or history of a non-North American civilization, a course which fits the theme of the track the student has chosen	3
Total hours for major	36

(30 hours of the required 36 must be upper-division)

*If the student has chosen this track, an additional upper-division course from any other track may be substituted.

American Democracy: Institutions, Governance, and Public Policy Track
BLST 3103 Blacks in the American Educational System
BLST 4101 Black Politics
CHST 4133 Latinos and the American Political System
ECON 3535 Natural Resource Economics
ECON 3545 Environmental Economics
ECON 4525 Economic History of the United States
ECON 4697 Government and Business in the Economy
HIST 4415 History of the United States, 1900-1929
HIST 4425 History of the United States, 1933-1968
HIST 4445 United States since 1968
PHIL 3200 Social and Political Philosophy
PHIL 4260 Philosophy of Law
PHIL 4380 Rationality, Democracy, and Policy
PSCI 4011 The American Presidency
PSCI 4021 Legislatures and Legislation
PSCI 4031 Political Parties and Pressure Groups
PSCI 4054 American Political Thought
PSCI 4071 Urban Politics
PSCI 4111 Urban Policy Analysis
PSCI 4141 Bureaucratic Power in American Politics
PSCI 4161 Political Ethics in Policy Analysis
PSCI 4171 Government and Capitalism in the United States
PSCI 4191 National Security Organization and Policy Making
PSCI 4201 The Environment and Public Policy
PSCI 4211 Public Priorities: Revenues and Program Expenditures
PSCI 4241 Constitutional Law 1
PSCI 4251 Constitutional Law 2
PSCI 4261 The Judicial System
PSCI 4271 Sex Discrimination: Constitutional Issues
PSCI 4291 Sex Discrimination: Federal and State Law

Diversity in America: Race, Gender, Ethnicity Track
ANTH 3130 North American Indians: Traditional Cultures
ANTH 4560 North American Indian Acculturation
AIST 3010 Marxism and Native Americans
AIST 3135 North American Indians: Traditional Cultures
AIST 3400 Indian/Government Conflicts
AAST 3013 Contemporary Asian/Pacific American Communities
AAST 3420 Contemporary Asian-American Issues
BLST 3000 Race, Class, and Gender
BLST 3020 Selected Topics in Afroamerican Studies
BLST 3103 Blacks in the U.S. Educational System
BLST 3203 Afroamerican Psychology
BLST 3505 Historical and Contemporary Issues of Black Women (see WMST 3505)
BLST 3703 Culture, Racism, and Alienation in America
BLST 4101 Black Politics (see PSCI 4101)
BLST 4650 Contemporary Issues in Afroamerican Studies
BLST 4692 Contemporary African-American Literature 1 (also ENGL 4692)
BLST 4702 Contemporary African-American Literature 2
CHST 3023 Sociology of the Chicano and Mexican Americans
CHST 3135 Study of Chicanas
CHST 3153 Folklore, Mysticism, and Power of the Hispanic Southwest
CHST 3814 Chicano Poetry
CHST 3824 Chicano Prose Fiction
CHST 4000 Hispanic and Native American Culture of the Southwest
CHST 4133 Latinos and the American Political System (also PSCI 4131)
CHST 4682 Special Topics
ENGL 3262 Women Writers (U.S. and Britain)
ENGL 3672 Jewish-American Fiction
FILM 3013 Women and Film
FINE 3059 American Art
HIST 4026 U.S-Indian Relations
HIST 4327 American Southwest
HIST 4576 U.S. Immigration History
HIST 4616 History of Women in the U.S. to 1890
HIST 4617 The Indian in American History: The Eastern Region
HIST 4626 History of Women in the U.S. since 1890
HIST 4627 The Indian in American History: The Western Region
PSCI 4271 Sex Discrimination: Constitutional Issues
PSCI 4291 Sex Discrimination: Federal and State Law
RLST 4300 Topics in Native American Religions
RLST 4350 Native American Religions: Regional Studies
SOCY 3022 Sociology of Chicanos and Mexican Americans
SOCY 4101 Education in Multilingual Communities

Regional Studies: The American West Track
ANTH 3130 North American Indians
ANTH 4200 North American Archaeology
ANTH 4210 Southwest Archaeology
ANTH 4270 Plains Archaeology
ANTH 4560 North American Indian Acculturation
AAST 3013 Contemporary Asian/Pacific American Communities
AAST 3420 Contemporary Asian-American Issues
AIST 3135 North American Indians (see ANTH 3130)
AIST 3400 Indian/Government Conflicts
AIST 4565 North American Indian Acculturation (see ANTH 4560)
AIST 4627 Indian in American History-West (see HIST 4627)
CHST 3023 Sociology of Chicano and Mexican Americans (see SOCY 3022)
CHST 3135 Study of Chicanas (see WMST 3135)
CHST 3153 Folklore, Mysticism, and Power
CHST 3814 Chicano Poetry
CHST 3824 Chicano Prose and Fiction
CHST 4000 Hispanic and Native American Culture of the Southwest (see SPAN 4000)
FINE 4439 North American Indian Art
GEOG 4501 Water Resources and Management of the Western U.S.
GEOG 4872 Geography of Colorado
HIST 3317 Selected Readings in the American West
HIST 4026 U.S.-Indian Relations
HIST 4217 Early American Frontier
HIST 4227 Later Frontier
HIST 4327 American Southwest
HIST 4617 The Indian in American History: The Eastern Region
HIST 4627 The Indian in American History: The Western Region
PSCI 4131 Latinos and the American Political System (see CHST 4133)
PSCI 4201 Environment and Public Policy
RLST 4300 Topics in Native American Religions
RLST 4350 Native American Religions: Regional Studies

Representation: Nature, Culture, and Society Track
ANTH 3170 America: An Anthropological Perspective
AAST 3420 Contemporary Asian-American Issues
BLST 3000 Race, Class, and Gender
BLST 3505 Historical and Contemporary Issues of Black Women (also WMST 3505)
BLST 3703 Culture, Racism, and Alienation in America
BLST 4962 Contemporary African-American Literature 1
BLST 4702 Contemporary African-American Literature 2
CHST 3814 Chicano Poetry
CHST 3824 Chicano Prose Fiction
CHST 4000 Hispanic and Native American Culture of the Southwest
ENGL 3652 Survey of American Literature 1
ENGL 3662 Survey of American Literature 2
ENGL 3672 Jewish-American Fiction
ENGL 3682 Twentieth Century American Literature
ENGL 4232 American Novel 1
ENGL 4242 American Novel 2
ENGL 4352 American Drama
ENGL 4452 Modern American Poetry
ENGL 4652 Studies in American Literature to 1900
ENGL 4662 Studies in American Literature after 1900
ENGL 4692 Contemporary African-American Literature
ENVD 4114 American Architecture and Urbanism
FINE 3509 American Art
FINE 4509 American Art before the Civil War
FINE 4519 American Art 1860-1945
FINE 4870 American Art 1945-Present
FINE 4539 Contemporary Art
HIST 3416 Readings in Recent American History

HIST 4316 Origins of American Culture 1600-1830
HIST 4336 19th Century American Intellectual History
HIST 4346 20th Century American Intellectual History
HIST 4516 American Society in the 19th Century
HIST 4526 American Society in the 20th Century
HIST 4536 Popular Culture in America to 1900
HIST 4546 Popular Culture in American 20th Century
HIST 4556 History of Urban America
HIST 4616 History of Women to 1890
HIST 4626 History of Women since 1890
EMUS 3082 American Popular Music
EMUS 3642 Jazz
PHIL 3140 Environmental Ethics
PSCI 4051 Public Opinion and Political Behavior
PSCI 4054 American Political Thought
PSCI 4101 Black Politics (also BLST 4101)
PSCI 4151 Political Socialization
PSCI 4201 The Environment and Public Policy
PSCI 4301 Symbolic Politics
RLST 3500 Religion and Literature in America
SOCY 3016 Marriage and the Family in U.S. Society
SOCY 3046 Topics in Sex and Gender
SOCY 4016 Sex, Gender, and Society
SOCY 4086 Family and Society (see WMST 4086)
THTR 3009 American Musical Theatre
THTR 4001 American Theatre Studies

AMERICAN INDIAN STUDIES

See Center for Studies of Ethnicity and Race in America (CSERA), American Indian Studies.

ANTHROPOLOGY

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

Anthropology is the study of people, both ancient and modern, in their cultural context. The field involves a global look at human cultures from prehistoric times to the present, integrating findings from the social sciences, natural sciences, and humanities. Students of anthropology learn to appreciate the variety of cultures throughout human history and to understand the meaning of human biological and cultural development as well as diversity.

The following areas of knowledge are central to the undergraduate degree in anthropology:

- understanding of basic data, concepts, alternative theories and approaches, and modes of explanation appropriate to each of the four main subfields of the discipline (archaeology, anthropological linguistics, physical anthropology, and cultural anthropology);
- understanding of basic archaeological techniques, including site mapping, stratigraphy, dating, and inference of human behavior from archaeological data, as well as a general knowledge of human history from its beginning through the emergence of complex societies;
- understanding of variation and patterning in human social behavior and symbolic systems, including ecological, social, cultural, and psychological factors, and the kinds of data relevant to each (this includes knowledge of the distribution and diversity of contemporary and recent human societies in terms of social, political, religious, and economic organization, the effects of culture contact, and industrialization);
- a basic understanding of primate evolution, including knowledge of theories of human evolution, and familiarity with the basic data of the hominid fossil record; and
- an understanding of human language, the diversity of verbal expression, and its relationship to the invention of writing systems and religion.

In addition, students completing the degree in anthropology are expected to acquire:

- the ability to identify trends or patterns in anthropological data from different cultures or periods, to identify an appropriate context of explanation or interpretation, and to formulate a testable explanation or reasonable interpretation, including the ability to identify data that constitute credible evidence for an explanation or interpretation; and
- the ability to identify and define a significant problem or topic in anthropology and the ability to analyze and interpret data in a systematic manner.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below. (A minimum of 30 semester hours in anthropology, 18 of which must be upper division, is required for the degree.)

Major Requirements	*Semester Hours*
ANTH 2010 Introduction to Physical Anthropology 1	3
ANTH 2100 Frontiers of Cultural Anthropology 1	3
ANTH 2200 Introduction to Archaeology	3
One upper-division topical course in cultural anthropology	3
One upper-division ethnographic area course in cultural anthropology	3
One upper-division course in archaeology	3
One upper-division course in physical anthropology	3

(Students planning to pursue graduate work in anthropology are advised to take ANTH 4000 and 4530)

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 are asked to present a 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 February 1. 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 ANTH 4000 or 5000 (Quantitative Methods in Anthropology) 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 are 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, or physical anthropology. Further specialization in applied anthropology, medical anthropology, or 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 graduate secretary, Department of Anthropology.

APPLIED MATHEMATICS

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

The Applied Mathematics Program in the College of Arts and Sciences offers courses and degree programs for undergraduate and graduate students. Course offerings at the undergraduate level, which are part of the distributed studies program, focus on providing students with the mathematical tools and problem-solving strategies that are useful in science and engineering. The applied mathematics major at the undergraduate level is a part of the distributed studies program. The program offers a range of courses and research opportunities in many areas, including computational mathematics, discrete mathematics, nonlinear phenomena, and physical applied mathematics. Each of these areas is described below.

Computational Mathematics

The principal areas of study include computational linear algebra, optimization, numerical solution of ordinary and partial differential equations, and solution of nonlinear algebraic equations.

Students choosing to specialize in this area are expected to gain some knowledge of computer organization and hardware and to develop proficiency in the analysis and use of the methods of computational mathematics. This includes, but is not limited to, understanding the practical aspects of computers with necessarily limited precision as well as the theoretical basis of numerical algorithms.

Discrete Applied Mathematics

Discrete mathematics has become a large and very active research area in all of mathematics. Previous unsolved problems in applied disciplines such as engineering, physics, chemistry, and the social, biological, and environmental sciences have become tractable through the use of computers. Since solvable computer problems invariably are discrete, their theoretical analysis generally depends on discrete mathematics techniques. This accounts for the enormous growth in the use of discrete mathematics during the past three decades. Courses in discrete mathematics introduce students to both the methods and techniques of discrete mathematics as well as to their application to specific problems.

Nonlinear Phenomena

In recent years there has been an explosion of interest in the study of nonlinear waves (e.g., solutions, integrable systems, symmetries), nonlinear dynamics and chaos (e.g., period doubling routes to chaos, complex analytic dynamic systems, and area preserving mappings), and the analysis of nonlinear evolution equations arising in physical problems (e.g., the structure and understanding of singular solutions, bifurcations, existence and uniqueness of solutions of the underlying equations). The applied mathematics faculty is actively and intensively involved with research in the rapidly growing field of nonlinear phenomena. The course requirements include analysis, computation, and methods in applied mathematics.

Physical Applied Mathematics

Physical applied mathematics refers to the study of mathematical problems with direct physical application. Students and their advisors decide which subfield of the natural sciences or engineering on which to concentrate. Physical applied mathematics is interdisciplinary; in addition to mathematical analysis, it requires a deep understanding of the underlying applications area and often requires numerical computation as well. Course requirements of the program are designed to provide students with knowledge of each of these areas (analysis, computation, and some aspect of the physical sciences or engineering) that are needed to begin doing research.

Bachelor's Degree Programs

The program currently offers two pathways leading to a bachelor's degree. For students in the College of Engineering and Applied Science, the B.S. degree is available, while in the College of Arts and Sciences the B.A. degree is possible though an interdisciplinary major program that focuses on applied mathematics.

The undergraduate curriculum in applied mathematics trains students in the applications of mathematics in engineering and science. The use of computational methods and implementation of algorithms on computers is central. Technical electives are selected from mathematics, engineering, physics, chemistry, computer science, biology, astrophysics, and geology.

In general, nontechnical electives should be broadening and have multicultural value. Students interested in research are also encouraged to take a foreign language as early as possible. French, German, or Russian are recommended.

Interested students should contact the applied mathematics office in the College of Arts and Sciences for information on specific major and degree requirements.

Graduate Studies

Prerequisites for graduate study in applied mathematics include three semesters of calculus and a course in differential equations and linear algebra. Other course requirements are Methods in Applied Mathematics 1 and 2 (APPM 4350 and 4360); Intermediate Numerical Analysis (APPM 4650 and 4660, or MATH 4650 and 4660); either Matrix Methods (APPM 3310) or Linear Algebra (APPM 2360, MATH 3150, or MATH 5150); and Advanced Calculus 2 (MATH 4320 or MATH 4380). The overall grade point average for mathematics and applied mathematics must be *B-* or better.

Ph.D. Degree

The Applied Mathematics Program on the Boulder campus offers course work and research leading to the Ph.D. degree in applied mathematics. This is a coordinated Ph.D. degree program jointly administered with the Department of Mathematics at the University of Colorado at Denver under the auspices of the systemwide Graduate School. Information on the program and degree requirements is available from the applied mathematics office and the Graduate School.

ASIAN STUDIES

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

The program in Asian Studies is undergoing major revision. Interested students should contact the program office, (303) 492-2110, for further information.

ASIAN-AMERICAN STUDIES

See Center for Studies of Ethnicity and Race in America (CSERA), Asian-American Studies.

ASTROPHYSICAL, PLANETARY, AND ATMOSPHERIC SCIENCES

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

Although an undergraduate major is not offered, APAS courses may be used in undergraduate 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, atmospheric sciences and planetary, 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 in 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 5540 Mathematical Methods

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, CO, 80309-0391.

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 Astrophysics
APAS 5720 Galaxies and Cosmology
APAS 5730 Stellar Atmospheres and Radiative Transfer
APAS 5740 Interstellar Astrophysics
APAS 5750 Observational Astronomy
APAS 6000 Seminar in Astrophysics
APAS 6010 Topical 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 of hot and cool stars
- Solar physics
- Interstellar and intergalactic medium
- Cosmology and large-scale structure of the universe
- Stellar interiors, pulsations, and neutron stars
- Cosmic X-ray sources, supernovae and their remnants
- Galactic evolution, quasars, and active galaxies
- Radio astronomy
- Plasma astrophysics
- Astrophysical fluid dynamics
- Laboratory and atomic astrophysics
- UV, IR, 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. CU-Boulder has also been awarded NASA grants for theoretical astrophysics and solar-terrestrial theory. 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 the Center for Astrophysics and Space Astronomy (CASA) established within the APAS department. (See descriptions in the Graduate School section.) In addition, research is carried out with national laboratories and international collaborators: High Altitude Observatory (HAO) in Boulder (solar physics), National Optical Astronomical Observatories in Tucson and Chile (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).

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 5960 Theories of Climate and Climate Variability
APAS 7200 Dynamics and Photochemistry of the Upper Atmosphere
APAS 7240 Physics of Planetary Airglows
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, expetimental 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, Saturn, Uranus, and Neptune), planetary magnetospheres, and cometary physics
- 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 laboratoty 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 above research activities.

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.

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. Courses offered are:

APAS 5000 Seminar in Plasma Physics
APAS 5150 Introductory Plasma Physics
APAS 5220 Nonlinear Dynamics
APAS 7150 Magnetohydrodynamics
APAS 7160 Intermediate 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 carefully read 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 is necessary for graduate study. Courses should include thermodynamics, mechanics, electricity and magnetism, atomic physics, and mathematics at least through complex variables and 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 should be taken before the time of application to the department.

Preliminary Examination. Students in the Department of Astrophysical, Planetary, and Atmospheric Sciences are given an oral preliminary examination prior to the beginning of the fall semester of their first year. This oral interview examines fundamental knowledge in undergraduate 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 are normally 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. The examination under plan II is more comprehensive and 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.

Doctoral Degree

In addition to the master's degree requirements above, Ph.D. students must complete the following.

Course Requirements. A minimum of 30 semester hours of work (36 hours for students in astrophysics and solar physics, including 4 hours of graduate seminars) in courses numbered 5000 or above is required; however, the overall emphasis is on independent study and research.

Language Requirement. None.

Examinations. Students in the Ph.D. program are required to remove any deficiencies identified at the preliminary examination, to pass a two-part comprehensive examination composed of a written test on graduate course material and an oral exam on a research paper, and satisfactorily defend the thesis before a faculty committee.

BIBLIOGRAPHY

Several courses in bibliography are offered to students who wish to develop competence in the use of information tools for their study and career needs. See the course descriptions for further information.

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.*

The following areas of knowledge are central to the undergraduate degree in environmental, population, and organismic biology:

- knowledge of the diversity of living organisms, cellular structures and processes, Mendelian, molecular, and population genetics, and ecological processes at the population, community, biome, and biosphere levels;
- knowledge of the sources of variation within and among populations, and the mechanisms of natural selection;
- knowledge of scientific methods and of the relationships among theory, experiment, data, data analysis, and general knowledge;
- awareness of the relevance of mathematics, chemistty, and physics to biology; and
- awareness of the development of biological thought.

In addition, students completing the degree in environmental, population, and organismic biology are expected to acquire:

- the ability to read, critically evaluate, and synthesize information from biological literature;
- the ability to make observations and generate hypotheses to account for observations;
- the ability to formulate experiments to test hypotheses and reach conclusions based on biological data; and
- the ability to articulate, in oral and written form, knowledge of biology, biological methods, and biological thought.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

EPOB 1210 and 1220 General Biology 1 and 2, *or* EPOB 1610 and 1620 Honors General Biology 1 and 2, *and* EPOB 1230 and 1240

General Biology Laboratory 1 and 2.....8
(MCDB 1050 and 1060 Introduction to MCD Biology 1 and 2 can be substituted. NASC 1230 and 1240 Biology—A Human Approach 1 and 2 do not carry credit toward the 38 hours required for the EPOB major, but fulfill the requirements of completing general biology.)
EPOB 3200 Genetics.....3
(MCDB 3400 Molecular Genetics is not accepted as a substitute)
EPOB 3020 Principles of Ecology.....3
One of the following courses:
EPOB 3500 Plant Kingdom; EPOB 3510 Plant Anatomy and Development; EPOB 3520 Plant Systematics; EPOB 3530 Essentials of Plant Physiology.....4
One of the following courses:
EPOB 3240 Animal Behavior; EPOB 3400 Microbiology; EPOB 3630 Parasitology; EPOB 3650 Embryology and EPOB 3660 Developmental Biology Laboratory; EPOB 3700 Comparative Animal Physiology; EPOB 3720 Principles of Comparative Vertebrate Anatomy.....3-5
(Students may not present both 3420 Introduction to Human Anatomy and EPOB 3720 Principles of 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. Students may not present EPOB 3420 Introduction to Human Anatomy and EPOB 3430 Human Physiology to fulfill the requirement of total semester hours passed for a bachelor's degree.)
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

Ancillary Courses

One year of college chemistry:
CHEM 1111 General Chemistry 1 and CHEM 1071 Introduction to Organic and Biochemistry, *or* CHEM 1111 and CHEM 1131 General Chemistry 1 and 2 *or* CHEM 1151 and CHEM 1171 Honors General Chemistry 1 and 2.....9-12
One year of college physics:
PHYS 2010 and PHYS 2020 General Physics 1 and 2 *or* PHYS 1110 and PHYS 1120 General Physics 1 and 2 and PHYS 1140 Experimental Physics 1.....9-10
One semester of college calculus:
MATH 1300 Analytic Geometry and Calculus 1 or MATH 1310 Calculus 1 and Combinatorics or APPM 1350 Calculus for Engineers 1.....4-5

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 are counted as part of the 12-hour limit for courses taken outside the department.) A listing of acceptable courses may be obtained from the EPOB Office, Ramaley N122.

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 evolution, 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), the Institute of Behavioral Genetics (IBG), and the Cooperative Institute for Research in Environmental Sciences (CIRES). 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 some small endowments 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 January 15 for consideration for fall semester admission. A complete application includes a statement of intent, letters of recommendation, official transcripts, and GRE scores (both the general as well as advanced biology). Applications for spring semester admission are discouraged. Students are required to have a bachelor's degree in biology or an equivalent. 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 completing 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 to see whether application for the M.A. I or Ph.D. program is appropriate. Applicants should communicate with potential advisors before January 15. 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 below.

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 January 15. 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. Financial support is not guaranteed for M.A. II students.

Comprehensive Examination

Before completion of the master's degree students must take a comprehensive examination, which consists of three half-day written examinations (four half-days, M.A. I program); one of these examinations is in general biology. The other two (three, M.A. I program) may be chosen from biology of special taxa; anatomy, morphology, and physiology; genetics and evolution;

taxonomy and systematics; animal behavior; and ecology. Written exams are followed by an oral exam (optional for the M.A. II program) by the student's advisory committee.

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 aids 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 that are similar to the M.A. I program comprehensive exam (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.*

The following areas of knowledge are central to the undergraduate degree in molecular, cellular, and developmental biology:

- basic knowledge about the biological sciences in general, together with other supporting sciences including chemistry, mathematics, and physics;
- a relatively detailed understanding of currently important aspects of cell biology, molecular biology, biochemistry, genetics, and developmental biology, as well as an appreciation for the dynamic interplay among these fields in current research; and
- an understanding of the relationship of the specialty area to broader areas of science and to society in general, including ethical issues raised by current biological research and by the rapid growth of biotechnology as an important shaping force for the future.

In addition, students completing the degree in molecular, cellular, and developmental biology are expected to acquire:

basic skills from laboratory courses that equip them to learn detailed laboratory procedures rapidly when the opportunity arises;

- a scientific vocabulary and an understanding of research methods that permits them to read articles from current journals, to extract pertinent information, and to judge the quality of the work described;
- the ability to evaluate a biological problem, to determine which aspects are understood, and to apply basic research methods and techniques to the unknown aspects; and
- the ability to communicate scientific concepts and analytical arguments clearly and concisely, both orally and in writing.

Bachelor's Degree Program

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 in Porter Biosciences, Room 131.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
MCDB 1050 and 1060 Introduction to Molecular, Cellular, and Developmental Biology 1 and 2 and MCDB 1070 and 1080 Introduction to Molecular, Cellular, and Developmental Biology Laboratory 1 and 2; *or* EPOB 1210 and 1220 General Biology 1 and 2 and EPOB 1230 and 1240 General Biology Laboratory 1 and 2	8
MCDB 3120 Cell Biology and 3140 Cell Biology Laboratory	5
MCDB 3400 Molecular Genetics	4
MCDB 4650 Developmental Biology and MCDB 4660 Developmental Biology Laboratory	5
Upper-division electives in MCDB	9
CHEM 1111 and 1131 General Chemistry 1 and 2 *or* CHEM 1151 and 1171 Honors General Chemistry 1 and 2	10-12
CHEM 3311 and 3331 Organic Chemistry 1 and 2 and CHEM 3321 and 3341 Laboratory in Organic Chemistry 1 and 2 *or* CHEM 3351 and 3371 Organic Chemistry 1 and 2 for Chemistry Majors and CHEM 3361 and 3381 Laboratory in Organic Chemistry 1 and 2 for Chemistry Majors	8-10
CHEM 4711 General Biochemistry 1	3
PHYS 1110 and 1120 General Physics 1 and 2 and PHYS 1140 Experimental Physics *or* PHYS 2010 and 2020 General Physics 1 and 2	9-10
MATH 1300 Analytic Geometry and Calculus 1	5

Animal Use Policy. Biology is the science of life, and a major in it must include some hands-on experience with living organisms to be complete. Exercises involving the use of living animals or animal tissues are included, therefore, in MCDB laboratory courses. Majors with objections on moral grounds may arrange to limit their participation in these exercises, although their educational experience is compromised by doing so.

Nonmajors may take MCD biology lecture courses without the accompanying laboratories. Laboratory courses in which living vertebrate animals or tissues are used are identified both in the course description section of this catalog and in the *Registration Handbook and Schedule of Courses*. For additional information, please contact the department.

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, regulation of yeast mating type loci, genetic dissection of yeast spindle pole bodies, synthesis and secretion of glycoproteins and polysaccharides, and high-voltage electron microscopy.

Developmental Biology. Mechanisms and regulation of morphogenesis and cell growth, genetic control of development, molecular genetics of ras proteins and vulval development in nematodes, molecular genetics of *Drosophila* neurobiology, developmental genetics of *Drosophila* and *Caenorhabditis*, and cellular aging.

Membrane Biology. Biogenesis of mitochondria and chloroplasts, assembly of membrane protein complexes, and photosynthesis.

Entrance Requirements and Prerequisites. The graduate program of the Department of Molecular, Cellular, and Developmental Biology is 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 are expected to develop competence in five areas: biochemistry, including biochemical phenomena associated with cellular and molecular biology; genetics, including molecular mechanisms of gene function, regulation of gene activity, genetic control of development, and chromosome behavior; cell structure and function, including interaction of organelles, molecular organization, ultrastructure, biosynthesis, growth and reproduction; developmental systems and mechanisms, including types of developmental phenomena and the morphological and molecular mechanisms involved; and current research techniques of experimental biology.

Doctoral Program

Course of Study. The faculty of the department offers 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 an advisory 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.

The comprehensive examination, which is normally scheduled immediately after the fourth regular semester in residence, consists of two parts: a written research proposal and an oral examination designed to test the student's ability to defend the proposal, the breadth and depth of knowledge in the field of concentration, and the ability to communicate information and engage in scientific discussion.

Language. The department does not have a language requirement.

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.

Master's Program. 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. For plan I a thesis based on original research must be submitted. Final determination of whether a student follows plan I or plan II is made by the department.

BLACK STUDIES

See Center for Studies of Ethnicity and Race in America (CSERA), Afroamerican Studies.

BRITISH STUDIES

The Center for British Studies encourages students to develop programs that include a focus on British culture, history, and contemporary life from a variety of disciplinary perspectives. At the undergraduate level, the center offers a certificate in British studies for students who have taken 24 credit hours in British literature, history, and/or other fields. The center also assists undergraduates who want to study or do research in Britain.

For graduate students, it offers a series of interdisciplinary seminars, designed and planned by students, with a different focus each semester. These offer exposure to methods and sources outside the students' own departments and provide preprofessional training in presenting research. The center has funds for acquiring microfilm collections for dissertation research, offers travel fellowships for graduate students, and awards writing prizes for both undergraduate and graduate papers.

CENTER FOR STUDIES OF ETHNICITY AND RACE IN AMERICA (CSERA)

The Center for Studies of Ethnicity and Race in America (CSERA) promotes interdisciplinary research and teaching in Afroamerican studies (formerly Black studies), American Indian studies, Asian-American studies, Chicano studies, and in cross-cultural and comparative race and ethnic studies. Afroamerican studies is an established undergraduate degree program; Chicano Studies grants a certificate; American Indian and Asian-American Studies are new programs being developed.

CSERA seeks to provide a coherent framework for the study of ethnic and racial minorities and to promote research and critical examination of culture, history, and contemporary issues. The primary focus is on people of color and indigenous peoples of the United States, but the center also considers important the study of race and ethnic issues. Interaction across the Americas and global interaction are studied, as well as diasporas. Also of primary concern is recognition and incorporation of multicultural definitions and values in the university curriculum.

CSERA has a core faculty of its own, but also draws on the faculty resources of many departments in the College of Arts and Sciences, as well as the School of Education, the College of Environmental Design, the School of Journalism and Mass Communication, the School of Law, the College of Music, and the University Libraries.

Please contact the CSERA office for more information, (303) 492-8852.

Afroamerican Studies

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

The Afroamerican Studies Program is multidisciplinary. 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 that focus on the African and Caribbean experience.

The following areas of knowledge are central to the undergraduate degree in Afroamerican studies:

- knowledge of African origins, migrations, and contributions to the development of different civilizations;
- knowledge of the history of African Americans and their contribution to America;
- knowledge of African Americans in contemporary American society; and
- an understanding of Black identity.

In addition, students completing the degree in Afroamerican studies are expected to acquire:

- the ability to conduct research on a topic or problem in the area of Afroamerican studies;
- the ability to write a clear and well-argued paper on such a topic or problem; and
- the ability to present the results of research in cogent, articulate oral argument.

Degree Requirements

In addition to the general requirements of the College of Arts and Sciences, students must complete at least 33 semester hours in Afroamerican studies. A grade of *C* (2.00) or better must be received in all courses taken toward the major. At least 18 hours must be upper-division courses (3000 and 4000 level). No more than 6 semester hours may be taken in independent study in Afroamerican studies. No pass/fail courses may satisfy the 33-semester-hour minimum requirement. Specific courses listed below may be substituted by other appropriate courses on a case by case basis, if requested by the student in advance and in writing. Such substitutions must be approved in advance by the student's faculty advisor in Afroamerican studies and by the director of CSERA.

Required Afroamerican Studies Courses

BLST 2000 Introduction to Afroamerican Studies....3
BLST 4500 Research Methods....3
BLST 4950 Senior Seminar....3
At least 9 semester hours of arts, literature, and culture courses (at least 3 hours must be in Afroamerican literature).
At least 9 semester hours of social sciences and history course work (at least 3 hours must be in Afroamerican history).
At least 6 semester hours of electives in a special field or area. Electives should be selected with advisor approval. Students are encouraged to take one CSERA elective outside of Afroamerican studies.

American Indian Studies

American Indian Studies comprises interdisciplinary courses spanning the humanities and social sciences. It emphasizes understanding the sociocultural, politico-economic, and legal relationships between North America's indigenous peoples and the settler states that emerged on this continent since 1600. Courses analyze and compare the experiences of American Indians with other peoples of color in the United States. The program is designed to explore a comprehensive range of factors making up Native American life, history, and culture. It is enhanced by an assortment of seminars, colloquia, and cross-listed courses offered by other departments on campus. American Indian Studies is presently in its developmental stage.

Asian-American Studies

The Asian-American Studies Program has been consolidated within the Center for Studies of Ethnicity and Race in America (CSERA). Courses are administered under the direction of CSERA and further program revisions are expected in the future. Contact the CSERA office for current information.

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 with an extensive knowledge and insight into the largest single language minority in the country. It also provides an academic context to study the Chicano experience in both an historic and a demographic/structural framework and includes studies in Chicano art, humanities, and social sciences. The program provides a viable methodology for research in this area.

Study Abroad

CSERA encourages students to participate in the study abroad programs offered through the Office of International Education. These programs give students a deeper understanding of the culture and attitudes of people of color in other parts of the world and their carryover into the United States. CU-Boulder is a member of the International Student Exchange Program that offers semester and full-year exchange programs with many institutions abroad, most notably in Africa, Asia, and Latin America. Programs of special interest include study in Mexico, Dominican Republic, Spain, Taiwan, and Japan. Further information appears in this catalog under International Education in the University Policies, Programs, and Services section.

CENTRAL AND EAST EUROPEAN STUDIES

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

The following areas of knowledge are integral to the undergraduate degree in Central and East European Studies:

- knowledge of political development prior to 1918, when the area was dominated by the Russian, German, and Austrian empires;
- knowledge of the gradual evolution of the sovereign states of Eastern Europe, including the evolution of political parties, the emergence of democratic institutions, and the problems of national minorities;
- knowledge of the impact of fascism, nazism, and communism on the emerging democracies of Eastern Europe;
- knowledge of the economic and political integration of Eastern Europe with the Soviet Union;
- knowledge of the general impact of the Soviet Union and the West on Eastern Europe; and
- knowledge of the recent changes in Central and Eastern Europe brought about by the workers in response to Gorbachev's glastnost and perestroika.

In addition, students completing the degree in Central and East European Studies are expected to acquire:

- the ability to analyze historical and contemporary social, economic, and political developments in Eastern Europe; and
- the ability to read, speak and analyze literature with a degree of sophistication in either Russian, German, Czech, Serbo-Croatian, Bulgarian, or any other slavic language.

All schedules for students majoring in Central and East European studies must be approved by the advisor of the program.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

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 B. A. 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.*

The following areas of knowledge are central to the undergraduate degrees in chemistry and biochemistry:

- knowledge of the basic principles of chemistry—atomic and molecular theory, reactivities and properties of chemical substances, and the states of matter;
- knowledge of the basic subfields of chemistry—organic, physical, analytical, and inorganic chemistry (and biochemistry for biochemistry majors);
- knowledge of mathematics sufficient to facilitate the understanding and derivation of fundamental relationships and to analyze and manipulate experimental data;
- knowledge of the basic principles of physics (and for biochemistry majors, knowledge of biology and genetics); and
- knowledge of safe chemical practices, including waste handling and safety equipment.

In addition, students completing the degree in chemistry or biochemistry are expected to acquire:

- the ability to read, evaluate, and interpret information on a numerical, chemical, and general scientific level;
- the ability to assemble experimental chemical apparatus, to design experiments, and to use appropriate apparatus to measure chemical composition and properties (for biochemistry students, this includes properties of proteins, nucleic acids, and other biochemical intermediates); and
- the ability to communicate results of scientific inquiries verbally and in writing.

Bachelor's Degree Program

A student can earn a bachelor's degree in either chemistry or biochemistry. For either option, students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

Chemistry

(A minimum of 33 semester hours in chemistry is required for a degree)

CHEM 1111 and 1131 General Chemistry 1 and 2 *or* CHEM 1151 and 1171 Honors General Chemistry 1 and 2 (Honors CHEM 1151 and 1171 are recommended for the student with advanced high school training in mathematics and physics) 10-12
CHEM 3351 and 3371 Organic Chemistry 1 and 2 for Chemistry Majors.....6
CHEM 3361 and 3381 Laboratory in Organic Chemistry 1 and 2 for Chemistry Majors 4
CHEM 4181 Instrumental Analysis.....4
CHEM 4511 or 4411 and CHEM 4531 or 4431 Physical Chemistry 1 and 2 6
CHEM 4561 Experimental Physical Chemistry.....3
PHYS 1110 and 1120 General Physics 1 and 28
PHYS 1140 Experimental Physics 1.....1
MATH 1300, 2300, and 2400 Analytical Geometry and Calculus 1, 2, and 3 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

CHEM 1111 and 1131 General Chemistry 1 and 2 *or* CHEM 1151 and 1171 Honors General Chemistry 1 and 2 (Honors CHEM 1151 and 1171 are recommended for students with advanced high school training in mathematics or physics).....10-12
CHEM 3351 or 3311 *and* CHEM 3371 or 3331 Organic Chemistry 1 and 2 6
CHEM 3321 and 3341 Laboratory in Organic Chemistry 1 and 2.....2
CHEM 4411 or 4511 and CHEM 4431 or 4531 Physical Chemistry 1 and 2 6
CHEM 4711 and 4731 General Biochemistry 1 and 2.....6
CHEM 4761 Biochemistry Laboratory.....4
PHYS 1110 and 1120 General Physics 1 and 28
PHYS 1140 Experimental Physics 1
MATH 1300, 2300, and 2400 Analytical Geometry and Calculus 1, 2, and 3 14
MCDB 1050 and 1060 Introduction to Molecular, Cellular, and Developmental Biology 1 and 2 and MCDB 1070 and 1080 Introduction to Molecular, Cellular, and Developmental Biology Laboratory 1 and 2 *or* EPOB 1210 and 1220 General Biology 1 and 2 and EPOB 1230 and 1240 General Biology Laboratory 1 and 2.....8
MCDB 3400 Molecular Genetics 4

All biochemistry majors, 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, and courses in the biological sciences, such as MCDB 3120, 4650, 4720, and 4410, and EPOB 3200 and 3700.

American Chemical Society 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 undergraduate 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 Program, together with advising information and alternate course options, is available at the undergraduate office in the Department of Chemistry and Biochemistry.

Graduate Degree Programs

Students wishing to pursue graduate work in chemistry or biochemistry 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. The GRE general test and advanced subject test in either chemistry or biochemistry, or cellular and molecular biology, is required for admission and for fellowship competition. Some or all of these tests may be waived under special circumstances.

Master's Degree

Language. The department does not require foreign language proficiency for the master's degree.

Examinations. Administration of preliminary examinations varies, depending on students' entering field. Candidates must pass a master's final oral examination at the time they complete 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 credit hours of formal course work, 9 credit hours in research courses, the completion of a research investigation, and the presentation of a thesis. Plan II requires 30 credit hours including 21 credit hours of formal course work plus 9 credit hours of research, and presentation of a research report, but no thesis; plan II is available only with departmental approval.

Doctoral Degree

Language. The department does not require foreign language proficiency for the Ph.D. degree.

Examinations. Administration of preliminary examinations varies, depending on students' entering field. These examinations are used in an advisory capacity. Course requirements are determined by level of preparation for graduate school, as assessed by departmental graduate advisors. Ph.D. students must pass a comprehensive examination consisting of a series of written cumulative exams and 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. Candidates must write a research proposal during their studies, complete a research investigation and present a thesis, and pass a Ph.D. final oral examination at the time they complete their work.

CHICANO STUDIES

See Center for Studies of Ethnicity and Race in America (CSERA), Chicano Studies.

CLASSICS

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

Upon consultation with the undergraduate advisor, the bachelor's degree 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, a broadly based program in classical antiquities (mythology, literature, philosophy, religion, art, archaeology, and history), classics and ancient history, general classics and computer science applications, or classical languages and computer science applications. Prospective majors should consult with the undergraduate advisor and review the departmental major list.

The following areas of knowledge are central to the undergraduate degree in classics:
- knowledge of ancient Greek or Latin sufficient to allow the reading and understanding of larger works of literature written in that language;
- comprehensive knowledge of the history of Greek and Roman literature, the development of the major genres, and of important works of literature, read in the original language and in translation;
- an outline knowledge of the history of the ancient world, important historical problems, and major ancient historians, read in the original language and in translation;
- general knowledge of ancient art, religion, and philosophy as the foundation and model for western civilization; and
- knowledge of the identification system for classical items, including grammatical and rhetorical categories and descriptions and Latin tags.

In addition, students completing the degree in classics are expected to acquire:
- the ability to read, understand, and interpret written documents and works of literature with an eye to genre, structure, historical context, and authorial intent;
- the ability to communicate in spoken and written form with adequate complexity and clarity for the relevant audience; and
- the ability to read and think critically.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements — *Semester Hours*

Track I: Greek and/or Latin
Greek and/or Latin 36
N.B. The first year of either ancient language (Greek or Latin) does not count toward the major.
Electives (general classics and honors courses dealing with the ancient world, ancient history, classical archaeology, or ancient philosophy).....6

Track II: General Classics
CLAS 1100 Greek Mythology and CLAS 3610 From Paganism to Christianity.....6
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: HIST 3011; CLAS 4041; CLAS or HIST 1051, 1061, 4021, 4031, 4071, 4081, or 4091. CLAS 4051 and 4761 may be substituted for any of the history courses)..12
CLAS 2124 and one higher course, or CLAS 3123 and one higher course..... 6

Track III: Classics and Ancient History
Ancient history (courses may be selected from among the following: CLAS or HIST 1051, 1061, 4021, 4031, 4071, 4081, 4091; CLAS 4041, 4051, 4761) 18
General classics courses with substantial historical content may be selected from the following: CLAS 1110, 1120, 2100, 2110, 4049, 4059. With permission of the undergraduate advisor, a candidate may offer up to a maximum of 6 credit hours in substitution for general classics courses 18
CLAS 2124 and one higher course (Latin) or CLAS 3123 and one higher course (Greek)...6

Track IV A: General Classics and Computer Science Applications
Computer science applications: CSCI 1200, 1210, 2204, 2250, 3245, 3263, and 3287 (or courses substituted by computer science); three upper-division computing electives including CSCI 4028 and 4218 (Senior Project 1 and 2).....30
General classics:
Literature in translation.....6
Ancient history.....6
Classical archaeology.....6
(A maximum of 6 hours may be substituted for required general classics courses, with advisor permission.)
Electives 12
Second-year level of either Greek or Latin 8

Track IV B: Classical Languages and Computer Science Applications
Computer science applications as above 30
Classics:
Classical languages (Latin and/or Greek)—15 hours must be in the same language in courses beyond second-year level 32
General classics electives.....6

Graduate Degree Programs

Master's Degree

Candidates may choose to emphasize Greek, Latin, classical antiquity, or the teaching of Latin.

It is expected that students opting for the teaching of Latin either have achieved accreditation at the secondary level or are planning to do so through the School of Education. 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 take at least one graduate-level course in the other classical language.

Degree Requirements. Candidates for the M.A. degree in Latin or Greek are required to take written examinations in the fields of translation (Greek or Latin) and literature (Greek or Latin).

Candidates for the M.A. degree with emphasis on classical antiquity are required to complete at least two graduate-level courses in Greek and/or Latin and must take a written examination in three of the following fields: history, art and archaeology, religion and mythology, philosophy and political theory, and Greek or Latin translation.

Candidates for the M.A. plan I (24 hours of course work plus 4 hours of thesis) take an oral comprehensive examination in defense of the thesis. Candidates for the M.A. plan II (30 hours without thesis) must have departmental approval and take an oral comprehensive examination covering their course work.

Candidates for the M.A. degree with emphasis on the teaching of Latin take a written examination in both Latin translation and Latin literature and an oral comprehensive examination on teaching methods. Thirty hours of course work, including one Latin workshop and a special project, are required. Plan I is not offered for the M.A. degree with emphasis on teaching.

Doctoral Degree

Candidates may choose to emphasize classics, classics with historical emphasis, or classics with archaeological emphasis. For those selecting classics or classics with historical emphasis, the following are required:

1. A reading knowledge of two modern foreign languages; one must be German and the other must be approved by the department.
2. Successful completion of at least four graduate seminars.
3. Two courses in ancient history and one course in classical archaeology.
4. The candidate is tested in Greek and Latin languages (translation tests) and must write examinations on a major classical author and a special field. There is an oral comprehensive examination in which the student is expected to demonstrate overall factual knowledge of Greek and Latin literature (with historical emphasis, as appropriate).
5. The candidate must write a Ph.D. dissertation and complete a final oral examination in defense of the dissertation.

For those selecting classics with archaeological emphasis, the following are required:

1. A reading knowledge of two modern foreign languages; one must be German and the other must be approved by the department.
2. Successful completion of at least four graduate seminars.
3. Two courses in classical archaeology and one course in ancient history.
4. One course in the minor classical language.
5. One course in anthropology and one course in either museum studies or geology.
6. The candidate is tested in the Greek or Latin language (translation test) and must write examinations in classical archaeology, a major classical author, and a special field. There is an oral examination in which the student is expected to demonstrate overall factual knowledge of the fields of Greek and Latin literature and archaeology.
7. The candidate must write a Ph.D. dissertation and complete a final oral examination in defense of the dissertation.

COMMUNICATION

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

The bachelor of arts degree in communication provides theoretical work from both humanistic and scientific perspectives and practical work to improve communicative performance in various kinds of situations.

The following areas of knowledge are central to the undergraduate degree in communication:

- general understanding of the history and development of communication as an object of scholarly study, including both the humanistic tradition and the scientific tradition;
- understanding of the basic contexts in which communication is enacted (e.g., interpersonal, small group, and organizational and public contexts);
- understanding of the various functions of communication within these contexts;
- understanding of the characteristics of both verbal and nonverbal modes of human communication;
- familiarity with the basic methods of investigating questions about problems in communication; and
- understanding of the ethical issues and responsibilities of communication practice, particularly the role of debate and discussion in a free society.

In addition, students completing the degree in communication are expected to acquire:

- the ability to express ideas in an informed, coherent, and effective manner, particularly the ability to articulate and develop a sustained argument, both orally and in writing;
- the ability to analyze, criticize, evaluate, and reflect upon messages and interactions in a variety of practical contexts, both orally and in writing; and
- the ability to adapt messages and to negotiate interactions responsibly in diverse and changing situations.

Bachelor's Degree Program

In current practice, most courses are restricted to communication majors and prioritized based on progress toward graduation.

Students who declared a major in communication on or before September 28, 1990, must present a minimum of 30 semester hours of course work in communication. This work must include COMM 3200 (Principles and Practices of Argumentation) and at least fifteen additional semester hours in COMM courses numbered 3000-4999. Students may count toward major requirements a total of no more than 6 semester hours in COMM 4840-4900 (Undergraduate Independent Study) and COMM 4930 (Senior Internship).

Students who declare a major in communication after September 28, 1990, must fulfill the following requirements in addition to the College of Arts and Sciences general education requirements.

Major Requirements	*Semester Hours*
Majors must present a minimum of 30 hours of course work in communication.	
COMM 1000 Interaction Skills	3
COMM 1010 Public Speaking	3
COMM 3200 Principles and Practices of Argumentation	3
COMM 4800 Current Issues in Communication and Society	3
Two of the following:	
COMM 2000 Perspectives on Human Communication	3
COMM 2030 Interpersonal Communication	3
COMM 2240 Organizational Communication	3
COMM 2300 Communication and Society	3
One of the following:	
COMM 3500 Human Communication Theory	3
COMM 3600 Rhetorical Foundations of Communication	3
Three of the following:	
COMM 4000 Special Topics	3
COMM 4510 Senior Seminar: Interpersonal Communication	3
COMM 4520 Senior Seminar: Organizational Communication	3
COMM 4530 Senior Seminar: Communication Codes	3

COMM 4540 Senior Seminar: Rhetoric 3
COMM 4550 Senior Seminar: Functions of Communication 3

The Department of Communication encourages its majors to take related courses in other departments as well as other colleges and schools. Relevant work may be found in business and administration (courses may be available during the summer only), communication disorders and speech science, English, journalism and mass communication, linguistics, political science, philosophy, psychology, sociology, and theatre and dance.

Students who wish to major in communication should visit the department, where they are given an updated list of major requirements.

Graduate Degree Program

The graduate program admits a few students who have high promise of completing the doctorate. Interested students should read requirements for advanced degrees in the Graduate School section and should call or write 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.

The following areas of knowledge are central to the undergraduate degree in communication disorders and speech science:

- a general understanding of the role of the professional speech/language pathologist and audiologist, including an understanding of the history and development of the profession, an understanding of the scientific traditions of the discipline, and an understanding of the ethical issues in providing service to communicatively disordered individuals;
- an understanding of the anatomy of the speech and hearing mechanism, as well as the processes of speech production, transmission, and reception;
- an understanding of the development of language;
- an understanding of the etiologies, manifestation, and treatment of the speech/language/learning and hearing disorders encountered in the profession; and
- familiarity with scientific methods used in evaluating and investigating speech/language/learning and hearing disorders.

In addition, students completing the degree in communication disorders and speech science are expected to acquire:

- the ability to express themselves effectively both orally and in written scientific and clinical discipline-specific reports;
- the ability to critically evaluate literature in the discipline; and

the ability to analyze the acoustic output of the speech production process auditorily and/or instrumentally.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

Majors must present a minimum of 36 semester hours of course work as listed in the schedule below.

Sophomore Year
Fall or Spring
CDSS 2500 Voice and Diction 3
Fall
CDSS 3106 General Phonetics 3
Spring
EPOB 3420 Introduction to Human Anatomy 5
CDSS 4560 Language Development 3

Junior Year
Spring
CDSS 3006 Introduction to Speech and Hearing Science 3
CDSS 3120 Anatomy and Physiology of Speech and Hearing Mechanisms 4

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)

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) and the Colorado State Department of Education.

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 with an undergraduate degree in speech-language pathology and audiology can expect to complete the program in two calendar years. Those without such background are required to make up undergraduate deficiencies, which normally require at least an additional 16 to 20 semester hours of courses in communication disorders. Students must meet standards for both academic and clinical competence, as well as professional conduct. Full-time graduate study is required. Students not seeking clinical certification may place major emphasis on speech-hearing science.

Doctoral 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 have some professional experience before entering the program, and that they have specific academic or professional goals in mind. Ph.D. candidates must take a four-course sequence in statistics and computer science. Beyond that, student degree plans are individually prepared through the joint efforts of the student and an advisory committee.

COMPARATIVE LITERATURE

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

Graduate Degree Programs

The master's and doctoral degree programs in comparative literature are offered through the Graduate School. Students wishing to pursue graduate work in comparative literature leading to candidacy for an advanced degree should read the infor-

mation 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 358.

All entering students must submit GRE scores, a sample course paper, and a statement describing intellectual goals and language preparation. Normally, entering students 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 (COML 5000) and Introduction to Literary Theory (COML 5610) 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.

Doctoral Degree

Prerequisites. Prospective candidates should have an M.A. degree in comparative literature, in a national literature (which may be English), or in a cognate discipline (e.g., philosophy). Students should be qualified to take graduate courses in two foreign languages and should have begun study of a third. One of these three must be either a classical or, subject to the director's approval, a modern non-European language.

Requirements. Students take the Proseminar in Comparative Literature (COML 5000) and Introduction to Literary Theory (COML 5610) in their first two semesters. Students also take the Colloquium in Comparative Literature (COML 6970), normally in their second or third year. Students 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, and is conducted by the student's advisory committee after all other requirements for the Ph.D. have been completed.

COMPUTER SCIENCE APPLICATIONS

The computer science applications major is 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 work, 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 Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
CSCI 1200 Introduction to Programming 1	3
CSCI 1210 Introduction to Programming 2	4
CSCI 2010 C/UNIX Workshop	1
CSCI 2204 Discrete Structures	3
CSCI 2250 Data Structures and Algorithms	3
CSCI 3245 Programming Languages	3
CSCI 3263 Computer Systems	3
CSCI 3287 Database and Information Systems	3
CSCI electives (CSCI 4208 and 4218 recommended)	9

and completion of 30 hours in a participating arts and sciences department, 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

The Conflict and Peace Studies Program offers an individually structured undergraduate major in the study of peace, conflict, justice, and global security. The program, which is jointly sponsored by the Departments of History, Philosophy, Political Science, and Sociology, provides an interdisciplinary curriculum of courses, seminars, and independent study. Program offerings are augmented by an extensive selection of courses in 15 departments.

The program promotes the historical, philosophical, and scientific understanding of conflict and peace, and allows students to integrate important contemporary issues such as environmental effects, the role of religious beliefs, and development in the third world. The goal of the program is to prepare students for careers related to solving problems of conflict and peace in government, non-governmental organizations, and business.

Students design an individually-structured interdisciplinary major within the guidelines set forth by the dean of the College of Arts and Sciences. (See the Individually Structured Major section of this catalog.) Such a major allows students a great deal of flexibility for creating an innovative and intensive course of study focused on a personal choice of issues relating to conflict and peace.

The Conflict and Peace Studies Program also offers a certificate program in voluntary service training. The INVST Program offers a unique educational opportunity to all majors. This 17-credit-hour program is taken during the junior and senior years, and is designed to train students, both intellectually and experientially, in global development, human ecology, and social justice. When accepted into the program, students are considered for financial assistance, in return for which they serve one or two years of community, national, or international humanitarian service. Training includes two summer experiences, four and

six weeks, the second one of which includes travel to a foreign country. Applications are available each January for a new group to begin in August. Interested students should contact the program office, Campus Box 471, (303) 492-7719.

DISTRIBUTED STUDIES PROGRAM

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

Students working toward the B.A. degree may elect a two- or three-area major 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 students 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.*

The following areas of knowledge are central to the undergraduate degree in economics:

- knowledge of the necessary conditions for efficiency in free market production and exchange;
- knowledge of contemporary theories concerning economic growth, inflation, unemployment, and distribution of income;
- knowledge of the concepts, methodologies, and information sources used in a few of the specialized fields of economics;
- acquaintance with the descriptive statistics commonly used by economists; and
- acquaintance with the institutional characteristics of the U.S. economy, and awareness of how these differ from those in some other economies.

In addition, students completing the degree in economics are expected to acquire:

- the ability to apply the tools of microeconomic theory to reach sound conclusions for simple economic problems;
- the ability to follow arguments concerning macroeconomic theory, to distinguish between sound and fallacious reasoning, and to understand how differences in policy prescription may arise;
- the ability to use library resources to obtain and interpret commonly used statistical series and other economic factual material;
- the ability to use descriptive statistics, to perform statistical analysis such as multiple regression, and to understand similar analyses performed by others; and
- the ability to communicate economic reasoning in writing, to understand similar writing by others, and to appreciate the diversity of views that may reasonably exist about economic problems.

Bachelor's Degree Program

First-year students interested in economics are 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 and 2020, and one of the mathematics options listed below under "Pre-Economics Major." Admission to the major requires grades in the prerequisite courses of at least *C- and* a minimum grade point average of 2.00.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Pre-Economics Major

Major Requirements	*Semester Hours*
ECON 2010 and 2020 Principles of Microeconomics and Macroeconomics	8
Six credit hours of math modules (MATH 1050, 1060, 1070, 1080, 1090, and 1100) or equivalent, *and* either ACCT 2000 Introduction to Financial Accounting or CSCI 1200 Introduction to Programming 1	9
or MATH 1050 Linear Equations and Matrices, MATH 1060 Linear Programming, MATH 1070 Combinatorics and Probability Theory, and MATH 1300 Analytic Geometry and Calculus 1	8
or Mathematics at or above the level of MATH 1300	8

Economics Major

Major Requirements	*Semester Hours*
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 in upper-division ECON courses	9

Note: Transfer students majoring in economics must complete at least 12 semester hours of upper-division economics courses at CU-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. For foreign applicants, a TOEFL score of 525 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 Seminar: 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 grades of *B-* or better to effect the substitution. A course syllabus is 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 have passed them within two and one-half academic years from the date of enrollment 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 enrolls 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 of 4 semester hours;

b. Minimum of 18 semester hours, *exclusive* of thesis, which must be in courses at the 6000 level or above;

c. 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 21 semester hours, which must be in courses at the 6000 level or above;

c. 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 must take written examinations in two fields. In each of the fields offered, the candidate must have taken a minimum of 6 semester hours of course credit, of which at least 3 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 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 department's director of graduate studies. Passing the Ph.D. preliminary examinations in microeconomic and macroeconomic theory is accepted as passing an M.A. field exam in economic theory. Passing the Ph.D. preliminary examination in quantitative methods is accepted as passing an M.A. field exam in quantitative economics. Passing a Ph.D. comprehensive examination in a field is accepted as passing an M.A. exam in that field.

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 course (ECON 6909).

Doctoral 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 microeconomic and macroeconomic theory courses, introductory calculus, and introductory statistics.

c. Submit Graduate Record Examination scores for aptitude. For foreign applicants, a TOEFL score of 525 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 December 1 for summer and fall terms and October 15 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 (ECON 7010, 7030), macroeconomic theory (ECON 7020, 7040), and quantitative economic methods (ECON 7808, 7818) must be completed with a grade of *B-* or better. 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 fulfilled 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. Students 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 are 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. Students must pass written examinations 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 grades of *B-* or better. Field course work may be taken at any University of Colorado campus.

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 students 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 are 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 (ECON 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 or above at any campus of the University of Colorado. (The term "formal course" as used here includes seminars but excludes independent study.)

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.*

The following areas of knowledge are central to the undergraduate degree in English:

- knowledge of canonical and noncanonical works of English and American literature;
- awareness of the general outlines of the history of British and American literature;
- awareness of literary theories, including knowledge of recent theoretical developments; and
- awareness of the social and historical contexts in which the traditions developed.

In addition, students completing the degree in English are expected to acquire:

- the ability to analyze literary texts;
- the ability to interpret texts on the basis of such analysis;
- the ability to relate analyses and interpretations of different texts to one another; and
- the ability to communicate such interpretations competently in written form.

The following areas of knowledge are central to the undergraduate degree in creative writing:

- a knowledge of literary works, including the genres of fiction, poetry, playwriting, and screenwriting, and the major texts of contemporary writers;
- a knowledge of literary history, including the origins and development of genres, major writers of the past, and the role of the writer in society; and
- a knowledge of literary analysis, including theories of literaty composition and critical theory.

In addition, students completing the degree in creative writing are expected to acquire:

- the ability to write in different poetic modes and styles;
- the ability to write in various fictive styles; and
- the ability to evaluate other students' written work.

Bachelor's Degree Program

Expository writing courses (freshman composition) do not apply toward the major. English courses taken on a pass/fail basis do 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 do not count in the English major.

Students must complete the general requirements of the College of Arts and Sciences and one of the two programs listed below.

Major Requirements *Semester Hours*

Program I: Literature

A minimum of 36 credit hours must be earned in the Department of English, 24 of which must be upper division.

Note: Six hours must be taken in courses dealing with pre-1790 subject matter (3 hours of which must be pre-1500 subject matter), and 6 hours must be taken in courses dealing with post-1790 subject matter. These requirements may be fulfilled by taking any courses except those in the backgrounds of British and American literature (see II below), which are not designed to fulfill the historical component of the major.

I. Two basic courses:

ENGL 1002 Seminar in Critical Analysis 1: Poetry *or* ENGL 1012 Seminar in Critical Analysis 2: Prose.....3

ENGL 2012 Modern Critical Thought.....3

II. Five cluster courses:

One course from each: the backgrounds of British and American literature, British literature, and American literature.....9

One course from any two categories: theory, popular culture, multicultural literature, and gender studies.....6

III. One seminar in English:

ENGL 4032 Critical Thinking: New Directions in English Studies.....3

IV. Four elective courses.....12

In addition to the 36 hours specified above, an additional 9 hours may be taken, for a maximum of 45 hours in English.

Program II: Creative Writing

A minimum of 36 credit hours must be earned in the Department of English, 18 of which must be upper division.

I. Two basic courses:

ENGL 1002 Seminar in Critical Analysis 1: Poetry *or* ENGL 1012 Seminar in Critical Analysis 2: Prose.....3

ENGL 2012 Modern Critical Thought.....3

II. Three cluster courses:

One course from any two: the backgrounds of British and American literature, British literature, and American literature.....6

One course from theory, popular culture, multicultural literature, or gender studies.....3

III. One seminar in English:

ENGL 4032 Critical Thinking: New Directions in English Studies.....3

IV. Six creative writing workshops, three of which must be upper division.....18

In addition to the 36 hours specified above, 9 additional hours may be taken, for a maximum of 45 hours in English.

Admission to the creative writing program is not automatic. Students must have taken at least 6 hours of writing with the program before being considered (3 hours for transfer students). In addition, they

must have an English department faculty sponsor and must submit a manuscript of 8-10 pages to the admissions committee for approval. Students should apply no later than the second semester of their junior year.

In order to take a workshop beyond ENGL 1191, students must submit a manuscript to the creative writing office prior to registration. Each workshop may be taken three times for credit.

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 151, Education building. Students should consult Mrs. Cline, Mr. Olson, or Dean DiStefano, who supervise the English education program. Since fulfilling requirements for both 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.

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.

The Jovanovich Imaginative Writing Prize. The Jovanovich prize is a $500 annual award for excellence in poetry, fiction, playwriting, or nature writing. Information is available in the creative writing office.

Graduate Degree Programs

Admission Requirements

Master's Degree in English. Applicants interested in *English literature* should have satisfactory scores on the verbal and advanced literature parts of the GRE. In addition, at least 24 semester hours in English (exclusive of composition, creative writing, and speech) are normally required for admission. Sixteen of the 24 hours must be in upper-division courses.

Those applicants interested in *creative writing* must submit satisfactory scores on the verbal and advanced literature parts of the GRE, plus at least 18 semester hours in literature. In addition, each student must submit a manuscript of at least 10 pages of poetry or a minimum of 25 pages of fiction, nonfiction prose (other than literary criticism), or a screen or stage play for evaluation.

Doctoral Degree in English. Students must present satisfactory scores on verbal and advanced literature parts of the GRE, and must have 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. are normally 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 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 several areas: biology, computer science, economics, geography, history, philosophy, physics, political science, and quantitative methods. A double major of environmental conservation and geography is not allowed.

The following areas of knowledge are central to the undergraduate degree in environmental conservation:

- an understanding of the range and dimensions of the major environmental conservation problems of the United States and the world;
- an awareness of the complexity of factors relating to human interaction with the environment, especially the fact that environmental problems have both human and biophysical components;
- knowledge of the general geographic principles of human-environment interaction, global habitability and environmental change, and human spatial organization;
- knowledge of the specific basic principles of physical geography; and
- knowledge of the basic principles of one other cognate discipline, especially biology or economics.

In addition, students completing the degree in environmental conservation are expected to acquire:

- skills in spatial and temporal data analysis, in both quantitative and qualitative modes;
- ability in one or more of the skill areas of cartography, air photography interpretation, remote sensing, and geographic information systems;
- research skills in the cognate discipline;
- skills in writing, numeracy, and computer literacy; and
- skill in selecting an environmental conservation topic for research and synthesis in the department's capstone experience.

Bachelor's Degree Program

To complement the curriculum, the Department of Geography offers environmental conservation majors internship opportunities, in which students earn academic credit in GEOG 3930 while working in selected positions with private and public agencies and firms.

Students should consult with the secretary in Guggenheim 110 for further information.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
Students must complete 33 hours from the following courses:	
ECON 2010 Principles of Microeconomics	4
ECON 2020 Principles of Macroeconomics	4
EPOB 1210, 1220, 1230, and 1240 *or* NASC 1230 and 1240 Biology: Human Approach 1 and 2 *or* MCDB 1050, 1060, 1070, and 1080 Introduction to MCD Biology 1 and 2 with labs	8
EPOB 3020 Principles of Ecology	3
GEOG 1001 Environmental Systems 1—Climate and Vegetation	4
GEOG 1011 Environmental Systems 2—Landforms and Soils	4

GEOG 3412 Conservation Practice or GEOG 3422 Conservation Thought 3
Any computer science or computer applications course....3

Skills Courses Group (One course required from the following)
ECON 4808 Introduction to Mathematical Economics....3
EPOB 3500 Plant Kingdom 4
EPOB 3520 Plant Systematics 4
EPOB 4410 Biometry....4
GEOG 2053 Maps and Mapping 3
GEOG or GEOL 3023 Statistics for Earth Sciences....4
GEOG 3053 Cartography 1 4
GEOG 3093 Geographic Interptetation of Aerial Photos....3
GEOG 4043 Computer-Assisted Cartography....3
GEOG 4053 Cartography 2 3
GEOG 4093 Remote Sensing of the Environment....3
GEOG 4103 Geographic Information Systems 3
GEOG 4173 Research Seminar....3
GEOG 4383 Methods of Vegetation Analysis 3
Quantitative Methods: any introductory statistics course....3

Elective Courses Group
(select any four courses)
ANTH 4150 Human Ecology 1 3
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
ENVD 3091 Environment and Behavior....3
ENVD 4023 Environmental Impact Assessment 3
EPOB 3160 Paleoecology 3
EPOB 3170 Arctic and Alpine Ecology *or* GEOG 3321 Geoecology of Alpine and Arctic Regions 3
EPOB 3180 Global Ecology 3
EPOB 4020 Stream Biology....3
EPOB 4030 Limnology 3
EPOB 4040 Conservation Biology....3
EPOB 4070 Geographical Ecology 3
EPOB 4100-4140 Advanced Ecology 3
EPOB 4660 Insect Biology (with laboratory)...4
EPOB 4750 Ornithology....3
EPOB 4760 Mammalogy (with laboratory) ...4
GEOG 3251 Mountain Geography....3
GEOG 3351 Biogeography....3
GEOG 3402 Natural Hazards 3
GEOG 3511 Introduction to Hydrology....4
GEOG 3662 Economic Geography....3
GEOG 3930 Internship....3
GEOG 4371 Forest Geography: Principles and Dynamics....3
GEOG 4430 Seminar: Conservation Trends...3
GEOG 4501 Water Resources and Water Management of Western United States 3
GEOG 4732 Population Geography....3
GEOG 4742 Environments and Peoples....3
GEOL 3520 Environmental Issues in Geosciences 3
HIST 4227 The Later American Frontier 3
PHIL 3140 Environmental Ethics....3
PHYS 3070 Energy in a Technical Society....3
PHYS 3080 The Physics of Contemporary Social Problems 3
PSCI 4201 The Environment and Public Policy....3
SOCY 3091 Environmental and Behavior 3

FILM STUDIES

Degrees.....*B.A., B.F.A.*

The Film Studies Program educates students in the history and development of film as an art form and a neutral medium. The curriculum instills an informed analytic awareness of the ways in which film has been used and provides the resources for significant creative exploration of the medium.

The following areas of knowledge are central to the undergraduate degrees in film studies:

- knowledge of the major artistic contributions to the evolution of film, from the advent of the moving image to the present;
- awareness of the general outlines of world film from the silent period to the present, with emphasis on the historical contributions of major national cinemas; and
- awareness of methodological variations in film criticism and film theory, including knowledge of at least one recent methodological development.

In addition, students completing either the B.A. or the B.F.A. degree in film studies are expected to acquire:

- the ability to analyze and interpret films critically; and
- the ability to communicate such interpretations competently in essay form.

Also, students completing the B.F.A. degree should have the ability to make a short 16-mm sound film.

Admission to the Program

Beginning with fall semester 1990, admission to both the bachelor of arts and the bachelor of fine arts degrees in film studies is competitive and by application. Students wishing to apply must complete the application form supplied by the department along with a transcript of all college work. To be eligible to apply, students must have completed at least 12 semester hours of film studies courses at CU-Boulder, including at least 6 hours of critical studies courses.

Additionally, students applying for admission to the bachelor of fine arts program must submit a film portfolio that includes at least one 16mm film produced in FILM 3500.

Bachelor's Degree Program

All course work submitted for a film studies degree must have a grade of *C* or higher. The arts and sciences 18-hour minimum of upper-division hours must be in film studies courses. No more than 6 hours of independent study may be credited toward the major.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

UWRP 1050 Introductory Composition: Directed Writing, *or* UWRP 1150 Introductory Composition: Expository Writing, *or* ENGL 2002 Writing About Literature, *or* satisfaction by exam of the arts and sciences written communication requirement....3

One of the four options listed below:

Option 1: Humanities
HUMN 1010 and 1020 Introduction to Humanities 1 and 2 12

Option 2: Fine Arts History
FINE 1109 and 1209 Introduction to Western Art 1 and 2....6
Two upper-division courses in fine arts history....6

Option 3: British and/or Another Literature
ENGL 3502 and 3512 Survey of British Literature 1 and 2 6
Any two literature courses in the following departments: classics, comparative literature, English, or a literature course offered by a foreign language department....6

Option 4: Fine Arts History and British Literature
FINE 1109 and 1209 Introduction to Western Art 1 and 2....6
ENGL 3502 and 3512 Survey of British Literature 1 and 2....6

Creative Arts/Performance Requirement
Completion of two creative/performance courses in the following departments: creative writing (English), fine arts (not including FINE 1161), music, or theatre and dance 4-6

Required Film Studies Courses
FILM 2000 Beginning Filmmaking....3
FILM 3051 and 3061 Film History 1 and 2 (Note 1) 8
FILM/HUMN 4004 Film Theory (Required for B.A. only) 3
Both B.A. and B.F.A. students must complete 12 hours from the following courses. At least 6 of the 12 hours must be upper division.
FILM 1502 Introduction to Film Studies 3
FILM 2002 Recent International Cinema....3
FILM 2003 Film Topics (Note 2)....3
FILM 2013 Quest for Truth....3
FILM 2300 Beginning/Intermediate Filmmaking (Note 2) 3
FILM 2400 Intermediate Small-Format Production (Note 3)....3

FILM 3002 Major Film Movements (Notes 2 & 4) 3
FILM 3003 Major Film Directors (Note 2) ...3
FILM 3012 Documentary Film 3
FILM 3013 Women and Film 3
FILM 3900 Independent Study (Note 5)....1-3
FILM 4003 Film and Fiction (Note 6) 3
FILM 4004 Film Theory (Note 7) 3
FILM 4604 Colloquium in Film Aesthetics (Note 8) 3
FILM 3501 Film and Production Management (Note 9) 3
FILM 3563 Producing the Feature Film (Note 9) 3

B.F.A. students must also complete the following:
FINE 1161 Basic Photography 1.....3
FILM 3500 Intermediate Filmmaking, 16mm (Note 2) 3
FILM 4500 Advanced Filmmaking (Note 10)..3
FILM 3930 Film Studies Internship 1-6
FILM 2400 Intermediate Small Format Production (Note 3).....3

Curriculum Notes
1. Same as HUMN 3051 and 3061. It is strongly recommended that students take FILM 3051 and 3061 in chronological order.
2. Course may be taken for credit more than once, provided that the topics vary.
3. Required for B.F.A.; optional for B.A.
4. Repeatable for credit within same term (maximum of 9 hours total).
5. Total number of independent study credit hours cannot exceed 6.
6. Same as HUMN 4003.
7. Same as HUMN 4004. Can be taken as an option for the B.F.A. Cannot be counted in the required 12-hour option for the B.A., as it already is a required film studies course.
8. Occasionally crosslisted with FREN 4600.
9. Offered by the Division of Continuing Education.
10. May be repeated for completion of thesis film project.

Admission to any class after the third meeting of the class is contingent on professor permission. Students who have missed more than the equivalent of one and one-half weeks may be excluded.

FINE ARTS

Degrees .....B.A., B.F.A., M.A., M.F.A.

The Department of Fine Arts offers the bachelor of arts degree in studio art and art history, and the bachelor of fine arts in creative arts. The master of arts degree is offered in art history, and a master of fine arts degree is offered in creative arts. Students are encouraged to consult with an advisor in the appropriate area in order to obtain advice and current information.

The following areas of knowledge are central to the undergraduate degrees in art history:

- knowledge of the major artistic monuments of the western world in a historical context (students may also master an overview of Asian art);
- concentrated knowledge of artistic monuments and their cultural context in either ancient, byzantine, Indian and Southeast Asian, medieval European, Renaissance and Baroque European, pre-Columbian, or modern art;
- familiarity with varied methodologies used to study art historically; and
- general knowledge of artistic media and techniques.

In addition, students completing the degree in art history are expected to acquire:

- the ability to relate individual monuments to their historical and cultural context by identifying technique, style, and subject matter;
- the ability to interpret historical and critical information about works of art, artists, and related issues; and
- the ability to organize and communicate concepts and data pertaining to the history of art effectively in written and oral form.

The following areas of knowledge are central to the undergraduate degrees in studio art:

- general knowledge of the significance of the major monuments in art history, with an emphasis on contemporary art;
- in-depth knowledge of one discipline of studio art;
- general awareness of related critical issues in studio practice; and
- familiarity with a wide range of stylistic approaches.

In addition, students completing a degree in studio art are expected to acquire:

- the ability to analyze their own works of art in terms of form and content;
- the ability to interpret the work of others;
- the ability to execute ideas in one or more artistic media;
- demonstrated artistic prowess and technical proficiency in one chosen medium; and
- the ability to communicate in verbal and written form the particular conceptual and perceptual attitudes and stances of their own artistic production.

Bachelor's Degree Programs

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

Art History (40-45 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 two of the following lower-division art history courses: FINE 1109 Introduction to Western Art 1; FINE 1209 Introduction to Western Art 2; FINE 2409 Introduction to Asian Art 6
Any five to six upper-division courses 15-18
Secondary area: any three to four courses at the upper-division level in departments outside fine arts that complement the student's major area of interest, with approval of the art history advisor (see department or art history advisors for list of approved courses).....9-12

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 of the following: FINE 1047 Art Lecture; FINE 1109 Introduction to Western Art 1; FINE 1209 Introduction to Western Art 2; FINE 1709 Experiencing Art; FINE 2409 Introduction to Asian Art 9
Any two upper-division art history courses.....6
Upper-division studio electives (minimum)..12

Required Studio Courses for Studio Arts Majors
Painting and drawing majors must take any sequence of courses culminating in FINE 4002 (Drawing), FINE 4302 (Watermedia) or FINE 4202 (Painting).
Ceramics majors must take FINE 4085 Advanced Ceramics and FINE 4095 Undergraduate Ceramics Seminar
Electronic media majors must take FINE 3230 Electronic Arts Survey and FINE 4719 History of Media Arts

Bachelor of Fine Arts Degree Requirements (65-67 Credits)

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 lower- and upper-division art history requirement is the same as for the B.A. degree.

Divisional Studio Emphasis (23 credit hours)

Students must take any six upper-division studio courses which represent their interests in one studio area.

Students must complete four studio courses (15 credit hours) outside their major studio concentration. Students must also complete FINE 4117 B.F.A. Seminar, a 3-credit hour course.

The remaining 5 credits, required to reach the minimum of 65 for the degree, can be either lower- or upper-division fine arts electives.

Note: B.A./B.F.A. candidates must complete a minimum of 9 out of 15 credits in the major on the Boulder campus.

Honors

Students may graduate with departmental or general honors. Those interested in pursuing this program should contact the Honors Department or the Department of Fine Arts 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 thesis exhibitions, and fine arts faculty 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 prehistoric 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 left at their own risk.The department will not be held responsible for loss or damage.

Graduate Degree Programs

Master of Arts Degree (Art History)

Prerequisites. The following are required for admission to the graduate program:

1. A baccalaureate degree from an approved college with a 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 comprehensive exams are given to measure graduate student knowledge of art history at the master's-degree level. The exams are approximately five hours in length and consist of essay questions and slides relevant to the student's chosen major and minor special areas in art history.

Plan I (With Thesis) Course Requirements.

1. Two semesters of acceptable graduate work (minimum of 31 credits) must be spent in residence. Summer residence alone is unacceptable.
   a. FINE 6929 Seminar: Theories of Art History must be completed during the first semester in the program.
   b. FINE 6919 Tools of Research must be completed during the second semester in the program.
   c. At least one course in four of the following five areas of art history: ancient art, medieval art, renaissance/baroque art, modern/American art, and Asian/tribal arts. Each course must be a 3-credit, 5000-level course.
   d. At least two seminars in art history, which may fulfill the course requirements in the above listed five areas of art history.
   e. At least one course in a department outside the Department of Fine Arts. The course must be 3 credits, at the 3000 level or above, and supplement the major and/or minor special areas of concentration.
   f. FINE 6959 Master's Thesis (4-6 credits).
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 by the thesis advisor, an oral examination takes place dealing with the subject matter of the thesis and any areas of weakness that may have been found in the written comprehensive.
4. Language requirement: Candidates for the master's degree in art history are required to demonstrate an adequate reading knowledge of French, German, or another appropriate language before receiving the degree by passing an approved language exam. Minimum scores required on the GSFLT are: German, 450; Russian, 380; French, 425; and Spanish, 425. Other languages may be taken with approval from the art history faculty.

Plan II (Without Thesis) Course Requirements. Students must complete a minimum of 6 hours of course work beyond the requirements for plan I in place of the thesis.

A nonthesis project (3 hours) must also be completed. This major study project (FINE 5969) 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 a slide portfolio (must include 20 examples) representing creative work.
4. Electronic media students should submit a portfolio 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 interdisciplinary arts committee for presentation to the full graduate faculty.
5. 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 must be completed beyond the bachelor's degree, consisting of:

a. Fourteen hours in "nonstudio" art. Six of these must be in art history (5000-level courses), or a combination of FINE 5087 (Selected Topics in Contemporary Art) plus one art history course; the remaining 8 hours must include the Graduate Visiting Artist Program (FINE 5118) for 3 hours, and a minimum of 5 additional hours to be taken in art history, criticism, and/or art seminars. Nonstudio hours completed *outside* the department may be taken at the 3000 level or above.

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.

Interdisciplinary Arts (IDA) Program

Graduate students interested in the IDA program should apply through their main area of concentration. Each IDA graduate student studies in at least one discipline outside of his or her main area of concentration. It is possible for IDA students to design their program so that it reflects two majors and one minor. The advisor assigned to each IDA student should be a faculty member from the main area of concentration. The student's course of study is planned with the advisor and/or the IDA committee. The IDA program allows students to explore at least three separate disciplines, two within the fine arts department and possibly a third outside of fine arts.

IDA Program Requirements	*Hours*
Studio	
Fine arts courses in accepted area	12
Fine arts courses outside of accepted area (minimum)	12
Electives outside accepted area in fine arts, theatre and dance, music, film studies, or any other relevant department	10
Nonstudio	
Art history	6
Critical theory (taken as studio or nonstudio hours)	3
FINE 5118 Visiting Artist Program	3
Electives in fine arts, minority studies, philosophy, computer science, physics, or any other relevant department	2-5

Year-End Review

After completing 18 semester hours of work, students must apply for a year-end review. The mandatory review is 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 are not counted towards the degree. No student who has accumulated more than 40 hours without a year-end review is 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 determines whether students may continue in the program, and identifies specific requirements for further work in both studio and nonstudio course work.

Transfer of Credit

Procedures for transferring credit from other graduate programs are governed by the regulations of the Graduate School. Transfer 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 FINE 6957 (M.F.A. Thesis) or FINE 6959 (M.A. Thesis), 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 is an oral comprehensive examination and the candidate must provide a critical written statement concerning the work.

3. Upon the successful completion of the oral examination, the candidate's written statement and 10-15 slides (representing work in the exhibition) are 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 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.*

The following areas of knowledge are central to the undergraduate degree in French:

- an awareness of the fundamental outlines of the history of French literature, from the Middle Ages to the present;
- familiarity with selected widely recognized works;
- awareness of the historical and cultural contexts in which particular works were written and which they portray;
- awareness of basic critical methodologies applicable to different genres of literature;
- awareness of the traditional analysis and description of the grammar of modern standard French; and
- awareness of the importance of language to intellectual development and cultural vitality.

In addition, students completing the degree in French are expected to acquire:

- the ability to speak and understand modern, spoken, standard French sufficient for all purposes of daily life and for intellectual discussion in academic settings;
- the ability to read and write modern, standard French with sufficient fluency and correctness that literary or linguistic analysis of French texts can be performed without being hindered by grammatical problems;
- the ability to analyze and interpret literary texts in terms of style, plot, structure, characters, themes, and the use of literary devices;
- the ability to analyze and describe linguistic problems in terms of the traditional grammar of French (if linguistics has been emphasized, the ability to analyze and describe French using modern linguistic theories is expected); and
- the ability to communicate such interpretations and descriptions competently, if simply, in standard French (or in standard English at a more sophisticated level).

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Thirty hours must be completed beyond the second year with a 2.00 average or better. Nine 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.

Note: Students undertaking a major in French should expect to have regular conferences with the undergraduate advisor to

ensure that they are making adequate progress and that requirements are being met in a timely way. The department will not certify majors for graduation when a failure to satisfy requirements is the fault of the student.

Major Requirements	*Semester Hours*
FREN 3010 French Phonetics and Pronunciation	3
FREN 3050, 3060 French Composition 1 and 2	6
FREN 3110, 3120 Main Currents of French Literature 1 and 2 (or any other two 3000-level survey courses)	6
Five or more other courses at the 3000 or 4000 level, of which 9 hours *must* be at the 4000 level	15

Business French Option

Note: Starting in fall 1992, the business French major program is no longer offered. Majors already enrolled in business French should complete the degree by May 1992 at the latest; no additional students will be admitted thereafter. However, the following business French courses will continue to be offered, although no credit toward the French major will be given:

FREN 3030 and FREN 4050

Study Abroad

For students interested in study abroad, CU-Boulder offers a year-long study abroad program at the University of Bordeaux and a semester program in Rennes. 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 French 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 at the University of Bordeaux 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: the ability to read, write, speak, and understand spoken standard French; general knowledge of French literature and civilization; and ability to read one language in addition to English and French. See department guidelines for the specific requirements for the M.A. in French.

Doctoral Degree

Prerequisites. Doctoral candidates should possess excellence in reading, speaking, writing, and understanding spoken standard French; general knowledge of French literature and civilization; and knowledge of one language other than English and French (see below).

Required Courses. The department offers a specialization in literature or in linguistics. Each track differs from the other in its requirements. See department guidelines for Ph.D. candidates.

Language Requirement. A sound reading knowledge of one modern language other than English and French is required. Proficiency may be shown by taking undergraduate courses in the language through the 4000 level, or by successfully passing a reading examination in the language. The examination normally consists of a timed translation of a literary text or a text dealing with literature (e.g. literary criticism). This language may be one of the following: German, Spanish, Italian, or Russian. Other languages are considered depending on the student's area of research. A dictionary is permitted.

Italian

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

The primary goals of the major program are to provide mastery of the language skills (listening, speaking, reading, writing) of modern standard Italian 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 is 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.

For courses in other departments with an Italian emphasis (e.g., comparative literature, fine arts, history, etc.) see those sections of this catalog.

The following areas of knowledge are central to the undergraduate degree in Italian:

- an awareness of the fundamental outlines of the history of Italian literature, from the Middle Ages to the present;
- familiarity with selected widely recognized works;
- awareness of the historical and cultural contexts in which particular works were written and which they portray;
- awareness of the traditional analysis and description of the grammar of modern standard Italian; and
- awareness of the importance of language to intellectual development and cultural vitality.

In addition, students completing the degree in Italian are expected to acquire:

- the ability to speak and understand modern, spoken, standard Italian sufficient for all purposes of daily life and for intellectual discussion in academic settings;
- the ability to read and write modern, standard Italian with sufficient fluency and correctness that literary or linguistic analysis of Italian texts can be performed without being hindered by grammatical problems;
- the ability to analyze and interpret literary texts in terms of style, plot structure, characters, themes, and the use of literary devices;
- the ability to analyze and describe linguistic problems in terms of the traditional grammar of Italian; and
- the ability to communicate such interpretations and descriptions competently, if simply, in standard Italian (or in standard English at a more sophisticated level).

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below. Thirty hours beyond the first year with a 2.00 grade point average or better are required, as listed below.

Major Requirements	*Semester Hours*
ITAL 2110-2120 Second-Year Italian Reading, Grammar, and Composition 1 and 2	6
ITAL 3120-3130 Readings in Italian Literature 1 and 2	6
ITAL 3210-3220 Advanced Conversation and Composition 1 and 2	6
ITAL 4110 Dante: Inferno and Purgatorio	3
ITAL 4200 Italian Culture and Civilization from Origins through the Renaissance or ITAL 4250 History of Italy: 1815 to Present	3
6 hours of elective credit at the upper-division level	6

Study Abroad

Students interested in study abroad should see the International Education section of this catalog. The Ayer Romance Language Scholarship is available for majors going on accredited study abroad programs. The Lamont Scholarship is awarded to an

Italian major in alternate years. While there are no University of Colorado sponsored programs for the academic year or summer in Italy, there are a number of programs sponsored by other universities. For further information, inquire at the Office of International Education.

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; human geography, including urban, social, economic, political, 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).

The following areas of knowledge are central to the undergraduate degree in geography:

- an awareness of the unique contributions of the discipline to understanding the spatial components of problems and the diverse factors relating to human interaction with the environment:;
- understanding the spatial distributions of physical and human characteristics on the Earth's surface, the general patterns these form, and the processes that have created and are changing these patterns;
- understanding the major themes of geographical analysis, including absolute and relative location; human and physical characteristics of place; human and environmental relations; movement of people, ideas, and products; and regionalization; and
- knowledge of the general geographical principles of human-environment interaction, global change, and human spatial organization.

In addition, students completing the degree in geography are expected to acquire:

- an ability in one or more of the specific geographic skill areas of cartography, air photograph interpretation, remote sensing, and geographic information systems;
- abilities in writing, quantitative methods, computer literacy, and in library and field methods of data collection; and
- the ability to identify the geographic dimensions of a problem and to analyze, synthesize, and evaluate relevant data, and to apply geographic principles to offer a geographic perspective on that problem.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
GEOG 1001 Environmental Systems 1—Climate and Vegetation	4
GEOG 1011 Environmental Systems 2—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
Skills (complete one course)	
GEOG 2053 Maps and Mapping	3
GEOG 3053 Cartography 1	4
GEOG 3093 Geographical Interpretation of Aerial Photographs	3
GEOG 4093 Remote Sensing of the Environment	3
GEOG 4173 Research Seminar	3
GEOG 4383 Methods of Vegetation Analysis	3
Statistics (complete one course)	
GEOG 3023 Statistics for Earth Science	4
GEOG 4023 Introduction to Quantitative Methods in Geography	3
MATH 2510 Introduction to Statistics	3
EPOB 3030 Introduction to Biological Statistics	3
ECON 3818 Introduction to Statistics with Computer Applications	4
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
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 semester 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 basis.

General Requirements. The minimum requirements for an M.A. in geography may be fulfilled 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).

All grades offered for a degree must average at least 3.00 (a *B* average).

Doctoral 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 is 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 (3.00) 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 undergraduate program in geology consists of a geology option, a geophysics option, and a geoscience option, all leading to the B.A. degree. The geoscience option offers flexibility and broad training; the geology and geophysics options offer more traditional paths of training for those students who wish to pursue a career in geology or geophysics. All options provide a strong basis for graduate study and professional employment. Students who are uncertain as to which option best suits their needs should consult a departmental advisor. The B.A. in geology is also excellent preparation for later professional work in other fields, such as law, journalism, economics, engineering, etc.

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. Individual programs can be tailored for such students.

The undergraduate program emphasizes course work in theoretical, laboratory, and field-oriented aspects of the geological sciences. The nearby Rocky Mountains provide a natural laboratory for the study of geological materials and processes.

The following areas of knowledge are central to the undergraduate degree in geology:

- knowledge of the ways in which Earth responds to internal and external forces; the physical, chemical, and biological evolution of Earth; the nature of the materials of which Earth is made; and mineralogy and petrology of igneous, metamorphic, and sedimentary rocks;
- awareness of the interactions of solid Earth with the hydrosphere and atmosphere, and how these interactions affect mankind and the environment;
- an understanding of the processes of sedimentation, the use of stratigraphy, paleobiology of marine environments, and the role of geophysics and tectonics in understanding the nature of Earth and its history;
- awareness of the roles of physics, chemistry, biology, and mathematics in understanding geological processes;
- knowledge of the history of discoveries and ideas that have contributed to our current awareness of the Earth and the planetary system;
- knowledge of appropriate techniques for measuring and recording both past and present Earth processes; and
- knowledge of the methods used in the field to map and interpret the diverse variety of rock types and structures.

In addition, students completing the degree in geology are expected to acquire:

- the ability to read and critically evaluate relevant geological literature;
- the ability to observe and measure, in the field and laboratory, physical, chemical, and biological aspects of rock successions and to develop models of Earth history;
- the ability to present geological information in both written and oral form; and
- the ability to use appropriate tools from mathematics, chemistry, physics, and biology, including computers, to solve geological problems.

Bachelor's Degree Programs

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

All majors are required to take the following courses, and must also demonstrate a basic ability to work interactively with computers. Completion of this requirement is a prerequisite to all 3000- and 4000-level courses in geological sciences. Information on how to satisfy this requirement is available in the departmental office.

Major Requirements — *Semester Hours*

GEOL 1010 and 1020 Introduction to Geology 1 and 2 or GEOL 1060 and 1070 Global Change 1 and 2 *or* GEOL 1130 and 1140 Our Dynamic Earth 1 and 2 6
GEOL 4960 Senior Paper 1
GEOL 4110 Field Geology (or a summer field course offered by another institution with departmental and college approval) 4
CHEM 1111 and 1131 General Chemistry 1 and 2 *or* CHEM 1151 and 1171 Honors General Chemistry 1 and 2 5-6
MATH 1300 and 2300 Analytical Geometry and Calculus 1 and 2 *or* MATH 1310 and 1320 Calculus and Combinatorics 1 and 2 *or* APPM 1350 and 1360 Calculus for Engineers 1 and 2.....8-10
Note: GEOL 1080 and 1090 Geology Laboratory 1 and 2 are also recommended, particularly for students taking GEOL 1010 and 1020.

Geology Option
Students electing the geology option are required to take the following additional courses:
PHYS 1110 General Physics 1 4
PHYS 1120 General Physics 2 4
PHYS 1140 Experimental Physics 1 1
GEOL 3010 Introduction to Mineralogy.....3
GEOL 3020 Petrology.....3
GEOL 3120 Structural Geology 1 4
GEOL 3430 Sedimentology and Stratigraphy ...4
And any two of the following courses:
GEOL 3410 Paleobiology.....3
GEOL 3320 Introduction to Geochemistry...3
GEOL 4130 Geophysics and Tectonics *or* GEOL 4530 Introduction to the Physics of the Solid Earth 3

Geoscience Option
Students electing the geoscience option are required to take the following additional courses:
PHYS 1110 and 1120 General Physics 1 and 2 and PHYS 1140 Experimental Physics 1 *or* EPOB 1210, 1220, 1230, and 1240 General Biology 1 and 2 with labs.....8-9
And at least five of the following courses:
GEOL 3010 Introduction to Mineralogy.....3
GEOL 3020 Petrology.....3
GEOL 3070 Oceanography.....3
GEOL 3120 Structural Geology 1 4
GEOL 3320 Introduction to Geochemistry...3
GEOL 3420 Paleobiology.....3
GEOL 3430 Sedimentology and Stratigraphy 4
GEOL 4040 Geohydrology or GEOL 4980 Hydrology.....3
GEOL 4130 Geophysics and Tectonics *or* GEOL 4530 Physics of the Solid Earth 3
GEOL 4241 Geomorphology 3
Because of the flexibility of this program, students are required to develop their program under the guidance of a faculty advisor and must submit a course plan by the end of their sophomore year or upon declaration of the major, whichever is later.

Geology and Geoscience Options
Students in either of these options must take additional 3000- or 4000-level courses so that the total number of upper-division hours in geological sciences is at least 30 hours. Any upper-division course is acceptable, with the exception that only one of the following may be counted towards the 30-hour minimum:
GEOL 3040 Global Change: The Recent Geological Record.....3
GEOL 3500 Mineral Resources, World Affairs, and the Environment 3
GEOL 3520 Environmental Issues in Geosciences.....3
GEOL 3620 Controversies in Planetary Geology.....3
GEOL 3720 Evolution of Life: The Geologic Record.....3
GEOL 4950 Geologic Hazards and Natural Catastrophes.....3

Geophysics Option.....
Students electing the geophysics option are required to take the following additional courses:
GEOL 3010 Introduction to Mineralogy.....3
GEOL 3020 Petrology.....3
GEOL 3120 Structural Geology 1 4
GEOL 4530 Introduction to the Physics of the Solid Earth 3
PHYS 1110 General Physics 1 4

PHYS 1120 General Physics 2 4
PHYS 1140 Experimental Physics 1 1
PHYS 2130 General Physics 3 3
PHYS 2140 Methods of Theoretical Physics..3
PHYS 2150 Experimental Physics Lab 1
PHYS 3210 Analytical Mechanics.....3
PHYS 3310 Electricity and Magnetism.....3
MATH 2400 Analytical Geometry and Calculus 3 4
APPM 2360 Introduction to Linear Algebra and Differential Equations 3

Additional information on required courses and other departmental requirements may be obtained from the departmental office. Students should contact the department to obtain a list of current major requirements.

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 to have previous course work in geology, math, and allied sciences evaluated.

Computer Science Applications

The department cooperates with the College of Engineering and Applied Science in offering a degree in Computer Science Applications in the Geological Sciences. For additional information, contact the College of Arts and Sciences Dean's Office.

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.

Geology Internship Program

This program is an academically supervised opportunity for geological science majors to work with public or private organizations. Students interested in the internship program should contact the departmental internship 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 are used both for determining admittance and for initial academic counseling.

Entering students 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 may substitute for part of the 24 hours in geological science.

Initial counseling is provided on an individual basis by the departmental committee on academic progress. Thereafter each student acquires an advisory committee which provides 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 (Plan II Master's Research) 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.

Doctoral 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 GEOL 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

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

The major in Germanic studies is an interdisciplinary program focusing on study of the German language, its manifestations in history, and its usage in the current cultural and social context; the literary, artistic, and philosophical aspects of German culture in the past and the present; the major historical events and developments in Germany and its neighboring countries, and the current political institutions and dynamics in Germany within the broader European framework.

Students are required to structure their curriculum according to the departmental checklist for majors in close consultation with a departmental advisor.

The following areas of knowledge are central to the undergraduate degree in German:

- an awareness of the fundamental outlines of the history of German literature, from the Middle Ages to the present;
- familiarity with major German writers and representative works;
- familiarity with the historical context of which particular German literary and artistic works are part;
- an awareness of basic critical methodologies in the study of different genres of literature; and
- an awareness of the historical development of modern German as a manifestation of the particular cultural history of the region.

In addition, students completing the degree in German are expected to acquire:

- the ability to read modern German at a level at which sophisticated literary analysis can be performed;
- the ability to write and speak German sufficiently to participate in critical discussions and write critical essays;
- the ability to speak and comprehend German sufficiently for all situations in daily life and for basic academic conversation;
- the ability to analyze and interpret literary texts in terms of style, structure, character, themes, and use of allusion; and
- the ability to communicate such interpretations competently in both German and English.

Bachelor's Degree Program

In addition to the general requirements of the College of Arts and Sciences, students who declare their major after July 1, 1990, must complete the major requirements listed below.

Major Requirements *Semester Hours*

Completion of 42 hours beyond 2000-level language courses with grades of *C* or better (none may be taken pass/fail), distributed as follows:

German Language Courses

Completion of the following upper-level German language courses or demonstration of third-year proficiency. GRMN 4010 and 4020 are required of all majors.

GRMN 3010 Advanced Conversation and Grammar....3
GRMN 3020 Advanced Conversation and Composition....3
GRMN 4010 and 4020 Advanced Composition, Conversation, and Stylistics 1 and 2....6

German Literature and Culture Courses
GRMN 1601 Introduction to Modern German Culture and Civilization....3
GRMN 3110 German Literature from 1910 to Present *or* GRMN 3120 Modern German Literature from 1750 to 1910....3
GRMN 4550 Senior Seminar....3
Additional hours of German literature and culture....6

Area Courses
HIST 4413 German History to 1848....3
HIST 4423 German History since 1849....3
PSCI 4002 Advanced Comparative Politics—Western Europe....3

Electives
Complete a minimum of two courses. At least one elective must be from outside the Department of Germanic Languages and Literatures.
ECON 4514 Economic History of Europe....3
FILM 3051 Film History 1....3
FINE 4259 Northern Eutopean Painting....3
FINE 4329 and 4339 Modern Art 1 and 2....6
GRMN course selected from the departmental checklist....3
HIST 4312 Nineteenth-Century Europe....3
HIST 4412 Twentieth-Century Europe....3
HIST 4414 European Intellectual History, 1750-1870....3
HIST 4424 European Intellectual History, 1870-Present....3
HIST 4444 Topics in European Thought: Twentieth Century....3
HIST 4613 History of East-Central Europe to 1815....3
HIST 4623 History of East-Central Europe since 1815....3
PHIL 4030 Studies in Nineteenth-Century Philosophy....3
PHIL 4040 Studies in Twentieth-Century Philosophy....3
PHIL 4080 Introduction to Phenomenology....3
PHIL 4250 Marxism....3
PSCI 4212 Europe in the International System....3
SCAN 2250 Contemporary Sweden and Norway....3
Note: GRMN 1010, 1020, 2010, 2020, and 2050 are not counted toward the 42 hours required for the bachelor's degree in German.

Scandinavian Program

Courses are offered in English on Norwegian, Swedish, and Scandinavian culture and civilization. The language courses satisfy arts and sciences language requirements for the B.A. and B.F.A. degrees. 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.

Study Abroad

The department strongly recommends that all majors take part in study abroad. The University's programs in Regensburg and Tübingen provide a full year of study abroad. Kassel provides the opportunity for language study during the summer for a shorter period of time. For further information on study abroad programs, see the International Education section of this catalog.

HISTORY

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

The following areas of knowledge are central to the undergraduate degree in history:
- knowledge of the main topics in the political, social, cultural, and economic history of the United States, from its origins to the present;
- knowledge of the main topics in the political, social, cultural, and economic history of western civilization, from its origins in antiquity to the present;
- knowledge of the main topics in the political, social, cultural, and economic history of one or more geographic areas outside Europe and America;
- more concentrated knowledge of one area of the world—the United States, Europe, or the third world—acquired through upper-division study; and
- knowledge of methodological alternatives in historical studies.

In addition, students completing the degree in history are expected to acquire:
- research skills sufficient to conduct an investigation, consulting appropriate works for developing a bibliography;
- analytical skills sufficient to distinguish between primary and secondary sources, to analyze arguments and interpretations, and to recognize conflicts;
- the ability to interpret evidence found in primary sources and develop an historical argument based on and sustained by the evidence available; and
- writing skills sufficient to write an historical essay that is coherent, cogent, and grammatically correct.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
Completion of 33 hours in history courses with grades of *C* (2.00) or better (18 hours must be upper division).	
HIST 1015 The United States to 1865 and HIST 1025 The United States since 1865 *or* HIST 1035 Honors: The United States to 1865 and HIST 1045 Honors: The United States since 1865	6
HIST 1010 and 1020 Western Civilization 1 and 2 *or* HIST 1030 and 1040 Honors: Western Civilization 1 and 2	6
Complete one of the following:	
HIST 1038 Introduction to Latin American History; HIST 1208 Introduction to African History; HIST 1308 Introduction to Middle Eastern History; HIST 1408 Introduction to Indian History; HIST 1608 Introduction to Chinese History; HIST 1708 Introduction to Japanese History; HIST 1009 Introduction to Third World History	3
Complete a twelve-hour concentration at the upper-division level in either United States, European, or third-world (African-Asian-Latin American-Middle Eastern) history, including a 3000-level seminar in the area of the concentration (senior history majors may, with instructor consent, substitute a 6000-level course).	

Note: No more than 45 semester hours in history applies 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* accepted.) 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 of this catalog. The 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 is generally expected. Ph.D. applicants who do not have an M.A. degree from the department must also take the advanced history portion of the GRE. For these applicants, the department expects scores in the 80th percentile or above on the verbal portion and in the 70th percentile or above in the history portion.

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 6 hours of 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 field of study before the degree is granted. Applicants should request a copy of the *Graduate Student Handbook* from the Department of History.

Doctoral Degree

Prerequisites. Students who wish to work toward the Ph.D. degree in history must indicate knowledge of 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 is 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 classroom credit hours, at least 15 of which must be taken at this University, and a dissertation are required for the degree. A minimum of 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. Applicants should request the *Graduate Student Handbook* from the Department of History.

HISTORY AND PHILOSOPHY OF SCIENCE

The College of Arts and Sciences offers courses in the history and philosophy of science. These courses are PHIL 3410, 3430, and 3440. The three semesters cover three distinct time periods: ancients to Newton, Newton to Einstein, and the twentieth century. Of related interest are PHIL 3400 Philosophy of Science, PHIL 4450 or PHYS 4450 History and Philosophy of Physics, and 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 on 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 studies 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 courses 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 members 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 strive to be integrative. They encourage students to combine and synthesize concepts and methodologies from other courses and disciplines. Many honors courses are consciously interdisciplinary, but all 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 general 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. The general honors program 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; with one or two published exceptions, each course is limited to an enrollment of approximately 15 students.

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 in the top percentile of the entering class are invited to join the Honors Program. Students currently enrolled are accepted on the basis of academic achievement at CU-Boulder. 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 undergraduate major in humanities emphasizes:

- knowledge of western literature in an interdisciplinary context;
- understanding complex works of art in different media (visual, literary, music, film); and
- a sense of human history.

In addition, humanities majors may expect to develop the following skills:

- the ability to analyze works of art in terms of style, structure, and cultural (historical) context;
- the ability to make connections among the arts;
- the ability to recognize meaningful connections with the past in order to develop a sense of self as well as critical and ethical judgment; and
- the ability to express thought clearly in both writing and speaking.

Bachelor's Degree Program

The humanities major takes an interdisciplinary approach to the arts. The major consists of three parts: interdisciplinary work within the Department of Humanities; course work in the literature of a single language (English, French, German, etc.); and a secondary field of concentration (fine arts, music, philosophy, etc.). Since the program is tailored as much as possible to individual students' interests, majors should see their humanities advisor each semester.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below. Early completion of the foundation courses, HUMN 1010 and 1020, is essential.

Major Requirements	*Semester Hours*
HUMN 1010 and 1020 Introduction to Humanities 1 and 2	12
Upper-division humanities courses	18
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.)	18
Courses chosen from a single one of the following areas: foreign language literature (first-year courses or course work in translation may not be counted), fine arts, music, dance, theatre, film, philosophy, other disciplines	12

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 of world issues to the United States, employment opportunities in government and in international organizations, agencies, and business have expanded enormously. Today there is an urgent need for college graduates with a strong background in international affairs. To meet this need the University of Colorado offers a comprehensive and flexible interdisciplinary program in international affairs leading to the bachelor of arts degree.

The following areas of knowledge are central to the undergraduate degree in international affairs:

- knowledge and understanding of the major political, economic, social, and cultural problems facing the international community, including international economic relations, world population, and resource utilization;
- knowledge of the international political system in the broadest global context, of international organizations and alliances, and of foreign political systems and processes;
- awareness of the ethical issues involved in international relations;
- knowledge of patterns of conflict and cooperation among nations;
- knowledge of the chief historical factors that give rise to existing international institutions and processes; and
- knowledge of the problems and issues in American foreign policy.

In addition, students completing the degree in international affairs are expected to acquire:

- the ability to analyze an international problem from a political, economic, historical, and cultural perspective;
- the ability to read, critically evaluate, and synthesize information obtained from international affairs literature;
- the ability to analyze international phenomena critically so as to separate the essential from the irrelevant and to identify the probable; and
- the ability to communicate, orally and in writing, findings to other students of international affairs and to a broader audience.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements in the three categories listed below.

1. Core Courses. Completion of 41 hours with a grade of *C* (2.00) or better (none may be taken pass/fail), distributed as follows:

Major Requirements	*Semester Hours*
Lower Division (17 hours)	
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
Upper Division (24 hours)	
ANTH 4500 Crosscultural Aspects of Socioeconomic Development *or* ANTH 4580 Power: Anthropology of Politics *or* GEOG 4682 Geography of International Development	3
ECON 3403 International Economics and Policy	3
ECON 3433 International Conflict in a Nuclear Age *or* ECON 4433 Economic Relations Among the United States, Japan, and Canada *or* ECON 4714 Comparative Economic Systems *or* ECON 4774 Economic Development: Theory and Problems *or* ECON 4784 Policies of Economic Development	3
GEOG 4712 Political Geography	3
HIST 4412 Twentieth-Century Europe or three hours of contemporary history in area of concentration if other than western Europe	3
PSCI 4142 International Relations *or* PSCI 4192 International Behavior *or* PSCI 4202 Alternative World Futures	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 the director of the program. None may be taken pass/fail. A minimum course grade of *C* (2.00) 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* (2.00) or better, or by certification from the appropriate department of such competence.

Recommendations:

a. All international affairs majors should have a *good* command of the English language.

b. Students should choose electives with a view to their relevance to this program.

c. During the semester prior to graduation, each student must complete a statement of major status obtained from the office of the College of Arts and Sciences.

d. 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 are 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.A., M.S.*

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 in kinesiology or careers in such areas as fitness management, cardiac and physical rehabilitation, corporate or industrial fitness, sports psychology, human factors, physical therapy, or premedicine.

The following areas of knowledge are central to the undergraduate degree in kinesiology:

- knowledge of human movement and performance related to the major sub-disciplines and their interactions, including the historical and philosophical foundations of kinesiology and its development as an academic discipline; the fundamentals of human anatomy, physiology, and biomechanics; physiological and biochemical adaptations to exercise and movement; the psychological effect of exercise and movement on both individual and group behavior, and the effect of psychological variables on human performance; and the principles governing the acquisition and development of motor skills and concepts concerning the control of movement;
- knowledge of the methods of research in the study of human movement; and
- understanding of potential applications of kinesiological information in practical settings.

In addition, students completing the degree in kinesiology are expected to acquire:

- the ability to observe human movements and performance to describe and understand the physical principles involved and the muscular actions required for stability and control of the action;
- the ability to assess human movement and performance using basic laboratory equipment, and to interpret findings;
- the ability to communicate kinesiological knowledge through the written and spoken word;
- the ability to read and interpret current scientific journal articles concerned with human movement and performance with an understanding of the methods, procedures, statistics, and design of the study; and
- the ability to synthesize this information and develop testable hypotheses based upon theory and past research.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
KINE 1010 Introduction to Kinesiology	2
KINE 2700 Introduction to Statistics and Research in Kinesiology	3
KINE 3500 Human Development and Movement Behavior	3
KINE 3710 Social Psychological Aspects of 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
EPOB 1210-1240 General Biology 1 and 2 with Labs *or* MCDB 1050 and 1060 Introduction to MCDB 1 and 2	8
CHEM 1051, 1071 Introduction to Chemistry and Introduction to Organic and Biochemistry *or* CHEM 1111 and 1071 General Chemistry 1 and Introduction to Organic and Biochemistry *or* CHEM 1111 and 1131 General Chemistry 1 and 2	8-10
PHYS 2010 General Physics 1	5
EPOB 3420 Introduction to Human Anatomy	5
EPOB 3430 Human Physiology	5
Ten to twenty-eight hours of electives, chosen from the following:	
KINE 3420 Nutrition and Health	3
KINE 3430 Nutrition and Physical Performance	3
KINE 3440 Theory and Practical Applications of Resistance Exercise and Conditioning Programs	3
KINE 4450 Disabilities and Motor Development	3
KINE 4460 Prevention and Management of Athletic Injuries	3
KINE 4470 Evaluation and Rehabilitation of Athletic Injuries	3
KINE 4480 Perspectives on Aging	3
KINE 4630 Modality Usage in Sports Medicine	3
KINE 4660 Selected Topics in Exercise Physiology	3
KINE 4680 Exercise Management	3
KINE 4870 Honors Thesis	1-3
KINE 4930 Internship	1-6
Recommended electives: CHEM 3331, 4711, 4731; MATH 1300, 2300; PSYC 4030, 4052; MCDB 3120, 3200; ASEN 3018; CSCI 1200, 1700.	

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 (thesis) or plan II (non-thesis) 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. Candidates in plan I or plan II must also pass the departmental written examination, satisfy the breadth area requirement, and demonstrate evidence of participation in a research experience.

Master of Science Degree

Prerequisites. Entering graduate students must have an undergraduate preparation equivalent to the basic core curriculum requirements in kinesiology at the University of Colorado or make up any undergraduate deficiencies. The following requirements have been established by the department as basic core requirements. All students must have had a basic laboratory experience (exercise physiology students must have had an undergraduate exercise physiology laboratory course) and an introductory statistics or research design course. In addition, students are required to have completed four of the following five

courses or their equivalent: KINE 3500 Human Development and Movement Behavior; KINE 3710 Social Psychological Aspects of Physical Activity; KINE 3720 Motor Learning and Performance; KINE 4540 Analysis of Human Movement; and KINE 4650 Exercise Physiology.
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 are 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 physiology, motor behavior, or general studies. 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 departmental written examination; and requirements for advanced degrees as stipulated by the Graduate School. For students enrolled in plan I, KINE 6950 (Master's Thesis) is required; for students enrolled in plan II, additional course work is required.

Comprehensive Examination. All candidates are required to complete an oral examination covering the thesis or research project, as well as a written departmental examination covering course work leading to the degree.

LATIN AMERICAN STUDIES

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

The considerable value of an understanding of Latin America is generally evident today. The Latin American Studies Program offers a broad and flexible interdisciplinary approach designed to provide a comprehensive understanding of Latin America. The curriculum leads to the bachelor of arts with a major in Latin American studies.

The following areas of knowledge are central to the undergraduate degree in Latin American studies:

- knowledge of both humanistic and social science methods as they apply to contemporary understanding of Latin America;
- an informed awareness of the social, economic, and political circumstances in at least one Latin American nation, and an in-depth understanding of the historical development of that nation; and
- an informed awareness of the creative arts in Latin America, including familiarity with the work of several recognized Latin American artists.

In addition, students completing the degree in Latin American studies are expected to acquire:

- reading and speaking ability in at least one of the primary languages of Latin America (Spanish or Portuguese);
- the ability to engage in thoughtful dialogue about Latin America with educated Latin Americans;
- the ability to locate Latin American ideas, historical events, and cultural phenomena in the Latin American context from which they originate; and
- the ability to communicate competently in effective English prose.

Bachelor's Degree Program

1. Satisfaction of the regular arts and sciences requirements for the bachelor of arts degree.

2. Demonstrated proficiency in Spanish or Portuguese (successful completion of at least one upper-division Spanish or Portuguese course).

3. A total of 30 hours from designated courses. Of these 30 hours, 12 must be lower division, and of these 6 must be in the area of social sciences (anthropology, economics, geography, history, political science, religious studies, and sociology) and 6 in the area of humanities (Chicano studies, fine arts, Latin American studies, Spanish and Portuguese, and music).

In addition, 18 hours of upper-division credit are required, and of these 9 must be in the social science area and 9 in the humanities.

4. There are two courses required of all Latin American studies majors: LAMS 1000 Introduction to Latin American Studies, and LAMS 4815 Senior Seminar in Latin American Studies. The 6 hours of credit earned in these two courses may be counted toward the 30 credit hours required for the major and may be applied in either the social science or the humanities area.

In addition, while students cannot receive credit toward the major in lower-division courses in the language presented for proficiency (Spanish or Portuguese), they may receive up to 6 hours of lower-division humanities credit for courses taken in the language not presented for proficiency (i.e., students who demonstrate proficiency in Spanish may receive 6 hours of credit for lower-division courses in Portuguese, and vice versa).

5. The committee on Latin American studies maintains a list of courses that meet the requirements for the Latin American studies major. The list is available in both the College of Arts and Sciences office and in the office of the director of the Latin American Studies Program.

6. Latin American studies majors are strongly encouraged to include a study abroad semester or summer in their academic program.

Certificate in Latin American Studies

A certificate is awarded to students who, while majoring in another area, demonstrate strong participation in Latin American studies. Students who satisfy the following requirements are eligible for the certificate in Latin American studies:

1. Demonstrated proficiency in Spanish or Portuguese (successful completion of at least one upper-division Spanish or Portuguese course).

2. At least 12 hours of credit in upper-division courses chosen from the Latin American studies list. Of these, at least 6 hours must be in social sciences and 6 in humanities. (This is the same as the upper-division requirement for the major).

3. Students must take LAMS 4815 Senior Seminar in Latin American Studies.

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 Department of Linguistics, on the nature of language. In addition, the major draws on courses offered in other areas of the University.

The following areas of knowledge are central to the undergraduate degree in linguistics:

- knowledge of the fundamental architecture of language in the domains of phonetics and phonology, morphology and syntax, and semantics and pragmatics;
- knowledge of the general variety of structures by which diverse human languages realize this architecture;
- knowledge of the main interactions between language, culture, and society, including the role of language as a cultural institution and the social functions of language diversity;
- knowledge of the processes of language change over time and their consequences for the diversity and similarity of the world's languages; and
- knowledge of the approaches to the study of language that are used by a discipline other than linguistics.

In addition, students completing the degree in linguistics are expected to acquire:

- proficiency in a second language equivalent to the third-year university level;
- the ability to infer language structures from the data analysis of unfamiliar languages; and
- the ability to give coherent general interpretations of common language phenomena in terms of language structure and language use.

Bachelor's Degree Program

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.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

Complete the following courses in general linguistics with grades of *C* or better:

LING 2000 Introduction to Linguistics.....3
LING 1000 Language in U.S. Society *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

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 is 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.

Electives. A minimum of 9 elective hours must be completed with a grade of *C* (2.00) or better:

One course chosen from.....3
ANTH 4810 Language and Culture
CDSS 3006 Introduction to Speech and Hearing Sciences
PHIL 3490 Philosophy of Language
PSYC 4220 Psycholinguistics
SOCY 3121 Sociology of Language
Two courses in linguistics (in addition to the 21 hours above).....6

Study Abroad

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 normally calls 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 fewer than 12 hours of linguistics, or who wish an emphasis on the teaching of English as a second language (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.

Doctoral 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, LING 5450 Introduction to Formal Syntax, 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.

The Department of Mathematics offers a degree program leading to the B.A. degree in mathematics in the College of Arts and Sciences. A B.S. degree in applied mathematics is also offered through the College of Engineering and Applied Science. For information regarding the applied mathematics program, please contact the applied mathematics office.

The following areas of knowledge are central to the undergraduate degree in mathematics:

- knowledge of basic real analysis of one variable;
- knowledge of calculus of several variables and vector analysis;
- knowledge of basic linear algebra and theory of vector spaces;
- knowledge of the structure of mathematical proofs and definitions; and
- knowledge of at least one additional specialized area of mathematics.

In addition, students completing a degree in mathematics are expected to acquire:

- the ability to use techniques of differentiation and integration of one and several variables;
- problem-solving capabilities using differentiation and integration;
- techniques for solving systems of linear equations;
- the ability to give direct proofs, proofs by contradiction, and proofs by induction;
- the ability to formulate definitions;
- the ability to read mathematics without supervision;
- the ability to write a simple computer program; and
- the ability to apply mathematics.

Bachelor's Degree Program

Before receiving a bachelor's degree in mathematics, students must obtain a passing grade on a standardized major field achievement test administered by the Department of Mathematics. Mathematics majors must attain an overall grade point average of at least 2.00 in all mathematics courses numbered 1300 and above.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
MATH 1300, 2300, and 2400 *or* APPM 1350, 1360, 2350 Calculus	12 or 14
MATH 3000 Introduction to Abstract Mathematics	3
MATH 3130 Introduction to Linear Algebra	3
MATH 3140 Introduction to Modern Algebra	3
MATH 4310 Advanced Calculus 1	3
Elective mathematics courses numbered above 3000 (Note 1)	6
Elective mathematics course numbered above 4000 (Note 1)	3

Note 1: MATH 3830, 4570, or 5570 cannot be used to fulfill these requirements.

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* (2.00) 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 21-hour upper-division requirement must be approved by the Department of Mathematics. Courses accepted as mathematics credit but excluded from the minimum 21-hour upper-division requirement still count in the 45 maximum hours allowed in mathematics.

Undergraduate students planning to do graduate work in mathematics should take MATH 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 emphasizing preparation for graduate work, computer science, preparation for secondary teaching, or applied mathematics.

Graduate Degree Programs

The Department of Mathematics offers programs leading to the degrees M.A. or Ph.D. in mathematics and M.S. 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 modern 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 non-thesis plan, 30 semester hours of course work are required.

For the M.S. degree, 30 semester hours of credit are required. Of these, 6 to 12 semester hours must be in an approved minor program outside the mathematics department. Four to six 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 the 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. The basic requirements for a Ph.D. degree in mathematics are as follows: demonstration of reading knowledge of two languages (French, German, or Russian); completion of Graduate School requirements for languages and course and thesis hours; a written thesis that contains substantial original contributions to mathematics; and successful completion of a final examination.

MEDIEVAL STUDIES

The Committee on Medieval Studies is founded on the conviction that the European Middle Ages represent a period of 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 that transcended the normal boundaries of nation, language, and scholarly discipline. Medieval studies are 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 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 program of study and as part of the requirements for an advanced degree. For additional details concerning these courses, see departmental listings.

Semester Hours

Medieval Culture
MEDV 4020 Medieval Studies: Texts and Contexts....3
MEDV 4030 Medieval Studies: Special Topics....3
ENGL 5704 Chaucer....3
ENGL 5855 Tutorials in Medieval Studies....1-3
ENGL 7855 Advanced Medieval Studies....1-3
FINE 4029 or 5029 Art of Islam....3
FINE 4039 or 5039 Byzantine Art....3
FINE 4109 or 5109 Early Christian and Early Medieval Art....3
FINE 4119 or 5119 Romanesque Art....3
FINE 4129 or 5129 Gothic Art....3
FINE 4139 or 5139 Italian Gothic Art....3
FINE 5919 Late 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 A.D. 500-1600....3
HIST 4711 History of the Mediterranean World, 1099-1571....3
HIST 6511 Readings in Medieval History....3
ITAL 4110 Dante: *Inferno* and *Purgatorio*....3
ITAL 4130 Medieval Lyric Literature....3
ITAL 4700 Dante: *Paradiso, la Vita Nuova,* and Minor Works....3
MUSC 5822 Ancient and Medieval Music....3-4
PHIL 3410 History of Science: Ancients to Newton....3
SPAN 5140 Seminar: Spanish Literature, Medieval Period....2-4

Medieval Languages
CLAS 5804 Accelerated Latin 1....3
ENGL 5674 Anglo-Saxon....3
ENGL 5684 Beowulf: Advanced Anglo-Saxon....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 or 5720 History of Russian Language....3
SPAN 5420 or 7420 Seminar: History of Spanish Language....2-4

MUSEUM

Museum courses listed in this catalog may be taken with the approval of the student's major department, although no undergraduate major is offered in museum studies.

Graduate training in anthropology, botany, entomology, paleontology, and zoology is provided under the direction of museum faculty in cooperation with cognate departments and the master of basic science program. Areas of study include:

archaeological theory and interpretation
southwestern archaeology and ethnology
textile history and analysis
early humans in North America
plant taxonomy, evolution, and phytogeography
vertebrate paleontology and Cenozoic stratigraphy
lower vertebrate paleontology
African Tertiary faunas and paleoenvironments
palcoccology
biology of mollusks
systematics and ecology of mammals
biology of aquatic invertebrates
systematics and population biology of insects of the Rocky Mountain Region
plant and insect interaction

Museum assistantships, research support from the Walker Van Riper and William Henry Burt museum funds, 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, CO 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.

Semester Hours

Museum Courses
ANTH 4840 Independent Study....1-3
ANTH 5840 Guided Study....1-3
ANTH 6950 Master's Thesis....1-6
ANTH 7840 Independent Research....1-3
EPOB 4670 or 5670 Advanced Invertebrate Biology....2-4
EPOB 4760 or 5760 Mammalogy....4
EPOB 4840 or 4870 Independent Study/Independent Research....1-6
EPOB 6950 Master's Thesis....1-6
GEOL 3400 Evolution of Continental Ecosystems....4
GEOL 4470 or 5470 Paleontology of the Lower Vertebrates....4
GEOL 4480 or 5480 Paleontology of the Higher Vertebrates....4
GEOL 5560 Seminar in Evolution....3
GEOL 5610 Mammalian Micropaleontology....2
GEOL 5620 Field Problems in Vertebrate Paleontology....5
GEOL 5700 through 5790 Geological Topics Seminar....1-3
GEOL 4840 through 4849 Independent Study in Geology....1-3
GEOL 5840 through 5851 Graduate Independent Study....1-3
GEOL 6950 Master's Thesis....1-6

NATURAL SCIENCE

The natural science program is not a degree program; it 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. Overall, the natural science program strives to make the sciences an integral part of the undergraduate liberal arts curriculum.

ORIENTAL LANGUAGES AND LITERATURES

Chinese Degree....*B.A., M.A.*
Japanese Degree....*B.A.*

Students may choose to major in either Chinese or Japanese. In either case they 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.

Before registering for specific courses, students should consult with a departmental 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 Chinese or Japanese.

Bachelor's Degree Programs

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Chinese

The following areas of knowledge are central to the undergraduate degree in Chinese:

- an awareness of the fundamental outlines of the history of Chinese literature, from the *Shih ching* to the present;
- familiarity with selected canonical or widely recognized works;
- awareness of the historical and cultural contexts in which particular works were written;
- awareness of basic critical methodologies as applicable to different genres of literature;
- awareness of the importance of language to intellectual development and vitality; and
- awareness of the challenges, deficiencies, and possible gains inherent in the process of translating from one language to another.

In addition, students completing the degree in Chinese are expected to acquire:

- the ability to read modern Chinese with sufficient fluency to analyze texts without being hindered by grammatical problems;
- the ability to read classical Chinese, with the aid of appropriate reference works, at the level at which the text may begin to be appreciated for its literary value;
- the ability to speak and comprehend Mandarin sufficiently for all situations in daily life and for a basic level of academic conversation;
- the ability to analyze and interpret literary texts in terms of style, structure, character, themes, and use of allusion; and
- the ability to communicate such interpretations competently in standard written English.

Major Requirements *Semester Hours*

Successful completion of 30 credit hours of courses in Chinese language and literature, beyond the beginning (i.e. first-year) level. At least 18 credit hours must be in upper-division courses.

CHIN 2110-2120 Intermediate Chinese 1 and 2 10
CHIN 3110-3120 Advanced Chinese 1 and 2 6
CHIN 3210 Introduction to Classical Chinese 3
CHIN 3220 Readings in Classical Chinese 3
Any two of the following courses:
CHIN 4811 Worlds of Ancient and Medieval Poetry 3
CHIN 4821 Chinese Fiction in Translation 3
CHIN 4841 Women and the Supernatural in Chinese Literature 3
CHIN 4851 Twentieth-Century Literature in Translation 3

Japanese

The following areas of knowledge are central to the undergraduate degree in Japanese:

- an awareness of the fundamental outlines of the history of Japanese literature, from the Nara period to the present;
- familiarity with selected canonical or widely recognized works;
- awareness of the historical and cultural contexts in which particular works were written;
- awareness of basic critical methodologies as applicable to different genres of literature;
- awareness of the importance of language to intellectual development and vitality; and
- awareness of the challenges, deficiencies, and possible gains inherent in the process of translating from one language to another.

In addition, students completing the degree in Japanese are expected to acquire:

- the ability to read modern Japanese with sufficient fluency to analyze texts without being hindered by grammatical problems;
- the ability to read classical Japanese, with the aid of appropriate reference works, at the level at which the text may begin to be appreciated for its literary value;
- the ability to speak and comprehend Japanese sufficiently for all situations in daily life and for a basic level of academic conversation;
- the ability to analyze and interpret literary texts in terms of style, structure, character, themes, and use of allusion; and
- the ability to communicate such interpretations competently in standard written English.

Major Requirements *Semester Hours*

Successful completion of 30 credit hours of courses in Japanese language and literature, beyond the beginning (i.e. first-year) level. At least 18 credit hours must be in upper-division courses.

JPNS 2110-2120 Intermediate Japanese 1 and 2 10
JPNS 3110-3120 Advanced Japanese 1 and 2 6
JPNS 3441 Language and Japanese Society 3
JPNS 4110-4120 Readings in Classical and Modern Japanese 1 and 2 6
JPNS 4811 Classical Japanese Literature in Translation 3
JPNS 4821 Modern Japanese Literature in Translation 3

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 1051 is a core curriculum course that focuses on the "Great Books" of China, both ancient and modern. CHIN 4811, 4821, 4841, and 4851 focus, respectively, on Chinese poetry, fiction, the worlds of women and the supernatural, and contemporary literature.

JPNS 1051 is a core curriculum course focusing on both ancient and modern "Great Books" of Japan. JPNS 4811 and 4821 focus, respectively, on classical and modern Japanese literature.

Study Abroad

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 study abroad programs based at National Taiwan University, Taipei, Taiwan; at Tunghai University, Taichung, Taiwan; and at Kansai Gaidai, Osaka, 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.

Master's Degree Requirements

Candidates for the M.A. in Chinese are required to present 24 hours of approved course work, plus a master's thesis (6 hours).

A student may, with approval of the graduate committee, present for graduation 30 hours of course work without a thesis. All other requirements apply. Contact the Department of Oriental Languages and Literatures for specific master's-level requirements.

PHILOSOPHY

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

The following areas of knowledge are central to the undergraduate degree in philosophy:

- knowledge of some of the principal philosophical texts in the history of western philosophy, from its beginnings in Greece to the late nineteenth century;
- knowledge of some of the main currents in twentieth-century philosophy, including some acquaintance with contemporary philosophical issues and modes of inquiry;
- more concentrated and detailed knowledge of a single major author or a single

philosophical movement; and
• mastery of elementary formal logic.

In addition, students completing the degree in philosophy are expected to acquire:
• the ability to form reasoned opinions about the issues—moral, religious, political, etc.—that educated people debate;
• the ability to understand, analyze, and evaluate complex arguments and theories;
• the ability to distinguish between the main thrust of an argument or position and what is ancillary to it;
• the ability to discover and critically examine the underlying presuppositions of major systems of ideas or programs for action;
• the ability to see important connections between different systems of ideas or programs for action;
• the ability to explain difficult ideas and concepts in an informed, effective, and coherent manner;
• the ability to develop a thesis and present a coherent argument for it;
• the ability to write a clear and coherent essay; and
• the ability to engage in rational and productive discussion of issues and arguments.

Bachelor's Degree Program

Beginning 1992-93, the department has introduced a new general track major. See the department office for details.

Students are advised to consult the current *Registration Handbook and Schedule of Courses* for the most accurate information on prerequisites, since these sometimes vary with instructors. Students should also obtain a copy of the complete course descriptions published each semester by the department.

Courses may be taken in any order providing prerequisites, if any, are met.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
PHIL 3000 and 3010 History of Ancient Philosophy and History of Modern Philosophy	6
PHIL 3100 Ethical Theory	3
PHIL 2440 Symbolic Logic or 4440 Mathematical Logic	3
PHIL 4040 Twentieth-Century Philosophy	3
PHIL 4340 Epistemology	3
PHIL 4360 Metaphysics	3
One course concerned with a single philosopher or a philosophical movement (or a substitute as approved by the student's advisor)	3
Electives	6

Note: The department offers a number of topically oriented majors that are interdisciplinary in nature, including law and society, dimensions of 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 departmental 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.

The following areas of knowledge are central to the undergraduate degree in physics:
• knowledge of the basic subfields of physics (classical mechanics, electricity and magnetism, quantum mechanics, statistical mechanics and thermodynamics), as well as knowledge of at least one specialty area of application (e.g., solid state physics or optics);
• knowledge of the major principles of physics, their historical development, and the roles they play in the various subfields of physics;
• awareness of the interrelations between theory and observation, the role of systematic and random experimental errors, and methods used to analyze experimental uncertainty and compare experiment with theory;
• knowledge of physical phenomena and experience in the use of basic experimental apparatus and measuring instruments;
• knowledge of mathematics sufficient to facilitate the acquisition and application of physical principles; and
• awareness of the importance of physics in other fields such as chemistry, biology, engineering, medicine, and in society at large.

In addition, students completing the degree in physics are expected to acquire:
• the ability to solve problems involving applications of physical principles to new situations;
• the ability to construct and assemble experimental apparatus, to conduct and analyze measurements of physical phenomena, to analyze properly experimental uncertainty, and to make meaningful comparisons between experiment and theory; and
• the ability to communicate results of scientific inquiries verbally and in writing.

Bachelor's Degree Programs

Three different plans are available to students in physics. A distributed studies program, computer applications in physics, is also available (see Curriculum Note 1 below). Because there is some flexibility within each plan, 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.

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.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below (see Note 2).

Plan 1

Primarily for those planning graduate work in physics; includes 45 hours of physics courses.

Major Requirements	*Semester Hours*
PHYS 1110 and 1120 General Physics 1 and 2	8
PHYS 1140 Experimental Physics	1
PHYS 2140 Methods of Theoretical Physics	3

PHYS 2150 Experimental Physics.....1
PHYS 2170 Foundations of Modern Physics...3
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 Laboratory.....5
PHYS 4230 Thermodynamics and Statistical Mechanics.....3
PHYS 4410 and 4420 Atomic and Nuclear Physics.....6
PHYS 4430 Senior Laboratory.....2
In addition, the following nonphysics courses are required:
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 1 and 2 *or* CHEM 1151 and 1171 Honors General Chemistry 1 and 2.....10-12
Electives in physics, to be chosen from departmental list.....1-3

Recommendations for Plan 1 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.

Plan 2

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, pre-medicine, etc.; includes a minimum of 36 hours of physics.

Major Requirements *Semester Hours*

PHYS 1110 and 1120 General Physics 1 and 2.....8
PHYS 1140 Experimental Physics.....1
PHYS 2140 Methods of Theoretical Physics....3
PHYS 2150 Experimental Physics.....1
PHYS 2170 Foundations of Modern Physics...3
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 PHYS courses: 3340, 4150, 4340, 4510, 4610, 4620, 4410, 4430, 4810, 4820, 4830, 4840, 5010, 5030, 5040, 5770.....3
In addition, the following nonphysics courses are required:
CHEM 1111 and 1131 General Chemistry 1 and 2 *or* CHEM 1151 and 1171 Honors General Chemistry 1 and 2.....10-12
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 2 be in close contact with their advisors. For example, astrophysical, planetary, and atmospheric science courses numbered 3710 or above are acceptable to meet the plan 2 astrophysics or atmospheric physics interdisciplinary requirement.

Plan 3

For students intending to be secondary teachers; includes a minimum of 26 hours of physics and a minimum of 20 hours in education courses.

Major Requirements *Semester Hours*

PHYS 1110 and 1120 General Physics 1 and 2.....8
PHYS 1140 Experimental Physics.....1
PHYS 1150 Experimental Physics.....1
PHYS 2130 General Physics 3.....3
PHYS 2140 Methods of Theoretical Physics....3
PHYS 2150 Experimental Physics.....1
PHYS 2160 Experimental Physics.....1
PHYS 3210 Analytical Mechanics.....3
PHYS 3310 Principles of Electricity and Magnetism 1.....3
PHYS 3330 Junior Laboratory.....2
In addition, the following nonphysics courses are required:
CHEM 1111 and 1131 General Chemistry 1 and 2 *or* CHEM 1151 and 1171 Honors Geneal Chemistry 1 and 2.....10-12
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:
Students are required to take EDUC 3303 or pass a speech adequacy test before they can register for student teaching.
Biology and earth science (geology or physical geography): two semesters each.
History and/or philosophy of science: one semester.

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.....2
EDUC 4912 Practicum in Teaching.....1
EDUC 4232 Teaching Reading in the Content Area.....2
EDUC 4463 Teaching Exceptional Children in the Regular Classroom.....2
EDUC 4382 Methods and Materials in Science.....3
EDUC 4712 Student Teaching.....14
Note: Recommended elective mathematics courses for students in this plan include MATH 3000 Introduction to Abstract Mathematics, MATH 3110 Introduction to Theory of Numbers, and MATH 3210 Euclidean and Non-Euclidean Geometries.

Curriculum Notes
1. Students may transfer among plans at any stage of their college career. However, junior or senior students transferring into plan 1 or the distributed studies program, computer applications in physics, may require one or two semesters beyond the normal four years.
2. With the approval of an advisor, a student who starts with PHYS 2010 and then decides to become a physics major may go directly into PHYS 1120. Similarly, it is not essential for a student who has 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

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 1, 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 2 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 the Graduate School.

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 covers the thesis. The comprehensive-final examination is oral.

Doctoral Degree

Prerequisites. Same as for master's degree, above.

Languages. The department has no requirement in foreign languages.

Qualifying Examination. Same as for master's degree, above.

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 is given. The examination covers the material in the courses normally taken by all Ph.D. candidates in the first and second years of graduate study. The oral part is given shortly after the written part. Both the written and oral parts are 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 *B* (3.00) or better), of which at least 27 must be 5000-level-or-above physics courses. The remainder must also be from that group or be 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 students with typical undergraduate preparation will take Quantum Mechanics 1 and 2 (PHYS 5250 and 5260), Electricity and Magnetism (PHYS 7310-7320), Statistical Mechanics (PHYS 7230), and Theoretical Mechanics (PHYS 5210). Most students also find it necessary to take one or more mathematical physics courses. In addition, Quantum Mechanics 3 (PHYS 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, 5250, 5260, 7230, 7310, 7320, and 6 semester hours of 5000- or 6000-level mathematics courses. In addition, 18 semester hours of courses in medical physics at the University of Colorado Health Science Center 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 1 and 2 (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 in the art and science of politics. Work within the department is organized around seven basic fields: American government and politics, comparative politics, public policy, 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. Four centers of research activity are housed within the department: the Center for the Study of American Politics, the Center for Comparative Politics, the Center for International Relations, and the Center for Public Policy Research.

The department participates in the distributed studies program and also offers a computer applications major combining computer science and data analysis skills with knowledge of the political system. In addition, programs leading to the M.A. and Ph.D. degree are offered.

The following areas of knowledge are central to the undergraduate degree in political science:

- knowledge of basic facts and concepts about the American political system;
- knowledge of basic facts and concepts relating to similarities and differences in Western and non-Western political systems;
- knowledge of basic facts and concepts about international relations, international organizations, and alliances;
- knowledge of the basic policy problems, domestic and international, facing contemporary political systems; and
- knowledge of the history of Western political thought and of the values espoused in contemporary politics.

In addition, students completing the degree in political science are expected to acquire:

- citizenship skills, including the ability to analyze and debate alternative policy options for the problems facing the U.S. and the world community;
- analytical skills, including the ability to construct logical arguments, to collect and

interpret evidence, and formulate reasoned conclusions; and

• writing skills sufficient to write research papers or essays on topics in political science. The department does not teach writing skills, but does provide opportunities to develop those skills through essay exams and term papers.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

Students in the regular political science major must complete 36 semester hours in the department, of which 24 hours must be in upper-division courses. All 36 hours must be completed with grades of *C-* or better and an overall grade point average of 2.00. None of the required hours may be taken pass/fail.

Nine hours are required from the following lower-division fields:

American

PSCI 1101 The American Political System 3

International

PSCI 2222 Introduction to International Relations 3

Comparative

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

Students may not receive credit for PSCI 2012 if they have taken PSCI 2112 or PSCI 2122.

Complete 18 hours of the required 24 upper-division hours from the following four primary fields:

American 6

Comparative 3

International 3

Theory (PSCI 4004 History of Political Theory and one other upper-division theory course) 6

Nine hours of political science elective credit are required. Six of these hours must be upper division.

Required courses in addition to political science courses:

ECON 2010 Principles of Microeconomics....4

ECON 2020 Principles of Macroeconomics ...4

All undergraduate transfer students majoring in political science must accumulate a minimum of 45 grade points (grade points are equal to credit hours multiplied by letter grade as expressed numerically on a four-point scale) in upper-division political science courses at the University of Colorado at Boulder in order to qualify for the B.A. degree.

All political science majors graduating in the spring, summer, or fall terms are required to take the senior comprehensive exam given in the spring. Percentile performances are recorded in student files.

Graduate Degree Programs

Applications for the M.A. and Ph.D. degrees are accepted from qualified and motivated students wishing to probe deeply into the analysis of political life. Professional courses in the graduate curriculum range from problem definition in policy analysis to the study of the global political economy. The curriculum is structured to lead to the Ph.D. degree and also offers several programs culminating in the M.A. degree. In addition to the regular master's degree in political science, special focus is placed on two professionally oriented M.A. degrees, one oriented toward entry into the public sector as a policy analyst and one that prepares 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.

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. Applicants for the M.A. in political science (public policy) should present at least 9 hours of undergraduate political science course work. In addition, the department requires applicants to present quantitative and verbal GRE scores that total at least 1100 and that show a score of at least 500 on the verbal portion. Three letters of recommendation, an undergraduate grade point average of at least 3.00, official transcripts, and a short essay detailing interests and plans are also required to complete the application packet. Foreign applicants may supplement their application by presenting TOEFL scores. Students with especially strong records (e.g., total GRE scores greater than 1250 and an undergraduate GPA greater than 3.50) may apply for direct admission to the Ph.D. program. Applications should be filed with the department by February 15, although late applications are considered until May 1, and may be considered after that at the department's discretion. Decisions regarding admission and financial aid are typically completed during March each year.

Graduate Minor in Political Science

Graduate students who choose to minor in political science should consult the course descriptions for 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 students can be admitted as regular degree students and the work involved is in addition to the minimum hourly requirements for the degree.

Students shall concentrate in any one of seven political science fields and take 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 policy, law, and politics; international political science, 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, including at least 21 semester hours at the 5000 level or above, with at least 12 semester hours of work in regularly scheduled political science seminars; and 4 semester hours for the M.A. thesis. Students may take 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.

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.

Students 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 serves as the first reader of the M.A. thesis. The second read-

er, who likewise has 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.

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 is oral and lasts approximately two hours. It concentrates on the student's field of emphasis as well as the M.A. thesis. The comprehensive-final examination committee has 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 the three committee members.

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 nongovernmental 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 take 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 is 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 the M.A. program in public policy is to train professional policy analysts for nonacademic careers. The curriculum is designed to provide the analytical skills necessary to participate responsibly and effectively in the government. The M.A. in political science (public policy) may be taken concurrently with the interdisciplinary graduate certificate program in environmental policy.

This is an M.A. with thesis, requiring 33 credit hours. It includes 27 hours of course work, 2 hours of independent study for an applied research internship, and 4 hours of thesis credit. Completion of these requirements normally takes two years and at least one summer.

The core curriculum consists of two required seminars in the areas of policy analysis, introduction to data analysis, and context-sensitive methods. Specific courses in economics are not required, but there is a strong expectation that all students should be familiar with the tools of economic analysis, particularly in the policy area in which they are interested. The remaining 15 hours of electives should be used to develop additional analytical skills and/or substantive specialization in the student's area of substantive interest. The certificate program in environmental policy provides one alternative for substantive specialization, drawing on courses in economics, philosophy, geography, and other subjects. The internship is a supervised applied research project for a policy client, which should lead into the thesis project.

The thesis is a research report on a policy problem that provides concrete demonstration of the student's analytical skills, intellectual perspective, and substantive knowledge. As a general rule, the policy research report is somewhat shorter (but not less analytical) than a standard M.A. thesis.

For a description of the thesis committee, see the section on Master of Arts in Political Science.

Doctor of Philosophy

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 that 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 Ph.D. candidate must present three fields of competency. The first two, labelled the major field and second field, are to be the subject of the Ph.D. comprehensive examination. A minimum of two seminars must be presented in these fields. Additional course work is anticipated in the major and second fields. Competency in the third field may be demonstrated by completing two graduate seminars in that field with a GPA of 3.50 or higher, or through comprehensive examination. Furthermore, each student's program shall include at least one seminar in each of the following three categories: American government, public administration, and law and politics; international relations/comparative politics (comparative politics and international relations); and theory (political philosophy, empirical theory, and methodology).

Thirty-three hours must be taken in political science. Of this 33, 30 must be in regularly scheduled seminars. Not more than 6 hours of political science graduate research topics combined are allowed toward the degree. The maximum amount of work that may be transferred to this University for the Ph.D. is 15 semester hours.

First-Year Requirements. All graduate students in the Ph.D. program are required to take three core seminars. At least two of these core seminars must be in the fields of American politics, comparative politics, and international relations. During the first year in residence, at least two of the three core seminars must be completed. Also during the first year in residence, students

enrolled in the Ph.D. program take PSCI 5075 (Introduction to Professional Political Science) and PSCI 5085 (Introductory Data Analysis).

Preliminary Ph.D. Research Paper. Each Ph.D. student is required to select a topic that leads to the formulation, execution, and written presentation of a piece of original research. This research paper is expected to be of potentially publishable quality.

The research paper is read by the student's three-person advisory committee, consisting of the student's major advisor, a second major field reader, and a representative of the student's second field of concentration. Following consideration of the written work, an oral examination is conducted by the advisory committee to test both the depth of the student's research as well as the breadth of the student's general training. Competence in core seminar materials is expected.

The oral examination committee is charged with the task of evaluating the potential of each Ph.D. student. Students whose work is deemed inadequate are asked to leave the program.

Students who have not previously earned a master's degree in political science are eligible for a plan II M.A. upon completion of 30 hours of graduate course work. The awarding of the plan II M.A. is at the discretion of the examining committee. This decision is independent of the decision to encourage or discontinue the student in the Ph.D. program.

Advisory Committee. The role of the advisory committee is crucial; its function is to guide students through their degree programs. Students shall select a chair for the committee no later than the end of the second semester in residence. 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.

Research Competency. Each Ph.D. student must fulfill the research competency requirements as determined in conjunction with the advisory committee. At a minimum, this standard may be met by successful completion of a program of methodological or language study.

Methodological competency is demonstrated by completing PSCI 5095 or 7095 with a grade of *B* or better, or successfully completing other course work as approved by the GCC each year. Advanced competency requires completion of at least two advanced methods courses beyond PSCI 5085 or 7085.

Language competency is evidenced by completion of a fourth-semester college-level language course of 3 or more hours with a grade of *B* or better, high GSFLT scores for the language, high scores on another standardized examination recognized by University of Colorado language departments, or evidence of competence in the language. Advanced competency is demonstrated by completion of at least a fifth-semester language course or other work deemed appropriate by the advisory committee.

The competency requirement may also be met by demonstrating basic competency standards in both methodological and language skills (i.e., by completing PSCI 5095 or 7095 *and* fourth-semester foreign language skills).

Committees may set higher research competency standards for the student than those outlined above.

The competency standard must be communicated in writing to the Director of Graduate Studies by the end of the second year in residence. Both the principal advisor and the student must signify that they accept the committee's determination of research competency standard. Required course work (or its surrogate) must be completed no later than the semester in which the Ph.D. comprehensive examination is taken.

Comprehensive Examinations. The comprehensive examination serves to demonstrate that students have acquired the skills and knowledge necessary to function as independent scholars in political science generally and in their chosen fields of specialization. Broad knowledge is expected as well as a critical understanding of the literature and the ability to apply that understanding to the central, enduring questions of politics and government.

The exam is divided into three parts: the written, the oral, and the dissertation prospectus defense. For the purposes of the examination, political science is divided into seven fields of concentration: American government, law and politics, public administration and policy, comparative politics, international relations, political philosophy, and empirical theory and methodology. Both the written and the oral parts of the comprehensive exam cover two fields chosen by the student and provide a rigorous, comprehensive test of the student's knowledge of the specialization field and of the relationships among these fields as well as their location in a broad context, spanning comparative, philosophical, historical, and methodological issues.

Comprehensive examinations are administered once each semester. In the fall semester, the written examinations are normally given during the last week of November, and in the spring semester they are normally given during the third week of April. Oral examinations are scheduled individually, within three weeks of the completion of the written part of the examination and typically during the normal University examination period.

The written examination is constructed by the graduate curriculum committee, through the actions of the field examination committees. The written examination in each field is comprised of two sections of questions. Questions in the first section emphasize breadth of knowledge and integration, while those in the second section focus more on the student's depth of knowledge on specific topics and issues in the field.

A passing grade on the written part of the exam indicates that the student is prepared to proceed to the oral examination, which may hinge in part on the elaboration and exploration of the material in the written examination. Students who fail the written exams are provided a single opportunity to retake them, and are given an explanation of the failure by the readers.

The oral part of the comprehensive examination is conducted by a five-member committee, normally consisting of the student's advisory committee, the chair of which also chairs the examination committee, and the two-member examining committee from the student's major field. In addition to general questions in all chosen fields, the oral examinations probe the written examination answers, providing students the opportunity to amplify, elaborate, and explain their answers. Final grades in each field are assigned by the majority vote of the oral examination committee. A final grade of distinction, pass, or fail is assigned following the orals. Distinction is reserved for excellence on both written and oral examinations. Failing a field in the oral examination may, at the discretion of the examining committee, involve retaking

both the written and the oral examinations at the next administration of the exam, whether the failure was announced following the written or the oral part of the examination. If a student fails the oral exam, the chair of the advisory committee provides a written explanation to the student.

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 is 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 disqualifies 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.

CU-Boulder's Department of Psychology has been ranked by the National Academy of Sciences 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.

The following areas of knowledge are central to the undergraduate degree in psychology:

- general understanding of the wide range of topics with which modern psychology deals;
- knowledge of the social and biological background of human nature;
- critical awareness of the research bases necessary for understanding and predicting behavioral outcomes;
- understanding of descriptive and inferential statistics, including measures of central tendency, variance, and correlation;
- understanding of psychology as a laboratory science and of the interplay between theory and research;
- awareness of possible practical applications of research knowledge;
- knowledge of the nature and the individual development of the psychological attributes of persons;
- knowledge of the influences of interactions between attributes of the social situation and psychological attributes of a person in generating human behavior and subjective experience;
- understanding of the development and amelioration of abnormal thoughts, feelings, and behavior;
- understanding of major philosophical issues in biological and developmental psychology;
- familiarity with the mechanics of heredity, neural transmission, plasticity, development, and aging;
- achievement of a reasonable integrated historical overview of modern psychology, including the major subdivisions of the discipline and their interrelations;
- knowledge of major ideas and scholars in the discipline's subfields and the relationship of ideas from one area to another; and
- awareness of the ethical issues germane to research investigation raised by the applications and practice of psychology as a profession.

In addition, students completing the degree in psychology are expected to acquire:

- the ability to calculate and interpret basic statistical tests;
- the ability to design basic factorial experiments;
- the ability to evaluate critically research designs, results, and interpretations;
- the ability to design and carry out research on their own;
- the ability to know when to use basic statistical tests to formulate hypotheses, collect and analyze data, draw conclusions, and clearly communicate research findings;
- the ability to design, interpret, and criticize laboratory experiments and results;
- the ability to assess the characteristics of social situations and measure the psychological attributes of individuals;
- the ability to relate the subject of psychology to their own experience;
- the ability to use the primary literature of biological and developmental psychology to prepare a clear written summary of a research topic; and
- the ability to place current psychological concerns into an appropriate overarching conceptual framework that encompasses the entire field.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below. These requirements apply to all psychology majors who declare their major after July 1, 1990. Those majors who declared before that date have the option of completing their major under either the old rules or the new rules.

Major Requirements	*Semester Hours*
PSYC 1001 General Psychology	4
PSYC 2101 Statistics and Research Methods in Psychology	4
(Students must complete each of the two classes above with a grade of *C* or better before declaring psychology as a major.)	
PSYC 2012 Biological Psychology 1	3
At least one course from the following experimental/quantitative laboratory courses:	
PSYC 4145 Cognitive Psychology	4
PSYC 4165 Psychology of Perception	4
PSYC 4205 Psychology of Learning	4
PSYC 4376 Research Methods in Social Psychology	4
At least one course from the following social/clinical courses:	
PSYC 4303 Abnormal Psychology or PSYC 4313 Psychopathology	3-4
PSYC 4406 Social Psychology	3
PSYC 4456 Psychology of Personality	3
PSYC 4684 Developmental Psychology	3
PSYC 4733 Principles of Psychological Testing	4
At least one course from the following biopsychology courses:	
PSYC 4052 Physiological Psychology	4
PSYC 4072 Clinical Neuroscience	3
PSYC 4092 Hormones and Behavior	3
PSYC 4102 Behavioral Genetics	3
PSYC 4132 Behavioral Neuropharmacology	3
PSYC 4385 Ethology and Comparative Psychology	3

PSYC 4672 Principles of Developmental Psychobiology 3
At least one course from the following integrative psychology courses:
PSYC 4001 Honors Seminar.....3
PSYC 4511 History of Psychology.....3
PSYC 4521 Critical Thinking 3
Additional electives to bring total hours in psychology to at least 30, of which at least 18 must be upper division. (Students are encouraged to use independent study to gain field or laboratory experience. However, independent study hours are pass/fail credit only and cannot be used toward the 30 hours required for graduation.)

In addition to the courses listed above and the minimum of 30 hours in psychology, the student is required to pass one of the following natural science sequences with a grade of *C-* or better:
ANTH 2010-2020 Introducrion to Physical Anthropology 1 and 2
CHEM 1011-1031 Environmental Chemistry 1 and 2
CHEM 1051-1071 Introduction to Chemistry and Introduction to Organic and Biochemistry
CHEM 1111-1131 General Chemistry 1 and 2
CSCI 2204-2250 Discrete Structures and Data Structures and Algorithms
EPOB 1210-1220 General Biology 1 and 2
MATH 1300-2300 Analytical Geometry and Calculus 1 and 2
MCDB 1050-1060 Introduction to MCD Biology 1 and 2
PHYS 1110-1120 General Physics 1 and 2 (science and engineering majors only)
PHYS 2010-2020 General Physics 1 and 2

Note: Transfer students must complete at least one upper-division course on the Boulder campus with a *C-* or better in each of the areas of experimental/quantitative laboratory psychology, social/clinical psychology, and biopsychology.

In order to graduate in psychology, all students are required to complete an assessment test.

Graduate Degree Programs

Students are admitted for graduate studies leading to the Ph.D. in one of five fields: behavioral genetics, behavioral neuroscience (including learning and motivation), clinical (adult and child), cognitive, and social. 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 mechanisms 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, with separate tracks in adult adjustment and child development/child clinical psychology. 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. Additional courses in the department offer 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 receive a master of arts degree in the course of working toward the Ph.D. Students who receive the Ph.D. 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 show the ability to work independently in their chosen field and must make 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. There is a first-year research requirement that starts the student on an active program of research. The student must also enroll in a sequence of courses designed to give exposure to various research topics and methods. In addition, 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 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 a public 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 used 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.

The following areas of knowledge are central to the undergraduate degree in religious studies:
- a general knowledge of the beliefs, practices, and institutions of Asian, Western, and Native American religious traditions;
- in-depth knowledge of one major religious tradition; and
- general knowledge of different methodological approaches to the study of religion.

In addition, students with a degree in religious studies are expected to acquire:
- the ability to identify textual, performative, and artifactual data relevant to the study of religion;
- the ability to draw connections between different historical and/or cultural contexts of religion; and
- the ability to communicate data analysis and interpretation competently in written form.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements

Students must complete at least 36 hours of courses on religion, including at least three of the lower-division offerings (9 hours, preferably completed before upper-division work) and RLST 4830 (Senior Majors Seminar). At least

18 hours of upper-division work (including RLST 4830) must be taken on the Boulder campus.

Graduation with Honors

The honors program in religious studies offers the opportunity for highly motivated undergraduates to undertake a deeper and more individualized study than is provided by the regular B.A. curriculum and to earn an honors designation on their diploma. Religious studies 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.

Master of Arts in Religious Studies

The master of arts in religious studies requires 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 Approaches to 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. An acceptable thesis must be written and, after approval of the final draft of the thesis, a comprehensive-final examination must be passed.

SLAVIC LANGUAGES AND LITERATURES

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

The department offers a major in Russian, emphasizing language and literature. 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.

The following areas are central to the undergraduate degree in Russian:

- awareness of the fundamental outlines of the history of Russian literature, from the Middle Ages to the present day, together with an awareness of major historical events;
- familiarity with the major Russian creative writers of the nineteenth and twentieth centuries;
- awareness of basic critical methodologies as they relate to the study of Russian literature; and
- awareness of the cultural determinants that help shape the contemporary Soviet mindset.

In addition, students with a degree in Russian are expected to acquire:

- the ability to comprehend contemporary Russian, written or spoken, to a degree permitting sophisticated analysis of literary works or films;
- the ability to analyze Russian literary texts and give a reasoned response to them in literate English;
- the ability to write and converse in Russian at their own intellectual level; and
- the ability to determine the ways in which a Soviet interpretation or approach to a particular issue would differ from an American one.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
Required beginning- and middle-level courses (may be met totally or in part by courses taken elsewhere, transfer credit, or other work accomplished):	
RUSS 1010 and 1020 Beginning Russian 1 and 2	10
RUSS 2010 and 2020 Second-Year Russian Grammar and Composition 1 and 2	6
RUSS 2030 and 2040 Second-Year Russian Oral Practice 1 and 2	4
RUSS 3010 and 3020 Third-Year Russian 1 and 2	6
RUSS 3200 Russian Phonetics	3
Recommended electives:	
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 1 and 2	4
RUSS 4821 Twentieth-Century Russian Literature (in English)	3
Students must complete 35 hours beyond the first year or 30 hours beyond the second year on the Boulder campus (even if they enter the program at an advanced level), to include the following courses:	
RUSS 4010 and 4020 Advanced Grammar Topics and Composition 1 and 2	6
RUSS 4810 Pre-Revolutionary Russian Literature	3
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 4210 Open Topics: Nineteenth-Century Russian Literature in Russian	3
RUSS 4310 Pushkin and His Time	3
RUSS 4440 Tolstoy	3
RUSS 4510 Twentieth-Century Russian Poetry	3
RUSS 4610 Twentieth-Century Russian Literature: Prose in the Soviet Union	3

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 is determined in consultation with the department and should be done before registering for classes.

Students studying Russian may earn credit for courses taken abroad in the summer or during the academic year after consultation with the department. Information on such programs may be obtained through the Office of International Education.

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.

SOCIOLOGY

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

The Department of Sociology offers an undergraduate major in general sociology as well as undergraduate concentrations in

four fields: criminology, population and health issues, sex and gender, and social conflict.

The following areas of knowledge are central to the undergraduate degree in sociology:

- knowledge of the basic data, concepts, theories, and modes of explanation appropriate to the understanding of human societies;
- knowledge of the structure of modern American society, its social stratification, its ethnic, racial, religious, and gender differentiation, and its main social institutions—family, polity, economy, and religion;
- knowledge of the basic social processes that maintain and alter social structure, especially the processes of integration, organization, and conflict; and
- understanding of the diversity of human societies, including the differences between major historical types such as foraging, agricultural, industrial, and post-industrial societies.

In addition, students completing the degree in sociology are expected to acquire:

- research and writing skills sufficient to locate and consult works relevant to a sociological investigation and to write a sociological paper that is coherent, cogent, and grammatically correct;
- methodological skills sufficient to understand the basic procedures of sociological research and to understand the problems of reliability and validity;
- statistical skills sufficient to understand and interpret the results of sociological research; and
- critical skills sufficient to analyze and evaluate sociological writings.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
SOCY 1001 Analyzing Society and SOCY 1011 Introduction to Sociological Ideas	6
SOCY 4001 Research Methods in Sociology *or* SOCY 4011 Field Experience in Sociology	6
Electives	18

Graduate Degree Programs

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 preparation and completion of 6 thesis hours. At least 18 of these hours must be taken in the sociology department at CU-Boulder. The M.A. thesis must be defended at an oral examination.

Doctoral Degree

The main requirements for the doctoral 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 write a Ph.D. dissertation and defend this dissertation in an oral examination.

A detailed description of the M.A. and Ph.D. programs is 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, CO 80309-0327.

SPANISH AND PORTUGUESE

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

The department has identified the following as educational outcomes for the two tracks within the Spanish major.

The following areas of knowledge are central to the undergraduate degree in **Spanish language and literature:**

- awareness of the fundamental outlines of the history of Spanish literature or of Spanish-American literature;
- familiarity with the major creative writers in either Spanish or Spanish-American literature;
- awareness of basic critical methodologies in the study of poetry, drama, narrative fiction, and the essay; and
- awareness of the social and historical contexts in which particular literary traditions developed.

In addition, students completing the degree in Spanish language and literature are expected to acquire:

- the ability to read sophisticated Spanish texts at a level at which literary analysis can be performed;
- the ability to write and speak Spanish sufficiently to participate in critical discussions and write critical essays;
- the ability to analyze and interpret literary texts in terms of themes, characters, structure, style, and overall textual strategies;
- the ability to relate analysis and interpretations of different texts to one another; and
- the ability to communicate such interpretations competently in written form in Spanish.

The following areas of knowledge are central to the undergraduate degree in **international Spanish for the professions:**

- a basic command of modern business practices as applied to the Spanish-speaking world;
- a working knowledge of the theories of economics, business law, and international trade and finance;
- an awareness of the cultural environment in which business is conducted in the Spanish-speaking world;
- a working knowledge of fundamental business Spanish terminology;
- basic business knowledge according to the canons of this discipline; and
- an awareness and understanding of international relationships.

In addition, students completing the degree in international Spanish for the professions are expected to acquire:

- the ability to read and interpret in cultural and business-related terms sophisticated Spanish texts concerning business transactions;
- the ability to write and speak Spanish sufficiently to communicate effectively on business-related issues, to be involved in critical discussions, and to write critical essays on the subject;
- the ability to analyze a particular business problem—to place it in a relevant context and to formulate an appropriate response; and
- the ability to translate adequately business-related documents.

Bachelor's Degree Programs

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Language and Literature Option

Major Requirements *Semester Hours*

SPAN 3000 Advanced Spanish Language Skills, SPAN 3100 Literary Analysis in Spanish, and SPAN 3120 Advanced Spanish Grammar...11

At least 9 hours in upper-division literature, culture, and/or language courses.....9

At least 12 hours in courses at the 4000 level or above, with at least 6 hours devoted to Spanish Peninsular literature (4150 and 4160) or Spanish-American literature (4170 and 4180), and 3 hours devoted to either Spanish or Spanish-American literature (from the four masterpieces courses listed previously). 12

In addition to the 32 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 32 credit hours in 3000-level or above courses. Students seeking teaching certification in Spanish must take SPAN 3050, 3120, and 3200 or 3210. Students who want certification for teaching at the secondary level should note that the School of Education requires SPAN 4650 and 4660. 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 CU-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 are not 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.

Professional Spanish Courses (15 credit hours)

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

Spanish Language Courses (17 credit hours)

SPAN 3000 Advanced Spanish Language Skills.....5
SPAN 3100 Literary Analysis in Spanish 3
SPAN 3120 Advanced Spanish Grammar 3
SPAN 4010 Advanced Rhetoric and Composition 3
Elective (recommended: SPAN 3310 or 3340) 3

Courses in the College of Business and Administration (15 credit hours)

Fall, Junior Year
ACCT 2000 Introduction to Financial Accounting.....3
Spring, Junior Year
MKTG 3000 Principles of Marketing.....3
Fall-Spring, Senior Year
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.)

Area Courses (12 credit hours)

These are related courses in arts and sciences to be taken from the following distribution: 12 credit hours total from areas I and II or from areas I and III. Note: Some courses are not offered every semester.

Area I (6 credit hours)
ANTH 3110 Ethnography of Mexico and Central America 3
ANTH 4220 Archaeology of Mexico and Central America 3
CSCI 1200 Introduction to Programming 1...3
CSCI 1210 Introduction to Programming 2...4
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 3018 Selected Readings in Latin American History.....3
HIST 4118 History of Mexico to 1821.....3
HIST 4128 The Emergence of Modern Mexico 3
HIST 2537 Chicano History 3
LING 2200 Language in its Social Context....3
LING 3500 Language and the Public Interest.....3
MATH 1050, 1060, 1070 math modules 3
MATH 1080, 1090, 1100 math modules 3
Area II (6 credit hours)
ECON 4111 Money and Banking Systems....3
ECON 4211 Seminar: 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 4032 Latin American Political Systems...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 (6 credit hours)
Complete 6 more hours from the courses listed above or other upper-division courses in Spanish. The required 6 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 are 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.

Study Abroad

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 Costa Rica, Dominican Republic, Mexico, and Spain. Credit earned normally counts 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 is evaluated on an individual basis. It should be noted that courses taken abroad and designated as Spanish are also subject to the 45-hour maximum rule of the College of Arts and Sciences.

Students interested in study abroad should see the International Education section of this catalog.

Students who present transfer work or credit earned in CU study abroad programs to satisfy major requirements are expected to complete at least 12 upper-division credits, including at least 9 from the 4000-level masterpiece courses listed above, on the Boulder campus.

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.

Graduate Degree Programs

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 M.A. 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).

Doctoral 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 must 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 are 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.

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 Doug Varone, Meredith Monk, John Mead, Wade Madsen, and Judith Ren-Lay in dance; Celeste Holm, Jean-Claude van Itallie, Billie Whitelaw, and Robert Patrick 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 Programs—Theatre

The following areas of knowledge are central to the undergraduate degrees in theatre:

- knowledge of the major works of dramatic literature that are representative of the most important eras in the development of theatre and drama in the western world;
- knowledge of the history of theatrical production—its styles, conventions, and socially related mores—from the ancient Greeks to the present time;
- knowledge of the various means through which a theatrical concept is realized; and
- awareness of the aesthetic and intellectual relationship between theatre in its various twentieth-century modes and contemporary society.

In addition, students completing the degree in theatre are expected to acquire:

- the ability to analyze and interpret plays and literature with particular attention to acting and performance of literature, designing, directing, and/or playwriting and criticism;
- the ability to use, with safety and efficiency, the tools and equipment basic to theatre production technology;
- the ability to communicate to an audience through at least one of the components of theatrical art—acting, directing, designing, playwriting, or criticism; and
- the ability to function effectively as a member of a production team in the preparation of regularly scheduled public productions.

B.A. Degree in Theatre

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.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements	*Semester Hours*
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 Laboratory	1
THTR 2035 Design Fundamentals	3
THTR 2003 Acting: Beginning	3
THTR 2013 Performance of Literature	3
THTR 2085 History of Fashion 1 *or* THTR 2043 Vocal and Physical Preparation (Note 1)	3
(The courses listed above should be taken during the first two years of study.)	
THTR 3035 Theatre Practicum (2 semesters)	4
THTR 3071 Directing	3
THTR 4081 Senior Seminar	3
Elective THTR hours, 3 of which must be in theatre history/literature	9
Elective(s) in dance	3
Electives in dramatic literature, outside the Department of Theatre and Dance, including at least one course in Shakespeare (ENGL 3562, 3572) (Note 2)	6

Curriculum Notes:

1. B.F.A. (acting and performance) students must take Vocal and Physical Preparation (THTR 2043).
2. B.F.A. (acting and performance) students must elect to take all six credits in Shakespeare (ENGL 3562 and 3572).

A student wishing to qualify for teaching certification should check in the department office for the requirements of this option.

B.F.A. Degree in Theatre

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 pursues 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 is 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 is based on talent, academic record, motivation, and audition-interviews. Auditions are held each fall semester. The college counts only 67 semester hours of THTR credits toward the total hours required for graduation. B.F.A. students with concentrations in acting or performance studies must achieve grades of *A* or *B* in their concentration to remain in the B.F.A. program.

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.)

Major Requirements *Semester Hours*

I. Concentration in Acting
29-33 semester hours are required: 26 in THTR courses, 3-7 in other disciplines. Students accepted into the acting concentration each year constitute an ensemble and as a group 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.

THTR 3013 Studio 1: Acting Process: Technique 4
THTR 4003 Studio 2: Ensemble Performance of Literature 3
THTR 4013 Studio 3: Performance of Elizabethan Roles 4
THTR 4023 Studio 4: Acting Process: Scene Study 4
THTR 4033 Advanced Vocal and Physical Preparation 3
THTR 4043 Studio 5: Contemporary British and American Theatre 4
THTR 4053 Studio 6: Senior Repertory 4
Plus:
DNCE 1100 Beginning Ballet 1
DNCE 1160 Dance Techniques: Recreational Dance Forms *or* DNCE 2400 Theatre Dance Forms 1-2
Additional dance/movement courses 0-3
PMUS 1200 Voice Class 1

II. Concentration in Design and Technical Theatre
33 semester hours are required: 24 in THTR courses, 9 in other disciplines. Students in the design and technical theatre concentration should use the electives in the B.A. requirements to fulfill prerequisites for the following.

THTR 3025 Developments in Theatre Architecture and Design 3
THTR 4005 Costume Design 2 *or* THTR 4015 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 are required: 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.

THTR 4003 Studio 2: Ensemble Performance of Literature *or* THTR 4051 Playwriting 3
THTR 4011 Seminar: Theory and Criticism 3
THTR 4071 Advanced Directing 3
Electives in theatre history/literature 12
Elective in design and technical theatre 3
Plus: courses in film studies, literature, art and/or music, as advised 12

Bachelor's Degree Programs—Dance

The following areas of knowledge are central to the undergraduate degrees in dance:
- knowledge of the major works of dance literature that are representative of the most important eras in the development of dance in the western world;
- knowledge of the history of dance, from early eras to the present;
- knowledge of the various means through which a dance performance is realized; and
- knowledge of the aesthetic and intellectual relationship between dance and other disciplines in the twentieth century.

In addition, students completing the degree in dance are expected to acquire:
- the ability to analyze and evaluate dance as an art form with particular attention to at least one of the areas of dance, choreography, dance production, and criticism;
- the ability to understand and use the anatomy and physiology of the body so that choreography is creative and not damaging to the body;
- the ability to communicate to an audience through at least one of the components of modern dance—performance, choreography, or criticism; and
- the ability to function effectively as a member of a dance ensemble in the preparation of regularly scheduled public productions.

B.A. Degree in Dance

The B.A. degree program in dance consists of 45 semester hours in dance plus 7 hours in theatre. This program is designed for dance students who desire a dance component as part of their liberal arts education. 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.

Major Requirements *Semester Hours*

DNCE 1029 Dance as a Universal Language 3
Ballet courses, any level 4
DNCE 1001-4071 Dance Techniques: Modern Dance (Note 1) 8
Dance technique elective(s) 2
DNCE 1005 Movement Awareness and Injury Prevention for the Performing Artist 3
DNCE 2013 Dance Improvisation 2
DNCE 2033 Beginning Composition 3
DNCE 3015 Movement Analysis 3
DNCE 2014 Rhythmic Analysis and Accompaniment *or* DNCE 3024 Musical Resources for Dance 2
DNCE 4016 Creative Dance for Children *or* DNCE 4036 Methods of Teaching Dance 3
DNCE 4017 History and Philosophy of Dance 3
DNCE 4027 Dance in the Twentieth Century 3
Dance electives 6
THTR 2005 Stagecraft and THTR 2015 Stagecraft Laboratory 4
THTR 4081 Senior Seminar 3

Curriculum Note:
1. Students are placed at the appropriate technique level in this series of courses. Dance

courses listed as nonmajor technique courses do not normally count toward the major.

B.F.A. Degree in Dance

The B.F.A. in dance is designed to meet the needs of highly talented students interested in preparing for a professional dance career while in an academic setting. The degree requires 67 semester hours in dance and 16 hours in theatre. Admission is limited to ensure the type of individual attention necessary for effective training. Interested students should identify themselves by the end of their freshman year. Selection is based on demonstrated competency, motivation, and grade point average. All normal college requirements must be met. A GPA of 3.20 or better in the major and 3.00 or better overall is needed to fulfill the requirements for the B.F.A. degree. An advanced level of modern dance technique must be attained by the beginning of the junior year. Students should be advised that 9 or 10 semesters may be needed to complete the B.F.A. program. More than 120 hours are needed for graduation.

Major Requirements	*Semester Hours*
DNCE 1029 Dance as a Universal Language	3
DNCE 1005 Movement Awareness and Injury Prevention for the Performing Artist	3
DNCE 1101-4171 Dance Techniques: Ballet (Note 1)	8
DNCE 1001-4071 Dance Techniques: Modern (Note 1)	16
DNCE 2013 Dance Improvisation	2
DNCE 2014 Rhythmic Analysis and Accompaniment	2
DNCE 2033 Beginning Composition	3
DNCE 2240 or 2250 Intermediate Jazz	1
DNCE 3015 Movement Analysis	3
DNCE 3024 Musical Resources for Dance	2
DNCE 3043 Intermediate Dance Composition	3
DNCE 4016 Creative Dance for Children *or* DNCE 4036 Methods of Teaching Dance	3
DNCE 4027 Dance in the Twentieth Century	3
DNCE 4038 Dance Repertory	3
DNCE 4053 Advanced Dance Composition	3
DNCE 5052 Studio Concert	3
Dance electives	6
THTR 2003 Acting: Beginning	3
THTR 2005 Stagecraft and THTR 2015 Stagecraft Laboratory	4
THTR 4029 Touring Theatre	6
THTR 4081 Senior Seminar	3

Curriculum Note:

1. Students are placed at the appropriate technique level in this series of courses.

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 are required of them in order to make up deficiencies. Applicants for the M.F.A. program in dance must audition in person; foreign students may audition by video tape. Contact the dance office for specific audition dates.

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 are 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.F.A. Degree in Dance

Course Requirements. A minimum of 60 semester hours are required, at least 45 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 program can be individualized to emphasize choreography/performance or teaching. It is designed to accommodate recent B.A. or B.F.A. graduates and practicing professionals desiring a graduate degree.

The M.F.A. in dance is based on a required core of courses including modern dance, ballet, choreography, readings in dance, seminars, research strategies, methods of teaching, and a creative project or thesis.

Project or Thesis. Early in the semester prior to the completion of the thesis or project, a written proposal for a creative project or thesis must be presented and approved. Upon its completion, a defense of the project or 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 prior to the oral examination.

M.A. Degree in Theatre

Course Requirements. All master's degree students in theatre are required to complete THTR 6009, 6959, and two of the following: THTR 6011, 6021, 6031, 6041, or 6061.

After any undergraduate deficiencies have been removed, students must earn 30 semester hours, at least 16 of which must be in THTR courses at the 5000 level or above. Four thesis credit hours are counted toward the 30-hour requirement.

Ph.D. Degree in Theatre

Doctoral students in theatre are normally 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
Plus four of the following:
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
THTR 6061 On-Stage Studies: Contemporary British and American Drama

Beyond the core courses, studies are determined by students and their advisory committees, consistent with Graduate School and departmental requirements. Doctoral students are required to demonstrate proficiency in a foreign language, at a fourth semester college level, by passing a

standardized examination. Doctoral students should also consult the Graduate School description of dissertation hour requirements.

UNIVERSITY WRITING PROGRAM

The University Writing Program trains students from all disciplines, schools, and colleges in the techniques of writing analysis 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.

Upper-division seminars are open to all juniors and seniors, and will fulfill the written communication requirement of the College of Arts and Sciences core curriculum. 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 *Registration Handbook and Schedule of Courses*. University Writing Program courses do *not* fulfill the humanities requirement under the pre-1988 curriculum for students in the College of Arts and Sciences.

WOMEN STUDIES

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. Since 1974, the women studies program has offered 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.

The following areas of knowledge are central to the program in women studies:

- knowledge of the main social, economic, political, and psychological issues of contemporary American women's lives;
- knowledge of the main topics in the history of feminist thought;
- knowledge of women's cultural and racial diversity;
- knowledge of the history of women in a particular area of the world (e.g., the United States, Europe, or the Third World); and
- knowledge of women's literary expression within a genre, a time period, or a theme.

In addition, students completing the program in women studies are expected to acquire:

- the ability to identify ideas and concepts about women within various fields and to connect these ideas in common themes or topics;
- the ability to write a focused and coherent analytical essay based upon and sustained by evidence;
- the ability to analyze arguments and interpretations for internal consistency and underlying assumptions; and
- the ability to design and implement a research project on a women studies topic.

Bachelor's Degree Program

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below.

Major Requirements *Semester Hours*

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 3000 Women in Organizations....3
WMST 4000 Senior Seminar: Special Topics....3
WMST 4020 Senior Research Seminar....3

Women Studies Certificate Requirements (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 3000 Women in Organizations....3
WMST 4000 Senior Seminar: Special Topics....3
WMST 4020 Senior Research Seminar....3
WMST 4090 Feminist Theory....3

PREPROFESSIONAL STUDY

All advising for preprofessional study is now conducted through the Office of Preprofessional Advising in the Advising Resource Center, Willard 400, (303) 492-8811. Students can receive information about course requirements, test deadlines, and enrollment limitations, and discuss other concerns about professional study in the health sciences and law. See the section of this catalog titled Preprofessional Advising under Campus Facilities and Resources for more information.

COURSE DESCRIPTIONS

The following courses are offered in the College of Arts and Sciences 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 current information on times, days, and instructors of courses, students should consult the *Registration Handbook and Schedule of Courses* issued at the beginning of each semester.

Many courses may be open to nonmajors. Students should check with individual departments for current policies.

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.

Courses are organized by subject matter within each department, and are generally listed numerically *by last digit* (courses ending in the number "0" are listed before courses ending in "1," and so on). The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:

Prereq.—Prerequisite
Coreq.—Corequisite
Lab.—Laboratory
Lect.—Lecture
Rec.—Recitation
Sem.—Seminar

American Studies

AMST 2000-3. Themes in American Culture: 1600-1865. Enables students to explore various themes in pre-1865 American culture. Examines these themes, which vary each year, in their social context. Approved for arts and sciences core curriculum: United States context.

AMST 2010-3. Themes in American Culture: 1865-Present. Enables students to explore various themes in post-1865 American culture.

Examines these themes, which vary each year, in their social context. Approved for arts and sciences core curriculum: United States context.

AMST 3960-3. American Studies: Junior Seminar. Students examine major conceptions of American studies as a method of researching and organizing historical information. Special attention given to ideas and works of individuals that have had the greatest influence on the shaping of the discipline. Prereq., AMST 2000 or 2010.

AMST 4500-3. American Autobiography. Investigates the genre of autobiography as practiced in British North America and the U.S. from the seventeenth century to the present. Autobiography cuts across the usual disciplinary categories and provides insight into cultural values and expression. Prereq., AMST 2000, 2010, or instructor consent. Approved for arts and sciences core curriculum: United States context.

AMST 4840 (1-3). Independent Study.

AMST 4950-3. Seminar in American Studies. Prereq., AMST 2000 or 2010.

AMST 4960-3. Seminar in American Studies. Prereq., AMST 2000 or 2010.

Anthropology

ANTH 1030-3. Principles of Anthropology 1.[1] Evolution of humanity and culture from beginnings through early metal ages. Covers human evolution, race, prehistory, and rise of early civilizations.

ANTH 1040-3. Principles of Anthropology 2.[1] Surveys the world's major culture areas; culture and its major components, such as subsistence, social organization, religion, and language.

ANTH 1100-3. Exploring a Non-Western Culture: The Tamils. Surveys the social and economic patterns, ideas and values, and aesthetic achievements of the Tamils, a Hindu people who live in south India and Sri Lanka. Approved for arts and sciences core curriculum: cultural and gender diversity.

ANTH 1110-3. Exploring a Non-Western Culture: Japan. Examines modern Japan in terms of cultural styles, social patterns, work practices, aesthetic traditions, ecological conditions, and historical events that shape it as both a non-western culture and a modern industrial state. Approved for arts and sciences core curriculum: cultural and gender diversity.

ANTH 1120-3. Exploring a Non-Western Culture: Hopi and Navajo, Cultures in Conflict. Studies the evolution of Hopi and Navajo cultures and cultural interrelationships from the protohistoric through the contemporary period, using an integrated, holistic, and humanistic viewpoint. Principal goal is to instill an appreciation of non-western cultural diversity in material adaptations, social patterns, ideas and values, and aesthetic achievements, thus recognizing a range of cultural solutions to common human problems. Same as AIST 1125. Approved for arts and sciences core curriculum: cultural and gender diversity.

ANTH 1130-3. Exploring a Non-Western Culture: Amazonian Tribal Peoples. Examines the Amazonian tribal cultures of South America, their histories, cultural attributes, and contemporary problems and dilemmas. Approved for arts and sciences core curriculum: cultural and gender diversity.

ANTH 1140-3. Exploring a Non-Western Culture: The Maya. Explores the culture of the Maya of Central America, emphasizing their material adaptations, social organizations, ideals and values, and artistic achievements in the past and the present. Approved for arts and sciences core curriculum: cultural and gender diversity.

ANTH 1150-3. Exploring a Non-Western Culture: Regional Cultures of Africa. Explores a small number of cultures in a specific subregion of Africa from an integrated holistic viewpoint, emphasizing material adaptations, social patterns, ideas and values, and aesthetic achievements. Approved for arts and sciences core curriculum: cultural and gender diversity.

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. Approved for arts and sciences core curriculum: natural science.

ANTH 2020-3. Introduction to Physical Anthropology 2. Continuation of ANTH 2010. Emphasizes quantitative analysis, genetics, and race. Students may not receive credit for both ANTH 2020 and 2060. Prereq., ANTH 2010. Approved for arts and sciences core curriculum: natural science.

ANTH 2030-1. Laboratory in Physical Anthropology 1. Lab in human osteology and musculoskeletal system emphasizing comparative primate morphology and adaptation. Coreq., ANTH 2010. Approved for arts and sciences core curriculum: natural science.

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. Approved for arts and sciences core curriculum: natural science.

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 living primates, and the fossil record for human evolution. Students may not receive credit for both ANTH 2010 and 2050. Approved for arts and sciences core curriculum: natural science.

ANTH 2060-3. Honors—Human Origins 2. Surveys evidence for the continuing evolution of *Homo sapiens*. Emphasizes 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. Approved for arts and sciences core curriculum: natural science.

ANTH 2080-3. Anthropology of Gender. Offers a comparative analysis of gender-based status and social roles. Examines in cross-cultural context relations among women's subsistence and reproductive activities, division of labor by sex, cultural forces, and societal technology level. Emphasizes basic anthropological methods, perspectives, and knowledge base. Same as WMST 2080.

ANTH 2100-3. Frontiers of Cultural Anthropology. Covers current theories in cultural anthropology and discusses the nature of field work. Explores major schools of thought and actual field studies.

ANTH 2200-3. Introduction to Archaeology. Discusses history, basic concepts, techniques, and theoretical construction of archaeological field and laboratory investigations.

ANTH 2210-2. Laboratory Course in Archaeological Methods. Studies 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 cultural processes involved with human adjustment to an agricultural-based lifestyle in both Old and New Worlds, and importance in terms of the subsequent growth of modern societies.

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. Surveys the languages of the world. Studies theories of the origin of language, its relationship 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. Surveys naturalistic primate behavior. Social behavior, behavioral ecology, and evolution emphasized as they lead to an understanding of human behavior. Prereq., ANTH 2010 and 2020 *or* EPOB 1210 and 1220. Approved for arts and sciences core curriculum: natural science.

ANTH 3010-3. The Human Animal. Identifies genetic, anatomical, physiological, social, and behavioral characteristics humans share with other mammals and primates. Explores how these characteristics are influenced by modern culture. Prereqs., ANTH 2010 and 2020 or equivalent. Approved for arts and sciences core curriculum: natural science.

ANTH 3020-3. Seminar: Physical Anthropology. Offers students an opportunity to probe more deeply topics presented in ANTH 2010-2020. Prereq., ANTH 2010-2020 and instructor consent.

ANTH 3030-3. Seminar: Archaeology. Studies theoretical and methodological advances in

[1] Also available through correspondence study.

anthropological archaeology. Prereq., ANTH 2200 and instructor consent.

Cultures of the World (ANTH 3100 through 3180):

Each course covers peoples and cultural systems within areas indicated, including 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 3130-3. North American Indians: Traditional Cultures. Comprehensive survey of native cultures of America north of Mexico, including a review of their natural environments, prehistory, languages, and major institutions for the various culture areas. Same as AIST 3135.

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 considered from an anthropological perspective. Includes such topics as slavery, immigration to the United States, development of cities, American popular culture, and American character.

ANTH 3300-3. Elements of Religion. Universal components of religion, as inferred from religions of the world, primitive and civilized.

ANTH 3800-3. Languages and People. Investigation of roles that languages play in building new nations, in spread of world religions, in migration, and in diffusion of writing systems and other customs throughout the world.

ANTH 4000-3. Quantitative Methods in Anthropology. Surveys ways of deriving meaning from anthropological data by numerical means, including but not confined to basic statistical procedures. Same as ANTH 5000.

ANTH 4020-3. Explorations in Anthropology. Special topics in cultural, linguistic, and physical anthropology, as well as archaeology. Prereq., 15 hours of anthropology course work. Same as ANTH 5020.

ANTH 4030-6. 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 instructor consent. Same as ANTH 5030.

ANTH 4060-3. Nutrition and Anthropology. Nutritional requirements of humans and how they have been met by different populations, taking into account differences in soils, climate, natural resources, technology, and cultural practices. Prereqs., ANTH 2010 and 2020 *or* EPOB 1210 and 1220 *or* NASC 1230 or 1240. Same as ANTH 5060.

ANTH 4080-3. Anthropological Genetics. Considers data and theory of human genetics. Emphasizes analytical techniques relating to a genetic analysis of individual, family, and populations. Prereqs., ANTH 2010 and 2020 *or* EPOB 1210 and 1220. Same as ANTH 5080.

ANTH 4110-3. Human Paleontology. 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 and 2020 *or* EPOB 1210 and 1220. Same as ANTH 5110.

ANTH 4120-3. Advanced Physical Anthropology. Introduces population genetics and its application to understanding problems of process in human evolution and the formation of races in humans. Prereqs., ANTH 2010 and 2020 *or* EPOB 1210 and 1220. Same as ANTH 5120.

ANTH 4140-3. Human Growth and Development. Considers individual and population differences in human body size, shape, composition, and function. Emphasizes how these differences arise as a result of the growth process and in relation to genetic variation and environmental influences. Prereqs., ANTH 2010 and 2020 *or* EPOB 1210 and 1220 *or* NASC 1230 or 1240. Same as ANTH 5140.

ANTH 4150-3. Human Ecology 1. Studies demographic and ecological variables as they relate to humans. Considers aspects of natural selection, overpopulation, and environmental deterioration. Prereqs., ANTH 2010 and 2020 *or* EPOB 1210 and 1220. Same as ANTH 5150.

ANTH 4170-3. Primate Paleontology. Focuses on the fossil record of nonhominoid primates. Special emphasis placed on delineating the origins of the order *Primates,* the origins of the primate suborders *Strepsirhini* and *Haplorhini,* and the adaptations of extinct primates. Prereq., ANTH 2010 *or* EPOB 1410 or 1210. Same as ANTH 5170.

ANTH 4180-3. Anthropological Perspectives: Contemporary Issues. Students read, discuss, and write critical evaluations of selected classical texts in anthropology. These and classroom lectures identify basic themes that inform major anthropological perspectives. Students then bring these perspectives to bear on issues currently facing the human species. Prereq., background knowledge of general areas in anthropology and upper-division standing. Approved for arts and sciences core curriculum: critical thinking.

ANTH 4200-3. North American Archaeology. Prehistoric and protohistoric cultures and areas of North America, excluding the American Southwest. Same as ANTH 5200.

ANTH 4210-3. Southwestern Archaeology. Prehistoric cultures of the American Southwest, their origins, characteristics, and relationships. Same as ANTH 5210.

ANTH 4220-3. Archaeology of Mexico and Central America. Prehistoric and protohistoric cultures and areas of Mexico and Central America, including the Aztecs and Mayas. Prereq., ANTH 2200 or equivalent. Same as ANTH 5220.

ANTH 4230-3. Settlement Archaeology. Studies the manner in which primitive humans adapt their residences to physical environment and social needs. Considers prehistoric settlement data as well as inferences to be derived: population, communiry organization, architecture, and land use. Same as ANTH 5230.

ANTH 4240-3. Archaeology of South America. Prehistoric and protohistoric cultures of South America, their origins, characteristics, and relationships, including the high civilization of the Andean area. Same as ANTH 5240.

ANTH 4270-3. Plains Archaeology. Prehistoric and protohistoric cultures of the North American plains are examined in five subregions. Origins, characteristics, and structural elements of these cultures are discussed in detail. Prereq., ANTH 2200 or 2270. Same as 5270.

ANTH 4330-3. Environmental Archaeology. Surveys the method of cultural ecology as it can be applied to archaeological investigations. Same as ANTH 5330.

ANTH 4340-3. Archaeological Method and Theory. Review of methods of cultural theories employed in investigating and explaining the archaeological record. Prereq., ANTH 2200. Same as ANTH 5340.

ANTH 4350 (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. Same as ANTH 5350.

ANTH 4380-3. Lithic Analysis and Replication. 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 2200. Same as ANTH 5380.

ANTH 4500-3. Cross-Cultural Aspects of Socioeconomic Development. Examines goals of international agencies which support development in underdeveloped countries. Anthropological perspective is ptovided for such issues as urban planning, health care and delivery, population control, rural development, and land reform. Same as ANTH 5500.

ANTH 4510-3. Applied Cultural Anthropology. Analysis of problems of cultural change due to contacts between people of different cultures. Same as ANTH 5510.

ANTH 4520-3. Symbolic Anthropology. Exploration of anthropological approaches to the study of symbolic systems, including patterns of belief, ritual, art, and myth. Theoretical issues involve nature of symbols, impact of modes of communication, and interpretation of meaning cross-culturally. Same as ANTH 5520. Approved for arts and sciences core curriculum: critical thinking.

ANTH 4530-3. Theoretical Foundations of Social and Cultural Anthropology. History of the growth of anthropology from earliest times to mid-twentieth century, including various schools of thought, outstanding contributors, and their works. Same as ANTH 5530.

ANTH 4550-3. Culture Dynamics. Studies culture change emphasizing the role of individual

motivation in promoting or inhibiting such change. Surveys literature and analysis of selected case material, including problems of directed change. Same as ANTH 5550.

ANTH 4560-3. North American Indian Acculturation. Comprehensive survey of changes in the native cultures of America north of Mexico caused by 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. Same as ANTH 5560 and AIST 4565. Approved for arts and sciences core curriculum: contemporary societies, or cultural and gender diversity.

ANTH 4570-3. Maritime Peoples. Archaeological studies of maritime peoples are considered first, followed by detailed study of contemporary maritime peoples, emphasizing fishermen and fishing communities. Course concludes with consideration of contemporary issues involving humanity's present and future use of the seas. Same as ANTH 5570.

ANTH 4580-3. Power: The Anthropology of Politics. Covers nature and distribution of power in state and stateless societies, evolution of political stratification, political economy of colonialism, and selected aspects of power in modern society. Same as ANTH 5580.

ANTH 4590-3. Urban Anthropology. Comparative study of urban life. Same as ANTH 5590.

ANTH 4600-3. Human Ecology 2. Descriptive and analytical study of change in demographic and ecological variables within one or more specific cultures undergoing rapid assimilation. Compares aspects of breeding isolates, population structures, settlement patterns, and family and community institutions. Same as ANTH 5600.

ANTH 4610-3. 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. Same as ANTH 5610.

ANTH 4710-3. Departmental Honors in Anthropology 1. Course work built around 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 4760-3. Ethnography of Southeast Asia and Indonesia. Same as ANTH 5760.

ANTH 4800-3. Analyzing Exotic Languages. Teaches methods used by anthropologists and linguists to record and analyze exotic and sometimes unwritten languages. Methods used by researchers in cultures where interpreters are scarce or lacking. Students analyze data recorded by native speakers. Same as ANTH 5800.

ANTH 4840 (1-3). Independent Study. For upper-division undergraduate students. May be repeated for credit, up to a maximum of two in one semester.

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 5000-3. Quantitative Methods in Anthropology. Same as ANTH 4000.

ANTH 5020-3. Explorations in Anthropology. Same as ANTH 4020.

ANTH 5030-6. Comparative Primate Anatomy. Same as ANTH 4030.

ANTH 5060-3. Nutrition and Anthropology. Same as ANTH 4060.

ANTH 5080-3. Anthropological Genetics. Same as ANTH 4080.

ANTH 5110-3. Human Paleontology. Same as ANTH 4110.

ANTH 5120-3. Advanced Physical Anthropology. Same as ANTH 4120.

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 5140-3. Human Growth and Development. Same as ANTH 4140.

ANTH 5150-3. Human Ecology 1. Same as ANTH 4150.

ANTH 5170-3. Primate Paleontology. Same as ANTH 4170.

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 5200-3. North American Archaeology. Same as ANTH 4200.

ANTH 5210-3. Southwestern Archaeology. Same as ANTH 4210.

ANTH 5220-3. Archaeology of Mexico and Central America. Same as ANTH 4220.

ANTH 5230-3. Settlement Archaeology. Same as ANTH 4230.

ANTH 5240-3. Archaeology of South America. Same as ANTH 4240.

ANTH 5270-3. Plains Archaeology. Same as ANTH 4270.

ANTH 5330-3. Environmental Archaeology. Same as ANTH 4330.

ANTH 5340-3. Archaeological Method and Theory. Same as ANTH 4340.

ANTH 5350 (2-6). Archaeological Field and Laboratory Research. Same as ANTH 4350.

ANTH 5380-3. Lithic Analysis and Replication. Same as ANTH 4380.

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 5500-3. Cross-Cultural Aspects of Socioeconomic Development. Same as ANTH 4500.

ANTH 5510-3. Applied Cultural Anthropology. Same as ANTH 4510.

ANTH 5520-3. Symbolic Anthropology. Same as ANTH 4520.

ANTH 5530-3. History of Anthropology. Same as ANTH 4530.

ANTH 5550-3. Culture Dynamics. Same as ANTH 4550.

ANTH 5560-3. North American Indian Acculturation. Same as ANTH 4560.

ANTH 5570-3. Maritime Peoples. Same as ANTH 4570.

ANTH 5580-3. Power: The Anthropology of Politics. Same as ANTH 4580.

ANTH 5590-3. Urban Anthropology. Same as ANTH 4590.

ANTH 5600-3. Human Ecology 2. Same as ANTH 4600.

ANTH 5610-3. Medical Anthropology. Same as ANTH 4610.

ANTH 5620-3. Seminar: Ethnography as a Genre. Explores how the assumptions of ethnographic writing have evolved from the late nineteenth centuty to the present day. Compares conventional ethnographic descriptions with more innovative forms of crosscultural representation to bring out the underlying issues of ethnographic authority, allegory, voice, reflexivity, and accountability.

ANTH 5760-3. Ethnography of Southeast India and Indonesia. Same as ANTH 4760.

ANTH 5800-3. Analyzing Exotic Languages. Same as ANTH 4800.

ANTH 5830-3. Biocultural Foundations of Language. Investigation of species-specific language behavior as it relates to the hominoid fossil record, primate communication, and physiology. Evidence drawn from archaeological data and from cultural anthropology.

ANTH 5840 (1-3). Guided Study. Directed individual research based on a specific area of specialization. May be repeated for credit, up to a maximum of two in one semester.

ANTH 6940-3. 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 7140-3. Seminar: Archaeology of Selected Areas. Considers 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. Detailed consideration of morphological and genetic range of variability of major continental divisions of humankind.

ANTH 7300-3. Seminar: Research Methods in Cultural Anthropology.

ANTH 7840 (1-3). Independent Research. Research aimed at developing a solution to an originally conceived research problem. May be repeated for credit, up to a maximum of two in one semester.

ANTH 8990-10. Doctoral 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 4269-3. Biblical Archaeology. Old Testament history in the light of archaeological investigation; the Old Testament in framework of the literature of the ancient Near East. Same as ANTH 5269 and CLAS 4269.

ANTH 4419-3. Archaeology of Ancient Near East. Emphasizes similarity and differences between the archaeological material of nations of the Middle East and the archaeological influences which were exchanged between such nations. Same as ANTH 5419 and CLAS 4419.

ANTH 4429-3. Archaeology of Ancient Egypt. Archaeology of ancient Egypt in light of recent excavations; the link between history and archaeology of the nations of the Bible in the North and Egypt, Nubia, Ethiopia, and Yemen in the South. Same as ANTH 5429 and CLAS 4429.

ANTH 4789-3. Egyptian Hieroglyphics 1. Studies the culture of the ancient Middle East to shed light on the history of its languages. Reading and translating hieroglyphics into modern languages. Same as ANTH 5789 and CLAS 4789.

ANTH 5269-3. Biblical Archaeology. Same as ANTH 4269 and CLAS 5269.

ANTH 5419-3. Archaeology of Ancient Near East. Same as ANTH 4419 and CLAS 5419.

ANTH 5429-3. Archaeology of Ancient Egypt. Same as ANTH 4429 and CLAS 5429.

ANTH 5789-3. Egyptian Hieroglyphics 1. Same as ANTH 4789 and CLAS 5789.

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 modules (MATH 1000-1040).

APPM 1360-4. Calculus 2 for Engineers. Continuation of APPM 1350. Applications of the definite integral, methods of integration, improper integrals, Taylor's theorem, and infinite series. Prereq., APPM 1350 or MATH 1300.

APPM 2350-4. Calculus 3 for Engineers. Covers multivariable calculus, vector analysis, and theorems of Gauss, Green, and Stokes. Prereqs., APPM 1360, 1380, or MATH 2300.

APPM 2360-4. Introduction to Linear Algebra and Differential Equations. Introduces ordinary differential equations, systems of linear equations, matrices, determinants, vector spaces, linear transformations, and systems of linear differential equations. No credit is awarded to students already having credit in both MATH 3130 and 4430. Prereq., APPM 2350.

APPM 2380-4. Introduction to Ordinary Differential Equations. Basic concepts of ordinary differential equations. Covers methods to solve first-order equations and linear equations of higher order, especially equations with constant coefficients; series solutions; and numerical methods, implemented on a personal computer. Prereq., APPM 2350 or MATH 2400.

APPM 3170-3. Discrete Applied Mathematics. Introduces discrete structures, their representations, and applications. Emphasizes applications of graph theory to fields such as computer science, engineering, operations research, social sciences, and biology. Prereq. or coreq., APPM 3310. Same as MATH 3170.

APPM 3310-3. Matrix Methods and Applications. Introduces linear algebra and matrices, emphasizing applications. Includes methods of solving systems of linear algebra and linear ordinary differential equations. Discusses computational algorithms to implement these methods. Some applications in operations research may be included as time permits. Students may not receive credit for both MATH 3130 and APPM 3310. Prereq., APPM 2350 or MATH 2400, and APPM 2360.

APPM 3570-3. Applied Probability and Statistics. Introduces concepts in probability, including combinatorics and some common probability distributions (binomial, Poisson, normal, etc.). Introduces statistical inference, organization of statistical data, sampling, testing hypotheses, linear regression, and analysis of variance. Students may not receive credit for both APPM 3570 and MATH 2510 or MATH 4570. Prereq., APPM 2350 or MATH 2400.

APPM 4350-3. Methods in Applied Mathematics 1. Reviews ordinary differential equations, including solutions by series. Physical derivation of the classical linear partial differential equations (heat, wave, and Laplace equations). Solution of these equations via separation of variables, with Fourier series, Fourier integrals, and more general eigenfunction expansions. Prereqs., APPM 1350, 1360, 2350, and 2360.

APPM 4360-3. Methods in Applied Mathematics 2. Introduces methods of complex variables. Contour integration and theory of residues. Application to solving partial differential equations by transform methods; Fourier and Laplace transforms; Reimann-Hilbert boundary-value problems. Conformal mapping with application to ideal fluid flow and/or electrostatics. Prereq., APPM 4350 or instructor consent.

APPM 4380-3. Modeling in Applied Mathematics. Exposition of a variety of mathematical models arising in the physical and biological sciences. Models may be taken from applications in classical and celestial mechanics, fluid dynamics, traffic flow, population dynamics, economics, and elsewhere. Prereqs., APPM 2360.

APPM 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. Same as APPM 5520 and MATH 4520.

APPM 4560-3. Introduction to Stochastic Population Models. Studies mathematical models used in demography, epidemic theory, statistical genetics, and mathematical ecology, and their strengths and limitations. Surveys mathematical techniques used in these applications. Prereq., one year of calculus and a course in probability and/or statistics. Same as APPM 5560.

APPM 4570-3. Statistical Methods. Covers discrete and continuous probability laws, random variables; expectations; laws of large numbers and central limit theorem; estimation, testing hypotheses, analysis of variance, regression analysis, nonparametric methods. Emphasizes applications with an introduction to packaged computer programs. Prereq., Calculus 2. Same as APPM 5570.

APPM 4650-3. Intermediate Numerical Analysis 1. Numerical solution of nonlinear equations; interpolation; methods in numerical integration; numerical solution of linear systems and matrix eigenvalue problems. Stresses significant computer applications and software. Prereq., APPM 2350 or MATH 2400; APPM 2360 and 3310 or MATH 3130. Same as MATH 4650.

APPM 4660-3. Intermediate Numerical Analysis 2. Continuation of APPM 4650. Numerical solution of initial-value problems, and two-point boundary-value problems for ordinary differential equations. Numerical methods for solving partial differential equations. Prereq., APPM 4650. Same as MATH 4660.

APPM 4720-3. Open Topics in Applied Mathematics. Provides a vehicle for the development and presentation of new topics not only accessible to graduate students but also with the potential of being incorporated into the core courses in applied mathematics. Prereq., APPM 4350, 4360, 4650 and 4660, or equivalent. Same as APPM 5720.

APPM 4840 (1-3). Independent Study. Introduces undergraduate students to the research focuses of the program in applied mathematics. Prereqs., APPM 1350, 1360, 2350, 2360, and either APPM 3310 or MATH 3130. Recommended prereqs., a course in ordinary or partial differential equations and APPM 4650.

APPM 4955-3. Undergraduate Seminar in Applied Mathematics. Introduces undergraduates to applied mathematical topics and strategies for research. A maximum of 6 hours of seminar work is allowed toward the degree in applied mathematics. Prereqs., three semesters of calculus, APPM 2360 or an upper-division applied mathematics course, and instructor consent.

APPM 5180-3. Discrete Applied Mathematics. Focuses on the use of discrete modeling to solve problems in several disciplines, using graph theory and combinatorics. Applications are selected from areas such as computer science communication networks, economics, operations research, and social, biological, and environmental sciences, as well as engineering. Prereqs., APPM 4650 and 4350, or instructor consent.

APPM 5440-3. Applied Analysis 1. Discusses the elements of basic real and complex analysis, Banach spaces, LP spaces, and many relevant inequalities. Includes applications of existence and uniqueness of solutions to various types of ordinary differential equations, partial differential equations, and integral equations. Prereqs., MATH 4310 and 4320 or equivalent; MATH 3130 or equivalent; or instructor consent.

APPM 5450-3. Applied Analysis 2. Continuation of APPM 5440. Prereq., APPM 5440 or instructor consent.

APPM 5470-3. Methods of Applied Mathematics 3: Partial Differential and Integral Equations. Studies properties and solutions of partial differential and integral equations. Covers methods of characteristics for partial differential equations, well-posed problems, main results for the well-known equations, Green's functions, and related integral equations. Prereq., upper-division applied mathematics equivalent to APPM 4360.

APPM 5480-3. Methods of Applied Mathematics 4: Approximation Methods. Covers asymptomatic evaluation of integrals (stationary phase and steepest descents), perturbation methods (regular and singular methods, and inner and outer expansions), multiple scale methods, and applications to differential and integral equations. Prereq., APPM 5470 or instructor consent.

APPM 5520-3. Introduction to Mathematical Statistics. Same as APPM 4520 and MATH 5520.

APPM 5560-3. Introduction to Stochastic Population Models. Same as APPM 4560.

APPM 5570-3. Statistical Methods. Same as APPM 4570.

APPM 5600-3. Numerical Analysis 1. Solution of linear systems, least squares approximations, nonlinear algebraic equations, interpolation, and quadrature. Prereqs., calculus, MATH 3130 and CSCI 1700. Same as MATH 5600.

APPM 5610-3. Numerical Analysis 2. Solution of ordinary and partial differential equations. Prereq., APPM 5600 or MATH 5600. Same as MATH 5610.

APPM 5720-3. Open Topics in Applied Mathematics. Same as APPM 4720.

APPM 6520-3. Mathematical Statistics. Mathematical theory of statistics. Topics include distribution theory, estimation and testing of hypotheses, multivariate analysis, and nonparametric inference, all with emphasis on theory. Prereq, APPM 5520 or MATH 5520. Same as MATH 6520.

APPM 6550-3. Introduction to Stochastic Processes. 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 4310 and 4510, or instructor consent. Same as MATH 6550.

APPM 6580-3. Statistical Methods for Data Analysis. Continuation of APPM 5570. 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 data analysis. Prereq., APPM 5570 or instructor consent.

APPM 6620-3. Numerical Computation in Applied Mathematics 1. Covers numerical solution of ordinary and partial differential equations, initial and boundary value problems, stability, and convergence of difference schemes. Prereq., APPM 4650 or MATH 4650 or instructor consent.

APPM 6630-3. Numerical Computation in Applied Mathematics 2. Continuation of APPM 6620. Prereq., APPM 6620 or instructor consent.

APPM 6900 (1-3). Independent Study.

APPM 6950 (1-6). Master's Thesis.

APPM 7100-3. Mathematical Methods in Dynamical Systems. Covers dynamical systems defined by mappings and differential equations. Hamiltonian mechanics, action-angle variables, results from KAM and bifurcation theory, phase portraits, Melnikov theory, strange attractors, routes to chaos, etc. Prereq., APPM 5440, PHYS 5210, or equivalent, or instructor consent.

APPM 7100-3. Mathematical Methods in Dynamical Systems. Includes dynamical systems, mappings and differential equations, period doubling route to chaos, Hamiltonian mechanics, action-angle variables, results from KAM and bifurcation theory, phase-plane analysis, Melnikov theory, strange attractors, etc. Prereq., APPM 5440, PHYS 5210 or equivalent, or instructor consent.

APPM 7300-3. Mathematical Methods in Nonlinear Waves and Integrable Equations. Includes basic results associated with linear dispersive wave systems, first-order nonlinear wave equations, nonlinear dispersive wave equations, solitons, and the methods of the inverse scattering transform. Prereqs., APPM 5470 and 5480, PHYS 5210, or instructot consent.

APPM 7500-3. Topics in Computational Fluid Dynamics. Covers numerical methods and analysis relevant to problems in fluid dynamics. Discusses difference, spectral, multilevel, and/or finite element methods as they apply to particular applications.

APPM 7900 (1-3). Reading and Research in Applied Mathematics. Introduces graduate students to the research focuses of the program in applied mathematics. Prereq., instructor consent.

APPM 8100-1. Seminar in Dynamical Systems. Introduces advanced topics and research in dynamical systems. Required for all advanced Ph.D. students.

APPM 8200-1. Seminar in Nonlinear Waves and Integrable Equations. Introduces advanced topics and research in nonlinear waves and integrable systems. Required for all advanced Ph.D. students.

APPM 8990-10. Doctoral Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree.

Arts and Sciences

Expository Writing

ARSC 1000-4. General Expository Writing. Helps students develop their abilities to do college-level reading, writing, and thinking. Students are asked to read critically, then construct written responses that are revised and crafted into more formal essays and position papers. Offered through the University Learning Center. Prereq., program coordinator consent.

ARSC 1100 (3-4). Advanced Expository Writing. Continuation of the writing skills addressed in ARSC 1000. The advanced course requires students to create longer papers informed by independent library research and containing more complex, multi-layered arguments. Offered through the University Learning Center. Prereq., ARSC 1000 or program coordinator consent. Approved for arts and sciences core curriculum: written communication.

Special Curricula

ARSC 2274-3. Peer Counseling. Overview of the field of paraprofessional counseling. Introduces students to counseling theory and techniques. Students study the philosophy of a liberal arts education as well as policies and requirements of the College of Arts and Sciences.

Theses

ARSC 4909 (2-6). Senior Thesis for Individually Structured Major.

ARSC 4949 (3-6). Senior Thesis.

Special Programs

ARSP 3000-1. Journeys Between Self and Other. Explores typical ways Western sojourners have described what they have discovered while living in another culture and how they have been affected by that encounter. Analyzes the cultural adjustment process and subsequent changes in personality and world view through film, novels, and students' personal experiences. Prereq., one semester or year on a study abroad program and instructor consent.

Asian Studies

ASIA 1840, 2840, 3840, 4840 (1-3). Independent Study.

ASIA 4830-3. Senior Thesis in Asian Studies. Studies an approved East Asian topic, following guidelines established by the program director.

Undertaken either as an independent study with an Asian studies faculty member or as part of a seminar course approved by the Asian studies faculty represenrative in the student's disciplinary option.

Astrophysical, Planetary, and Atmospheric Sciences

APAS 1010-4. Introductory Astronomy 1. Introduces principles of modern astronomy for nonscience majors, summarizing our present knowledge about the Earth, moon, planets, Sun, and origin of life. Similar to APAS 1110, but with additional recitation and lab experience. Students must attend six nighttime observing sessions. Approved for arts and sciences core curriculum: natural science.

APAS 1020-3. Introductory Astronomy 2. Introduces principles of modern astronomy for nonscience majors, summarizing our present knowledge about the Sun, stars, birth and dearh of stars, neutron stars, black holes, galaxies, quasars, and the organization and origins of the universe. Prereq., APAS 1010. Students must attend six nighttime observing sessions. Approved for arts and sciences core curriculum: natural science.

APAS 1110-3. General Astronomy: The Solar System. 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 must attend six nighttime observing sessions. Approved for arts and sciences core curriculum: natural science.

APAS 1120-3. General Astronomy: Stars and Galaxies. 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 must attend six nighttime observing sessions. Approved for arts and sciences core curriculum: natural science.

APAS 1150-3. Dynamic Earth 3—Meteorology and Oceanography. Lect. Broad, mostly qualitative survey of the composition, structure, and primary dynamic phenomena of the Earth's atmosphere and oceans. Discusses selected applications to situations of societal interest (el Niño events, greenhouse effect and heating the atmosphere, ozone hole, nuclear winter). Prereq., APAS 1010 or GEOL 1130. Approved for arts and sciences core curriculum: natural science.

APAS 1230-3. Light and Color for Nonscientists. Discusses light, color, vision, and perception. Covers reflection, refraction, lenses, and applications to photography and other methods of light sensing. Other topics include lasers and holography. Course is geared toward non-science majors. Approved for arts and sciences core curriculum: natural science.

APAS 2000-3. Ancient Astronomies of the World. Documents the numerous ways in which observational astronomy and cosmology have been features of ancient cultures. Includes naked eye astronomy, archaeoastronomy, ethnoastronomy, concepts of time, calendrics, cosmogony, and cosmology. Approved for arts and sciences core curriculum: natural science.

APAS 2010-3. Modern Cosmology—Origin and Structure of the Universe. A nonmathematical introduction to modern cosmology for nonscience majors. Covers the Big Bang; the age, size, and structure of the universe; the origin of the elements and of stars, galaxies, the solar system, and life. Approved for arts and sciences core curriculum: natural science.

APAS 2020-3. Introduction to Space Astronomy. Discusses reasons for making astronomical observarions from space, scientific goals, practical requirements for placing instruments in space, politics of starting new programs, and selected missions. Prereqs., APAS 1010 or 1020 or 1110 or 1120. Approved for arts and sciences core curriculum: natural science.

APAS 2840 (1-3). Independent Study. Prereq., instructor consent.

APAS 3060-3. Introduction to Space Experimentation. Provides a systems perspective of space exploration for students in all disciplines. Surveys the scientific and technical research that can be accomplished from space and the engineering principles and tools needed to make that research possible. Prereqs., one semester of calculus (MATH 1300; APPM 1350; or MATH 1080, 1090, and 1100; or equivalent) and one year of general physics (PHYS 2010 and 2020, or PHYS 1110 and 1120). Same as ASEN 3060. Approved for arts and sciences core curriculum: natural science.

APAS 3180-3. Aviation Meteorology. Familiarizes students with a wide range of atmospheric behavior pertinent to air travel: rudiments of aerodynamics; aircraft stability and control; atmospheric circulation, vertical motion, turbulence, and wind shear; fronts, clouds, and storms. Prereq., APAS 1150 or equivalent. Approved for arts and sciences core curriculum: natural science.

APAS 3190-3. Atmospheric Science 1: Meteorology. Topics vary from year to year and may include weather-map analysis and prediction, weather modification, severe storms, air quality, and regional weather. Prereq., APAS 1150 or GEOG 1001. Same as GEOG 3191. Approved for arts and sciences core curriculum: natural science.

APAS 3200-3. Atmospheric Science 2: Climatology. Topics vary from year to year and may include climatic change, snow and ice, mountain weather and climate, and applied climatology. Same as GEOG 3201. Approved for arts and sciences core curriculum: natural science.

APAS 3210-3. Intermediate Astronomy: Solar System. Topics in modern solar-system astronomy are pursued. Topics 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 or 1010. Approved for arts and sciences core curriculum: natural science.

APAS 3220-3. Intermediate Astronomy: Stars and Galaxies. Topics in modern astronomy outside the solar system are pursued. Topics vary but often include stars, black holes, galaxies, quasars, and cosmology. Nonmathematical (simple algebra only) but physical concepts introduced. Prereq., APAS 1120 or 1020. Approved for arts and sciences core curriculum: natural science.

APAS 3500 (1-3). 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. May be taken up to two times for credit.

APAS 3710-3. The Earth's Atmosphere and Oceans. 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 formation of severe storms. Prereqs., PHYS 1110 and 1120, *and* either MATH 1300 and 2300 or APPM 1350 and 1360.

APAS 3720-3. Planets and their Atmospheres. Physics and chemistry of the armospheres of Mars, Venus, Jupiter, Saturn, and Titan. 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. Prereqs., PHYS 1110 and 1120, *and* either MATH 1300 and 2300 or APPM 1350 and 1360.

APAS 3730-3. Astrophysics 1—Stellar and Interstellar. APAS 3730 and 3830 provide a year-long introduction to physical processes, observations, and current research methods in stellar, interstellar, galactic, and extra-galactic astrophysics, with asttonomical applications of gravity, radiation processes, spectroscopy, gas dynamics, and plasma physics. Prereq., PHYS 1110/1120 and MATH 1300/2300 or APPM 1350/1360.

APAS 3740-3. Cosmology and Relativity: Stellar and Interstellar. APAS 3730 and 3740 provide a year-long introduction to physical processes, observations, and current research methods in stellar, interstellar, galactic, and extra-galactic astrophysics, with astronomical applications of gravity, radiation processes, spectroscopy, gas dynamics, and plasma physics. Prereqs., PHYS 1110/1120, and MATH 1300/2300 or APPM 1350/1360.

APAS 3750-3. Planets, Moons, and Rings. Approach to the physics of planets which emphasizes their surfaces, satellites, and rings. Topics 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., PHYS 1110 and 1120, *and* either MATH 1300 and 2300 or APPM 1350 and 1360.

APAS 3830-3. Astrophysics 2: Galactic and Extragalactic. Continuation of APAS 3730. Prereqs., PHYS 1110-1120, MATH 1300-2300 or APPM 1350-1360, and APAS 3730.

APAS 4010-3. Astrophysical Research Seminar. Intensive seminar on the science and methods of astrophysical research. In-class work presents theoretical background and an overview of ongoing research at CU; students also work on individual research projects in an area of specialization. Prereqs., two semesters of calculus, two semesters of physics, and a major in either math, physics, or engineering.

APAS 4150-3. Plasma Physics. Discusses the fundamentals of plasma physics, including particle motion in electromagnetic fields, wave propagation, collisions, diffusion, and resistivity. Presents examples from space plasmas, astrophysical plasmas, laboratory fusion plasmas, and plasmas in accelerators. Prereqs., PHYS 1110 and 1120, *and* MATH 2400 or APPM 2350. Prereq. or coreq., PHYS 3310. Same as PHYS 4150.

APAS 4300-3. Dynamics of Fluids. Describes the fundamentals of fluid dynamics, particularly recent developments in topics of physical interest, such as boundary layers; thermal convection in the Earth's mantle, oceans, atmosphere, and the Sun; compressible flows; magnetohydrodynamics; turbulence; chaos; super fluids; ferro fluids; and non-Newtonian fluids. Prereqs., MATH 2400 or APPM 2350, APPM 2360, PHYS 3210, PHYS 3310, and PHYS 3320. Same as PHYS 4300.

APAS 4800-3. Space Science: Practice and Policy. Exposes students to current controversies in science that illustrate the scientific method and the interplay of observation, theory, and science policy. Students research and debate both sides of the issues, which include strategies and spinoffs of space exploration, funding of science, big vs. small science, and scientific heresy and fraud. Prereqs., APAS 1110/1120, APAS 1010/1020, PHYS 1120, or PHYS 2020. Approved for the arts and sciences core curriculum: critical thinking.

APAS 4810-3. Science and Pseudo-Science in Astronomy. Stimulates students to critically distinguish science and pseudo-science astronomical concepts. Discusses some current astronomical controversies, as well as pseudo-scientific topics. Prereqs., APAS 1110 and 1120, or APAS 1010 and 1020, or PHYS 1110 and 1120, or PHYS 2010 and 2020. Approved for arts and sciences core curriculum: critical thinking.

APAS 4840 (1-3). Independent Study. Prereq., instructor consent.

APAS 5000-3. Seminar in Plasma Physics. Graduate seminar on current plasma physics research. Reviews the goals and techniques of research in areas of plasma physics (controlled fusion, numerical simulations, solar and space physics). Discusses current topics and research literature in depth. May be repeated for an additional 1 credit hour for a total of four credit hours to meet candidacy requirement. Prereq., graduate standing or instructor consent. Same as PHYS 5000.

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. Prereq., undergraduate physics.

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. Prereq., undergraduate physics.

APAS 5150-3. Introductory Plasma Physics. 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). Prereq., undergraduate physics. Same as PHYS 5150.

APAS 5220-3. Nonlinear Dynamics. 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 instructor consent. Same as PHYS 5220.

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. 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. Introduces 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. Same as ASEN 5217.

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. Examines these topics from the onset of small amplitude disturbances to their nonlinear development and equilibration. Prereq., APAS 5400.

APAS 5540-3. Mathematical Methods. Applied mathematics course designed to provide the necessary analytical background for courses in astrophysics, 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 areas of physics listed above.

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 the greenhouse effect, inversion methods and climate models. Prereq., APAS 5110 or instructor consent.

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, including compact objects. Prereq., undergraduate physics.

APAS 5710-3. High-Energy Astrophysics. Astrophysics of UV, X-ray, gamma-ray, and cosmic-ray sources, including fundamentals of radiative and particle processes, neutron stars, black holes, pulsars, quasars, supernovae and their remnants; stellar flares; accretion disks; binary X-ray sources; and other cosmic X-ray sources. Prereq., undergraduate physics.

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. Prereq., undergraduate physics.

APAS 5730-3. Stellar Atmospheres and Radiative Transfer. Stellar atmospheres: basic stellar atmospheres, spectral line formation, interpretation of stellar spectra, and model atmospheres. Solar physics: the Sun as a star, solar cycle, chromospheric and coronal structure, energy balance, magnetic field, and solar wind. Prereqs., APAS 5110 and undergraduate physics.

APAS 5740-3. Interstellar Astrophysics. Structure, dynamics, and "ecology" of the interstellar medium, stressing the physical mechanisms that govern the thermal, ionization, and dynamic state of the gas and dust; observations at all wavelengths; star formation; relation to external galaxies. Prereq., APAS 5110 or instructor consent.

APAS 5750-3. Observational Astronomy. Surveys the tools of observational astronomy, emphasizing practical applications. Topics include telescopes, instruments, detectors, and techniques used from X-ray to radio wave lengths; error analysis and data reduction techniques. Gives hands-on experience with the Sommers Bausch Observatory telescope, CCD, and image processing facility. Prereq., senior-level undergraduate physics or instructor consent.

APAS 5920 (1-6). Reading and Research in Astrophysical, Planetary, and Atmospheric Sciences. Prereq., instructor consent.

APAS 5950-3. Seminar: Climatic Change. Cross-disciplinary survey of evidence for and theories of climatic change. Same as GEOG 5951 and GEOL 5951.

APAS 5960-3. Theories of Climate and Climate Variability. Critical review of current theories of climatic variability based on analysis of different physical processes affecting climate. Same as GEOG 5961.

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 6010-1. Seminar in Astrophysics. Graduate seminar on research topic related to a semester's core astrophysics course. Research literature explored in depth. May be repeated with APAS 6000 to a maximum of 4 credit hours to meet candidacy requirements. Prereq., graduate standing or instructor consent.

APAS 6340-3. Remote Sensing of Planetary Surfaces. Same as GEOL 6340.

APAS 6610-3. Earth and Planetary Physics 1. Mechanics of deformable materials, with applications to earthquake processes. Introduces seismic wave theory. Inversion of seismic data for the structure, composition, and state of the interior of the Earth. Same as GEOL 6610 and PHYS 6610.

APAS 6620-3. Earth and Planetary Physics 2. Covers space and surface geodetic techniques as well as potential theory. 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. Same as GEOL 6620 and PHYS 6620.

APAS 6630-3. Earth and Planetary Physics 3. 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. Same as GEOL 6630 and PHYS 6630.

APAS 6640-3. Introduction to Planetary Science. Provides overview of the nature of the solar system. Topics include geologic processes and histories of solid planets, planetary chemistry, interiors and atmospheres, outer planets, planetary rings, comets, asteroids, extrasolar planets, and formation of the solar system. Prereqs., graduate standing in a physical science, and basic undergraduate physics. Same as GEOL 6640.

APAS 6650 (1-3). Seminar in Geophysics. Advanced seminar studies in geophysical subjects for graduate students. Same as GEOL 6650 and PHYS 6650.

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. Astro-geophysical applications (varies somewhat according to instructor). Prereqs., APAS 5150 and 5400.

APAS 7160-3. Intermediate Plasma Physics. 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., APAS 5150 or instructor consent. Same as PHYS 7160.

APAS 7240-3. Physics of Planetary Airglows. Theory of physical processes that lead to excitation of airglows. Ground- and space-based observational techniques used to measure nightglow, twilightglow, and dayglow, Determination of structure and composition of planetary atmospheres from airglow measurements. Prereqs., APAS 5110, 5250, and PHYS 6550.

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 Nonlinear 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 (1-3). Special Topics in Astrophysical, Planetary, and Atmospheric Sciences. Acquaints students with current research in astrophysical, planetary, and atmospheric sciences. (Topics vary each semester.) May be taken up to three times for credit.

APAS 7920 (1-6). Reading and Research in Astrophysical, Planetary, and Atmospheric Sciences. Prereq., instructor consent.

APAS 8990-10. 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 this catalog.

Bibliography

BIBL 3010-3. Methods of Library Research. Development of library research methods for undergraduates 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 instructor consent.

BIBL 4900 (1-3). Independent Library Research. In-depth library research project. For upper-division students. Arranged with instructor consent.

Biological Sciences

CU-Boulder offers five two-semester introductory biology course sequences. A student may receive credit for only one sequence. The Department of Environmental, Population, and Organismic (EPO) Biology offers three 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 1610 and 1620 are lecture-only courses designed for biology majors and others with at least one year each of high school biology and chemistry. (3) 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. The accompanying labs (MCDB 1070 and 1080) are designed for and required of majors. There is a two-semester sequence, NASC 1230-1240, designed exclusively for nonscience majors.

Students who receive 4 or 5 on the AP biology test receive 8 hours of credit and are exempt from EPOB 1210-1240. Students who score in the 66th percentile or higher on the CLEP test in biology will receive 6 hours of credit and are exempt from EPOB 1210 and 1220. EPO biology and MCD biology majors should consult their departmental advisor before applying AP or CLEP credit. Students majoring in biology who transfer biology credit from other institutions must also consult their departmental advisor.

Biology—Environmental, Population, and Organismic

EPOB 1210-3. General Biology 1. Lect. Concentrated introduction to molecular, cellular, genetic, and evolutionary biology. Emphasizes fundamental principles, concepts, facts, and questions which receive more detailed consideration later in the core curriculum. Recommended for science majors. Approved for arts and sciences core curriculum: natural science.

EPOB 1220-3. General Biology 2. Lect. Concentrated introduction to organisms, homeostasis, development, behavior, and ecology. Emphasizes fundamental principles, concepts, facts, and questions which receive more detailed consideration later in the core curriculum. Prereq., EPOB 1210. Recommended for science majors. Approved for arts and sciences core curriculum: natural science.

EPOB 1230-1. General Biology Laboratory 1. One 3-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. Recommended for science majors. This course uses animals and/or animal tissues. Approved for arts and sciences core curriculum: natural science.

EPOB 1240-1. General Biology Laboratory 2. One 3-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. Recommended for science majors. This course uses animals and/or animal tissues. Approved for arts and sciences core curriculum: natural science.

EPOB 1410-4. Introduction to Biology 1. Includes molecular, cellular, developmental, and organismic biology. Emphasizes fundamental principles, concepts, facts, and questions. Meets for three lectures and two recitations per week, and is for students with little or no high school science. Approved for arts and sciences core curriculum: natural science.

EPOB 1420-4. Introduction to Biology 2. Continuation of EPOB 1410. Introduces organisms, homeostasis, behavior, ecology, and evolutionary biology. Emphasizes fundamental principles, concepts, facts, and questions. Meets for three lectures and two recitations per week , and is for students with little or no high school science. Prereq., EPOB 1410. Approved for arts and sciences core curriculum: natural science.

EPOB 1430-1. Introduction to Biology: Laboratory. Series of two-hour laboratory exercises designed to provide direct experience with the scientific process. Observations for developing hypotheses and experiments for testing hypotheses used to investigate structure-function relations, inheritance, development, adaptations, diversity, behavior, and ecology. Prereq., EPOB 1410 or instructor consent. Recommended for nonscience majors. This course uses animals and/or animal tissues. Approved for arts and sciences core curriculum: natural science.

EPOB 1610-3, 1620-3. Honors General Biology 1 and 2. Broad and thorough introduction to fundamental biological principles and facts, including molecular, cellular, organismic, population, and environmental levels of organization. Requires dedicated students well prepared for college-level science. Students may not receive credit for both EPOB 1610 and 1210 *or* EPOB 1620 and 1220. Prereqs., one year of high school chemistry, one year of high school biology, and faculty permission. Approved for arts and sciences core curriculum: natural science.

EPOB 1840 (1-6). Independent Study (Freshman).

EPOB 1870 (1-6). Independent Research (Freshman).

EPOB 2000 (1-3). Topics in Montane Ecology. Introduces special aspects of ecology and population biology unique to montane environments. Topics include winter ecology, winter limnology, and montane physiological ecology. Most courses will use the facilities of the Mountain Research Station at 9500 ft. No credit for EPOB majors. May be repeated only once for credit. This course uses animals and/or animal tissues.

EPOB 2010-3. Environmental Issues and Biology. The natural environment is currently stressed by a variety of human actions. Examines the nature of these environmental problems and their impact on living organisms, both human and nonhuman species. Prereqs., one semester of introductory biology or instructor consent.

EPOB 2020-2. Field Methods in Environmental Sciences for Teachers. Field, lab and lecture course intended to improve the science training of K-12 teachers. Topics include tree-ring analysis, entomology, geology, mammalogy, pollen analysis, pollination ecology, soils, and water chemistry. Course will be team-taught at the Mountain Research Station.

EPOB 2500-4. Introduction to Horticulture. Covers the principles and techniques of plant science applied to cultivated plants. Emphasizes basic plant biology, aspects of the culture environment as variable, and the tools and technology utilized in culture, regulation, propagation, and protection. Includes a brief survey of the industries related to cultivated plants.

EPOB 2840 (1-6). Independent Study (Sophomore).

EPOB 2870 (1-6). Independent Research (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 3050-3. Conservation Biology for Nonscientists. Ecological, genetic, and biogeographic principles of species conservation and strategies for prevention of species extinction. Extensive outside reading and contribution to class project will be required. For upper division, nonscience majors. No biology credit for biology majors. Prereq., one year of natural science. Approved for arts and sciences core curriculum: natural science.

EPOB 3160-3. Paleoecology. 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, limiting physical factors (such as geomorphology and climatic history), and 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. Lect. Involves 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, or instructor consent. Open to nonmajors. Same as NASC 3180. Approved for arts and sciences core curriculum: natural science.

EPOB 3200-3. Genetics. Lect. and rec. Studies 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 3400-4. Microbiology. Lect. and lab. Surveys 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 emphasizing infectious diseases, basic concepts of immunology, and microbial ecology. Prereqs., EPOB 1210 and 1220 and CHEM 1071, 1131, or 1171. Organic chemistry advised. This course uses animals and/or animal tissues.

EPOB 3420-5. Introduction to Human Anatomy. Lect. and lab. Introduces 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. This course uses animals and/or animal tissues.

EPOB 3430-5. Human Physiology. Lect., lab and rec. Introduces 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. This course uses animals and/or animal tissues.

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. Preteqs., EPOB 1210 and 1220, or MCDB 1060. Open to nonmajors.

EPOB 3500-4. Plant Kingdom. Lect. and lab. Surveys plant types emphasizing diagnostic features of plants in general and major taxa in specific. Emphasizes 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 Development. Lect. and lab. Introduces structures of seed plants, especially angiosperms, and 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. Stresses role of plant structures in the living plant. Prereqs., EPOB 1210 and 1220, or MCDB 1060.

EPOB 3520-4. Plant Systematics. Lect. and lab. Principles and techniques of modern systematics of organisms, illustrated with examples from the plant kingdom, usually the angiosperms. Framework of course is evolutionary and ecological, as well as taxonomic. Prereqs., EPOB 3020 and 3200.

EPOB 3530-4. Essentials of Plant Physiology. 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. Surveys animal parasites, including life histories; emphasizes parasites of humans. Prereqs., EPOB 1210 and 1220, or MCDB 1060, *and* CHEM 1071, 1131, or 1171, *or* instructor consent. This course uses animals and/or animal tissues.

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 Laboratory. 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. Same as MCDB 4660. This course uses animals and/or animal tissues.

EPOB 3700-5. Comparative Animal Physiology. Lect., lab, and rec. Introduces 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. This course uses animals and/or animal tissues.

EPOB 3720-5. Principles of Comparative Vertebrate Anatomy. Lect. and lab. Introduces 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. This course uses animals and/or animal tissues.

EPOB 3840 (1-6). Independent Study (Junior).

EPOB 3870 (1-6). 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 students' career goals. Each project has both academic and work components.

EPOB 4000-3. 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. Same as EPOB 5000.

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 4020-3. 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 or 5150, 5160, 5170). Prereq., EPOB 3020 or instructor consent. Same as EPOB 5020.

EPOB 4030-3. 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. Same as EPOB 5030.

EPOB 4040-3. Conservation Biology. Applies principles of population ecology, population genetics, biogeography, animal behavior, and paleobiology to the maintenance of global biodiversity and natural systems. Resulting theory is then applied to conservation policy and management techniques. Prereqs., EPOB 3020 and 3200, or instructor consent. Same as EPOB 5040.

EPOB 4045-3. Medical Ecology and Environmental Health. Concerns the ecology, evolution, and environmental relationships of disease. Emphasizes zoonotic infections, i.e., animal diseases transmissible to humans, such as encephalitis and Lyme disease; and on environmental factors in chronic diseases. Prereqs., EPOB 1210, 1220, 1230 and 1240, or instructor consent.

EPOB 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 4070-3. Geographical Ecology. Lect. Discussion of ecological and faunistic distribution of animals on a world basis. How 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. Emphasizes ecological aspects. Prereq., EPOB 3020 or instructor consent. Same as EPOB 5070.

EPOB 4080-3. 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. Same as EPOB 5080.

EPOB 4100, 4110, 4120, 4130, 4140 (2-4). Advanced Ecology. Specific aspects of ecology, emphasizing specialties of faculty. One or more courses are offered most semesters. Topics may include dynamics of mountain ecosystems, tundra ecology, ethnoecology, population dynamics, tropical and insular biology, ecology of fishes, quantitative plant ecology, and arctic and alpine environments. One or more courses may use animals and/or animal tissues. Prereqs., EPOB 1210 and 1220, or MCDB 1060 and EPOB 3020. Same as EPOB 5100, 5110, 5120, 5130, 5140.

EPOB 4150 (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. Same as EPOB 5150.

EPOB 4170-3. Ecosystem Ecology. Examines the concepts and approaches to studying ecosystem processes, including primary and secondary production, energy flows, and elemental cycles. Attention given to biotic and abiotic controls on biogeochemical cycles and the potential for anthropogenic changes in ecosystem processes. Prereq., EPOB 3020. Same as EPOB 5170.

EPOB 4180-3. Ecological Perspectives on Global Change. Discusses evolutionary and recent geological history of modern environmental problems, using natural changes in climate, biotic diversity, drought, desertification, flood, forest destruction, etc., to show students the range and frequency of such events as a perspective on modern reports. Prereq., EPOB 3020. Approved for arts and sciences core curriculum: critical thinking.

EPOB 4190-3. Introduction to Neurobiology. Lect. Introduces cellular structure and physiology of neurons, followed by a consideration of integrative mechanisms. Topics include action potential, synaptic transmission development, sensory systems, motor systems, and the neural basis of behavior. Prereq., EPOB 3700 or MCDB 3120, or instructor consent. Same as EPOB 5190.

EPOB 4200-3. Developmental Neurobiology. Lect. Intensive survey of mechanisms involved in development of neurons and neural circuits in both vertebrates and invertebrates. Prereq., EPOB 3650 or instructor consent. Same as EPOB 5200.

EPOB 4210-3. Arguments in Evolutionary Biology. Uses original literature to study, examine, and evaluate major controversial issues of evolutionary biology. Emphasizes critical evaluation of arguments, evidence, and interpretation of author's advocacy. Students are expected to

develop and demonstrate high levels of critical thinking and verbal argumentation. Discussion and debate format. Prereq., junior standing in biology or instructor consent. Approved for arts and sciences core curriculum: critical thinking.

EPOB 4230-3. Organic Evolution. Lect. Presents organic evolution, the central idea in modern biology, from an historical perspective and from the standpoint of contemporary research. Stresses modern controversies surrounding neutralism vs. selectionism, hominid phylogenetic patterns, coevolution, and extinctions. Prereqs., EPOB 3020 and 3200, or equivalent.

EPOB 4240 (1-4). Advanced Topics in Animal Behavior. Lect. Special areas of ethology such as sociobiology, animal communication. Prereqs., EPOB 3240 and instructor consent. Same as EPOB 5240.

EPOB 4260-4. Evolutionary Ecology of Plants. Lect. Ecology and evolution of plant populations: population dynamics, geographic variation, adaptive strategies, and plant-animal coevolurion. Prereqs., EPOB 3020, 3200, and 3250, or instructor consent. Same as EPOB 5260.

EPOB 4270-3. Population Genetics and Evolution. Lect. Focuses on 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. Same as EPOB 5270.

EPOB 4280 (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. Same as EPOB 5280.

EPOB 4300 (2-4). Advanced Genetics. Courses deal with specialized topics in genetics. Prereq., EPOB 3200. Same as EPOB 5300.

EPOB 4320. (1-2). Techniques in Genetics. Courses involve specific procedures and their applications in solving genetic research problems. Same as EPOB 5320.

EPOB 4340-3. Evolutionary Morphology of Vertebrates. Lect. Advanced course in vertebrate structure and evolution, emphasizing 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. Same as EPOB 5340.

EPOB 4350 (2-4). Biological Field Studies. Courses stress broad areas of biology and employ field approaches. Prereq., instructor consent. Same as EPOB 5350. This course uses animals and/or animal tissues.

EPOB 4360-3. 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. Same as EPOB 5360. This course uses animals and/or animal tissues.

EPOB 4380-3. Respiratory Adaptations to the Environment. Investigates the evolutionary development of respiratory gas exchange systems, including the physical properties of gases and their exchange in burrows, water, high altitudes, and space, and models of how respiratory mechanisms have evolved in these environments. Prereq., EPOB 3430 or 3700. Same as EPOB 5380. Approved for arts and sciences core curriculum: critical thinking.

EPOB 4410-4. Biometry. Lect. and lab. Demanding, problems-oriented methods course in statistical inference procedures, assumptions, limitations, and applications emphasizing 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. Same as EPOB 5410.

EPOB 4420-3. Environmental Animal Physiology. Lect. 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. Same as EPOB 5420. Approved for arts and sciences core curriculum: critical thinking.

EPOB 4430-3. Invertebrate Physiology. Lect. Mechanisms by which invertebrates achieve constancy of their internal milieu. Topics include temperature acclimation, freeze tolerance, bioenergetics, invertebrate symbioses, oxygen delivery, renal function, intracellular osmolytes, nervous and endocrine control and development and growth. Prereq., EPOB 3430 or 3700. Same as EPOB 5430.

EPOB 4440-3. Mammalian Endocrinology. Lect. Introduces mammalian endocrine system. Course provides a thorough analysis and integration of chemical communication by hormones, paracrines, and semiochemicals.

EPOB 4450-3. Biochemical Adaptation to the Environment. Lect. Adaptive adjustments in macromolecules, in their surrounding milieu, and in output of macromolecular systems. Addresses response of these components to temperature, hydrostatic pressure, water stress and oxygen availability. Examples include organisms from polar and xeric environments, deep-sea rift zones, reducing sediments, ephemeral pools and streams, and others. Prereqs., EPOB 3430 or 3700, CHEM 3311, and 3321. Same as EPOB 5450.

EPOB 4460, 4470 (2-4). Advanced Animal Physiology. Specialized areas of physiology including invertebrate physiology, cell physiology, vertebrate reproduction, and others. Prereq., EPOB 3430 or 3700. Same as EPOB 5460, 5470.

EPOB 4520-3. Plants of Colorado. Lect., lab, and field trips. 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 4550 (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. Same as EPOB 5550.

EPOB 4570, 4580 (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 instructot consent. Same as EPOB 5570, 5580.

EPOB 4590-3. Plants and Human Affairs. Considers plants as living entities and as essential to human survival, as well as to human well-being and the quality of life. Covers medical botany, forensic botany, plant foods, and human ecology. Prereqs., EPOB 1210 and 1220; EPOB 3400, 3510 or 3520; and EPOB 3200 or 3700. Approved for arts and sciences core curriculum: critical thinking.

EPOB 4630 (2-4). Field Techniques in Environmental Science. Field and laboratory course in assessing the abiotic and biotic environment. Emphasizes field techniques in climatology, surveying soils, hydrology, geomorphology, plant and animal ecology, and environmental law. Evaluation by written module reports and maps. This course uses animals and/or animal tissues. Instructor consent required. Same as EPOB 5630.

EPOB 4640 (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. Same as EPOB 5640.

EPOB 4650-5. Invertebrate Zoology. Lect. and lab. Morphology, physiology, ecology, and phylogeny of invertebrates. Prereqs., EPOB 1210 and 1220, or MCDB 1060. Same as EPOB 5650. This course uses animals and/or animal tissues.

EPOB 4660-4. Insect Biology. Lect. and lab. Introduces evolution, ecology, physiology, and behavior of insects. Emphasizes 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. Same as EPOB 5660. This course uses animals and/or animal tissues.

EPOB 4670, 4680 (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 Aufwuchs ecology. Prereqs., EPOB 1210 and 1220, or MCDB 1060. Same as EPOB 5670, 5680. This course uses animals and/or animal tissues.

EPOB 4740-3. Biology of Amphibians and Reptiles. Same as EPOB 5740 and PSYC 4740.

EPOB 4750-3. 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. Same as EPOB 5750. This course uses animals and/or animal tissues.

EPOB 4760-4. 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. Same as EPOB 5760. This course uses animals and/or animal tissues.

EPOB 4770 (2-4). Advanced Vertebrate Biology. Special aspects of vertebrate biology such as ichthyology, experimental embryology, biology of freshwater fishes, and vertebrate natural history. Same as EPOB 5770. This course uses animals and/or animal tissues.

EPOB 4840 (1-6). Independent Study (Senior).

EPOB 4870 (1-6). Independent Research (Senior).

EPOB 5000-3. Teaching of Modern High School Biology. Same as EPOB 4000.

EPOB 5020-3. Stream Biology. Same as EPOB 4020.

EPOB 5030-3. Limnology. Same as EPOB 4030.

EPOB 5040-3. Conservation Biology. Same as EPOB 4040.

EPOB 5045-3. Medical Ecology and Environmental Health. Same as EPOB 4045.

EPOB 5070-3. Geographical Ecology. Same as EPOB 4070.

EPOB 5080-3. Physiological Plant Adaptation. Same as EPOB 4080.

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 5100, 5110, 5120, 5130, 5140 (2-4). Advanced Ecology. Same as EPOB 4100, 4110, 4120, 4130, 4140.

EPOB 5150. (1-2). Techniques in Ecology. Same as EPOB 4150.

EPOB 5170-3. Ecosystem Ecology. Same as EPOB 4170.

EPOB 5180-3. Biophysical Ecology. First half of course examines aspects of solar radiation, thermal radiation, sensible heat transfer through conduction and convection, wind, and latent heat transfer through evaporation. During 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 5190-3. Introduction to Neurobiology. Same as EPOB 4190.

EPOB 5200-3. Developmental Neurobiology. Same as EPOB 4200.

EPOB 5240. (1-4). Advanced Topics in Animal Behavior. Same as EPOB 4240.

EPOB 5260-4. Evolutionary Ecology of Plants. Same as EPOB 4260.

EPOB 5270-3. Population Genetics and Evolution. Same as EPOB 4270.

EPOB 5280 (2-4). Advanced Topics in Evolution. Same as EPOB 4280.

EPOB 5300 (2-4). Advanced Genetics. Same as EPOB 4300.

EPOB 5320. (1-2). Techniques in Genetics. Same as EPOB 4320.

EPOB 5340-3. Evolutionary Morphology of Vertebrates. Same as EPOB 4340.

EPOB 5350 (2-4). Biological Field Studies. Same as EPOB 4350.

EPOB 5360-3. Microbial Biology. Same as EPOB 4360.

EPOB 5380-3. Respiratory Adaptations to the Environment. Same as EPOB 4380.

EPOB 5410-4. Biometry. Same as EPOB 4410.

EPOB 5420-3. Environmental Animal Physiology. Same as EPOB 4420.

EPOB 5430-3. Invertebrate Physiology. Same as EPOB 4430.

EPOB 5440-3. Vertebrate Endocrinology. Lect. Evolutionary analysis of chemical control and integration of physiology and behavior. Instructor consent required.

EPOB 5450-3. Biochemical Adaptation to the Environment. Same as EPOB 4450.

EPOB 5460, 5470 (2-4). Advanced Animal Physiology. Same as EPOB 4460, 4470.

EPOB 5550 (2-4). Advanced Botany. Same as EPOB 4550.

EPOB 5570, 5580 (2-4). Advanced Plant Physiology. Same as EPOB 4570, 4580.

EPOB 5630 (2-4). Field Techniques in Environmental Science. Same as EPOB 4630.

EPOB 5640 (2-4). Plant Field Studies. Same as EPOB 4640.

EPOB 5650-5. Invertebrate Zoology. Same as EPOB 4650.

EPOB 5660-4. Insect Biology. Same as EPOB 4660.

EPOB 5670, 5680 (2-4). Advanced Invertebrate Biology. Same as EPOB 4670, 4680.

EPOB 5740-3. Biology of Amphibians and Reptiles. Same as EPOB 4740 and PSYC 5740.

EPOB 5750-3. Ornithology. Same as EPOB 4750.

EPOB 5760-3. Mammalogy. Same as EPOB 4760.

EPOB 5770 (2-4). Advanced Vertebrate Biology. Same as EPOB 4770.

EPOB 5830-5. Neuroscience Research Lab. 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. Same as MCDB 5800, PSYC 5800, ASEN 5080.

EPOB 5840 (1-6). Independent Study (Graduate). Instructor consent required.

EPOB 6000-2. 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 6110 through 6120 (1-3). Seminar in EPO Biology. Open only to graduate students. Instructor consent required.

EPOB 6200 (1-3). Seminar in Population Biology.

EPOB 6840 (1-6). Independent Research in EPO Biology. Instructor consent required.

EPOB 6940 (1-6). Master's Degree Candidate—Plan II. Instructor consent required.

EPOB 6950 (1-6). Master's Thesis. Instructor consent required.

EPOB 8990 (1-10). Doctoral Dissertation. Instructor consent required.

Biology—Molecular, Cellular, and Developmental

MCDB 1010-3. Molecular Biology for Non-Scientists. Introduces nonmajors to modern molecular biology. Topics include gene cloning, biotechnology, oncogenes, the human immune system, AIDS virus, cancer, monoclonal antibodies, gene replacement therapy, screening for inherited diseases, and recombinant vaccines. No background in biology is required. Approved for arts and sciences core curriculum: natural science.

MCDB 1030-3. Plagues, People, and Microorganisms. Discusses biology, history, and social impact of human plagues and other major infectious diseases. Planned topics including bubonic plague, tuberculosis, leprosy, malaria, smallpox, syphilis, polio, AIDS, and the human immune response are each treated in detail. No prior experience in biology is required. Approved for arts and sciences core curriculum: natural science.

MCDB 1050-3. Introduction to Molecular, Cellular, and Developmental Biology 1. For nonmajors and majors. Preparation for upper-division MCDB courses. Function and structure of cells, molecular composition of cells, cell reproduction, cancer, cellular genetics, Mendelian genetics, cell differentiation, cell-cell interactions, origin and evolution of cells. MCDB 1070 must be taken concurrently by majors in biology or biochemistry and by pre-health science students. Approved for arts and sciences core curriculum: natural science.

MCDB 1060-3. Introduction to Molecular, Cellular, and Developmental Biology 2. Continuation of MCDB 1050. Topics include

multicellular organisms (their structure, physiology, nutrition, reproduction, and development), communities of organisms, the origin and evolution of life, and topics in ethics of biomedical science. MCDB 1080 must be taken concurrently by majors in biology or biochemistry and by prehealth science students. Prereq., MCDB 1050. Approved for arts and sciences core curriculum: natural science.

MCDB 1070-1. Introduction to Molecular, Cellular, and Developmental Biology Laboratory 1. One 2-hour lab per week designed to acquaint students with current research techniques used in molecular biology to analyze gene expression, protein structure, enzyme activity, carcinogenicity of specific compounds, analysis of biochemical pathways and genetics. Course must be taken concurrently with MCDB 1050. Approved for arts and sciences core curriculum: natural science.

MCDB 1080-1. Introduction to Molecular, Cellular, and Developmental Biology Laboratory 2. One 2-hour lab per week designed to enrich knowledge of cellular biology and animal physiology by investigating live cells, nerve cell transmission, muscle cell contraction, antibody-antigen reactions, respiration in mice and fish, fertilization and development, and natural selection. Course must be taken concurrently with MCDB 1060. This course uses living vertebrate animals and/or tissues. Approved for arts and sciences core curriculum: natural science.

MCDB 3120-3. Cell Biology. Introduces modern cell biology. Includes molecular basis of cellular organization and function, cellular membrane systems, intracellular organelles, mechanisms of energy transduction, the cytoskeleton, extracellular matrix, and 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 3 1/2 hour lab per week. Provides hands-on experience with modern cell biology laboratory techniques. Topics include microscopy, vital staining and cytochemistry, immunocytochemistry, biochemical fractionation, and molecular analyses of cells. This course does not use vertebrate animals. Coreq., MCDB 3120.

MCDB 3150-3. Biology of the Cancer Cell. Kinds of cancer among humans; loss of control of cell reproduction; 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. Approved for arts and sciences core curriculum: natural science.

MCDB 3200-3. Histophysiology: The Structure and Function of Vertebrate Organ Systems. Structure and function of the basic types of vertebrate tissues are discussed, as well as how arrangement of these tissues in major organs contributes to their functioning. Prereq., MCDB 1060 or EPOB 1220 or instructor consent.

MCDB 3210-1. Histophysiology Laboratory. Students identify and analyze the structure of vertebrate tissues and organs by means of the light microscope. Correlation with electron microscope images is stressed. Optional laboratory to accompany MCDB 3200. Coreq., MCDB 3200.

MCDB 3330-3. Evolution and Creationism. Intensive lecture/discussion course on the interrelationships among science, religion, and social policy. Includes historical and scientific development of evolution theory, social Darwinism/sociobiology, and the public perception of science. Does not count as an MCDB major's elective. Prereq., instructor consent. Approved for arts and sciences core curriculum: natural science, or critical thinking.

MCDB 3350-3. Fertility, Sterility, and Early Mammalian Development. Describes the production of germ cells, ovulation, fertilization, reproductive cycles, controls of reproduction, early development of the embryo, methods of contraception, and causes and treatments of sterility. Prereq., MCDB 1060 or EPOB 1220 or instructor consent.

MCDB 3351-3. Success and Failure in Human Reproduction. Describes the production of germ cells, fertilization, early development of the human embryo, and hormonal controls of reproduction. Causes and treatments of sterility are discussed. Prereq., MCDB 1060 or EPOB 1220 or NASC 1240. Does not count toward MCDB major. No credit given for both MCDB 3550 and 3551. Approved for arts and sciences core curriculum: natural science.

MCDB 3400-4. Molecular Genetics. Major emphasis on understanding genetic phenomena at the DNA level. Topics range from bacterial and viral genetics through Mendelian and human genetics. Attention given to techniques used for genetic mapping in prokaryotes and eukaryotes, the relationship between chromosomes and genetic maps, RNA and protein syntheses, gene expression, recombinant DNA procedures, transposable elements, and replication, mutation, and repair of DNA. Prereqs., CHEM 1131 and MCDB 1060, or instructor consent.

MCDB 4110 (1-3). 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 4140-3. Plant Molecular Biology and Biotechnology. Introduces some of the frontiers in experimental plant research with applications in modern biotechnology, including seed development, hormonal control of growth, photosynthesis and photomorphogenesis, stress responses (heat, water, salt), host-pathogen systems (bacteria, fungi, viruses, viroids), plant defense mechanisms, nitrogen fixation, plant cell tissue culture, and genetic engineering of plants. Prereqs., MCDB 3120 and 3400, or instructor consent. Same as MCDB 5140. Approved for arts and sciences core curriculum: critical thinking.

MCDB 4320-3. Eukaryotic Genetics Laboratory. Focuses on laboratory experiments in classical and molecular genetics to elucidate principles of these areas. Students perform research projects with a microbial organism. Prereq., MCDB 3400 or instructor consent.

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 4440-3. Cell Growth and Reproduction. Examines extracellular regulatory molecules and intracellular second message systems that control cellular growth and reproduction in detail, emphasizing recent advances. Special attention given to cellular growth factors and differences between normal and malignant cells. Prereqs., MCDB 3120, 3400; coreq., CHEM 4711. Same as MCDB 5440.

MCDB 4470-3. Regulation of Gene Expression in Development. Molecular biology of cell differentiation in development with special emphasis on mammalian systems. Part 1 focuses on biological systems, *in vivo* and in cell culture, with discussions on major cell differentiation systems, cell fusion, and hybridoma technology. Part 2 examines molecular mechanisms of gene expression, with discussions on actively pursued systems and coordinate regulations. Prereqs., CHEM 4711 and MCDB 3400, or instructor consent. Same as MCDB 5470.

MCDB 4500-4. Workshop in Electron Microscopy. Laboratory course that gives experience in the preparation of specimens, instruction in the operation of transmission and scanning electron microscopes. Photographic techniques and interpretation of micrographs also taught. This course may use vertebrate animal tissues. Prereqs. for MCDB 4500, 3120 and instructor consent; for MCDB 5500, graduate standing or instructor consent. Same as MCDB 5500.

MCDB 4530-3. Analysis of Biological Sequences. Examines methods for identifying and evaluating similarity between sequences, predicting RNA and protein structures, analyzing and predicting regulatory sites, and building phylogenetic trees. Describes algorithms and uses computer programs. Prereq., MCDB 1050 or instructor consent. Same as MCDB 5530. Approved for arts and sciences core curriculum: critical thinking.

MCDB 4650-3. Developmental Biology. Analysis of development emphasizing cellular, molecular, and genetic 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. Studies of live eggs and embryos from a variety of organisms (such as sea urchins, nematodes, fruit flies, frogs, and chickens) provide experience with experimental design and interpretation of data. Concurrent enrollment in MCDB 4650 required. This course uses living vertebrate animals and/or tissues.

MCDB 4680-3. Mechanisms of Aging. Studies aging as a developmental process emphasizing cellular and molecular mechanisms involved. Prereqs., MCDB 3120 and 3400; coreq.,

MCDB 4650 or EPOB 3650. Same as MCDB 5680. Approved for arts and sciences core curriculum: critical thinking.

MCDB 4720-3. Membranes. Examines the functional, biosynthetic, and metabolic interrelationships between cellular membranes and organelles. Topics include membrane structure and function, transmembrane signalling, organelle biochemistry, intracellular energy flow, organelle biogenesis and turnover, and cellular evolution. Prereqs., MCDB 3120 and CHEM 4711, or instructor consent. Same as MCDB 5720.

MCDB 4750-3. Animal Virology. Encompasses the structure, replication, and interactions with the host of both lytic and transforming animal viruses. Emphasizes diversity of naturally occurring genomic structures and the resulting strategies of infection as well as the impact of viral epidemics on society. Prereq., MCDB 3400 or instructor consent. Approved for arts and sciences core curriculum: critical thinking.

MCDB 4840 (1-6). Undergraduate Independent Study. Instructor consent required.

MCDB 4850-2. Advanced Topics in Early Mammalian Development. Intensive seminar course focusing on current topics in molecular and cellular biology of early mammalian development. In addition to lectures, course involves student presentations on current research and research literature in early mammalian embryogenesis. Emphasizes discussions of genomic and extragenomic forces that influence and direct development during the pre- and postfertilization period. Prereq., MCDB 3120, EPOB 3650, or instructor consent.

MCDB 4970-2. Seminar on Physical Methods in Biology. Covers basic mechanisms and applications of physical methods used in current biological research: microprobe analysis, elementary electron and X-ray crystallography, biomedical imaging (NMR, PET, CAT), Fourier analysis, synchrotron radiation, EXAFS, neutron scattering, novel ultramicroscopy techniques. Lectures, student presentations, and occasional demonstrations. Emphasis depends on student interest. Prereqs., MCDB 1060 or EPOB 1220, and PHYS 2020 or PHYS 1120, or instructor consent. Same as PHYS 4970.

MCDB 4980-3. Honors Research. Provides faculty-supervised research for students who have been approved by the departmental honors committee. Normally taken during the semester before completion of the honors thesis. Prereqs., MCDB 4840 and a GPA of 3.10 or better.

MCDB 4990-3. Honors Thesis. Preparation and defense of an honors thesis, based on faculty-supervised original research, including final phases of the research project. Prereqs., MCDB 4840 or 4980, GPA of 3.20 or better, and approval by the MCDB honors committee.

Note: Core Courses 1 through 8 meet eight hours per week for 4–5 week segments during fall and spring semesters.

MCDB 5050-2. Core Course 1: Cell Membranes and Bioenergetics. Must be taken concurrently with MCDB 5080. Instructor consent required.

MCDB 5060-2. Core Course 2: Cell Architecture and Cell Reproduction. Must be taken concurrently with MCDB 5080. Instructor consent required.

MCDB 5070-2. Core Course 3: Prokaryotic Molecular Biology. Must be taken concurrently with MCDB 5080. Instructor consent required.

MCDB 5080-1. Core Course 4: Graduate Core Course Student Presentations 1. Must be taken concurrently with MCDB 5050, 5060, and 5070.

MCDB 5090-2. Core Course 5: Eukaryotic Molecular Biology. Must be taken concurrently with MCDB 5120. Instructor consent required.

MCDB 5100-2. Core Course 6: Classical Genetics. Must be taken concurrently with MCDB 5120. Instructor consent required.

MCDB 5110-2. Core Course 7: Developmental Biology. Must be taken concurrently with MCDB 5120. Instructor consent required.

MCDB 5120-1. Core Course 8: Graduate Core Course Student Presentations 2. Must be taken concurrently with MCDB 5090, 5100, and 5110. Instructor consent required.

MCDB 5140-3. Plant Molecular Biology and Biotechnology. Same as MCDB 4140.

MCDB 5440-3. Cell Growth and Reproduction. Same as MCDB 4440.

MCDB 5470-3. Regulation of Gene Expression in Development. Same as MCDB 4470.

MCDB 5500-4. Workshop in Electron Microscopy. Same as MCDB 4500.

MCDB 5530-3. Analysis of Biological Sequences. Same as MCDB 4530.

MCDB 5680-3. Mechanisms of Aging. Same as MCDB 4680.

MCDB 5720-3. Membranes. Same as MCDB 4720.

MCDB 5780-2. Topics in Plant Cell Biology. 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 5800-5. Neuroscience Research Lab. Intensive study of methods and techniques in neuroscience research for advanced graduate students. Methods drawn from electrophysiology, neurohistology, computer neural modeling, neurochemistry, neuropharmacology, and psychophysics. Faculty and topics vary from term to term. Same as EPOB 5830 and PSYC 5800.

MCDB 6000-3. Introduction to Laboratory Methods. Introduces 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 findings, and to plan and execute experiments in selected areas. Open only to MCDB 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 6940-3. 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 7050-2. Genetics Seminar. Series of seminars that critically review both current and past research that uses formal genetics as a tool. Each member of the class presents seminars based on work in the literature. Discussion of presented work encouraged. May be repeated twice. 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 8990-10. 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 this catalog.

Center for Studies of Ethnicity and Race in America (CSERA)—Afroamerican Studies

BLST 1100-3. Contemporary Black Social Issues. Explores the history, sociology, education, and political, economic, and social issues relevant to the Afroamerican experience. Offered summer session only.

BLST 2000-3. Introduction to Afroamerican Studies. Overview of Afroamerican studies as a field of investigation, its origins, and history. Approved for arts and sciences core curriculum: cultural and gender diversity.

BLST 2200-3. Contemporary Black Protest Movements. Examines selected case studies of Black collective behavior in a historical context. Emphasizes an in-depth investigation of the continuing Black struggle for social/democratic rights. Approved for arts and sciences core curriculum: cultural and gender diversity, or contemporary societies.

BLST 2201-3. Blacks in Film. Examines images of Afroamericans, Africans, and Afro-Caribbeans in films. Films are analyzed and critiqued within historical, social, and artistic contexts and reveal the extent of the impact those images have exerted on audiences.

BLST 2210-3. Black Social and Political Thought. General introductory course designed to acquaint students with historical and contemporary thinking, writings, and speeches of Black people.

BLST 2350, 2360, 2370-1. Minicourses in Afroamerican Studies. Three five-week courses in Afroamerican 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. African-American Dance 1. Explores 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. Same as DNCE 2500.

BLST 2410-2. African-American Dance 2. Continuation of BLST 2400, but may be taken separately by permission of instructor. Emphasizes the growth of African-American dance from the roots of African dance. Technique, movement exploration, and improvisation includes plantation dance, African-American heritage dances, blues, and jazz. Same as DANCE 2510.

BLST 2550-3. Black Women in American Society. Sociological and psychological examination of Black women in American society—myths and stereotypes, sexism and racism, relationships in the family and with Black men—in a historical and contemporary context.

BLST 2600-3. Introduction to African Literature. Surveys African literature from its beginnings to the present: the oral tradition, the pioneer writers, market literature, the Negritude movement, and selected contemporary writers like Achebe, Laye, Ngugi, and Soyinka. Examines theoretical questions concerning second-language literatures.

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 2722-3. Survey of African-American Literature 2. Continuation of BLST 2722.

BLST 2800-3. African-American Music: History and Appreciation 1. Studies the history of Black music. African background studied as well as influences of Europe and the Caribbean. African-American folk music studied in detail. Same as EMUS 2802. Approved for arts and sciences core curriculum: cultural and gender diversity.

BLST 2810-3. African-American Music: History and Appreciation 2. Covers Black music since 1900, religious and secular. Development of jazz and modern rhythm and blues today. Black musicians and their technical development are also studied. Continuation of BLST 2800. Same as EMUS 2812. Approved for arts and sciences core curriculum: cultural and gender diversity.

BLST 3000-3. Race, Class, and Gender. Examines the uses of race, sex, and class as instruments of domination in Western society.

BLST 3020-3. Selected Topics in Afroamerican 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, the civil rights movement, and Martin Luther King, Jr. May be repeated for up to 6 credit hours on different topics.

BLST 3103-3. Blacks in the U.S. Educational System. Examines the history of the education of African Americans from early American history until current times. Covers primary, secondary, and higher eduction. Topics include education of Blacks before 1800, education of Blacks during the period of American slavery, and factors affecting today's education gains. Also covers current research being conducted in higher education.

BLST 3125-3. Black Religious Life in America. Emphasizes the four principle periods in the growth and expansion of the Black church: African traditional religion to the end of the American Civil War; development stage; traditional stage; and the contemporary period.

BLST 3203-3. Afroamerican Psychology. Describes the philosophy, theories, and research findings associated with the psychology of African Americans. Analyzes issues of identity and personality development of Afroamericans impacted by Euramerican system. Prereqs., upper-division standing and 6 hours or more of ethnic studies, or instructor consent.

BLST 3505-3. Historical and Contemporary Issues of Black Women. Explores the social, economic, political, historical, and cultural role of African-American women from an interdisciplinary perspective. Special emphasis is placed on African-American women's rich oral and literary tradition. Same as WMST 3505. Prereq., WMST 2000 or 2010 or BLST 2000.

BLST 3703-3. Culture, Racism, and Alienation in America. Examines African-American experiences, focusing on the post-civil rights era. Discusses psychosocial dynamics, issues of racism, attitudes, and cultural changes in relation to contemporary and future experiences.

BLST 3840 (1-3). Undergraduate Independent Study.

BLST 4000-3. Seminar in African-American, African, and Caribbean Literature. Seeks to explore the nature of the literary impulse in African, African-American, and Caribbean literature.

BLST 4101-3. Black Politics. Discusses 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. Same as PSCI 4101. Approved for arts and sciences core curriculum: contemporary societies, or cultural and gender diversity.

BLST 4237-3. History of South Africa since 1800. Examines the history of southern Africa, with special emphasis on the history of South Africa. Focuses on the decline of white rule and the region's strategic importance. Same as HIST 4238.

BLST 4500-3. Research Methods in Afroamerican Studies 1. Preparation for empirical inquiry in Afroamerican studies. Emphasizes 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 Afroamerican 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 Afroamerican Studies. Variable topic that allows intensive coverage of a subject, theme, or issue in Afroamerican studies. May be repeated for up to 6 credit hours on different topics.

BLST 4692-3. Contemporary African-American Literature 1. Advanced study of works of prominent African-American novelists and poets of the traditional school, e.g., Wright, Gaines, Ellison, and Morrison. Works are studied in terms of their literary, intellectual, and political values. Same as ENGL 4692.

BLST 4702-3. Contemporary African-American Literature 2. Nontraditional and experimental examination of the lirerature of the Black arts movement of the 1960s and 1970s. Students examine the works of such authors as Amiri Baraka (LeRoi Jones), Don L. Lee, William Melvin Kelly, and Ishmael Reed.

BLST 4710-3. The Black Female: A Feminist Analysis. Offers a Black feminist framework for the analysis of the experiences of Black women 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. Same as WMST 4710.

BLST 4800-3. The African Novel. In addition to a detailed study of works by distinguished African novelists, examines such areas as 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 instructor consent.

BLST 4950-3. Senior Seminar. Independent project summarizing the work done in Afroamerican studies. A public presentation of the work executed is a requirement.

CSERA—American Indian Studies

AIST 1125-3. Exploring a Non-Western Culture: Hopi and Navajo, Cultures in Conflict. Same as ANTH 1120. Approved for arts and sciences core curriculum: cultural and gender diversity.

AIST 2000-3. Introduction to American Indian Studies: Precontact Native America. Explores the attainments of various American Indian civilizations in the period immediately prior to first contact with Europeans. Examines agriculture, architecture, governance and social organization, medicine, mathematics, and population. Approved for the arts and sciences core curriculum: cultural and gender diversity.

AIST 2201-3. American Indians in Film. Examines images of American Indians in films. Films are analyzed and critiqued within historical, social, and artistic contexts, and examined in terms of the impact their images have exerted upon audiences.

AIST 2203-3. American Indian Women's Experiences. Examines the role of American Indian women in North America, in their tribal and urban communities, and non-Indian society by learning about the social spheres of their

bicultural and even tricultural lifestyles and experiences. Presents cultural experience from both a traditional and contemporary perspective in the context of their shared "third world" struggle with other indigenous women throughout the Americas.

AIST 3010-3. Marxism and Native Americans. Contrasts and compares the major tenets of Marxian philosophy with those prevailing in the philosophies of traditional American Indian societies. Conclusions are reached regarding the applicability of Marxist principle within a self-determining Native American future. Prereqs., SOCY 1001, PSCI 1101, or instructor consent.

AIST 3020-3. Special Topics in American Indian Studies. Examines a particular topic, theme, issue, or problem in American Indian Studies.

AIST 3135-3. North American Indians: Traditional Cultures. Same as ANTH 3130.

AIST 3400-3. Indian/Government Conflicts. Deals with historical events involving conflicts between the U.S. government and American Indians. Examples include the role of the FBI in the Pine Ridge Sioux Reservation (1972-76) or the 1864 massacre of the Cheyenne and Arapaho Indians in Colorado territory. Additional courses may relate to tribal governments. May not be repeated for credit.

AIST 3840-3. Undergraduate Independent Study. Please consult CSERA office for further information.

AIST 4350-3. Native American Religions: Regional Studies. Same as RLST 4350.

AIST 4565-3. North American Indian Acculturation. Same as ANTH 4560/5560. Approved for arts and sciences core curriculum: cultural and gender diversity, or contemporary societies.

AIST 4627-3. The Indian in American History: The Western Region. Same as HIST 4627. Approved for arts and sciences core curriculum: cultural and gender diversity.

CSERA—Asian-American Studies

AAST 1015-3. Introduction to Asian-American Studies. Examines the various factors that define minority groups and their positions in American society using Asian Americans as a case study. Emphasizes the perspectives and methodologies of the discipline of ethnic studies. Approved for arts and sciences core curriculum: contemporary societies, or cultural and gender diversity.

AAST 2717-3. Asian-American History. Introductory-level survey of social history of Asians in America from nineteenth century to the present. Focuses on delinearing and explaining changes that Asian Americans, one of the most visible ethnic groups in our society, have undergone since their arrival in the United States. Same as HIST 2717. Approved for arts and sciences core curriculum: United States context.

AAST 3013-3. Asian/Pacific American Communities. Covers the concepts, methods, and theories commonly used in community research, as well as substantive information on selected Asian/Pacific American communities. Emphasizes the ethical/political dimensions of community studies. Approved for arts and sciences core curriculum: United States context, or contemporary societies.

AAST 3420-3. Selected Topics in Asian-American Studies. Intensive examination of a topic or issue affecting Asian Americans, such as the Japanese-American internment during World War II, or Asian-American social movements or community organizations. May be repeated for up to 6 credit hours on different topics.

AAST 3840 (1-3). Undergraduate Independent Study. Independent study course work is available. Please consult the CSERA office for further information.

CSERA—Chicano Studies

Culture

CHST 4000-3. Hispanic and Native American Culture of the Southwest. Lecture course on Mexican-American culture. Includes guest presentations by experts in such fields as geography, anthropology, history, fine arts, comparative literature, political science, and sociology. Same as SPAN 4000.

Arts and Humanities

CHST 1031-3. Chicano Fine Arts and Humanities. Provides 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. Approved for arts and sciences core curriculum: cultural and gender diversity.

CHST 4351-3. 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. Examines a particular topic, theme, issue, or problem concerning Chicano studies. May be repeated for up to 6 credit hours on different topics.

Politics and Society

CHST 1013-3. U.S. Race and Ethnic Relations. Examines race and racism and facts and myths about great populations, including psychological, social, and cultural sources of bias and discrimination. Same as SOCY 1015. Approved for arts and sciences core curriculum: United States context.

CHST 1273-3. The Contemporary Mexican American. Gives special attention to family life cycle, migration, economic change, discrimination (race and sex), and political status in Mexican-American life.

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.

CHST 3013-3. Field Experience. Acquaints students with major ethnographic studies in ethnic communities and teaches such qualitative methods as participant observation and depth interviews. Students required to do a field study. Prereq., CHST 1015 or 1273.

CHST 3023-3. Sociology of the Chicano and Mexican Americans. Surveys contemporary sociological studies of Chicanos and theories used to understand and explain their status. Covers population growth, socioeconomic status, reverse discrimination, Chicana Feminism, and U.S.-Mexico relations. Same as SOCY 3022.

CHST 3153-3. Folklore, Mysticism, and Myth of the Hispanic Southwest. Concerned with the indigenous and Christian synchretic beliefs that underlie the many folkloric expressions of mysticism in the Hispanic Southwest. Focuses on traditional myths, storytelling, and the practice of curanderismo and shamanism. Approved for arts and sciences core curriculum: cultural and gender diversity.

CHST 4133-3. Latinos and the American Political System. Analyzes the social, cultural, and economic factors that affect political behavior of Mexican Americans. Pays special attention to Mexican-American cultural heritage and to relationships between Mexican Americans and Anglo Americans. Same as PSCI 4131. Approved for arts and sciences core curriculum: cultural and gender diversity.

CHST 4303-3. The Chicano and the United States Social Systems. Gives special attention to ways U.S. institutions (i.e., legal, economic, educational, governmental and social agencies) affect Chicanos. Discusses internal colonialism, institutional racism, assimilation and acculturation, and identity. Prereq., one of the following: CHST 1015, 1273, 2537, 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. Examines indigenous pre-Columbian roots and later Mexican influences, and contemporary Chicano poetry. Recommended prereq., CHST 1031 or 1044.

CHST 3824-3. Chicano Prose Fiction. Covers the most important Chicano writers of prose fiction of the past three decades. Considers progression of Chicano fiction from naturalism, realism, and romanticism to post-modernism. Recommended prereq., CHST 1031 or 1044.

Interdisciplinary

CHST 1015-3. Introduction to Chicano Studies. Introduces basic vocabulary, concepts, and topics relating to the study of the Mexican-American experience. Examines how social science theory and methodology produce stereotypes. Approved for arts and sciences core curriculum: cultural and gender diversity.

CHST 3135-3. Study of Chicanas. Provides insight into the present socioeconomic condition of Mexican-American women and the concept of *femenismo* through interdisciplinary study of history, sociology, literary images, and film portrayals. Prereq., CHST 1015 or 2537. Same as WMST 3135. Approved for arts and sciences core curriculum: cultural and gender diversity.

CHST 3905 (1-3). Independent Study. Instructor consent required.

CHST 4905 (1-3). Independent Study. Instructor consent required.

History

CHST 2537-3. Chicano History. Introduces historical developments of Chicano society and thought from pre-Columbian period to present. Same as HIST 2537. Approved for arts and sciences core curriculum: United States context.

CHST 4607-3. History of the Chicano in the American Labor Movement. Presents historical and topical analysis of the American labor movement, particularly its ethnic, sexual, racial, and skill divisions. Analyzes historical development of the American working class, specifically its culture, ideology, ethnicity, and union involvement with focus on Chicanos.

Central and East European Studies

CEES 4000-3. The Emerging Democracies of Central and Eastern Europe. Analyzes developments in the countries of Central and Eastern Europe (Poland, Czechoslovakia, Hungary, Yugoslavia, Bulgaria, Romania, and Albania) from 1956 to the present. Students will not receive credit for both CEES 4000 and PSCI 4062. Approved for arts and sciences core curriculum: contemporary societies.

Chemistry

CHEM 1001-3. Preparatory Chemistry. Lect. and rec. For students with no high school chemistry; prepares 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. No credit is allowed for CHEM 1001 if students already have credit for any other college-level chemistry course. Prereq., one year of high school algebra or concurrent enrollment in math modules MATH 1000, 1010, and 1020.

CHEM 1011-3. Environmental Chemistry 1. Lect. Introduces basic principles of chemistry with applications to current environmental issues including toxic chemicals, air and water pollution, energy sources and their environmental impact, and climate change resulting from the greenhouse effect. No credit given for CHEM 1011 if students already have credit in any chemistry course numbered 1051 or higher. Approved for arts and sciences core curriculum: natural science.

CHEM 1021-4. Introductory Chemistry. Lect., rec., and lab. Same as CHEM 1001 but with the addition of a lab. Course remedies a natural science deficiency in the MAPS entrance requirements and prepares students to enter CHEM 1111. No credit given for CHEM 1021 if students already have credit for any other college-level chemistry course. Prereq., one year of high school algebra or concurrent enrollment in math modules MATH 1000, 1010, and 1020.

CHEM 1031-4. Environmental Chemistry 2. Lect., rec., and lab. Applications of chemical principles to current environmental issues including acid rain, stratospheric ozone depletion, the Antarctic ozone hole, solar energy conversion and fuel cells, and the environmental consequences of nuclear war. Laboratory experience is included. No credit given for CHEM 1031 if students already have credit in any college-level chemistry course numbered 1071 or higher. Prereq., CHEM 1011. Approved for arts and sciences core curriculum: natural science.

CHEM 1051-4. Introduction to Chemistry. Lect., rec., and lab. First course in principles of chemistry. CHEM 1051-1071 meets the chemistry requirement for nursing and physical therapy. Prereq., one year of high school algebra or math modules MATH 1000, 1010, and 1020. Approved for arts and sciences core curriculum: natural science.

CHEM 1071-4. Introduction to Organic and Biochemistry. Lect., rec., and lab. Essential topics in organic and biochemistry. CHEM 1051-1071 or 1111-1071 completes the chemistry requirement for nursing, physical therapy, and kinesiology students. Prereq., CHEM 1051, 1111, or 1151. CHEM 1071 does not replace CHEM 1131 or 1171 as a prereq. for CHEM 3311 or 3351. Approved for arts and sciences core curriculum: natural science.

CHEM 1111-5. General Chemistry 1. Lect., rec., and lab. 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 or 1021; high school algebra. Not recommended for students with grades below *B-* in CHEM 1001 or 1021. Not open to students in the College of Engineering and Applied Science except by special arrangement. Students may not receive credit for CHEM 1111 and CHEM 1211. Approved for arts and sciences core curriculum: natural science.

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. Approved for arts and sciences core curriculum: natural science.

CHEM 1151-6. Honors General Chemistry 1. Lect., rec., and lab. 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. Prereqs., one year of high school chemistry, four years of high school math and/or a high score on the SAT or ACT mathematics examination, and one year of high school physics. Approved for arts and sciences core curriculum: natural science.

CHEM 1171-6. Honors General Chemistry 2. Lect., rec., and lab. Continuation of CHEM 1151. Prereq., CHEM 1511 with grade of *C-* or higher. Approved for arts and sciences core curriculum: natural science.

CHEM 1211-3. General Chemistry for Engineers. Lect. A one-semester course designed to meet the general chemistry requirement for engineering students. Topics include stoichiometry; thermodynamics; gases, liquids, and solids; equilibrium; acids and bases; bonding concepts; kinetics; reactions; and materials science. Examples and problems illustrate the application of chemistry to engineering subdisciplines. Prereqs., enrollment in the College of Engineering and Applied Science; one year of high school chemistry or satisfactory performance in CHEM 1001 or 1021; and high school algebra. Not recommended for students with grades below *B-* in CHEM 1001 or 1021. Students may not receive credit for CHEM 1211 and CHEM 1111. Coreq., CHEN 1221.

CHEM 3311-3. Organic Chemistry 1. Lect. For 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 or 3361.

CHEM 3321-1. Laboratory in Organic Chemistry 1. Lab. For biochemistry option and nonchemistry majors. Instruction in experimental techniques of modern organic chemistry emphasizing 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. Prereq., CHEM 1311 or 1171 or equivalent with a grade of *C-* or better; coreq., CHEM 3311 or 3351.

CHEM 3331-3. Organic Chemistry 2. Lect. For 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 techniques. Prereqs., CHEM 3311 or 3351 *and* CHEM 3321 or 3361 with grades of *C-* or higher; prereq. or coreq., CHEM 3341 or 3381.

CHEM 3341-1. Laboratory in Organic Chemistry 2. Lab. For biochemistry option and nonchemistry majors. Instruction in experimental techniques of modern organic chemistry emphasizing reactions involving alcohols, ketones, carboxylic acids, and their derivatives. Multistep syntheses are also introduced. Prereq., CHEM 3321 or 3361 with a grade of *C-* or higher; coreq., CHEM 3331 or 3371.

CHEM 3351-3. Organic Chemistry 1 for Chemistry Majors. Lect. Recommended for biochemistry option students. 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 or 3321.

CHEM 3361-2. Laboratory in Organic Chemistry 1 for Chemistry Majors. Required course for chemistry majors. Instruction in experimental techniques of modern organic chemistry emphasizing chemical separations and reactions of alkanes, alkenes, alcohols, ketones, and alkyl halides. Explores stereochemical modeling and the identification of organic unknowns. Prereq., CHEM 1131 or 1171 or equivalent with a grade of *C-* or higher; coreq., CHEM 3351 or 3311.

CHEM 3371-3. Organic Chemistry 2 for Chemistry Majors. Lect. Recommended for biochemistry option students. 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 or 3311 and CHEM 3361 or 3321 with grades of *C-* or higher; prereq. or coreq., CHEM 3381 or 3341.

CHEM 3381-2. Laboratory in Organic Chemistry 2 for Chemistry Majors. Lab. Required course for chemistry majors. Instruction in experimental techniques of modern organic chemistry, emphasizing 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; prereq. or coreq., CHEM 3371 or 3331.

CHEM 4011-3. Modern Inorganic Chemistry. Lect. Introduces modern inotganic 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. Theory and practice of instrumental methods of chemical analysis 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. Approved for arts and sciences core curriculum: critical thinking.

CHEM 4411-3. Physical Chemistry with Biochemistry Applications 1. Lect. Introduces thermodynamics and kinetics, emphasizing macromolecule and biochemical applications. Includes thermodynamics, chemical and physical equilibria, solution chemistry, transport properties, multiple site binding phenomena, and the rates of chemical and biochemical reactions. Alternative to CHEM 4511. Designed for biochemistry option and biology majors. Students may not take both CHEM 4411 and 4511. Prereqs., CHEM 3311 or 3351, MATH 2400 or APPM 2350, and PHYS 1110 or 2010. Prereq. or coreq., PHYS 1120 or 2020, or instructor consent. Same as CHEM 5411.

CHEM 4431-3. Physical Chemistry with Biochemistry Applications 2. Lect. Principles of physical chemistry (second semester) for students in the biological sciences. Topics include quantum mechanics, chemical bonds, principles of spectroscopy, statistical mechanics, and transport processes with application to biological systems. Mathematical background (integral and differential calculus including partial differentiation) required. Prereqs., CHEM 4411 or 4511 or equivalent, MATH 2400, and one year of physics. Same as 5431.

CHEM 4511-3. Physical Chemistry 1. Lect. Chemical thermodynamics and kinetics. Includes study of laws of thermodynamics, thermochemistry, entropy, free energy, chemical potential, chemical equilibria, and the rates and mechanisms of chemical reactions. Prereqs., CHEM 3311 *or* 3351, MATH 2400 *or* APPM 2350, and PHYS 1110. Prereq. or coreq., PHYS 1120 or instructor consent.

CHEM 4531-3. Physical Chemistry 2. Lect. Introduces the quantum theory of atoms, molecules and chemical bonding, and statistical thermodynamics. Includes principles of quantum mechanics and their application to atomic structure, molecular spectroscopy, symmetry properties, and the determination of molecular structure. Also includes principles of statistical mechanics and their applications to properties of gases, liquids, and solids. Prereq., CHEM 4511 or 4411.

CHEM 4541-2. Physical Chemistry Laboratory. One lect. and one 3-hour lab per week. Instruction in experimental techniques of modern physical chemistry emphasizing experiments illustrating 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. Advanced Physical Chemistry. Lect. Selected topics in advanced physical chemistry intended for students planning to go to graduate school in chemistry or to work in the physical chemistry area. Covers topics such as molecular spectroscopy, quantum chemical calculations of electronic structures of molecules, transition state theory, chemical dynamics, lasers and photochemistry, and condensed phase and surface chemistry. Prereq., CHEM 4431 or 4531.

CHEM 4561-3. Experimental Physical Chemistry. One lect. and two 3-hour labs per week. Instruction in experimental techniques of modern physical chemistry, emphasizing experiments illustrating 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. Prereq. or coreq., CHEM 4431 or 4531.

CHEM 4711-3. General Biochemistry 1. 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 2. 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. Two 5-hout periods per week. The first hour of each period is lecture; the remainder is laboratory. Introduces modern biochemical techniques. Topics include enzymology, spectrophotometry, electrophoresis, affinity chromatography, radioisotopes, recombinant DNA, and molecular cloning. Prereq., CHEM 4711; CHEM 4731 *or* MCDB 3400 recommended. Approved for arts and sciences core curriculum: critical thinking.

CHEM 4901 (1-6). Independent Study in Chemistry. Fot undergraduate study. May be repeated, but no more than a total of 8 credit hours will be applied toward graduation. Prereq., instructor consent.

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. Prereq., graduate standing or instructor consent.

CHEM 5061-3. Advanced Inorganic Chemistry 2. Lect. Studies modern coordination chemistry. Includes a description of bonding and properties of coordination compounds in terms of the ligand field and molecular orbital theories. Prereq., graduate standing or instructor consent.

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., graduate standing or instructor consent.

CHEM 5171-3. Electroanalytical Chemistry. Lect. Establishes a background for understanding electrochemical systems through a review of the relevant thermodynamic, kinetic, and electronic principles. Compares classical and modern electrochemical methods of analysis. Several special topics are discussed in depth. Prereq., graduate standing or instructor consent.

CHEM 5181-2. Chromatography and Analytical Separations. Lect. Analytical separation processes, with special reference to rheory and practice of liquid and gas chromatography. Prereq., graduate standing or instructor consent.

CHEM 5311-3. Advanced Synthetic Organic Chemistry. Lect. Surveys synthetic transformations emphasizing important functional group transformations and carbon-carbon bond-forming reactions. Required of all organic chemistry graduate students. Prereqs., one year of organic chemistry.

CHEM 5321-3. Advanced Physical Organic Chemistry. Modern concepts of physical organic chemistry and their use in interpreting data in terms of mechanisms of organic reactions and reactivities of organic compounds. Required of all organic chemistry graduate students. Prereq., one year of organic chemistry and one year of physical chemistry.

CHEM 5331 (2-3). Advanced Spectroscopic Techniques in Organic Chemistry. Advanced spectroscopic techniques for structure and determination in organic chemistry. Emphasizes 1H and 13C NMR spectroscopy. Prereq., one year of organic chemistry and one year of physical chemistry.

CHEM 5411-3. Physical Chemistry with Biochemistry Applications 1. Lect. Introduces thermodynamics and kinetics, emphasizing macromolecules and biochemical applications. Intended for biology graduate students. Not open to students in chemistry or other physical sciences. Prereq., graduate standing. Same as CHEM 4411.

CHEM 5431-3. Physical Chemistry with Biochemistry Applications 2. Lect. Principles of physical chemistry (second semester) for graduate students in biology. Not open to students of chemistry or the physical sciences. Prereqs., graduate standing and CHEM 5411, or instructor consent. Same as CHEM 4431.

CHEM 5511-3. Survey of Thermodynamics and Statistical Mechanics. Lect. Surveys basic laws of phenomenological equilibrium thermodynamics and their applications to problems in chemistry. Outline of concepts of statistical mechanics with special emphasis on the properties of perfect gases, crystals, and liquid models. Prereqs., undergraduate physical chemistry and graduate standing, or instructor consent.

CHEM 5521-3. Survey of Chemical Kinetics and Quantum Mechanics. Lect. Introduces chemical kinetics, including phenomenological discussion of rate laws, outline of theories of rate constants, and survey of experimental techniques. Introduces quantum mechanics with applications to problems in chemistry. Prereqs., undergraduate physical chemistry and graduate standing or instructor consent.

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. Prereqs., undergraduate physical chemistry and graduate standing, or instructor consent.

CHEM 5541-3. Chemical Dynamics. Lect. Discussion of mechanism and rate of chemical reactions from a fundamental point of view. Discusses nature of collision and develops concepts of cross section and rate constant. Theories of elementary bimolecular and decay processes are critically examined. Prereqs., undergraduate physical chemistry and graduate standing, or instructor consent.

CHEM 5551-3. Mathematical Methods of Chemistry. Lect. Develops and applies a variety of mathematical techniques important in physical chemistry. Topics include complex analysis, ordinary and partial differential equations, integral transforms, and some numerical analysis. Prereqs., undergraduate physical chemistry and graduate standing, or instructor consent.

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. Prereqs., one semester of physical chemistry and graduate standing, or instructor consent.

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., graduate standing or instructor consent.

CHEM 5591-3. Advanced Molecular Spectroscopy. Lect. Rotational, vibrational, and electronic spectra of molecules, and their interpretation in terms of the quantum theory of molecular structure. Prereq., graduate standing or instructor consent.

CHEM 5711-3. General Biochemistry 1. Lect. Same lectures as CHEM 4711. Course work includes library studies and preparation of special reports. Not open to undergraduates. Prereqs., one year of organic chemistry and graduate standing.

CHEM 5731-3. General Biochemistry 2. Lect. Same lectures as CHEM 4731. Course work includes library studies and report preparations. Not open to undergraduates. Prereqs., CHEM 5711 and graduate standing.

CHEM 5771-5. Advanced General Biochemistry 1. Lect. In-depth analysis of DNA structure and replication, RNA synthesis and processing, protein synthesis, enzyme function and mechanism, protein structure, protein dynamics, and physical chemistry of macromolecules. Intended as a comprehensive treatment of areas central to modern biochemistry for entering graduate students. Prereq., CHEM 4731 or equivalent, and graduate standing, or instructor consent.

CHEM 5781-5. Advanced General Biochemistry 2. Lect. Detailed consideration of contemporary topics in biochemistry, including protein structure (primary, secondary, tertiary, and quaternary), methods of structure determination and prediction, protein folding (kinetics, thermodynamics, denaturation, and renaturation), and protein dynamics (internal motions and methods of analysis). Prereq., CHEM 5771 and graduate standing, or instructor consent.

CHEM 6011-3. Reactions in Solution, Equilibrium and Kinetics. Prereq., graduate standing or instructor consent.

CHEM 6021 (1-3). Special Topics in Inorganic Chemistry. Lect. Subjects of current interest in inorganic chemistry. Primar-ily used for graduate-level presentations of special topics by visiting and resident faculty. Variable class schedule. Prereq., graduate standing or instructor consent.

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 deferred until presentation of satisfactory seminar. Prereq., graduate standing or instructor consent.

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 or instructor consent.

CHEM 6301-1. Seminar in Organic Chemistry. Discussions principally concerned with recent litetature in organic chemistry. Required of all organic chemistry graduate students. Prereq., graduate standing or instructor consent.

CHEM 6311(1-3). Special Topics in Synthetic Organic Chemistry. Selected topics in synthetic organic chemistry, encompassing both methodology and/or total synthesis of complex molecules. Prereqs., CHEM 5311 and graduate standing, or instructor consent.

CHEM 6321 (1-3). Special Topics in Organic Physical Chemistry. Selected topics in physical organic chemistry, which may include photochemistry, carbene chemistry, ftee radical chemistry, molecular orbital methods, organic materials, or gas phase ion chemistry. Prereqs., CHEM 5321 and graduate standing, or instructor consent.

CHEM 6331 (1-3). Special Topics in Bioorganic Chemistry. Selected topics in bioorganic chemistry, which may include molecular synthesis, gene cloning techniques, aspects of enzymology in organic chemistry, photobiology, biodynamics, or the use of catalytic antibodies in organic chemistry. Prereqs., CHEM 5321 and graduate standing, or instructor consent.

CHEM 6341-1. Open Topics in Organic Chemistry. Diverse topics in organic chemistry as presented by distinguished experts in the field of organic chemistry. Required of all organic chemistry graduate students. Prereqs., CHEM 5311 and 5321 and graduate sranding, or instructor consent.

CHEM 6411 (1-3). Advanced Topics in Physical Chemistry. Prereq., graduate standing or 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 and graduate standing, or instructor consent.

CHEM 6601-1. Biochemistry Seminar. Required of all biochemistry graduate students. Credit is deferred until presentation of satisfactory seminar. Prereq., graduate standing or instructor consent.

CHEM 6711, 6731 (3-6). Advanced Topics in Biochemistry. Detailed study of 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, graduate standing, and instructor consent.

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. Prereqs., graduate standing and instructor consent.

CHEM 6901 (1-6). Special Topics in Chemistry. May be repeated; no limit on total credit. Prereqs., graduate standing and instructor consent.

CHEM 6941-3. Master's Candidate.

CHEM 6951 (4-6). Master's Thesis.

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 electronic and molecular structure of transition metal complexes. Prereqs., graduate standing and instructor consent.

CHEM 7031-2. Seminar: Synthetic Chemistry of Transition Metal Compounds. Involves 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. Prereqs., graduate standing and 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. Prereqs., graduate standing and instructor consent.

CHEM 7111-2. Electrochemistry Seminar. Student and faculty discussions and reports on research advances in electrochemistry. Prereqs., graduate standing and 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. Prereqs., graduate standing and instructor consent.

CHEM 7151-1. Bioorganic and Environmental Chemistry. Sem. Discusses particularly the mechanism of enzymes involved in microbial degradation of pollutants. Prereq., graduate standing or instructor consent.

CHEM 7211-2. Seminar: Physical Organic Chemistry. Current research and literature in physical organic chemistry, emphasizing gas phase ion molecule reactions. Prereqs., CHEM 5321, one year of physical chemistry, graduate standing, and instructor consent.

CHEM 7221-1. Seminar: Photochemistry and Free Radical Chemistry. Current research in areas of organic free radical chemistry, photochemistry, and related topics are presented and discussed. Prereqs., graduate standing and instructor consent.

CHEM 7231-1. Seminar: Reactive Intermediates. Application of contemporary ideas of chemical physics to organic molecules. Special attention to structures and bonding in organic ions and radicals. Prereqs., organic and physical chemistry, graduate standing, and instructor consent.

CHEM 7241-1. Seminar: Synthetic Organic Chemistry. Series of seminars on directed total synthesis. Emphasizes modetn synthetic methodology and applications to total synthesis of natural products. Prereqs., graduate standing and instructor consent.

CHEM 7261-1. Seminar: Organometallic Chemistry. Specialized aspects of synthesis of organometallic reagents and their utility in organic synthesis. Emphasizes current research results being obtained both at the University of Colorado and from other research groups. Prereqs., graduate standing and instructor consent.

CHEM 7271-1. Seminar: Picosecond Dynamics of Reactions. Topics include development and application of picosecond laser spectroscopy to organic and organometallic reactions. Emphasizes relationship between current theoretical developments and experiments. Prereqs., graduate standing and instructor consent.

CHEM 7291-1. Seminar-Physical Organic Chemistry. Modern experimental techniques and theoretical models in physical organic chemistry are discussed in relation to the development of new materials, such as molecular size "tinkertoys" to the development of novel photochemical systems and their spectroscopies. Prereqs., graduate standing and instructor consent.

CHEM 7301-1. Synthetic and Mechanistic Chemistry. Seminar in organic chemistry. Discusses particularly the synthesis of complex organic molecules and the mechanism of reagents used in organic synthesis. Includes a study of transition metal mediated organic reactions.

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 application of thermodynamic, kinetic, and spectroscopic theory and experiment to the study of biophysical systems. Prereqs., CHEM 4411 or 4511, graduate standing, and instructor consent.

CHEM 7411-1. Seminar: Molecular Spectroscopy. Current research topics in molecular spectroscopy and the properties of molecules in excited electronic states. Prereqs., graduate standing and 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. Prereqs., graduate standing and instructor consent.

CHEM 7441-2. Research Seminar: Theoretical Chemistry. Studies theoretical description of molecular dynamics as related to rate processes. Focuses 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. Studies experiments and theory in modern reaction dynamics, energy transfer, and photodissociation; experimental techniques, critique of recently published literature, and current work. Prereqs., CHEM 4511, 4531, 4541, or equivalent, and graduate standing or 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. Reviews state of the art techniques available for the theoretical and experimental characterization of excited states. Prereqs., graduate standing and 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, vander Waals clusters, vibrationally induced dipole moments, and predissociation. Discussion of current research and recently published literature. Prereqs., graduate standing and instructor consent.

CHEM 7501-1. Seminar: Theoretical Molecular Dynamics. Variety of topics in theoretical chemical physics, emphasizing dynamics of molecules in dissipative environments or in radiation fields. Prereqs., graduate standing and instructor consent.

CHEM 7521-1. Atmospheric Kinetics and Photochemistry. Discusses laboratory studies of degradation mechanisms. Applies these studies to atmospheric phenomena such as global warming and stratospheric ozone loss. Prereq., graduate standing and instructor consent.

CHEM 7601-2. Seminar: Nucleic Acid Chemistry. Topics in various aspects of current research; emphasizes student readings and presentations. Prereqs., graduate standing and 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. Prereqs., graduate standing and instructor consent.

CHEM 7621-1. Seminar: Regulation of Transcription. Topics in transcriptional regulation are discussed, emphasizing eukaryotic RNA polymerases and auxiliary ptoteins. Discussion of current research and recently published literature. Prereqs., graduate standing and instructor consent.

CHEM 7631-1. Seminar: Eukaryotic Gene Expression. Discussion of current research, both published and unpublished; student and faculty presentations; occasional guest speakers. Prereqs., graduate standing and instructor consent.

CHEM 7641-2. Seminar: RNA Structure and Function. Topics include synthesis and characterization of RNA, RNA's structure and function

relationships, and the role of RNA in biological reactions. Prereqs., graduate standing and instructor consent.

CHEM 7651-2. Seminar: Biochemistry. Topics in various aspects of current biochemical research; emphasizing student reading and presentations. Prereqs., graduate standing and instructor consent.

CHEM 7671-1. Seminar: Protein and Enzyme Chemistry. Discussion and presentation of topics in protein chemistry and enzymology. Prereqs., graduate standing and instructor consent.

CHEM 7691-1. Seminar: Protein Dynamics and the Mechanism of Sensory Proteins. Discusses recent results and current literature in the areas of the mechanism of sensory proteins, internal motions of proteins, and protein folding. Prereqs., graduate standing and instructor consent.

CHEM 7701-1. Seminar: Enzyme Mechanisms and Kinetics. Studies experimental approaches to understand the mechanisms of enzymic catalysis. Techniques include steady-state and pre-steady-state kinetics, isotope trapping and partitioning, inhibition by substrate analogues, and covalent modification of proteins. Prereqs., graduate standing and instructor consent.

CHEM 7711-1. Seminar: Analysis of Intracellular Transport. Surveys genetic and biochemical approaches to the study of intracellular transport. Topics include protein translocation, vesicular transport between organelles, specific retention of organelle resident proteins, and sorting of proteins during transport. Prereq., graduate standing.

CHEM 7721-1. Structure and Study of Biological Macromolecules. Devoted to experimental and theoretical methods for studying structure and function of biological macromolecules, protein and nucleic acid structure determination by x-ray crystallography, and macromolecular modelling. Prereq., graduate standing or instructor consent.

CHEM 8991-10. Doctoral 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.

Classics

General Classics

No Greek or Latin Required

CLAS 1010-3. The Study of Words. Studies 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. Covers the Greek myths as documents of early human religious experience and imagination, the source of Greek culture, and part of the fabric of Western cultural tradition. Of particular interest to students of literature and the arts, psychology, anthropology, and history. Approved for arts and sciences core curriculum: literature and the arts.

CLAS 1110-3. Masterpieces of Greek Literature in Translation. Surveys Greek authors whose works have most influenced Western thought: Homer, Aeschylus, Sophocles, Euripides, Aristophanes, and Plato. Approved for arts and sciences core curriculum: literature and the arts.

CLAS 1120-3. Masterpieces of Roman Literature in Translation. Surveys ideas and culture of the Romans through a study of representative literature: comedy, tragedy, history, philosophy, oratory, the novel, lyric, epic, and didactic poetry. Approved for arts and sciences core curriculum: literature and the arts.

CLAS 1140-3. Roman Civilization. Surveys the outstanding achievements of Roman culture, as reflected in literature, philosophy and art, private and official religion, and political thought. Approved for arts and sciences core curriculum: historical context.

CLAS 2020-3. Science in the Ancient World. Covers the development of scientific modes of thought, theory, and research from mythological origins (e.g., Hesiod's poetry) through pre-Socratic philosophers. Culminates in theories and research of Plato and Aristotle, including the Roman Empire. Students read original sources in translation. Approved for arts and sciences core curriculum: natural science.

CLAS 2100-3. Women in Antiquity: Greece. Examines evidence of art, archaeology, and literature of Greek antiquity from a contemporary feminist point of view. Focuses on women's roles in art, literature, and daily life. Same as WMST 2100. Approved for arts and sciences core curriculum: cultural and gender diversity.

CLAS 2110-3. Women in Antiquity: Rome. Uses art, archaeology, and literature to study, from a contemporary feminist point of view, the status of women in works of Roman art and literature, the development of attitudes expressed toward them, and their daily life. Same as WMST 2110. Approved for arts and sciences core curriculum: cultural and gender diversity.

CLAS 2840 (1-3). Independent Study.

CLAS 3300-3. Visiting Scholar's Course. Topic to be announced.

CLAS 3330-3. Ancient Athletics. Examines 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 philosophical speculations on athletics by Plato, Aristotle, and others.

CLAS 3610-3. From Paganism to Christianity. Treats history of Greek and Roman religion from its Bronze Age origins through the rise of Christianity. Recommended prereq., CLAS 1100. Same as PHIL 3610.

CLAS 4110-3. 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. Same as CLAS 5110.

CLAS 4120-3. Greek and Roman Tragedy. Intensive study of selected tragedies of Aeschylus, Sophocles, Euripides, and Seneca in English translation. Same as CLAS 5120. Approved for arts and sciences core curriculum: literature and the arts.

CLAS 4130-3. Greek and Roman Comedy and Satire. Studies Aristophanes, Plautus, Terence, and Roman satire in English translation. Same as CLAS 5130. Approved for arts and sciences core curriculum: literature and the arts.

CLAS 4500-3. Open Topics. Especially tailored to needs of present and future teachers of classics. Covers specialized topics in classical humanities to be specified in the *Registration Handbook and Schedule of Courses.* Same as CLAS 5500.

CLAS 4820-3. Latin Backgrounds to English Literature: Selected Readings. Studies readings from selected Latin authors influential in English literature using a bilingual text. Emphasizes structure, word placement, diction, and meter in order to understand the debts of successors. Prereqs., CLAS 5804 and 5814, or instructor consent. Same as CLAS 5820.

CLAS 4840 (1-3). Independent Study.

CLAS 5110-3. Ancient Epic. Same as CLAS 4110.

CLAS 5120-3. Greek and Roman Tragedy. Same as CLAS 4120.

CLAS 5130-3. Greek and Roman Comedy and Satire. Same as CLAS 4130.

CLAS 5500-3. Open Topics. Same as CLAS 4500.

CLAS 5800-3. Philosophy of Plato. Same as PHIL 5080.

CLAS 5810-3. Philosophy of Aristotle. Same as PHIL 5081.

CLAS 5820-3. Latin Backgrounds to English Literature: Selected Readings. Same as CLAS 4820.

CLAS 5840 (1-3). Graduate Independent Study.

CLAS 6940-3. Master's Degree Candidate.

CLAS 7840 (1-3). Graduate Independent Study.

Ancient History

CLAS 1051-3. The World of the Ancient Greeks. Presents a survey of the emergence, the major accomplishments, the failures, and the decline of the ancient Greeks, from the Bronze Age civilizations of the Minoans and Mycenaeans through the Hellenistic Age (c. 2,000-30 B.C.). Same as HIST 1051. Approved for arts and sciences core curriculum: historical context.

CLAS 1061-3. The Rise and Fall of Ancient Rome. Presents a survey of the rise of ancient Rome in the 8th century B.C. to its "fall" in the 5th century A.D. Emphasizes political institutions, foreign policy, leading personalities, and unique cultutal accomplishments. Same as HIST 1061. Approved for arts and sciences core curriculum: historical context.

CLAS 4021-3. Athens and Greek Democracy. Studies Greek history from 800 B.C. (the rise of the city-state) to 323 B.C. (the death of Alexander the Great). Emphasizes the development of democracy in Athens. Readings are in the primary sources. Same as CLAS 5021 and HIST 4021.

CLAS 4031-3. Alexander and the Hellenistic World. 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. Same as CLAS 5031 and HIST 4031. Approved for arts and sciences core curriculum: historical context.

CLAS 4041-3. Classical Greek Political Thought. Studies main representatives of political philosophy in antiquity (Plato, Aristotle, Cicero) and of the most important concepts and values of ancient political thought. Same as CLAS 5041, HIST 4041, PHIL 4210, and PSCI 4094. Prereqs. for classics or history: CLAS/HIST 1051 or 1061, or HIST 1010; for philosophy: PHIL 3000; for political science: PSCI 2404.

CLAS 4051-3. Greek Constitutional History. Studies primarily Athenian constitutional and legal history with some consideration given to other Greek states. Same as CLAS 5051.

CLAS 4061-3. The Fall of the Roman Empire. Same as HIST 4061. Approved for arts and sciences core curriculum: historical context.

CLAS 4071-3. History of the Byzantine Empire. Approaches Byzantium as 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. Same as CLAS 5071 and HIST 4071.

CLAS 4081-3. The Roman Republic. Studies the Roman Republic from its foundation in 753 B.C. to its conclusion with the career of Augustus. Emphasizes the development of Roman Republican government. Readings are in the primary sources. Same as CLAS 5081 and HIST 4081. Approved for arts and sciences core curriculum: historical context.

CLAS 4091-3. The Roman Empire. Intense survey of Imperial Roman from the Roman revolution to the passing of centralized political authority in the western Mediterranean. Emphasizes life, letters, and personalities of the empire. Same as CLAS 5091 and HIST 4091.

CLAS 4761-3. Rome, the Law-Giver. Studies the constitutional and legal history of ancient Rome, emphasizing basic legal concepts and comparisons with American law. Same as CLAS 5761.

CLAS 5021-3. Athens and Greek Democracy. Same as CLAS 4021.

CLAS 5031-3. Alexander and the Hellenistic World. Same as CLAS 4031.

CLAS 5041-3. Classical Greek Political Thought. Same as CLAS 4041.

CLAS 5051-3. Greek Constitutional History. Same as CLAS 4051.

CLAS 5071-3. History of the Byzantine Empire. Same as CLAS 4071.

CLAS 5081-3. The Roman Republic. Same as CLAS 4081.

CLAS 5091-3. The Roman Empire. Same as CLAS 4091.

CLAS 5761-3. Rome, the Law-Giver. Same as CLAS 4761.

CLAS 6011-3. Readings in Ancient History. Prereq., graduate standing. Same as HIST 6011.

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 *Registration Handbook and Schedule of Courses.* May be repeated. Prereq., graduate standing (M.A. or Ph.D. students only).

CLAS 6102-3. Graduate Seminar. Author or topic to be specified in *Registration Handbook and Schedule of Courses.* May be repeated.

CLAS 6952 (1-6). Master's Thesis.

CLAS 8992-10. 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 this catalog.

Greek

CLAS 1013-4. Beginning Classical Greek 1. Concentrates on careful presentation of classical Greek grammar, with some reading in ancient Greek authors (especially prose).

CLAS 1023-4. Beginning Classical Greek 2. Continuation of CLAS 1013. Prereq., CLAS 1013.

CLAS 3113-3. Intermediate Classical Greek 1. Reading of selected prose texts of authors such as Plato, Xenophon, Lysias, and selections from the Greek New Testament. Prereqs., CLAS 1013 and 1023, or equivalent.

CLAS 3123-3. Intermediate Classical Greek 2. Students read a play of Euripides, emphasizing learning to read the dramas with ease and comprehension. Grammar and syntax receive a good deal of attention.

CLAS 4403-3. Attic Orators. Prereqs., CLAS 3113 and 3123, or equivalent. Same as CLAS 5403.

CLAS 4503-3. Herodotus. Students read the text of Herodotus and master the major scholarly problems, literary and historical, associated with the text. Prereq., graduate standing or instructor consent. Same as CLAS 5503.

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 *Registration Handbook and Schedule of Courses* (e.g., Homer, Hesiod, Pindar, Aeschylus, Sophocles, Euripides, Thucydides, Greek Comedy, Plato, Aristotle, Menander). May be repeated.

CLAS 5403-3. Attic Orators. Same as CLAS 4403.

CLAS 5503-3. Herodotus. Same as CLAS 4503.

CLAS 5803-3. Accelerated Classical Greek 1. Beginning course for graduate students. Grammar survey, intensive reading. No previous knowledge of Greek required.

CLASS 5813-3. Accelerated Classical Greek 2. Continuation of CLAS 5803. For graduate students. Successful completion of CLAS 5813 meets the Graduate School foreign language requirement. Prereq., CLAS 5803.

CLAS 5843 (1-3). Graduate Independent Study.

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 1014-4. Beginning Latin 1. Introduces Latin language, emphasizing Latin sentence syntax and the reading of Latin.

CLAS 1024-4. Beginning Latin 2. Continuation of CLAS 1014. Prereq., CLAS 1014.

CLAS 1034-4. Latin Review. For students with two to three years of Latin at the high school level, or one year of Latin at the University level. Cannot receive credit if CLAS 1014 and 1024 have been taken. Must have demonstrated proficiency of Latin language.

CLAS 2114-4. Intermediate Latin. Intermediate-level selections read from Caesar or Cicero. Substantial amount of grammar review incorporated into the reading. Prereq., demonstrated proficiency on the Latin placement examination, CLAS 1024, or CLAS 1034.

CLAS 2124-4. Intermediate Latin. Studies Vergil's *Aeneid.*

CLAS 3114-3. Cicero. Prereq., CLAS 2114, 2124, or three years of high school Latin.

CLAS 3124-3. Catullus-Horace. Prereq., CLAS 2114 or 2124 or three years of high school Latin.

CLAS 3214-3. Livy-Pliny. Prereq., CLAS 2114 or 2124 or three years of high school Latin.

CLAS 3224-3. Ovid. Prereq., CLAS 2114 or 2124 or three years of high school Latin.

CLAS 4024-3. Latin Prose Composition. Reviews grammar, syntax, and style, and introduction to writing Latin. Prereq., completion of one 3000-level sequence. Same as CLAS 5024.

CLAS 4034-3. Advanced Latin Prose Composition.

CLAS 4244-3. Roman Elegy. Covers the poetry of Propertius, Tibullus, Ovid: structure, unity, traditional influences, originality. Prereq., completion of one 3000-level sequence. Same as CLAS 5244.

CLAS 4324-3. Lucretius. Philosophical background to Lucretius' *De Rerum Natura*; tradition and originality in Lucretius' thought and poetry. Prereq., completion of one 3000-level sequence. Same as CLAS 5324.

CLAS 4554-3. Tacitus. Prereq., completion of one 3000-level sequence. Same as CLAS 5554.

CLAS 4824-3. Latin Teaching Methods: Open Topics. Covers specialized topics in Latin peda-

gogy to be specified in *Registration Handbook and Schedule of Courses.* Prereq., ptoficiency test in the translation of Caesar, Cicero, Vergil, and Ovid. Same as CLAS 5824.

CLAS 4844 (1-3). Independent Study.

CLAS 5004-3. Graduate Reading. Author or topic specified in *Registration Handbook and Schedule of Courses.* May be repeated. Prereq., graduate standing (M.A. or Ph.D. students only).

CLAS 5024-3. Latin Prose Composition. Same as CLAS 4024.

CLAS 5244-3. Roman Elegy. Same as CLAS 4244.

CLAS 5324-3. Lucretius. Same as CLAS 4324.

CLAS 5404-3. Special Project: Teaching. Required of master's candidates (teaching of Latin option). Trains students to prepare classroom-ready materials which are then tested in the students' own classroom. Prereq., fulfillment of the remaining requirements for M.A. (teaching of Latin) *or* 27 hours of graduate work in classics.

CLAS 5554-3. Tacitus. Same as CLAS 4554.

CLAS 5804-3. Accelerated Latin 1. Beginning course for graduate students. Grammar survey, intensive reading. No previous knowledge of Latin required.

CLAS 5814-3. Accelerated Latin 2. Continuation of CLAS 5804. For 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 5824-3. Latin Teaching Methods: Open Topics. Same as CLAS 4824.

CLAS 5844 (1-3). Graduate Independent Study.

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 4009-3. Art of the Ancient Near East. Same as CLAS 5009 and FINE 4009.

CLAS 4019-3. Art of Ancient Egypt. Same as CLAS 5019 and FINE 4019.

CLAS 4039-3. Byzantine Art. Same as CLAS 5039 and FINE 4039.

CLAS 4049-3. Pre-Classical Art and Archaeology. Greece and Crete from the Neolithic period to the end of the Mycenaean world. Same as CLAS 5049 and FINE 4049.

CLAS 4059-3. Classical Art and Archaeology. Greek art and archaeology from the end of the Mycenaean world through the Hellenistic era. Same as CLAS 5059 and FINE 4059.

CLAS 4079-3. Roman Art and Archaeology. Covers a millennium of development in Roman art and architecture; from the foundation of Rome (753 B.C.) to Constantine (A.D. 311-337). Geographical scope includes far-flung imperial provinces as well as the Italian homeland. Same as CLAS 5079 and FINE 4079.

CLAS 4269-3. Biblical Archaeology. Same as CLAS 5269 and ANTH 4269.

CLAS 4419-3. Archaeology of Ancient Near East. Same as CLAS 5419 and ANTH 4419.

CLAS 4429-3. Archaeology of Ancient Egypt. Same as CLAS 5429 and ANTH 4429.

CLAS 4789-3. Egyptian Hieroglyphics 1. Same as CLAS 5789 and ANTH 4789.

CLAS 4799-2. Egyptian Hieroglyphics 2. Same as CLAS 5799 and ANTH 4799.

CLAS 4849 (1-3). Independent Study.

CLAS 5009-3. Art of the Ancient Near East. Same as CLAS 4009 and FINE 5009.

CLAS 5019-3. Art of Ancient Egypt. Same as CLAS 4019 and FINE 5019.

CLAS 5039-3. Byzantine Art. Same as CLAS 4039 and FINE 5039.

CLAS 5049-3. Pre Classical Art and Archaeology. Same as CLAS 4049 and FINE 5049.

CLAS 5059-3. Classical Art and Archaeology. Same as CLAS 4059 and FINE 5059.

CLAS 5069-3. Prehistoric Greek Art and Archaeology. In-depth study of the Lithic and Bronze Age Aegean (c. 7000-1200 B.C.). Topics selected from architecture, frescoes, pottery, and minor arts. Emphasizes interpretation of materials. Prereq., CLAS 4049 or 5049, or instructor consent. Same as FINE 5069.

CLAS 5079-3. Roman Art and Archaeology. Same as CLAS 4079 and FINE 5079.

CLAS 5089-3. Classical Greek Art. Concentrates on the architecture, sculpture, pottery, and minor arts of the period 500-300 B.C. Regional characteristics and development stressed. Same as FINE 5089.

CLAS 5099-3. Archaic Greek Art. Concentrates on 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. Same as FINE 5099.

CLAS 5159-3. Hellenistic Art and Archaeology. Art and archaeology from the period following the death of Alexander the Great (late 4th Century B.C.) to the conquest of Greece by the Romans (middle 2nd Century B.C.). Prereq, CLAS 4059 or 5059, or instructor consent. Same as FINE 5159.

CLAS 5269-3. Biblical Archaeology. Same as CLAS 4269 and ANTH 5369.

CLAS 5419-3. Archaeology of Ancient Near East. Same as CLAS 4419 and ANTH 5419.

CLAS 5429-3. Archaeology of Ancient Egypt. Same as CLAS 4429 and ANTH 5429.

CLAS 5789-3. Egyptian Hieroglyphics 1. Same as CLAS 4789 and ANTH 5789.

CLAS 5799-3. Egyptian Hieroglyphics 2. Same as CLAS 4799 and ANTH 5799.

CLAS 5849 (1-3). Graduate Independent Study.

CLAS 7849 (1-3). Graduate Independent Study.

Communication

COMM 1000-3. Interaction Skills. Covers basic theories, concepts, and characteristics that underlie face-to-face interactions in interpersonal, small group, and organizational settings. Activities stress the development of both task and relational skills in these settings.

COMM 1010-3. Public Speaking. Covers theory and skills of speaking in various public settings. Treats fundamental principles from rhetorical and communication theory and applies them to oral presentations.

COMM 2000-3. Perspectives on Human Communication. Surveys communication in a variety of contexts and applications. Topics include basic concepts and general models of communication, ethics, language and nonverbal communication, personal relationships, group decision making, organizational communication, and impact of technological developments on communication.

COMM 2030-3. Interpersonal Communication. Focuses on basic processes in face-to-face interaction, including verbal and nonverbal messages, coordination in conversation, messages about self and other, and communication in personal relationships. Emphasizes theory and concepts rather than skills.

COMM 2240-3. 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 a rhetorical perspective.

COMM 2300-3. Communication and Society. Seeks to increase students' awareness of the ways in which gender, dialect (ethnic, regional, and social class), and cultural background influence communication behavior and its consequences. Deepens understanding of communication as a social process, making students more sophisticated observers and participants in their own and other cultures.

COMM 3200-3. Principles and Practices of Argumentation. Focuses on principles of argument, the process of critical decision making, and uses and limitations of logic and evidence. Contemporary issues (personal, social, political, or philosophical) are analyzed and debated. Required for majors. Prereq. for students declaring the major after 9/28/90: COMM 1010.

COMM 3500-2. Human Communication Theory. Acquaints students with general, thematic, and contextual theories of human communication. Gives attention to criteria for evalu-

ating theories. Prereq. for students declaring the major after 9/28/90: COMM 1000.

COMM 3550-3. Empirical Research Methods in Communication. Introduces empirically oriented research methods in communication: critical review of the logic of scientific methods in communication and social sciences; study and application of empirical methods in communication; statistical description; and inference. Prereqs. for students declaring the major after 9/28/90: COMM 3200 and 3500.

COMM 3600-3. Rhetorical Foundations of Communication. Discusses communication analysis, using rhetorical theories of contemporary and earlier theorists; implications for social interaction. Prereqs. for students declaring the major after 9/28/90: COMM 1000, 1010, and 3600.

COMM 3650-3. Rhetorical Criticism. Applies key concepts from rhetorical theory to the analysis of specific speeches, written texts, and social situation within the humanistic tradition. Students read a variety of types of criticism and are encouraged to develop their own strategies for critical analysis. Prereq. for students declaring the major after 9/28/90: COMM 3600.

COMM 4000-3. Special Topics. Analyzes special interest areas of communication research and practice. Course format is lecture, discussion, investigative analysis, and practical applications. May be taken up to two times for credit for different topics.

COMM 4510-3. Senior Seminar: Interpersonal Communication. Reviews current research and theory on topics such as strategic interaction, relationship formation and maintenance, and identity and self-presentation. May be taken up to two times for credit on different topics. Recommended prereq., COMM 2030.

COMM 4520-3. Senior Seminar: Organizational Communication. Reviews current research and theory on topics such as communication and organizational decision making, organizational culture, communication and power in organizations. May be taken up to two times for credit on different topics. Recommended prereq., COMM 2240.

COMM 4530-3. Senior Seminar: Communication Codes. Reviews current research and theory on topics such as the relationship between verbal and nonverbal codes, interaction processes, and cultural differences in communication processes. May be taken up to two times for credit on different topics. Recommended prereq., COMM 2300.

COMM 4540-3. Senior Seminar: Rhetoric. Reviews current research and theory on topics such as rhetoric and publics, rhetoric as an interpretive social science, rhetoric of social movements, and political campaigns. May be taken up to two times for credit on different topics. Recommended prereq., COMM 3600.

COMM 4550-3. Senior Seminar: Functions of Communication. Discusses functions of communication across interpersonal, organizational, and public contexts. Reviews current research and theory on topics such as communication and conflict, persuasion, and ethical dimensions of communication practices. May be taken up to two times for credit on different topics. Recommended prereq., COMM 3500 and/or 3600.

COMM 4800-3. Current Issues in Communication and Society. Studies issues of interpersonal relationships, organizations, and public life. Encourages students to read, think, write, and speak critically, based on their knowledge of communication theory and behavior. Prereq., COMM 3200. Approved for arts and sciences core curriculum: critical thinking.

COMM 4840 through 4900 (1-6). Undergraduate Independent Study. Six-hour limit in major. *Note:* the 6-hour limit in the major applies to any combination of independent study *and* internship credit. For students declaring the major after 9/28/90, these courses do not count toward the 30 hours required for the major. Prereq. for students declaring the major after 9/28/90: COMM 3550 or 3650.

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 any combination of independent study *and* internship credit. For students declaring the major after 9/28/90, these courses do not count toward the 30 hours required for the major.

COMM 6010-3, 6020-3, 6030-3, 6040-3. Communication Research and Theory. Four courses (Communication Research and Theory 1, 2, 3, and 4) that survey important theoretical and research topics in rhetoric and communication. Required for graduate students in communication. Prereq., graduate standing.

COMM 6100-3. Communication Colloquium. Offers current issues in communication research and theory including critical discussion of participants; writing in a workshop mode.

COMM 6200-3. Seminar: Selected Topics. Designed to facilitate understanding of current and past theory on a selected topic in communication and to develop new theory on that topic. May be taken up to two times for credit for different topics. Prereqs., graduate standing and instructor consent.

COMM 6940 (1-3). Master's Degree Candidate.

COMM 8990-10. 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 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. Surveys 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 improving the speaking voice. Group and individual laboratory practice.

CDSS 3120-4. Anatomy and Physiology of the Speech and Hearing Mechanisms. Studies structures and functions of those portions of the human body important to reception of sound and the production of speech. Prereq., EPOB 3420.

CDSS 4000-3. Multicultural Aspects of Communication Differences and Disorders. Focuses on the effects of variations in cultural background on communication in American society. Examines the development and implications of differing verbal and nonverbal communication styles of Blacks, Hispanics, Native Americans, and Asian Americans. Prereq., upper-division standing.

CDSS 4030-3. INREAL Specialist Training. Theories of leatning/communication and research relevant to dynamic interactions of individuals. Theory application through video analysis of experiences and interactions that effect learner communication and knowledge.

CDSS 4040-3. INREAL Adjoint Trainer Training. Certified specialists gain knowledge and skills for teaching the INREAL courses, individually designed to include selected readings, supervised practice in all aspects of INREAL field work, and guidance and evaluation with INREAL staff. Prereq., CDSS 4030 and INREAL certification. Same as CDSS 5040.

CDSS 4060 (1-3). INREAL Implementation. Designed for INREAL specialists using INREAL model in preschool, elementary classrooms, or clinical settings. Addresses relationship between INREAL and instructional content areas, and issues such as materials, scheduling, learning centers, grading, and teaming with other professionals. Prereq., CDSS 6030. Same as CDSS 5060.

CDSS 4070 (1-3). INREAL Special Topics. Provides new and relevant information in theory, research and practice for INREAL personnel, field site trainers, and trainers-in-training. Format includes guest lecturers, seminars, and discussion and readings relevant to special topics. Prereq., CDSS 4030 and/or CDSS 4040. Same as CDSS 5070.

CDSS 4560-3. Language Development. Covers the development of language in childhood and into adult life, emphasizing the role of environment and biological endowment in learning to communicate with words, sentences, and narratives. Prereqs., PSYC 1001 and LING 2000. Same as LING 4560 and PSYC 4560.

CDSS 5000-2. Research Methods in Communication Disorders and Speech Science. Familiarizes 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. Emphasizes analysis of typical CDSS problems, their computer-based solutions, and skills to utilize programs.

CDSS 5030-3. INREAL Specialist Training. Same as CDSS 4030.

CDSS 5040-3. INREAL Trainer Training. Same as CDSS 4040.

CDSS 5060 (1-3). INREAL Implementation. Same as CDSS 4060.

CDSS 5070 (1-3). INREAL Special Topics. Same as CDSS 4070.

CDSS 5120-3. Neural Bases of Communication Disorders. Neuroanatomical and neurophysiological bases for normal and disordered communication.

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 8990-10. 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 this catalog.

Didactic: Speech-Language Pathology

CDSS 4502-4. Speech Disorders 1. Surveys the following disorders: stuttering, articulation, and language and learning disabilities. Prereqs., CDSS 3006, 3106, 3120, and 4560, or instructor consent.

CDSS 4512-4. Speech Disorders 2. Surveys the following disorders: cleft palate, motor speech, aphasia, and voice. Prereqs., CDSS 3006, 3106, and 3120, or instructor consent.

CDSS 5202-2. Development of Communication: Birth to Six. Advanced study of communication development during the first six years of life from an interactive point of view.

CDSS 5212-2. Development of Communication: Ages 6 to 21. Lect. Covers the acquisition of communication and literacy skills in normally developing children ages 6 to 21. Considers oral language, reading, and writing within the context of emotional, cognitive, and linguistic development. Prereqs., CDSS 4560 or CDSS 5202.

CDSS 5232-3. Language Disorders of Children. Views language disorders from infancy through adolescence. Comparison is made of 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 5202 and instructor consent.

CDSS 5262-3. Neurogenic Communication Disorders. Focuses on the role of the speech-language pathologist in assessment and treatment of individuals with aphasia, related language disorders, and motor speech disorders.

CDSS 5272-2. Augmentative Alternative Communication: Theory and Use. Provides an overview of the application of current technology to alternative/augmentative communication. Emphasizes assessment and intervention with nonverbal children and adults with need for alternative/augmentative communication systems. Presents various technological devices and systems. Addresses system selection, programming, development, and integration of use in environmental contexts.

CDSS 5302-2. Phonological Development and Disorders. Provides an overview of normal aspects of phonological acquisition—perception and production. Presents factors related to articulation disorders. Focuses on traditional assessment procedures, phonological process analysis strategies, and critical examination of remediation approaches.

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 5362-3. Stuttering: Therapy and Research. Primary emphasis is evaluation and treatment of children and adults who stutter. Various stuttering intervention approaches are discussed and evaluated. Discussion also devoted to counseling parents of young children who stutter. Familiarity with research is a secondary emphasis.

CDSS 5402-3. Methods of Speech-Language-Learning Appraisal. Students are taught the appraisal process and techniques and learn about test construction. Discusses measures of social maturity, intelligence, hearing, speech, oral language, reading, writing, spelling, and mathematics.

CDSS 5602-2. Intervention for Children with Communication Challenges: Birth to Six. Orientation to family-focused intervention in serving young children with special needs and their families. Facilitates integration of theoretical perspectives with specific approaches to intervention.

CDSS 5612-2. School-Age Language and Learning Disability Intervention. Presents intervention methods and materials appropriate for school-age children with oral language, reading, writing, and spelling disorders. Includes legal issues, consultive models of intervention, and intervention with bilingual children. Prereq., CDSS 5212.

Didactic: Audiology

CDSS 2304-3. American Sign Language 1. Designed to teach basic sign vocabulary and introduction to 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; develops more complex receptive and expressive grammatical structures and a larger sign vocabulary. Classes continue to be taught using ASL, without depending on spoken English.

CDSS 2324-3. American Sign Language 3. Continuation of ASL 2. Emphasizes expressive sign language, storytelling, and discussions on deaf culture communicated exclusively through sign language. Covers ASL idiomatic expressions, approximately 500 vocabulary words, and 20 grammatical structures. Prereq., CDSS 2304 and CDSS 2314, or equivalent.

CDSS 2334-3. American Sign Language 4: Linguistics of ASL. Acquaints students with the concept of bilingualism (diglossia) in the deaf community, with ASL historical foundations, and with current research on the phonology and morphology of ASL. Conversational usage of ASL to refine expressive skills. Prereq., CDSS 2304, 2314, 2324, or equivalent.

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. Prereqs. or coreqs., CDSS 3006 and 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. Studies 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. Studies process and teaching of speech reading, basic features of auditory training, and development of speech and language skills for the hearing impaired.

CDSS 5684-3. Advanced Hearing Science. Studies 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. Studies basic processes of speech production, transmission, and perception.

CDSS 3106-3. General Phonetics. Introduces principles of speech production, transmission, and reception. Classification of speech sounds and development of an understanding and skill in transcription using International Phonetic Alphabet.

CDSS 6106-2. Experimental Phonetics 1. 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 course requirements.

CDSS 7106-2. Experimental Phonetics 2. Comprehensive survey of topics in physiological and articulatory phonetics emphasizing 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. Surveys 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 experience 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 1: Speech-Language-Learning Appraisal. Supervised clinical experience on campus in appraisal of speech, language, and learning disorders after training at the observational level.

CDSS 5898 (1-4). Practicum 1: Speech-Language-Learning Intervention. On-campus and off-campus supervised clinical practice in management of speech-language-hearing disorders in children and adults.

CDSS 5908 (1-4). Practicum 1: Speech-Language-Learning Intervention (Child Language Center). Supervised experience in management of preschool age children with identified disabilities who are enrolled in the Communication Disorders Clinic's integrated preschool program.

CDSS 5918 (1-3). Practicum 1: Audiology Appraisal. Supervised clinical experience on campus in 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 management of hearing disorders of children and adults.

CDSS 6918-5. Practicum 2: Speech-Language-Learning Internship. Off-campus experience in a clinical or hospital setting that provides in-depth practice in management of communication disorders of children and adults.

CDSS 6928-5. Practicum 2: Public School Internship. Off-campus supervised experience providing extended and in-depth practice using school-age children in a school classroom.

CDSS 6938-5. Practicum 2: Audiology Internship. 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 1, M.A.

CDSS 5859 (1-4). Independent Study 2, M.A.

CDSS 7849 (1-4). Independent Study 1, Ph.D.

CDSS 7859 (1-4). Independent Study 2, 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 *Registration Handbook and Schedule of Courses.* Please contact the Comparative Literature Program for more detailed plans.

COML 5000-3. Proseminar. Introduces basic issues in comparative literature and basic problems in research. Provides an overview of the field and methodological issues and an opportunity to solve bibliographical problems. Discusses basic questions of format for research and submission for publication. Prereq., graduate standing or instructor consent.

COML 5350-3. Studies in Prose Narrative. Examines both short and long narrative prose fiction from a variety of periods and from diverse national literatures. Focuses on issues of defining genre and on the origins and significance of narrative prose within its cultural context. Prereq., graduate standing or instructor consent.

COML 5360-3. Studies in Drama. Covers selected topics involving drama, using a comparative approach. Prereq., graduate standing or instructor consent.

COML 5370-3. Studies in Poetry. Traces the development of the rhetoric and poetic practice of major world poets from antiquity to the present day. Prereq., graduate standing or instructor consent.

COML 5610-3. Introduction to Literary Theory. Covers major trends in twentieth-century critical thinking. Prereq., graduate standing or instructor consent.

COML 5620-3. History of Literary Criticism 1. Prereq., graduate standing or instructor consent.

COML 5630-3. History of Literary Criticism 2. Prereq., graduate standing or instructor consent.

COML 5660-3. Themes, Motifs, and Characters. Prereq., graduate standing or instructor consent.

COML 5840 (1-3). Independent Study.

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 8990-10. Doctoral Dissertation.

Conflict and Peace Studies

CPST 2500-3. Introduction to Peace Studies. Introduces the interdisciplinary field of peace studies. Examines causes and dynamics of conflict and violence (interpersonal to global) and theological, logical, and philosophical bases for peacemaking, peace research, peace movements, nonviolence, conflict resolution, and careers in conflict resolution and peacemaking.

CPST 2860-3. Nuclear War: Its Risks and Preventions. Gives students a broad, interdisciplinary perspective on what is perhaps the most complex problem ever to confront the human species. Focuses on dramatic differences of opinion regarding the prevention of nuclear war. Helps students develop the ability to think critically and analyze arguments, and to clarify their opinions about the role of nuclear weapons in maintaining national security.

CPST 2900 (1-3). Sophomore Independent Study. Content to be determined by consultation between student and instructor.

CPST 3510-3. Ideology, Conflict, and Peace. Examines the origins, nature, and power of ideologies and the role specific ideologies, values, and belief systems play in the generation of conflict, violence, and war; the resolution of conflict; and the development of peace.

CPST 3520-3. Environmental Dimensions of International Security. Examines the linkages between human ecology and international security. Considers environmental degradation as a cause of conflict, the effects of militarization and war on the environment, and the prospects for solutions involving international cooperation and environmentally-sustainable development.

CPST 3800-3. Topics in Conflict and Peace Studies. Content varies depending on instructor. May provide an overview of the field, cover scientific, philosophical, or historical approaches, or analyze a specific substantive topic.

CPST 3900 (1-3). Junior Independent Study. Content to be determined by consultation between student and instructot.

CPST 4900 (1-3). Senior Independent Study. Content to be detetmined by consultation between student and instructor.

INVST: International and National Voluntary Service Training

CPST 1002-3. Global Human Ecology. Same as SOCY 1002. Approved for arts and sciences core curriculum: contemporary societies.

CPST 1912-1. Global Human Ecology Practicum. Students must participate in both individual and group service projects for a minimum of 6 hours per week in all practica. Emphasizes the problems of hunger, poverty, pollution, and resource shortages in both a local and global context, and stresses the observation of the characteristics of service organizations — their potentials and limitations; their perceptions of causes; solutions; and consequences. Prereq., participation in the INVST program; prereq. or coreq., CPST 1002.

CPST 3302-3. Facilitating Peaceful Community Change. Students gain knowledge and interpersonal skills that enable them to become more skillful facilitators of community efforts toward social change. Focuses on understanding the processes of building communiry and fostering grass-roots democratic processes with a multicultural emphasis.

CPST 3912-1. Facilitating Peaceful Community Change Practicum. Students must participate in both individual and group service projects for a minimum of 6 hours per week in all practica. Focuses on the development of organizational, administrative, and fund-raising skills in the non-government sector, while considering the ways and means of effective work for social change with different kinds of community organizations and the media. Students are encouraged to develop a personal philosophy of community service. Prereq., participation in the INVST program; prereq. or coreq., CPST 3302.

CPST 4012-3. Global Development. Same as PSCI 4012. Approved for arts and sciences core curriculum: contemporary societies.

CPST 4115-3. Democracy and Nonviolent Social Movements. Same as SOCY 4115.

CPST 4915-1. Democracy and Nonviolent Social Movements Practicum. Students must participate in both individual and group service projects for a minimum of 6 hours per week in all practica. Students will apply the principles of nonviolent, grass-roots, democratic movements with special consideration of leadership, decision-making, means and ends, and the nature of civil society to creating their own service project, which will focus on social issues at the local, national, or international level. Prereq., participation in the INVST program. prereq. or coreq., CPST 4115.

CPST 4992-1. Global Development Practicum. Students must participate in both individual and group service projects for a minimum of 6 hours per week in all practica. Students develop and implement service projects related to the study of the impact of different types of development on social systems — the global system, national societies, or local communities. Case studies from the first and third worlds are analyzed. Prereq., participation in the INVST program; prereq. or coreq., CPST 4012.

Economics

Theory and History of Economic Thought

ECON 2010-4. Principles of Microeconomics. Studies decision making under uncertainty in the presence of scarcity by households, firms, and government units. Analyzes resource allocation undet competitive and noncompetitive market structures, income distribution, and comparative economic systems. Approved for arts and sciences core curriculum: contemporary societies.

ECON 2020-4. Principles of Macroeconomics. Examines basic concepts of macroeconomics, or behaviors and interactions of individuals, firms, and government. Topics include determining economic problems, how consumers and businesses make decisions, how markets work and how they fail, and how government actions affect markets. Approved for arts and sciences core curriculum: contemporary societies.

ECON 3070-3. Intermediate Microeconomic Theory. Theory of behavior of consumers, firms, and industries; analysis of factor markets, general equilibrium, and market failures. Prereqs., ECON 2010 and 6 credits of math modules (MATH 1050, 1060, 1070, 1080, 1090, and 1100).

ECON 3080-3. Intermediate Macroeconomic Theory. National income and employment theory. Emphasizes unemployment, inflation, monetary and fiscal policies, and determination of levels of employment and prices. Theories of consumption, investment, and money are considered. ECON 3070 and 3080 may be taken in any order; there is no recommended sequence. Prereqs., 6 credits of math modules (MATH 1050, 1060, 1070, 1080, 1090, and 1100) or equivalent, and ECON 2020.

ECON 6070-3. Applied Microeconomic Theory. Develops competence in techniques of applied micro/macro theory for those going into policy and problem-solving jobs. Topics include estimating demand, cost, and production functions; operational models of production; processes from industry/agriculture; capital theory; and benefit-cost analysis. Prereqs, ECON 3070 and 4808.

ECON 6080-3. Applied Macroeconomic Theory. Develops competence in techniques of applied macro theory. Topics include theoretical and empirical work on consumption, investment, money demand and supply, and open economy macroeconomic 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. Deals with problems in methodology and practice of economics by presenting the history of economics. Introduces issues in philosophy of science and covers development of the value theories of classical and neoclassical schools. Prereqs., ECON 3070 and 3080.

ECON 7010-3. Microeconomic Theory 1. Recent and contemporary literature on fundamentals of economic theory. Considers value theory with particular emphasis on methodology, theory of demand, theory of the firm, theory of distribution, and general equilibrium theory. Prereqs., ECON 3070, 3080, and ECON 4808 or MATH 1300.

ECON 7020-3. Macroeconomic Theory 1. Considers theory of aggregative analysis and policy implications. General equilibrium model is constructed and applied to the problems of unemployment, inflation, and growth. Emphasizes theories of consumption, investment, and money demand and supply. 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 neoclassical view. Emphasizes paradigms associated with Austrian and Cambridge schools. Prereqs., ECON 7000, 7010, and 7020.

ECON 8370-3. Economics of Uncertainty and Information. Analyzes uncertainty and information in economics. Begins with the basic concepts in game theory and proceeds to individual behavior under uncertainty. Examines models of moral hazard, adverse selection, and principal-agent problems. Prereqs., ECON 7010, 7030, and 7808.

Money, Banking, and Public Finance

ECON 4111-3. Money and Banking Systems. Discusses money, financial institutions, and the monetary-financial system in a modern economy. Prereqs., ECON 2010 and 2020. Same as ECON 5111.

ECON 4121-3. Monetary Theory and Policy. Presents theories of the relation between money and the macroeconomy. Discusses goals and problems of monetary policy, especially with regard to recent history of the U.S. economy. Prereqs., ECON 3080 and 4111. Same as ECON 5121.

ECON 4211-3. Seminar: Public Finance. Taxation and public expenditures. Topics include economic rationale for government action, economic theory of government behavior, and effects of government policies on allocation of resources and distribution of income. Prereq., ECON 3070. Same as ECON 5211.

ECON 5111-3. Money and Banking Systems. Same as ECON 4111.

ECON 5121-3. Monetary Theory and Policy. Same as ECON 4121.

ECON 5211-3. Seminar: Public Finance. Same as ECON 4211.

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. Advanced Monetary Theory. Presents major ideas and issues in development of contemporary monetary and financial economics. Prereqs., ECON 6080 or 7020.

ECON 8131-3. Contemporary Monetary Theory and Policy. Explores contemporary issues and debates in monetary and financial economics. Prereq., ECON 8121.

ECON 8211-3. Seminar: Economics of Taxation. Advanced study of theory and practice of public expenditures and taxation. Focuses 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 emphasizing 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. Prereqs., ECON 6070 and 7010.

Urban Regional Economics

ECON 4252-3. Urban Economics. Analyzes the level, distribution, stability, and growth of income and employment in urban regions. Examines topics of urban poverty, housing, land use, transportation, and local public services with special reference to economic efficiency and social progress. Prereq., ECON 3070. Same as ECON 5252.

ECON 4292-3. Migration, Urbanization, and Development. Examines historical and current patterns of national settlement system development. Focuses on quantitative analysis of problems associated with population growth and decline, urbanization, and economic structural change in more developed and less developed countries. Same as ECON 5292 and GEOG 4292.

ECON 5252-3. Urban Economics. Same as ECON 4252.

ECON 5292-3. Migration, Urbanization, and Development. Same as ECON 4292 and GEOG 5292.

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. 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. Approved for arts and sciences core curriculum: contemporary societies.

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. Prereqs., ECON 2010, 2020, and instructor consent.

ECON 4413-3. International Trade. Theories of international trade and its impacts on economic welfare. Analysis of commercial policy, including tariffs, non-tariff barriers, retaliation, regional integration, and factor migration. Prereq., ECON 3070.

ECON 4423-3. International Finance. Covers balance of payments; foreign exchange market, income, trade and capital flows; asset markets adjustment mechanisms; stabilization policies in an open economy; and problems of international monetary systems. Prereq., ECON 3080.

ECON 4433-3. Economic Relations Among the United States, Japan, and Canada. Analyzes economic interrelationships in the Pacific Rim, emphasizing the United States, Japan, and Canada. Considers aspects of economic conflict, cooperation, and commercial policy in this area. Prereq., ECON 3403, 4413, or 4423.

ECON 5413-3. International Trade. Discusses theories of international trade and its impacts on economic welfare. Analyzes commercial policy, including tariffs, non-tariff barriers, retaliation, regional integration, and factor migration. Prereq., ECON 6070 or 7010.

ECON 5423-3. International Finance. Covers balance of payments; foreign exchange market, income, trade, and capital flows; asset market adjustment mechanisms; stabilization policies in an open economy; and problems of international monetary systems. Prereq., ECON 6080.

ECON 8413-3. Seminar: International Trade Theory. Covers theories of comparative advantage, including the classical, factor-proportions, fixed-factor, and non-competitive markets models. Examines trade policy including trade barriers, market distortions, strategic policy, regional integration, political economy, and factor migration. Prereq., ECON 6070 or 7010.

ECON 8423-3. Seminar: International Finance. Foreign exchange markets, past and current international monetary mechanisms, and processes of adjustment. Plans for international monetary reform. International monetary and banking institutions. Prereq., ECON 6080 or 7020.

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 interaction between real and monetary phenomena. Prereq., ECON 8121, 8413, or 8423.

Economic History and Economic Development

ECON 1524-3. Economic History of the United States. Surveys economic aspects of U.S. history from colonial period to present. Approved for arts and sciences core curriculum: United States context.

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 4494-3. 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. Prereqs., ECON 2010 and 2020. Same as ECON 5494.

ECON 4504-3. Comparative Economic History of Developing Areas 2: Africa and Latin America. Companion course to ECON 4494. History of trade, commercial policies, banking, and finance throughout colonial and precolonial periods until present date. Focuses on Middle East, Africa, and Latin America. Prereqs., ECON 2010, 2020, and ECON 4494. Same as ECON 5504.

ECON 4514-3. Economic History of Europe. Evolution of modern economic growth and development in Europe, emphasizing institutional change. Prereqs., ECON 2010 and 2020. Same as ECON 5514.

ECON 4524-3. Economic History of the United States. Evolution of modern economic growth and development in the U.S. from colonial times to the present, emphasizing institutional change. Prereqs., ECON 2010 and 2020. Same as ECON 5524. Approved for arts and sciences core curriculum: U.S. context.

ECON 4714-3. Comparative Economic Systems. Critical study of socialism, capitalism, communism, utopianism, syndicalism, cooperatives, and other functioning and proposed economic systems. Prereqs., ECON 2010 and 2020. Same as ECON 5714.

ECON 4774-3. Economic Development: Theory and Problems. Theoretical and empirical analysis of problems of economic development in both underdeveloped and advanced countries. Prereqs., ECON 2010 and 2020. Same as ECON 5774.

ECON 4784-3. Policies of Economic Development. Current conditions and policies of national and international economic develop-

ment with emphasis on accelerating and maintaining economic and social growth. Prereqs., ECON 2010 and 2020. Same as ECON 5784.

ECON 4794-3. Economic Development of Latin America. Current problems of economic development in Latin America. Prereqs., ECON 2010 and 2020. Same as ECON 5794.

ECON 5494-3. Comparative Economic History of Developing Areas 1. Prereqs., ECON 3070 and 3080. Same as ECON 4494.

ECON 5504-3. Comparative Economic History of Developing Areas 2. Prereqs., ECON 3070 and 3080. Same as ECON 4504.

ECON 5514-3. Economic History of Europe. Prereqs., ECON 3070 and 3080. Same as ECON 4514.

ECON 5524-3. Economic History of the United States. Prereqs., ECON 3070 and 3080. Same as ECON 4524.

ECON 5714-3. Comparative Economic Systems. Prereqs., ECON 3070 and 3080. Same as ECON 4714.

ECON 5774-3. Economic Development: Theory and Problems. Prereqs., ECON 3070 and 3080. Same as ECON 4774.

ECON 5784-3. Policies of Economic Development. Prereqs., ECON 3070 and 3080. Same as ECON 4784.

ECON 5794-3. Economic Development of Latin America. Prereqs., ECON 3070 and 3080. Same as ECON 4794.

ECON 8764-3. History of Economic Development. 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. Prereqs., ECON 3070 and 3080. Same as HIST 7214.

ECON 8774-3. Economic Planning and Development. Seminar in analysis of development planning and policy. Theoretical and analytical tools of development planning explored in the context of general equilibrium models, public finance and public choice, and project appraisal and analysis. 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. Problems in Economic Development. Specific problems in economic development explored in depth with reference to theoretical, empirical, and policy issues. Prereqs., ECON 3070 and 3080.

Natural Resources and Environmental Economics

ECON 3535-3. Natural Resource Economics. Integrates economic analysis with life science aspects of natural resource systems to develop social policies for use of natural resources. Economist's approach to 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 2010. Approved for arts and sciences core curriculum: contemporary societies.

ECON 3545-3. Environmental Economics. Causes of excessive environmental pollution and 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 2010. Approved for arts and sciences core curriculum: contemporary societies.

ECON 4535-3. Natural Resource Economics. 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. Same as ECON 5535.

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 5535-3. Natural Resource Economics. Same as ECON 4535.

ECON 8535-3. Seminar: Natural Resources. 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. Examines 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 and 6 credits of math modules (MATH 1050, 1060, 1070, 1080, 1090, and 1100) or equivalent.

Labor and Human Resources

ECON 4606-3. Introduction to Human Resources. Covers economics of investments in human beings with special emphasis on decisions made within the context of the family. Also focuses on income distribution issues and related policies such as job training and welfare reform. Prereq., ECON 3070.

ECON 4616-3. Labor Economics. Influence of markets, unions, and government on labor allocation and remuneration. Analysis of human capital, discrimination, mobility and migration, productivity, unemployment, and inflation. Comparison of outcomes under competition with those in a world marked by shared market power and bargaining. Prereqs., ECON 2010 and 3070. Same as ECON 5616.

ECON 5616-3. Labor Economics. Same as ECON 4616.

ECON 8666-3. Economic Demography. Investigates economic determinants and consequences of demographic behavior in developing and developed countries. Issues 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 markets. Detailed study of the supply of and demand for labor under competitive and noncompetitive conditions; concentrates on level and structure of bargaining theory, discrimination, unions, labor mobility, unemployment, and inflation. Prereqs., ECON 3070 and 3080.

ECON 8686-3. Seminar: Labor Economics 2. Focuses on special topics in labor economics: dynamic theories of labor supply, employment, and unemployment; labor supply in a household framework; labor market activity and income distribution. In each area both theoretical models and empirical tests are explored. Prereqs., ECON 3070 and 3080.

Industrial Organization

ECON 4697-3. Government and Business in the Economy. 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., ECON 2010 and 2020. Same as ECON 5697. Approved for arts and sciences core curriculum: U.S. Context.

ECON 5697-3. Government and Business in the Economy. Prereqs., ECON 3070 and 3080. Same as ECON 4697.

ECON 8747-3. Applied Industrial Organization. Topics selected from economic regulation, public utility economics, regulatory institutions, industry studies, and experimental economics as applied to industrial organization. Prereq., ECON 6070 or 7010.

ECON 8757-3. Industrial Organization and Control. Theory of interaction of firms within markets and industries, emphasizing importance of the number, relative size of firms, market institution, firm strategies, and nature of consumer demand. Examines neoclassical and game theoretic models, empirical industry studies, and laboratory tests of theoretical models and policies. Prereq., ECON 6070 or 7010.

Quantitative Economics

ECON 3818-4. Introduction to Statistics with Computer Applications. Introduces statistical

methods and their applications in quantitative economic analysis. Prereqs., ECON 2010, 2020, and 6 credits of math modules (MATH 1050, 1060, 1070, 1080, 1090, and 1100).

ECON 4808-3. Introduction to Mathematical Economics. Introduces the use of mathematics in economics. Topics include vectors and matrices, differential calculus, and optimization theory, with economic applications. Prereqs., ECON 2010, 2020, and 6 credits of math modules (MATH 1050, 1060, 1070, 1080, 1090, and 1100). Same as ECON 5808.

ECON 4818-3. Introduction to Econometrics. Designed to give undergraduate economics majors an introduction to econometric theory and practice. Develops the multiple regression model and problems encountered in its application in lecture and individual applied projects. Prereq., ECON 3818.

ECON 4828-3. Mathematical Economics: Special Topics. Considers mathematics of constrained optimization, comparative statistics, differential equations, game theory, and equilibrium analysis. Applications include problems in consumer and producer theory, general equilibrium, welfare economics, growth and discounting, oligopoly behavior, and game theory. Prereqs., ECON 3070 and ECON 4808 with a *B-* or better.

ECON 4838-3. Microcomputer Applications in Economics. Innovative uses of personal computers in economic analysis and model building techniques. Students acquaint themselves with economic models 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. Same as ECON 5838.

ECON 5808-3. Introduction to Mathematical Economics. Same as ECON 4808.

ECON 5838-3. Microcomputer Applications in Economics. Same as ECON 4838.

ECON 6818-3. Econometric Methods and Application. Master's-level introduction to econometric theory and practice. Develops the multiple regression model and problems encountered in its application 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 are Box-Jenkins autoregressive moving average, transfer function and vector autoregressive models, and the evaluation of forecasts from such models. Emphasizes applied computer assignments. 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. Mathematical Economics—Statics. Mathematical foundations of theories of consumption, production, and general equilibrium. Topics include demand and production theories, linear, nonlinear programming, input-output analysis, and welfare economics. Prereq., ECON 5808.

ECON 8818-3. Seminar: Mathematical Economics—Dynamics. 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. First semester of two-semester sequence in econometrics for Ph.D. students. Least squares and generalized least squares estimation of linear econometric models. Aysmptotic (large sample) theory of inference. Some topics in the estimation of microdata. Prereq., ECON 7818.

ECON 8838-3. Seminar: Econometrics 2. Mathematical and statistical foundations of simultaneous equations and time series models. Formal development of principles of identification and estimation of simultaneous equations models. Relation between time series and traditional econometric models. 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. Approved for arts and sciences core curriculum: critical thinking.

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 department consent.

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 department consent.

ECON 4909 (1-4). Independent Study. Offered only to students with a GPA of 3.00 or better. Prereqs., ECON 2010 and 2020; instructor and department consent required.

ECON 4999-3. Economics in Action: A Capstone Course. Students read current newspapers, selecting topics in which economics plays a role in understanding events. Background reading is then assigned. Encourages students to read about economic topics, to think about and research them in economics terms, and to improve their ability in writing and critical thinking. Prereqs., ECON 2010 and 2020, and junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

ECON 6339 (1-3). Teaching Economics. Explores a variety of topics applicable to the study and teaching of economics. 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 6909 (1-4). Independent Study. Prereq., instructor and department consent.

ECON 6949 (1-3). Master's Candidate.

ECON 6959 (1-4). Master's Thesis.

ECON 8909 (1-4). Independent Study. Prereqs., instructor and department consent.

ECON 8999-10. 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 this catalog.

English

College List and/or Core Curriculum

ENGL 1200-3. Introduction to Fiction. Reading and analysis of short stories and novels.

ENGL 1260-3. Introduction to Women's Literature. Introduces literature by women in England and America. Covers both poetry and fiction and varying historical periods. Acquaints students with the contribution of women writers to the English literary tradition and investigates the nature of this contribution. Same as WMST 1260. Approved for arts and sciences core curriculum: cultural and gender diversity.

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. Masterpieces of British Literature. 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. Approved for arts and sciences core curriculum: literature and the arts.

ENGL 1600-3. Masterpieces of American Literature. Enhances student understanding of the American literary and artistic heritage through an intensive study of a few centrally significant texts, emphasizing works written before the twentieth century. Approved for arts and sciences core curriculum: literature and the arts.

ENGL 1800-3. American Ethnic Literatures. Introduces significant fiction by ethnic Americans. Explores both the literary and the cultural elements that distinguish work by these writers. Primary emphasis given to materials from Native American, Afroamerican, and Chicano traditions. Approved for arts and sciences core curriculum: cultural and gender diversity.

ENGL 2260-3. Images of Women in Literature. Surveys images of women in English literature from the Middle Ages to the present. Same as WMST 2260.

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. Introduces 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. Introductory course in poetry writing. Prereq., instructor consent after submitting a manuscript (five to seven poems). May be taken up to three times for credit.

ENGL 2051-3. Introductory Fiction Workshop. Introductory course in fiction writing. Prereq., instructor consent after submitting a manuscript (one short story). May be taken up to three times for credit.

ENGL 3021-3. Intermediate Poetry Workshop. Intermediate course in poetry writing. Prereq., instructor consent based on submission of manuscript (five to seven poems). May be taken up to three times for credit.

ENGL 3051-3. Intermediate Fiction Workshop. Intermediate course in fiction writing. Prereq., instructor consent based on submission of manuscript (one short story). May be taken up to three times for credit.

ENGL 4021-3. Advanced Poetry Workshop. Advanced course in poetry writing. Prereq., instructor consent based on submission of manuscript (five to seven poems). May be taken up to three times for credit.

ENGL 4051-3. Advanced Fiction Workshop. Advanced course in fiction writing. Prereq., instructor consent 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 1002-3. Critical Analysis 1: Poetry. A basic skills course designed to equip students to handle the English major, emphasizing critical writing and acquiring the basic techniques and vocabulary of literary criticism through close attention to poetic language.

ENGL 1012-3. Critical Analysis 2: Prose. A basic skills course designed to equip students to handle the English major, emphasizing critical writing and acquiring the basic techniques and vocabulary of literary ctiticism through close attention to the varieties of prose language.

ENGL 2012-3. Modern Critical Thought. Introduces students to a wide range of critical theories that English majors need to know. Organized as a survey, course covers major movements in modern literary/critical theory, from Matthew Arnold through new criticism to contemporary post-modern framewotks.

ENGL 2712-3. Native American Literature. Surveys traditional and contemporary North American Native American literature, from traditional oral forms to contemporary genre literature of novels, short stories, and poetry.

ENGL 2722-3. Survey of African-American Literature 1. Chronological study of African-American literature from the seventeenth century to the Harlem Renaissance.

ENGL 2732-3. Survey of African-American Literature 2. Chronological study of African-American literature from the Depression writers to the present.

ENGL 2782-3. Studies in Literature. Studies a special literary topic or major author, especially designed for freshmen and sophomores.

ENGL 3002-3. Shakespeare for Nonmajors. Introduces students to Shakespeare's major works—the histories, comedies, and tragedies—and may include the nondramatic poetry as well. Approved for arts and sciences core curriculum: literature and the arts.

ENGL 3062-3. Modern and Contemporary Literature. Close study of significant twentieth-century poetry, drama, and prose works. Readings range from 1920s to the present. Approved for arts and sciences core curriculum: literature and the arts.

ENGL 3152-3. Report Writing. Instruction and practice in various forms of reports, papets, and articles. Style and editing are emphasized.

ENGL 3162-3. History and Literature of Georgian England. Provides interdisciplinary study of England in one of its most vibrant cultural and historical periods. Topics include politics, religion, family life, and the ways contemporary authors understood their world. Same as HIST 3163. Approved for arts and sciences core curriculum: historical context.

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. Introduces literature by British and American women. Same as WMST 3262.

ENGL 3302-3. Backgrounds of English and American Literature. Literary, philosophic, and religious traditions of the Greco-Roman and Judeo-Christian worlds: close analysis of major texts in translation. Comparison of ancient and modern texts where feasible.

ENGL 3312-3. The Bible as Literature. Surveys literary achievements of the Judeo-Christian tradition as represented by the Bible.

ENGL 3502-3. Survey of British Literature 1. Chronological study of 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.* 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.* 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 3672-3. Jewish-American Fiction and Old World Backgrounds. Explores cross-cultural transitions, influences, and ethnicity in the social and literary history of Europe and America through Jewish experience, expressed in the works of such writers as Heine, Sholom Aleichem, Peretz, Babel, Singer, Malamud, Roth, and Woody Allen. Approved for arts and sciences core curriculum: cultural and gender diversity.

ENGL 3682-3. Twentieth-Century American Literature. Reading course in American novelists, poets, and dramatists of the twentieth century. Primarily for nonmajors.

ENGL 3762, 3772, 3782-3. Studies in Literature. Studies a special literary topic or major author, specially designed for juniors and seniors.

ENGL 3802-3. Computer Applications in Language and Literature. Surveys major successful applications of computer technology to the analysis of literary texts. Analyzes selected texts, in the context of the most appropriate theories of language and lirerature and the proper structuring of literary databases.

ENGL 3912-3. Computer Practicum. Provides direct experience in using the computer as a tool of literary study: to analyze, edit, and make a concordance of a limited number of literary texts. Emphasizes 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 emphasis is primarily descriptive, some attention is paid to contempotary views of etiology.

ENGL 4032-3. Critical Thinking: New Directions in English Studies. Concerned with developments in the study of literature that have significantly influenced our conception of the theoretical bases fot study and expanded our understanding of appropriate subject matter.

New directions courses may include topics in women's literature and feminist criticism, Marxist criticism, various schools of psychological criticism, structuralism, semiotics, deconstruction, ethnopoetics, films studies, and applications of linguistic theories to literary criticism. Approved for arts and sciences core curriculum: critical thinking.

ENGL 4102-3. The English Language. Outlines 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 4112-3. History and Culture of Medieval England. Explores the major historical, literary, and cultural developments in England from the Anglo-Saxon period through the fifteenth century. Same as HIST 4113. Approved for arts and sciences core curriculum: historical context.

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. Studies 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. Close study of masterpieces by such novelists as Proust, Joyce, Woolf, Lawrence, Mann, Kafka, and Faulkner.

ENGL 4262-3. Contemporary Novel. Studies major novelists and developments in the genre, emphasizing novels written since 1945.

ENGL 4272-3. Topics in Women's Literature. Focuses on areas of research interest in the study of women's literature, such as selected themes or critical issues. Students expected to contribute original research to the topic under consideration. Same as WMST 4272.

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. Prereq., ENGL 3222.

ENGL 4302-3. Development of British Drama 1. From beginning to the closing of the theatres in 1642.

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 4362-3. Modern Drama. Continental, British, and American drama since Ibsen.

ENGL 4462-3. Modern Poetry. Selection of the works of British and American poets from 1900 to the present.

ENGL 4502-3. Medieval Literature 1. Intensive study of the major literary works of the Middle Ages in Europe.

ENGL 4512-3. Medieval Literature 2. 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. Extensive study of particular periods and movements in American literature.

ENGL 4662-3. Studies in American Literature after 1900. Extensive study of particular periods and movements in American literature.

ENGL 4672-3. Anglo-Saxon Language and Literature. Introduces Anglo-Saxon (Old English) language and literature. Emphasizes rapidly acquiring a reading knowledge of the language. Prose readings are followed by highlights of the shorter poetry (*Wanderer, Seafarer, Battle of Maldon,* etc.). Same as ENGL 5674.

ENGL 4682-3. Beowulf. Students read and analyze *Beowulf* in the original language, with some attention to additional background readings. Same as ENGL 5684.

ENGL 4692-3. Contemporary African-American Literature 1. Advanced in-depth study of the works of prominent African-American novelists and poets.

ENGL 4722, 4732, 4742, 4752, 4762-3. Seminar: Topics in English. Studies such topics as heroism in eighteenth century literature, eros and violence, South African women writers, politics and religion in sixteenth century literature, and American humor. Specially designed for senior English majors.

ENGL 4772, 4782, 4792, 4802-3. Seminar: Major Authors. Intensive study of one or more major British or American authors. Specially 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 instructor consent.

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 instructor consent.

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 instructor consent.

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. Advanced poetics 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, 5014, 5024-3. Studies in Major Authors. Individual British, American, and significant Continental authors. (Author for any given semester is specified in the *Registration Handbook and Schedule of Courses.*)

ENGL 5104 through 5174, 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 5504-3. Medieval Literature. Selections representative of 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 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 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 5674-3. Anglo-Saxon Language and Literature. Same as ENGL 4672.

ENGL 5684-3. Beowulf: Advanced Anglo-Saxon. Same as ENGL 4682.

ENGL 5704-3. Chaucer. Intensive study of *The Canterbury Tales* and other works by Chaucer.

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 7004-3. Studies in Major Authors. Intensive study of works of one major British, American, or significant continental author. (Author for a given semester is specified in the *Registration Handbook and Schedule of Courses.*)

ENGL 7104-3. Special Topics. Intensive study of specialized topics in English, American, and continental literature. (Topic for a given semester is specified in the *Registration Handbook and Schedule of Courses.*)

ENGL 7474-3. Problems in Literary Criticism.

ENGL 7484-3. Problems in Literary Theory.

ENGL 7883-1. Interdisciplinary Seminar in British Studies. Exposes students to methodologies of current work in English, history, theatre, and art history. With a different focus each semester, the seminar may be taken up to three times. Same as HIST 7183.

Independent Study

ENGL 1845 (1-3). Independent Study, Lower Division. Creative writing.

ENGL 1855 (1-3). Independent Study, Lower Division. Literature/language.

ENGL 3935 (1-6). Internship. Provides 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 (1-3). Independent Study, Upper Division. Creative writing.

ENGL 4855 (1-3). Independent Study, Upper Division. Literature/language.

ENGL 5845 (1-3). 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 (1-3). Tutorials in Medieval Studies.

ENGL 5865 (1-3). Tutorials in Renaissance Studies.

ENGL 5875 (1-3). Tutorials in Restoration and Eighteenth-Century Studies.

ENGL 5885 (1-3). Tutorials in Romantic Studies.

ENGL 5895 (1-3). Tutorials in Victorian Studies.

ENGL 5905 (1-3). Tutorials in Modern Studies.

ENGL 6845 (1-3). Tutorials in American Studies.

ENGL 6855 (1-3). Tutorials in Author Studies.

ENGL 6865 (1-3). Tutorials in Creative Writing.

ENGL 6945-3. Master's Degree Candidate.

ENGL 6955 (3-6). Master's Thesis.

ENGL 7845 (1-3). Independent Study, Graduate Level 2.

ENGL 7855 (1-3). Advanced Medieval Studies.

ENGL 7865 (1-3). Advanced Renaissance Studies.

ENGL 7875 (1-3). Advanced Restoration and Eighteenth-Century Studies.

ENGL 7885 (1-3). Advanced Romantic Studies.

ENGL 7895 (1-3). Advanced Victorian Studies.

ENGL 7905 (1-3). Advanced Modern Studies.

ENGL 8845 (1-3). Advanced American Studies.

ENGL 8855 (1-3). Advanced Studies in Authors.

ENGL 8995-10. 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 this catalog.

Film Studies

Production

FILM 2000-3. Beginning Filmmaking. Instructs students in making Super 8 films. Covers use of cameras and editing equipment, basic editing and splicing techniques, and analysis of pertinent films. May emphasize making personal experimental films or on making narrative sound films, according to 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 2300-3. Beginning/Intermediate Filmmaking. Usually taught by a distinguished visiting filmmaker. Covers basic camera, editing, and splicing techniques for Super-8 film. Skills in 16mm are also taught for more advanced students. Equipment is available at the film studies office for a modest rental fee. May be repeated for credit.

FILM 2400-3. Intermediate Small-Format Production. Instruction in shooting and editing Super-8 sound and/or small format video, as well as lab techniques. Students complete a project involving a semester of preparation, shooting, reshooting, editing, and final prints. Prereq., FILM 2000 or instructor consent.

FILM 3010-3. Film Production Topics. Offers students both theoretical and practical experience in various specialized areas of cinematic production. Topics vary but include production in the documentary, fictional narrative, animation, computer animation, and experimental genres.

FILM 3500-3. Intermediate Filmmaking, 16mm. Film production class in 16mm (emphasizing personal experimental films) and in film studies (with a documentary and/or narrative orientation). Covers 16mm camera operation, splicing, editing, sound transfer and recording, and dealing with the lab. Each student makes 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.[1] Prereqs., FILM 2000 or FILM 2300, and FILM 2400.

FILM 3900 (1-3). Independent Study (Production).

FILM 3930 (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.

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.[1] Preteqs., FILM 2000 and 3500.

History

FILM 3051-4. Film History 1. 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 Lumière 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. Same as HUMN 3051. Approved for arts and sciences core curriculum: literature and the arts.

FILM 3061-4. Film History 2. 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. Same as HUMN 3061. Approved for arts and sciences core curriculum: literature and the arts.

FILM 3901 (1-3). Independent Study (Critical Study).

Genre and Movements

FILM 1502-3. Introduction to Film Studies. Introduces critical study of film, exploring basic theoretical concerns while presenting a survey of important film genres, both narrative and non-

[1] Courses that may be repeated may be used for partial fulfillment of a college requirement only once.

narrative. Lectures presented by various faculty members. 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. Historical-aesthetic survey dealing with 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 within the same term (up to 9 hours total) with department consent.[1]

FILM 3012-3. Documentary Film. 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 (Reading).

Topics

FILM 2003-3. Film Topics. Varying topics on important individuals, historical developments, groupings of films, film directors, national cinemas, critical and rheoretical 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 *Registration Handbook and Schedule of Courses* for specific topics. Course may be repeated for credit with department consent.[1] Occasionally cross-listed with ENGL 3762.

FILM 3013-3. Women and Film. Examines the representation of women both in mainstream movies and in women's counter-cinema that resists traditional form, content, and spectator-text relationships of Hollywood models. Emphasizes work by key women filmmakers such as Margarethe con Trotta, Lizzy Borden, and Yvonne Rainer, as well as readings in feminist film theory. Approved for arts and sciences core curriculum: cultural and gender diversity.

FILM 3501-3. Film Production Management. Familiarizes students with principles of sound film management techniques as well as problem-solving methodologies developed specifically for the film industry. Emphasizes the technique of production boarding as the central tool in production management as well as budget and contracts information. Offered through continuing education.

FILM 3563-3. Producing the Feature Film. Designed to give students a behind-the-scenes look at the way production in the entertainment industry is structured and works. Emphasizes the critical role the script plays in the production process. Students analyze story structure and components and production values of various feature scripts. Also focuses on roles, functions, and relationships of writer, producer, director, and editor; the budget process; and all phases in the production process. Screenings in conjunction with script analysis will also be featured. Offered through continuing education.

FILM 4003-3. Film and Fiction. Explores similarities and differences between literature and film as narrative arts. Studies several novels, short stories, and plays and films made from them. Examines problems in point of view, manipulation of time, tone, structure, and setting. Same as HUMN 4003.

Intensive and Small

FILM 4004-3. Film Theory. A philosophical attempt to define the nature of cinema. An intensive seminar, involving a great deal of reading in classic and contemporary film theory, and requiring a working knowledge of silent film history. Prereq., FILM 3051. Same as HUMN 4004. Approved for arts and sciences core curriculum: critical thinking.

FILM 4604-3. Colloquium in Film Aesthetics. Seminar for the serious round table discussion and critique of film as an art form, emphasizing development of an appropriate verbal and written language for description of film. Occasionally cross-listed with FREN 4600.

Fine Arts

Electronic Media

FINE 3230-3. Electronic Arts Survey. Explores the development of electronic media as art form through tape screenings, readings, lectures, and discussions. Prerequisite for further studies in video image processing and computer graphics.

FINE 3900 (1-3). Undergraduate Independent Study—Video.

FINE 4120-3. Computer Imaging. Studio course utilizing the personal computer in generating and processing images in the visual arts. Prereqs., FINE 1002 or 1012 and familiarity with computer basics. Same as FINE 5120.

FINE 4130-3. Integrated Media. Interdisciplinary course encouraging experimentation with media and integration of traditional areas of drawing, painting, sculpture, and photography. Areas covered include two- and three-dimensional collage/assemblage, correspondence art, artist's books, site-specific, performance, and audio and video art. Same as FINE 5130.

FINE 4150-3. Performance/Installation. Primarily focuses on personal imagery as a live situation occurring either in invented constructed reality or real environment. Work may be individual or group configuration, and may also take on the visual linguistic form of a solo performer or of a multi-media presentation. Same as FINE 5150.

FINE 4230-3. Intermediate Electronic Arts Survey. Emphasizes video studio production techniques and basic computer graphics. Tape screenings, readings, lectures, and discussions cover development of the electronic medium as an art form. Prereq. for further studies in video image processing. Same as FINE 5230.

FINE 4240-3. Beginning Image Processing—Computer Animation. Studio course on video image processing, computer animation, and editing techniques. Explores the electronic language of analog and digital processing. Programs are stored on tape or disk. Same as FINE 5240.

FINE 4340-3. Intermediate Image Processing—Computer Animation. Explores the use of digital processing, computer animation field production, and sound processing, using a montage of theories and images for final programs stored either on disk or tape. Same as FINE 5340.

FINE 4440-3. Advanced Image Processing—Computer Animation. Primarily concerned with the conceptual realization of advanced student work and technical quality of that work. Emphasizes independent projects. Prereq., complete working knowledge of electronic lab equipment. Same as FINE 5440.

FINE 5120-3. Computer Imaging. Same as FINE 4120.

FINE 5130-3. Integrated Media. Same as FINE 4130.

FINE 5150-3. Performance/Installation. Same as FINE 4150.

FINE 5230-3. Intermediate Electronic Arts Survey. Same as FINE 4230.

FINE 5240-3. Beginning Image Processing—Computer Animation. Same as FINE 4240.

FINE 5340-3. Intermediate Image Processing—Computer Animation. Same as FINE 4340.

FINE 5440-3. Advanced Image Processing—Computer Animation. Same as FINE 4440.

FINE 5710 (1-3). Graduate Studio Critique. Consists of consultations with faculty on individual studio problems and projects. May be repeated for up to 6 credit hours with any single faculty member.

FINE 5840 (1-3). Graduate Independent Study—Video.

FINE 5841 (1-3). Graduate Independent Study—Film.

Photography

FINE 1161-2. Basic Photography 1. Introduces techniques and concepts of photography as art. Emphasizes photography as a means to formal and expressive ends. Students must have an adjustable camera. For non-art majors.

FINE 1171-3. Basic Photography 1. Introduces techniques and concepts of photography as art. Emphasizes 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. Explores 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 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 4131-3. Introduction to Electronic Photography. Introduces and explores electronic still photography (b&w). Includes image sources: conventional photographic materials, electronic still cameras, video and broadcast television systems, laser disk, and computer graphic systems (fractals, and paint and draw systems). Images are digitized, processed, stored, transmitted, and printed electronically. Same as FINE 5131.

FINE 4141-3. Advanced Electronic Photography. Explores electronic still photography as an art form, building on the information and experience gained in FINE 4131. Color image processing, artificial intelligence possibilities, and programming for photographers/artists are explained and used in image making. Prereq., FINE 4131. Same as FINE 5141.

FINE 4151-3. 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. Explores the zone system of exposure and development and advanced creative printing controls in depth. Students develop a body of work using a large format camera. Same as FINE 5151.

FINE 4161-3. Advanced Photography. Explores advanced techniques and concepts of photography as art. Emphasizes photography as a means to formal and expressive ends. May be repeated. Prereq., FINE 3191 or equivalent.

FINE 4171-3. New Directions in Photography. Investigates the use of the photographic image in new, antique, or nonstandard ways including nonsilver, photosculpture, various color processes, photolanguage, photoinstallations, electronic media, performance, filmmaking, electrostatic art (copy machine), photobooks, photocollage, and audio/visual art. May be repeated twice. Course content changes each semester. Prereq., FINE 2191 or equivalent.

FINE 4181-3. Advanced Photography. See FINE 4171. Prereq., FINE 2191 or equivalent.

FINE 5131-3. Introduction to Electronic Photography. Same as FINE 4131.

FINE 5141-3. Advanced Electronic Photography. Same as FINE 4141.

FINE 5151-3. Large Format Photography. Same as FINE 4151.

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. 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.

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. Emphasizes composition, color, and use of materials in expressing the student's ideas. Prereq., FINE 1202 or FINE 1212.

FINE 2212-3. Principles of Color. Basic introduction to the relative effects of color as used by the artist. Emphasizes 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. Emphasizes 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 3012-3. Pen and Ink Drawing. Develops skills in traditional pen and ink techniques with a creative approach to solving problems in drawing. 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. Lecture course providing insights into the art of painting. Contemporary painting, as well as that of the past, examined and discussed in depth.

FINE 3302-3. Watermedia Painting 1. Introduces 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. 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 emphasizing individual development. May be repeated. Prereq., FINE 3202.

FINE 4302-3. Advanced Watermedia Painting. Advanced painting problems using transparent and opaque water color media, emphasizing 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. Introduces intaglio and relief printing and printing media. May not be repeated.

FINE 2413-3. Beginning Lithography. Introduces the techniques, including metal plate lithography. May not be repeated.

FINE 2423-3. Beginning Screen Printing. Exploration in silkscreen techniques. Emphasizes 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. Course emphasizes 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. 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 emphasizing 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. Introduces advanced screen printing technology, emphasizing 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 improvement of 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

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. Explores a variety of materials, methods, and techniques and their application with reference to contemporary sculpture, i.e., moldmaking, welding, casting, vacuforming, photo techniques, and woodworking. 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 2524-3. Visual Thinking in Three-Dimensional Form. Explores ideas concerning the structure and nature of visual thinking and their relationship to the creative thought process. Also investigates form in terms of the organizing principles of three-dimensional design and its application to contemporary sculpture. Includes lecture and studio projects. Prereq., FINE 1514.

FINE 3504-3. Experiments in Sculpture 1. Further exploration of materials, methods, and techniques through a series of assignments emphasizing individual ideas and their relationship to contemporary aesthetics. May not be repeated. Prereq., FINE 2504 or 2514.

FINE 3514-3. Experiments in Sculpture 2. 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 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.

FINE 5844 (1-3). Graduate Independent Study—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. Introductory course concentrating on techniques of hand-built clay forms as they relate to function and nonfunction. Various clay techniques, glazing, and firing procedures are explored. Emphasizes ceramics in a fine arts context. May not be repeated.

FINE 2095-3. First-Year Wheelthrowing. 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.

FINE 5845 (1-3). Graduate Independent Study—Ceramics.

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 elementary school certification. 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 non-art major are covered. Through continuing education only.

FINE 3646-2. Art in the Elementary Schools. For art majors wishing to receive certification for teaching art in public elementary schools. Deals with theoretical and practical problems of teaching art in the elementary school and provides an opportunity for in-school observations of elementary art instruction.

FINE 3666-3. Art Materials Workshop. Introduces and explores art materials for use in the public school, grades K-9. Covers both two- and three-dimensional materials including painting, drawing, relief printmaking, and weaving. Prereqs., FINE 1002, 1202, 1504, and junior standing.

FINE 3676-2. Art Materials Workshop: Weaving. Introduces and explores 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 theoretical and practical problems of teaching art in the secondary school.

FINE 4626-2. Electronic Media Applications in Art Education. Introduces students seeking certification as art teachers to a variety of computer and video applications in teaching art in grades kindergarten through 12. Includes methods of developing computer-aided instruction, interactive-video programming, desktop publishing, and student skills testing. Prereqs., FINE 3646 and 3686, or instructor consent.

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 and 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 5966 (1-3). Graduate Project.

FINE 6956 (1-4). Master's Thesis (Art Education).

Seminars/Special Topics

FINE 1047-3. Art Lecture. Develops awareness of art from a nonhistorical perspective. Topics include technical aspects of painting and sculpture, origins and development of photography, theory of art values, and art criticism.

FINE 2097 (2-3), 3097 (2-3), 4097 (2-3), 5097 (2-3). Special Topics. Introduces timely subjects in fine arts that cannot be offered on a regular basis. Information concerning topics offered in any given semester will be available prior to preregistration from the Department of Fine Arts. May be repeated.

FINE 2127 (1-5), 3127 (1-5), 4127 (1-5), 5127 (1-5). Contemporary Issues and Images/ Summer Workshop Courses. Offered in summer only. Intensive studio courses with a solid grounding in one of the lens imaging art forms (still photography, video, or film). Taught by a nationally prominent artist or critic using the workshop format. Consists of individual and group discussions, critique sessions, field work and lectures about the work, and ideas of the visiting instructor, as well as other discipline-related ideologies.

FINE 3847 (1-3), 3857 (1-3). Independent Study.

FINE 3937 (1-6). Internship. Gives upper-division students the opportunity to work in public or private organizations on assignments relating to their career goals, and allows them to

explore the relationship between theory and practice in their major.

FINE 4087-3. Selected Topics in Contemporary Art. Selective study of significant areas of visual art of the last decade including major critical opinions. Prereq., twenty hours of fine arts courses. Same as FINE 5087.

FINE 4117-3. B.F.A. Seminar. For students intending to pursue graduate work and/or a professional career in art. Emphasizes the development of a critical overview of their work and interests and how they relate to the problems of professional activity. Prereq., B.F.A. candidate.

FINE 4137-3. Fine Arts Gallery Operations. Designed to introduce and involve the student in the operation of a visual arts gallery. Students study theoretical constructs guiding the field and receive hands-on experience helping run the CU Art Galleries. Students assist with installations, marketing, and special events. Same as FINE 5137.

FINE 5087-3. Selected Topics in Contemporary Art. Same as FINE 4087.

FINE 5117-2. Graduate Art Seminar.

FINE 5137-3. Fine Arts Gallery Operations. Same as FINE 4137.

FINE 5847 (1-3). Graduate Independent Study—Nonstudio.

FINE 5857, 5867 (1-3). Graduate Independent Study.

FINE 6947-3. Master's Degree Candidate.

FINE 6957 (1-6). Master of Fine Arts Creative Thesis.

Visiting Artist Program

FINE 4118-3. 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. Provides continuous input of significant developments and a comprehensive view of contemporary issues in the arts. May be repeated once. Prereq., portfolio review for undergraduates. Same as FINE 5118.

FINE 5118-3. Graduate Visiting Artist Program. Same as FINE 4118.

Art History

Some of the following courses are offered at both the undergraduate (4000) and graduate (5000) levels. 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 1109-3. Introduction to Western Art 1. Introduces Western art, from the early dynastic period of Egypt (c. 3000 B.C.) to the end of the sixteenth century A.D. Traces the expansion of European culture, painting, sculpture, and architecture in order to develop an awareness of how our artistic culture is derived from European civilization. Approved for arts and sciences core curriculum: literature and the arts.

FINE 1209-3. Introduction to Western Art 2. Introduces Western art, from about 1600 A.D. to the present. Traces the expansion of European culture, painting, sculpture, and architecture in order to develop an awareness of how our artistic culture is derived from European civilization. Approved for arts and sciences core curriculum: literature and the arts.

FINE 1709-3. Experiencing Art—Image, Artist, and Idea. Provides a broad introduction to understanding and appreciation of art from all time periods and all parts of the world. Particularly directed to nonmajors. Approved for arts and sciences core curriculum: literature and the arts.

FINE 2009-3. Art of Antiquity. Surveys 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. Surveys 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. Surveys sculpture, painting, and architecture from Giotto through the Rococo.

FINE 2309-3. Art of the Nineteenth and Twentieth Centuries. Surveys sculpture, painting, and architecture from the late eighteenth century to the present, beginning with neoclassicism and romanticism. Covers impressionism and all the other "isms" of the nineteenth and twentieth centuries.

FINE 2409-3. Introduction to Asian Art. Designed for those having no previous experience in the study of Asian art. Traces 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. Approved for arts and sciences core curriculum: literature and the arts.

FINE 2509-3. Contemporary Painting, Sculpture, and Intermedia Arts. Investigates the loss of beauty in art and discusses whether or not that loss is regrettable. A question of equal importance will be the function and historical meaning of modern and postmodern art. Is it all hype and strategic positioning by artists for fame and fortune? Is it "serious"? Are the fine arts still "fine"?

FINE 3209-3. Art, Culture, and Gender Diversity, 1400-1600: Renaissance Art out of the Canon. Studies rising status of painting, sculpture, and architecture in Europe and how Europeans perceived nonwestern art during the early modern period. Introduces history of race/ethnicity, gender, and class concerns embodied in the European category "visual arts." Emphasizes new methods for interpreting history without imposing Eurocentric viewpoints. Approved for arts and sciences core curriculum: cultural and gender diversity.

FINE 3509-3. American Art. Surveys American art and material culture from the pre-Colonial era to the present day. Considers cultural and artistic interaction, ethnic expressions, patronage, European and non-western influences, and the struggle to develop a uniquely American artistic identity. Approved for arts and sciences core curriculum: United Srates context.

FINE 4909 (1-3). Undergraduate Independent Study—Art History.

FINE 4009-3. Art of the Ancient Near East. Surveys 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. Same as FINE 5009, CLAS 4009, and CLAS 5009.

FINE 4019-3. Art of Ancient Egypt. Surveys development of Egyptian architecture, sculpture, painting, and the minor arts from their beginnings until the establishment of Christianity. Same as FINE 5019, CLAS 4019, and CLAS 5019.

FINE 4029-3. Art of Islam. Art and architecture of the Islamic peoples from the death of Muhammad through the eighteenth century from Spain to India. Same as FINE 5029.

FINE 4039-3. Byzantine Art. 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. Same as FINE 5039 and CLAS 4039.

FINE 4049-3. Pre-Classical Art and Archaeology. Same as FINE 5049 and CLAS 4049.

FINE 4059-3. Classical Art and Archaeology. Same as FINE 5059 and CLAS 4059.

FINE 4079-3. Roman Art and Archaeology. Same as FINE 5079 and CLAS 4079.

FINE 4109-3. 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. Same as FINE 5109.

FINE 4119-3. Romanesque Art. History of European art of the eleventh and twelfth centuries treating architecture, sculpture, fresco painting, and manuscript illumination. Same as FINE 5119.

FINE 4129-3. 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. Same as FINE 5129.

FINE 4139-3. 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. Same as FINE 5139.

FINE 4209-3. Italian Renaissance Art 1. Italian art and architecture from 1400 to the death of Donatello (1466), emphasizing the development of renaissance art in Florence and central Italy. Same as FINE 5209.

FINE 4219-3. 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. Same as FINE 5219.

FINE 4229-3. Italian Renaissance Art 3. Italian painting, c. 1550-1610, focusing on current debates over interpretation of art produced in the wake of the Counter Reformation. Examines the foundations of devotional painting in the sciences and the literary tradition, from Michelangelo's late work until the foundation of the Carracci Academy in Bologna and Rome. Same as FINE 5229. Prereq., FINE 3509.

FINE 4239-3. 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. Same as FINE 5239.

FINE 4259-3. Northern European Painting. History of painting in the Netherlands, France, and Germany in the fifteenth and sixteenth centuries. Same as FINE 5259.

FINE 4269-3. Art in France, 1500-1750. Examines the developing French style through 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. Same as FINE 5269.

FINE 4279-3. Michelangelo (1475-1564). Focuses on Michelangelo's long career, marked by outstanding achievements in sculpture, painting, architecture, and poetry. Emphasizes his projects and achievements in light of sixteenth-century artistic theory, including relationships to his contemporaries in the arts and literature. Prereqs., FINE 2209 and one other art history course. Same as FINE 5279.

FINE 4309-3. Neoclassicism and Romanticism: 1760 to 1840. Surveys painting and sculpture in England and France from the last quarter of the eighteenth century through the first half of the nineteenth century. Same as FINE 5309.

FINE 4319-3. European Art from 1830 to 1886. Surveys 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. Same as FINE 5319.

FINE 4329-3. Modern Art 1. In-depth study of the fin de siècle, stressing post-impressionism, art nouveau, and symbolism. Course closes with fauvism in France and the expressionist movement in Germany. Same as FINE 5329. Approved for arts and sciences core curriculum: literature and the arts.

FINE 4339-3. Modern Art 2. Emphasizing the various "isms" of the twentieth century, 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. Same as FINE 5339.

FINE 4349-3. Modern Architecture. Surveys world contemporary architecture from its beginnings with Richardson and Wright to the present. Same as FINE 5349.

FINE 4359-3. Modern Sculpture, 1870-1970. Extensive examination of outstanding sculptors in Europe and America from Rodin to the present. Emphasizes American sculpture since World War II. Same as FINE 5359.

FINE 4409-3. Art of Africa and Oceania. Covers native arts of non-western peoples of Africa and Oceania, including sculpture, architecture, and minor arts for both archaeological and ethnological cultures. Emphasizes the function of art in society as well as aesthetic analysis. Same as FINE 5409.

FINE 4419-3. Pre-Columbian Art. Surveys architecture, sculpture and painting of the high cultures of Meso-American and Andean areas before the Spanish Conquest. Same as FINE 5419.

FINE 4429-3. Latin American Art since 1492. Surveys arts of the colonies of Spain and Portugal in the Western Hemisphere from 1492 to the present. Same as FINE 5429.

FINE 4439-3. North American Indian Art. Surveys art of North American Indian cultures, including the northwest coast, southwest, southeast, northeast, and plains, covering architecture, sculpture, and minor arts for both archaeological and ethnological cultures. Same as FINE 5439.

FINE 4449-3. Art of India and Southeast Asia. Surveys 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. Same as FINE 5449.

FINE 4459-3. The Arts of Japan. Appreciation and chronological development of the arts of Japan. Emphasizes the arts of Shintoism and Buddhism as well as the particular Japanese aesthetic from prehistoric times to the present. Same as FINE 5459.

FINE 4469-3. The Arts of China. Surveys Chinese painting, sculpture, architecture, and other arts from neolithic to modern times. Same as FINE 5469.

FINE 4509-3. 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. Same as FINE 5509.

FINE 4519-3. American Art: 1860-1945. Examines such American art as painting, sculpture, architecture, photography, parks, and fairs from the Gilded Age to World War II. Considers major art styles, women and minority artists, the development of art schools and museums, and cultural interaction between America and other countries. Same as FINE 5519.

FINE 4529-3. American Art: 1945-1970. Examines the "triumph of American painting," sculpture, architecture, and other arts after World War II 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. Same as FINE 5529.

FINE 4539-3. 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-expressionist, feminist, minority, political, and public art. Same as FINE 5539.

FINE 4549-3. Contemporary Public Art. Focuses on the changing relationship of architecture, art and ornament, the role of the public, and the function and patronage of contemporary public art. Considers environmental art, community murals, activist art, temporary installations, issues of censorship, and monuments and memorials. Same as FINE 5549. Prereq., FINE 3509.

FINE 4609-3. 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.* Same as FINE 5609.

FINE 4619-3. 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.* Same as FINE 5619.

FINE 4629-3. 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.* Same as FINE 5629.

FINE 4639-3. Mannerist Painting and Sculpture. 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.* Same as FINE 5639.

FINE 4649-3. The Renaissance in Rome. Works of art produced in Rome between circa 1450 and 1600 are studied by attending on-site lectures that deal with style and intellectual and social contexts, and by writing extensively about works of art. *Offered abroad only.* Same as FINE 5649.

FINE 4659-3. The Roman Baroque. Traces 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.* Same as FINE 5659.

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 4709-3. Perspectives on Art and Criticism. Examines some traditional and current ideas that have shaped, defined, or influ-

enced 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. Same as FINE 5709.

FINE 4719-3. History of Media Arts. Surveys 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, emphasizing 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 in dialogue with ideas raised in those readings. Prereq., FINE 2191 or 3191.

FINE 4739-3. The Intellectual Roots of Italian Renaissance Art. Overview of critical issues raised in the literature on art, focusing on renaissance interpretations of key historical themes such as imitation and decorum. Carefully examines the language used in primary sources (available in English). Approved for arts and sciences core curriculum: critical thinking.

FINE 4809-3. Women Artists From the Middle Ages to the Present. Surveys women's art in the west, emphasizing painting and sculpture. Same as FINE 5809 and WMST 4809. Approved for arts and sciences core curriculum: cultural and gender diversity.

FINE 4909 (1-3). Independent Study—Art History.

FINE 4919-3. Undergraduate Seminar: Selected Topics in Art History. Seminar course dealing with selected areas or problems within the history of art. Consult current *Registration Handbook and Schedule of Courses* for seminar topic.

FINE 4929 (1-3). Special Topics in Art History. Same as FINE 5929.

FINE 5009-3. Art of the Ancient Near East. Same as FINE 4009 and CLAS 5009.

FINE 5019-3. The Art of Ancient Egypt. Same as FINE 4019 and CLAS 5019.

FINE 5029-3. Art of Islam. Same as FINE 4029.

FINE 5039-3. Byzantine Art. Same as FINE 4039 and CLAS 5039.

FINE 5049-3. Pre-Classical Art and Archaeology. Same as FINE 4049 and CLAS 5049.

FINE 5059-3. Classical Art and Archaeology. Same as FINE 4059 and CLAS 5059.

FINE 5069-3. Prehistoric Greek Art and Archaeology. In-depth study of the Lithic and Bronze Age Aegean (c. 7000-1200 B.C.). Topics selected from architecture, pottery, frescoes, and minor arts of the third millennium B.C. Same as CLAS 5069.

FINE 5079-3. Roman Art and Archaeology. Same as FINE 4079 and CLAS 5079.

FINE 5089-3. Classical Greek Art. Same as CLAS 5089.

FINE 5109-3. Early Christian and Early Medieval Art. Same as FINE 4109.

FINE 5119-3. Romanesque Art. Same as FINE 4119.

FINE 5129-3. Gothic Art. Same as FINE 4129.

FINE 5139-3. Italian Gothic Art. Same as FINE 4139.

FINE 5159-3. Hellenistic Art and Archaeology. Same as CLAS 5159.

FINE 5209-3. Italian Renaissance Art 1. Same as FINE 4209.

FINE 5219-3. Italian Renaissance Art 2. Same as FINE 4219.

FINE 5229-3. Italian Renaissance Art 3. Same as FINE 4229.

FINE 5239-3. Art and Architecture in Italy, 1580-1750. Same as FINE 4239.

FINE 5259-3. Northern European Painting. Same as FINE 4259.

FINE 5269-3. Art in France, 1500-1750. Same as FINE 4269.

FINE 5279-3. Michelangelo (1475-1564). Same as FINE 4279.

FINE 5309-3. Neoclassicism and Romanticism: 1760 to 1840. Same as FINE 5309.

FINE 5319-3. European Art from 1830 to 1886. Same as FINE 4319.

FINE 5329-3. Modern Art 1. Same as FINE 4329.

FINE 5339-3. Modern Art 2. Same as FINE 4339.

FINE 5349-3. Modern Architecture. Same as FINE 4349.

FINE 5359-3. Modern Sculpture 1870-1970. Same as FINE 4359.

FINE 5409-3. Art of Africa and Oceania. Same as FINE 4409.

FINE 5419-3. Pre-Columbian Art. Same as FINE 4419.

FINE 5429-3. Latin American Art since 1492. Same as FINE 4429.

FINE 5439-3. North American Indian Art. Same as FINE 4439.

FINE 5449-3. Art of India and Southeast Asia. Same as FINE 4449.

FINE 5459-3. The Arts of Japan. Same as FINE 4459.

FINE 5469-3. The Arts of China. Same as FINE 4469.

FINE 5509-3. American Art before the Civil War. Same as FINE 4509.

FINE 5519-3. American Art 1860-1945. Same as FINE 4519.

FINE 5529-3. American Art 1945-1970. Same as FINE 4529.

FINE 5539-3. Contemporary Art: 1970 to the Present. Same as FINE 4539.

FINE 5549-3. Contemporary Public Art. Same as FINE 4549.

FINE 5609-3. Roots of the Italian Renaissance. Same as FINE 4609.

FINE 5619-3. Quattrocentro Art in Florence and Central Italy. Same as FINE 4619.

FINE 5629-3. Monuments of the High Renaissance. Same as FINE 4629.

FINE 5639-3. Mannerist Painting and Sculpture. Same as FINE 4639.

FINE 5649-3. The Renaissance in Rome. Same as FINE 4649.

FINE 5659-3. The Roman Baroque. Same as FINE 4659.

FINE 5709-3. Perspectives on Art and Criticism. Same as FINE 4709.

FINE 5809-3. Women Artists From the Middle Ages to the Present. Same as FINE 4809.

FINE 5909 (1-3). Graduate Independent Study—Art History.

FINE 5929-3. Special Topics: Art History/Criticism. Subjects and instructors vary. Same as FINE 4929.

FINE 5969 (1-3). Graduate Project.

FINE 6909 (1-3). Graduate Independent Study—Art History.

FINE 6919-3. Seminar: Tools of Research. Required for M.A. (art history) candidates. Discusses problems in art history and theory. Emphasizes defining problems for research study and systematically acquiring and presenting written evidence. Studies 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 6929-3. Seminar: Theories of Art History. Required for M.A. (art history) candidates. Systematic critical overview of the development of art history as a discipline beginning with eighteenth century theories of aesthetics and ending with current interdisciplinary models of critical interpretation. Weekly readings, discussions, reports, and written papers constitute the format of this seminar in methodology.

FINE 6939-3. Graduate Seminar: Open Topics in Art History. Subjects and topics vary.

FINE 6949 (1-3). Master's Candidate for Degree.

FINE 6959 (1-6). Master's Thesis (Art History).

French and Italian

French

FREN 1010-5. Beginning French 1. For students with no previous knowledge of French. Introduces basic grammar and most commonly used vocabulary of French.

FREN 1020-5. Beginning French 2. Completion of presentation of most basic structures and vocabulary of French. Prereq., completion of one semester of college-level French or one year of high school French.

FREN 1050-5. Beginning French Review. Covers the material of FREN 1010 and 1020 in one accelerated semester. Intended for students who know some French (i.e., one or two years in high school) but do not have skills adequate for 2000-level courses. Students may not receive credit for FREN 1050 if they have completed FREN 1010 or FREN 1020.

FREN 2110-3. Second-Year French Grammar Review and Reading 1. Intensive review of important grammar structures. Introduces literary and cultural readings as well as to writing compositions in French. Prereq., completion of two semesters of college-level French or equivalent. Completes college undergraduate language requirement.

FREN 2120-3. Second-Year French Grammar Review and Reading 2. Completes detailed study of grammar begun in FREN 1010 and 1020. Continued reading in French literature and culture, considerable practice in writing and speaking French. Prereq., three semesters of college-level French or equivalent.

FREN 2170-3. French-Speaking Voices of the Third World. Introduces contemporary literature of French-speaking Africa and the Caribbean. Major topics include cultural conflict, search for identity, and oral tradition. Taught in English with translations of French texts. Approved for arts and sciences core curriculum: cultural and gender diversity.

FREN 2600-3. Introduction to French Film. History and evolution of French film from Lumière to today. Scripts and modern literary texts used as reference points for studying narrative structures in both literature and film. Handouts of technical terms and critical theory supplement readings. Taught in English.

FREN 3010-3. French Phonetics and Pronunciation. Training in correct pronunciation of standard French through understanding of the function of speech organs. International phonetic alphabet learned and used throughout the course; intensive ptactice in class and language laboratory. Required of all majors.

FREN 3020-2. Oral Practice. Course designed to build vocabulary and fluency in spoken French emphasizing correct pronunciation. Prereq., two years of college-level French. Does not count toward major.

FREN 3030-3. French for Business 1. Designed primarily for students in business French who have not spent time in a French-speaking milieu; those with some experience should take FREN 4030. Concentrates on composing business letters and conducting business in French. Prereq., FREN 2120 or equivalent.

FREN 3050-3. French Composition 1. Third-year grammar course where students perfect their written French through written grammar exercises and guided composition. Should be taken before FREN 3060. Required for French majors. Prereq., completion of FREN 2120 or equivalent.

FREN 3060-3. French Composition 2. Continues grammar study and composition practice begun in FREN 3050. Required for majors. Prereq., FREN 3050 or equivalent.

FREN 3110-3. Main Currents of French Literature 1. Surveys French literature from Middle Ages through eighteenth century. Students are expected to acquire a fairly detailed knowledge of principal writers and schools of the periods covered. Required for majors. Prereqs., completion of or concurrent enrollment in FREN 3050. Approved for arts and sciences core curriculum: literature and the arts.

FREN 3120-3. Main Currents of French Literature 2. Surveys nineteenth- and twentieth-century French literature. Close reading of selected texts of the principal writers and schools. Required for majors. Prereq., completion of or concurrent enrollment in FREN 3050. Approved for arts and sciences core curriculum: literature and the arts.

Courses at the 4000 level or above are not open to freshmen or sophomores.

FREN 4010-2. Advanced Composition 1. Systematic review of French grammar, vocabulary, and style. Writing expected to be clear, graceful, and grammatically and idiomatically correct. Prereq., FREN 3060 or equivalent.

FREN 4020-2. Advanced Composition 2. Continuation of FREN 4010; format and goals similar. Prereq., FREN 4010 or equivalent.

FREN 4030-3. Advanced Oral Practice and Interpreting. Intended for students who have spent six months or more in a French-speaking milieu. Concentrates on developing (or preserving) speaking fluency, correct pronunciation, and a good working vocabulary. Prereq., FREN 3020 or 3030 or equivalent. May be repeated.

FREN 4050-3. French for Business 2. Prereq., FREN 3030 or consultation with instructor.

FREN 4060-3. French Phonology and Morphology. Introduces the analysis and technical description of French structure. Students must have a good knowledge of French, but do not need prior knowledge of linguistics.

FREN 4070-3. Syntax of Modern Standard French. Continues examination of the structure of modern standard French, concentrating on syntax. Prereq., FREN 3010 or equivalent.

FREN 4080-3. Introduction to Old French. Introduces the structure of Old French, the medieval ancestor of modern French. Students must have a good knowledge of modern standard French; knowledge of Latin helpful, but not required. No previous knowledge of linguistics required.

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.

Prereqs. for all of the following courses are FREN 3110 and 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. Same as ITAL 4130.

FREN 4170-3. Francophone Literature. Studies the literary expression of French-speaking people of Africa, the Caribbean, and French Canada. Gives special attention to oral tradition, identity question, and cultural conflict.

FREN 4200-3. Contemporary French Culture and Civilization. Introduces a wide-ranging series of texts and audio-visual documents, providing a firm knowledge of the principal structures and emerging trends within contemporary French culture and civilization.

FREN 4210-3. History of French Civilization. Studies the main currents of French culture and civilization from the period of France's hegemony in the seventeenth century to the end of the first World War. Emphasizes French culture as an evolving symbolic system, organizing and responding to changes in its society and surroundings rather than as a series of discrete historical events.

FREN 4250-3. Medieval and Renaissance Readings. Introduces the masterpieces of French medieval and sixteenth-century literature.

FREN 4310-3. Seventeenth-Century French Tragedy and Poetry. Focuses on close readings of tragedies of Corneille and Racine, plus one "serious" comedy of Molière, lyrical poetry, and selected fables of La Fontaine. Discussions of cultural context and modern criticism.

FREN 4320-3. Seventeenth-Century French Prose. Close reading and discussion of selected works of Descartes, Pascal, Mme. de La Fayette, La Rochefoucauld, La Bruyère, and Perrault. Gives attention to cultural context and modern criticism.

FREN 4330-3. Molière and Seventeenth-Century French Comedy. Treats the complete theater of Molière plus the comedies of Mairet, Saint-Sorlin, Saint-Evremond, Rotrou, Scarron, and Cyrano de Bergerac.

FREN 4350-3. French Enlightenment.

FREN 4360-3. Survey of Eighteenth-Century French Literature.

FREN 4430-3. Survey of Nineteenth-Century French Literature. Fiction, poetry, and theatre in nineteenth-century France. Focuses on developing and changing literary styles and subject matter throughout the century in historical, philosophical, and social context.

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. Major aspects of the twentieth-century novel in France through works written by women. Gives historical perspective, studies a number of novels, and emphasizes works written since 1968, a turning point. Discusses relevance of women's writings today.

FREN 4510-3. French Dramatic Theories. Studies French dramatic theories since the sixteenth century, using representative plays as illustration of theoretical works.

FREN 4520-3. Renaissance French Poetry. Same as 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 requited 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 5010-3. Advanced Phonetics.

FREN 5060-3. French Phonology and Morphology.

FREN 5070-3. Syntax of Modern French.

FREN 5080-3. Introduction to Old French.

FREN 5090-3. Contrastive Analysis of French and English.

FREN 5110, 5120-3. French Special Topics. Different topics are offered and, in a number of cases, cross-listed with other departments.

FREN 5130-3. Medieval Lyric Literature.

FREN 5160-3. Modern Canadian Fiction. Introduces the most significant works of a tepresentative and broad selection of both Anglophone and Francophone Canadian fiction writers of the twentieth century—modern and postmodern, traditional and experimental. Prereq., graduate standing in French or comparative literature.

FREN 5170-3. Francophone African Literature.

FREN 5200-3. Contemporary French Culture and Civilization.

FREN 5210-3. History of French Civilization.

FREN 5250-3. Medieval and Renaissance Readings.

FREN 5310-3. Seventeenth-Century French Tragedy and Poetry.

FREN 5320-3. Seventeenth-Century French Prose.

FREN 5330-3. Molière and Seventeenth-Century French Comedy.

FREN 5350-3. French Enlightenment.

FREN 5360-3. Eighteenth-Century French Literature.

FREN 5420-3. Nineteenth-Century French Literature.

FREN 5430-3. Topics in Nineteenth-Century French Prose.

FREN 5440-3. Literary Ludics. Taught in French and English. Focuses on literary structures proposed by author to reader as games. Considers critical texts, both practical and theoretical, with a view toward defining the relation between criticism and its objects. Prereq., B.A. in French or instructor consent.

FREN 5470-3. Twentieth-Century French Theatre and Poetry.

FREN 5480-3. Twentieth-Century French Novel.

FREN 5490-3. Women Novelists of the Twentieth Century in France.

FREN 5510-3. French Dramatic Theories.

FREN 5520-3. Italian and French Poetry of the Renaissance.

FREN 5570-3. French Literary Criticism.

FREN 5600-3. Seminar on French and Francophone Film.

FREN 5770-2. College Foreign Language Teaching. Required for teaching assistants and graduate part-time instructors.

FREN 5860-3. 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 7040-3. History of the French Language from 1300 to the Present Day: Morphology and History.

FREN 7050-3. Old Provençal.

FREN 7110-3. Stylistics of French.

FREN 7120-3. Seminar in French Literature. Special topics taught by visiting lecturers and distinguished visiting professors.

FREN 7130-3. Seminar in French Literature.

FREN 7140-3. Seminar: Special Topics. Team-taught by French faculry. Upon demand.

Consult Registration Handbook and Schedule of Courses *for more information on seminar topics.*

FREN 7290-3. Seminar: Moyen Age.

FREN 7340-3. Seminar: Renaissance Literature.

FREN 7380-3. Seminar: 17e siècle.

FREN 7550-3. Seminar: 18e siècle.

FREN 7710-3. Seminar: 19e siècle.

FREN 7720-3. Seminar: 20e siècle.

FREN 8990-10. Doctoral 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 1. Studies 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 instructor consent. Taught in Italian.

ITAL 3130-3. Readings in Italian Literature 2. Studies selected masterpieces from the eighteenth, nineteenth, and twentieth centuries, with special emphasis on contemporary literature. Students should have passed ITAL 2120 or have instructor consent. 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 instructor consent.

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 cantos 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. Examines 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. Same as FREN 4130.

ITAL 4200-3. Italian Culture and Civilization from Origins through the Renaissance. Taught in English.

ITAL 4250-3. History of Italy: 1815 to Present. Surveys 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 focus on the changes and reinterpretation of the plot, characters, themes, and 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. Interdisciplinary course emphasizing the relationship between the fine arts, civil history, and 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. Close reading of major poets of the Renaissance. Special attention given to cultural context (influence of Petrarchism, revival of Platonism, and impact of the Counter-Reformation, etc.). Taught in English; readings in Italian for Italian majors. Same as FREN 4520.

ITAL 4700-3. Dante: *Paradiso, La Vita Nuova,* and Minor Works.

ITAL 4710-3. Italian Literature of the Nineteenth Century. Focuses 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. Studies 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 or environmental conservation majors to work in public and private organizations on projects related to the student's 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. Provides environmental conservation or geography majors with an undergraduate format for interdisciplinary discussion and research into current and future directions of conservation. Senior majors only. Approved for arts and sciences core curriculum: critical thinking.

GEOG 4990-3. Senior Thesis. Thesis research under faculty supervision. Open only to qualified senior geography majors.

GEOG 5840 (1-3). Graduate Independent Study. Independent research for master's 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. 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 creation of materials for classroom use in geography.

GEOG 6180-3. Seminar: Geographic Problems. Applies 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 experiment with new course content or structures, instructional objectives, curriculum materials, evaluation devices, communication skills, etc.

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 8990-10. 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 this catalog.

Physical Geography

GEOG 1001-4. Environmental Systems 1—Climate and Vegetation. Lect. and lab. Introduces the atmospheric environment of the Earth: elements and controls of climate and their implications for hydrology, vegetation, and soils. Emphasizes distribution of physical features across the Earth's surface and interactions between humans and their environment, especially those leading to global change on the decade to century time scale. Approved for arts and sciences core curriculum: natural science.

GEOG 1011-4. Environmental Systems 2—Landforms and Soils. Lect. and lab. Introduces two essential aspects of the natural environment: landforms and soils. Emphasizes the genesis, distribution, and utility of surface features in a variety of learning situations, including lectures, labs, and field trips. Prereq., GEOG 1001. Approved for arts and sciences core curriculum: natural science.

GEOG 3191-3. Atmospheric Science 1: Meteorology. Topics vary from year to year and may include weather-map analysis and prediction, weather modification, severe storms, air quality, and regional weather. Same as APAS 3190. Approved for arts and sciences core curriculum: natural science.

GEOG 3201-3. Atmospheric Science 2: Climatology. Topics vary from year to year and may include climatic change, snow and ice, mountain weather and climate, and applied climatology. Same as APAS 3200. Approved for arts and sciences core curriculum: natural science.

GEOG 3251-3. Mountain Geography. Surveys mountain environments and their human use with illustrations from temperate and tropical mountain areas.

GEOG 3321-3. Geoecology of Alpine and Arctic Regions. Comparisons and contrasts in natural sciences of alpine and arctic regions—biogeography, climatology, geomorphology. Examines concept geoecology 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. Emphasizes human impact on vegetation.

GEOG 3391-3. Conservation of Natural Resources. Introduces nature, distribution, and conservation of natural resources, emphasizing forest, rangeland, and wildlife resources. Resource problems of the western United States are contrasted with those of tropical latitude countries.

GEOG 3511-4. Introduction to Hydrology. Examines hydrologic processes in the surface environment, emphasizing the environment of the western United States. Emphasizes natural processes and their management to augment water resources. Students may not receive credit for this course and GEOL 4040 or 5040.

GEOG 4211-3. Physical Climatology—Principles. Introduces physical principles of flows of heat and moisture to and from the Earth's surface, interaction and modeling of such flows, and their distribution in space and time.

GEOG 4221-3. Physical Climatology—Applied. Examines applications of principles of physical climatology in areas such as water balance, agriculture and forestry, and urban climatology.

GEOG 4241-4. Principles of Geomorphology. Studies weathering, mass-wasting, fluvial, wind, and marine processes and the landforms resulting therefrom. Prereqs., GEOG 1001 and 1011 *or* GEOL 1010 and 1020. Same as GEOL 4241.

GEOG 4291 (3-4). Mountain Geomorphology. 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. Same as GEOG 5291, GEOL 4291, and GEOL 5291.

GEOG 4331 (3-4). Mountain Climatology. Survey and analysis of climatic characteristics of selected mountain environments and their study in the field; emphasis on Rocky Mountains. Offered during the summer at the Mountain Research Station. Same as GEOG 5331.

GEOG 4351-3. Landscape Ecology. Biogeographical and ecological analysis of non-urban landscapes. Emphasizes human modification of natural processes affecting vegetation. Prereq., GEOG 3351.

GEOG 4371-3. Forest Geography: Principles and Dynamics. Surveys 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. Same as GEOG 5371.

GEOG 4401-4. Nature and Properties of Soils. Discusses chemical and physical properties of soils, soil development, distributions, and management relevant to understanding plant-soil relationships in natural and human-altered landscapes. Prereq., GEOG 1011. Same as GEOG 5401.

GEOG 4501-3. Water Resources and Water Management of Western United States. Interpretation and analysis of hydroclimatic data, surface, and groundwater. Water use is critically evaluated emphasizing problems associated with geographic maldistribution, appropriations, irrigation, industry, pollution, and regional development. Same as GEOG 5501.

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 given to activity in physical geography in North America since 1945.

GEOG 5211-3. Seminar: Physical Climatology. Research seminar concerned with problems of mass and energy exchange in the Earth-atmosphere system. Topics 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 standpoint of synoptic and dynamic climatology.

GEOG 5241-3. Topics in Physical Geography. (Precise title specified in the *Registration Handbook and Schedule of Courses.*) Recent research topics that vary from year to year. May be taken twice.

GEOG 5291 (3-4). Mountain Geomorphology. Field course emphasizing study of landforms produced by weathering and soils, mass movement, and erosional processes under all climatic and altitudinal conditions. Same as GEOG 4291.

GEOG 5331-4. Mountain Climatology. Same as GEOG 4331.

GEOG 5371-3. Forest Geography: Principles and Dynamics. Same as GEOG 4371.

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 5401-4. Nature and Properties of Soils. Same as GEOG 4401.

GEOG 5501-3. Water Resources and Water Management of Western United States. Same as GEOG 4501.

GEOG 5951-3. Seminar: Climatic Change. Crossdisciplinary survey of evidence for the theories of climatic change. Same as APAS 5950 and GEOL 5951.

GEOG 5961-3. Theories of Climate and Climate Variability. Critical review of current theories of climatic variability based on analysis of the different physical processes affecting climate. Same as APAS 5960.

GEOG 6211-3. Readings in Climatology. Selected topics in current climatological literature discussed in seminars. Specific themes vary but may include aspects of microclimatology, paleoclimatic reconstruction, and climatic applications of satellite data.

GEOG 6301-4. Arctic and Alpine Environments. Concentrates 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. Uses interrelated concepts of population, urbanization, trade resources, and development as an organizing framework to geographically analyze the world's regions and place them in global perspective.

GEOG 1992-3. Introduction to Human Geography. 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 take part in role-playing simulations leading to human decisions causing geographic change.

GEOG 3002-3. Introduction to Research in Human Geography. Introduces philosophies, methodologies, and concepts used in human geographic research. Students analyze conceptual and methodological approaches used in human geography and apply them in a research project. Prereq., GEOG 1982, 1992, or 2002. Approved for arts and sciences core curriculum: critical thinking.

GEOG 3402-3. Natural Hazards. Impact of extreme geophysical events on human society. Emphasizes 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; diverse goals and philosophy of conservation movements in time and place.

GEOG 3662-3. 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. Aggregate geographical structure of regions studied as the geography of three major markets: labor, product, and capital, including the banking system. Economic growth of regions and policies designed to influence regional growth and welfare.

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. Studies physical and cultural regions of Africa; analytical comparison of natural and cultural regions; development of present nation-states.

GEOG 4292-3. Migration, Urbanization, and Development. Examines historical and current patterns of national settlement system development. Focuses on quantitative analysis of problems associated with population growth and decline, urbanization, and economic structural change in more developed and less developed countries. Same as GEOG 5292 and ECON 4292.

GEOG 4612-3. Geography of American Cities. Introduces 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. Same as GEOG 5612.

GEOG 4622-3. Urban Geography: Social. Analysis of the social, behavioral, political, and demographic factors that influence development and maintenance of communities in contemporary urban environments, with primary emphasis on U.S. cities. Same as GEOG 5622. Approved for arts and sciences core curriculum: critical thinking.

GEOG 4672-3. Seminar: World Agriculture. Analysis of origins, evolution, and distribution of agricultural systems. Problems of agricultural modernization and development. Same as GEOG 5672. Approved for arts and sciences core curriculum: critical thinking.

GEOG 4682-3. Geography of International Development. Compares and contrasts global characteristics and processes of development, emphasizing the developing countries of the world. Theories of development, specific development topics and case studies are integrated to explore the problems of development. Prereq., GEOG 3662 or instructor consent.

GEOG 4712-3. Political Geography. Systematic study of relations between geography and politics, especially as background for better understanding of international affairs. Includes topics such as frontiers and boundaries, power analysis, electoral geography, resource utilization, and strategic concepts. Same as GEOG 5712.

GEOG 4732-3. Population Geography. Emphasizes 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. Same as GEOG 5732.

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 dynamics of human geographic change through space and time.

GEOG 4752-3. Seminar: Recreational Geography. Inquiry into spatial distribution and environmental conditions of recreation. Emphasizes outdoor recreation in nonurban settings. Includes implications of recreational values to resource managers and land use decisions. Same as GEOG 5752.

GEOG 4872-3. Geography of Colorado. Location, distribution, evaluation, and utilization of Colorado resources emphasizing major problems of resource development and use in the population explosion.

GEOG 4882-3. Soviet Union. 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. Regional survey of cultural, political, economic, social, and physical geography of Western Europe, emphasizing the distinctive character and problems of each major area and the relationship of the region to the world. Approved for arts and sciences core curriculum: critical thinking.

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. Same as GEOG 4292 and ECON 5292.

GEOG 5612-3. Geography of American Cities. Same as GEOG 4612.

GEOG 5622-3. Urban Geography: Social. Same as GEOG 4622.

GEOG 5642-3. Seminar: Urban Geography. Surveys current research topics in urban geography. Emphasizes definition of possible student thesis topics.

GEOG 5672-3. Seminar: World Agriculture. Same as GEOG 4672.

GEOG 5712-3. Political Geography. Same as GEOG 4712.

GEOG 5732-3. Population Geography. Same as GEOG 4732.

GEOG 5752-3. Seminar: Recreational Geography. Same as GEOG 4752.

GEOG 5762-3. Sustainable Development. Provides an assessment of sustainable development primarily as it relates to the Third World. Follows a sequence from development theory through facts, approaches, and goals. Investigates specific topical problems and closes with analyses of case studies. Prereq., graduate standing or senior standing with instructor consent.

GEOG 6402-3. Seminar: Comparative Environmental Studies. 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 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 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 2053-3. Maps and Mapping. Introduces maps and their role in society. Includes fundamentals of reading and using both reference and special purpose maps, as well as influence of maps on attitudes toward and images of the geographic environment.

GEOG 3023-4. Statistics for Earth Sciences. Introduces parametric and distribution-free statistics, emphasizing applications to earth science problems. Not open to students who have taken a college-level statistics course. Same as GEOL 3023.

GEOG 3053-4. Cartography 1. Introduces the science and art of cartography. Develops skills necessary to create maps and graphs of spatially distributed phenomena. Emphasizes use of maps as descriptive and analytical tools, but some attention given to production and to computer-assisted cartography.

GEOG 3093-3. Geographic Interpretation of Aerial Photographs. Emphasizes use of aerial and space photography in geographic research. Includes properties and systematic application of imagery in the photographable portion of the spectrum for the evaluation of urban, transportation, landform, and vegetation features.

GEOG 4023-3. Introduction to Quantitative Methods in Geography. Introduces fundamental statistical and quantitative modeling techniques widely used in geography today. Geographic examples and spatial problems are emphasized, as are statistical routines now available on most computers. Prereq., GEOG 3023 or equivalent. Same as GEOG 5023.

GEOG 4033-1. Quantitative Methods in Geography Laboratory. Introduces the use of personal computers and statistical software in geographical analysis. Same as GEOG 5033.

GEOG 4043-3. Computer-Assisted Cartography. Emphasizes application of geographic information. Attention directed to mapping both physical and human phenomena. Students develop their own computer mapping programs. Same as GEOG 5043.

GEOG 4053-3. Cartography 2. Continuation of GEOG 3053. Advanced cartography with emphasis on independent research and projects. Field trips to leading map publishers and printers arranged. Prereq., GEOG 3053.

GEOG 4093-3. Remote Sensing of the Environment. Covers acquisition and interpretation of environmental data by remote sensing. Theory and sensors are discussed, as are manual and computerized interpretation methods. Infrared and microwave portions of the spectrum are stressed. Same as GEOG 5093, GEOL 4093, and GEOL 5093.

GEOG 4103-3. 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. Students encouraged to take GEOG 3053 before GEOG 4103. Same as GEOG 5103.

GEOG 4173-3. Research Seminar. Develops skills for research, emphasizing primary and secondary sources, methods of evaluating source materials, and geographic writing. Approved for arts and sciences core curriculum: critical thinking.

GEOG 4383-3. Methods of Vegetation Analysis. Techniques of describing, sampling, classifying, and analyzing change in vegetation applied to a variety of local vegetation types. Involves field trips and laboratory work. Same as GEOG 5383.

GEOG 4983 (1-6). Field Problems. Selected geographic problems 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. Same as GEOG 5983.

GEOG 5023-3. Introduction to Quantitative Methods in Geography. Same as GEOG 4023.

GEOG 5033-1. Quantitative Methods in Geography Laboratory. Same as GEOG 4033.

GEOG 5043-3. Computer-Assisted Cartography. Same as GEOG 4043.

GEOG 5093-3. Remote Sensing of the Environment. Same as GEOG 4093.

GEOG 5103-3. Geographic Information Systems. Same as GEOG 4103.

GEOG 5113-3. Seminar: Geographic Information Systems. Focuses on the current research topics in geographical information systems and selected areas of application. Includes major journal articles related to each topic. A seminar paper is completed and presented by each student. Prereq., GEOG 4103 or 5103.

GEOG 5183-3. Data Processing in the Earth Sciences. Same as GEOL 5183.

GEOG 5383-3. Methods of Vegetation Analysis. Same as GEOG 4383.

GEOG 5983 (1-6). Field Problems. Same as GEOG 4983.

Geological Sciences

GEOL 1010-3. Introduction to Geology 1. Introductory geology for majors and nonmajors. Studies the Earth, its materials, its characteristics, its dynamic processes, and how it relates to people. Separate lab (GEOL 1080) is optional. Approved for arts and sciences core curriculum: natural science.

GEOL 1020-3. Introduction to Geology 2. Introductory geology for majors and nonmajors. Studies evolutionary history of the Earth and life. Separate lab (GEOL 1090) is optional. Prereq., GEOL 1010 or equivalent. Approved for arts and sciences core curriculum: natural science.

GEOL 1080-1. Geology Laboratory 1. Features field trips to classic localities. Studies rocks and topographic and geologic maps. Approved for arts and sciences core curriculum: natural science.

GEOL 1090-1. Geology Laboratory 2. Studies research methods of historical geology, using field trips and lab exercises to construct a geologic map and interpret the geologic history of a region. Approved for arts and sciences core curriculum: natural science.

GEOL 1060-4. Global Change 1—An Earth Science Perspective. Lect. Surveys the problems of global change. Emphasizes the Earth as an interlocking system consisting of the lithosphere, hydrosphere (including snow and ice), and atmosphere. Discusses circulation and interaction of these components, as well as geological evidence for environmental changes in the recent past and prospect for future change. Approved for arts and sciences core curriculum: natural science.

GEOL 1070-3. Global Change 2—An Earth Science Perspective. Lect. Surveys the problems of global change. Emphasizes changes occurring in the oceans, atmosphere, and freshwater reservoirs from an earth science perspective. Topics include greenhouse warming of the atmosphere, acid rain, coastal erosion, and controlling biogeochemical cycles. Prereq., GEOL 1060. Approved for arts and sciences core curriculum: natural science.

GEOL 1110-1. Global Change Laboratory. Optional laboratory for GEOL 1070, featuring field excursions and laboratory exercises on topics such as solid waste management, flooding, climate change, desertification and water treatment. Approved for arts and sciences core curriculum: natural science.

GEOL 1130-3. Dynamic Earth 1—Introduction. Discusses how the origin and evolution of Earth as a planet lead to its composition and heat budget. Considers alternate energy resources. Basic concepts of the physics of the solid earth lead to a discussion of earthquakes—their causes and prediction. Not open to geology majors. Approved for arts and sciences core curriculum: natural science.

GEOL 1140-3. Dynamic Earth 2—The Solid Earth. Studies large-scale earth processes including formation of igneous, sedimentary, and metamorphic rocks; glacial eras; continental drift and plate tectonics. Students especially interested in the solid Earth are encouraged to take GEOL 1130 before GEOL 1140. Approved for arts and sciences core curriculum: natural science.

GEOL 1410-4. The Earth 1. Three lect., two rec. per week. Introductory course for students with inadequate or no high school science. Includes minerals, rocks, volcanism, processes that shape landscapes, earthquakes, mountains, and plate tectonics. Controlled enrollment through Fall Institute and University Learning Center. Coreq., GEOL 1430. Approved for arts and sciences core curriculum: natural science.

GEOL 1420-4. The Earth 2. Three lect., two rec. per week. Introductory course for students with inadequate or no high school science. Includes geologic time, fossils and evolution, and geologic development of North America. Controlled enrollment through Fall Institute and University Learning Center. Prereq., GEOL 1410. Approved for arts and sciences core curriculum: natural science.

GEOL 1430-1. The Earth Laboratory. Two-hour lab exercises and three-hour field trips provide experience with geological materials and the field interpretation of geological phenomena. Coreq., GEOL 1410. Approved for arts and sciences core curriculum: natural science.

GEOL 3010-3. Introduction to Mineralogy. One lect. and two labs per week. Origin, occurrence, identification, classification, and uses of minerals. Applications of mineralogy to economic geology and petrology are emphasized. Prereqs., CHEM 1111 and MATH 1300.

GEOL 3020-3. Petrology. 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 3040-3. Global Change: The Recent Geological Record. Geological records in lakes, oceans, deserts, and around glaciers indicate the significant changes in the global system that have taken place over the last few hundred or thousand years. Explores the timing and nature of these changes. Prereqs., GEOL 1060 and 1070, or GEOG 1001 and 1011, or any two-course sequence of natural science core courses. Approved for arts and sciences core curriculum: natural science.

GEOL 3070-3. Oceanography. Surveys ocean features and processes including ocean water, circulation, sediments, structure, faunas, floras, and history of the ocean basins. Prereqs., any 1000-level sequence in geological sciences, 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., any 1000-level sequence in geological sciences.

GEOL 3320-3. Introduction to Geochemistry. Introduces chemical principles as applied to geologic processes. Includes an introductory discussion of mineral and rock chemistry, aqueous geochemistry, and organic geochemistry. Prereqs., CHEM 1111 and MATH 1300, or equivalent.

GEOL 3400-4. Evolution of Continental Ecosystems. 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. Emphasizes vertebrates and their structure. Prereq., beginning geology, biology, or physical anthropology.

GEOL 3410-3. Paleobiology. Surveys morphology, ecology, and evolution of ancient animal and plant life and their interactions with the Earth. Fossils used to solve geological and biological problems. Prereq., one year of introductory biology or geology, or instructor consent.

GEOL 3430-4. Sedimentology and Stratigraphy. Introduces the study of sedimentary rocks emphasizing their origin, characteristics, and interpretation; and the principles and techniques for establishing the temporary order and spatial distribution of sedimentary layers. Prereq., any 1000-level sequence in geological sciences or equivalent.

GEOL 3500-3. Mineral Resources, World Affairs, and the Environment. Covers the geology of mineral resource deposits: metals, nonmetals, fuels, mineral economics, practical prospecting for mineral deposits, and the environmental impact of mineral extraction. Prereq., GEOL 1010.

GEOL 3520-3. Environmental Issues in Geosciences. Addresses current environmental problems in which an understanding of geology is needed. Topics include energy resources, climate modification, hydrology, waste disposal, and mining resources. Specific examples used to illustrate restrictions imposed by nature and man on solutions to these problems. Prereq., any 1000-level geology course(s) or introductory chemistry or physics. Approved for arts and sciences core curriculum: natural science.

GEOL 3620-3. Controversies in Planetary Geology. Covers the evolution of controversial ideas in planetary geology; discusses competing hypotheses and the critical thinking required to decide between them. Topics include origin of the moon, volcanic versus impact origin of craters, planetary plate tectonics, and geologic history of the planets. For nonmajors. Prereq., GEOL 1010 and 1020 *or* GEOL 1130 and 1140. Approved for arts and sciences core curriculum: critical thinking.

GEOL 3630-3. Great Geological Controversies. Critically examines significant historical and contemporary controversial issues in the geological sciences (*e.g.*, age of the Earth, ice ages, continental drift, health hazards related to rocks and minerals) by reading, classroom discussion and argument; and written assignments. Prereq., completion of a one-year sequence in any natural science. Approved for arts and sciences core curriculum: critical thinking.

GEOL 3700-2. Geology Field Techniques in the Colorado Front Range. Field-oriented approach to tracing the geologic development of the Colorado Front Range, from the Precambrian to recent times. Field observations provide a framework for discussions of current ideas concerning the geologic evolution of the Front Range. Prereq., 1000-level course in geology or equivalent.

GEOL 3720-3. Evolution of Life: The Geological Record. Discusses the evolution of

life on Earth, beginning with the earliest origins and surveying the major steps that led to the rise of higher plants and animals. Covers modern ideas on the causes of periodic mass extinctions in both the marine and terrestrial realms. Emphasizes geologic evidence for the pathways of evolution, using examples from the ordinary to the bizarre. Approved for arts and sciences core curriculum: natural science.

GEOL 3930 (1-6). Internship. The internship offers an academically supervised opportunity for geological sciences majors to work with public or private organizations. Projects are usually associated with students' career goals; each project will have an academic emphasis. Prereqs., junior standing and completion, with a *B* or better, of at least two courses for geology majors.

GEOL 4040-3. Geohydrology. Surface and ground water examined as a dynamic system within a geological framework. Considers implications for human management of watercourses, water supplies, and water quality. Same as GEOL 5040.

GEOL 4050-3. Earthquakes. Covers causes and effects of earthquakes, earthquake prediction, seismic waves, record interpretation, parameters of seismic foci, and seismo-tectonics of the world. Same as GEOL 5050.

GEOL 4080-3. Societal Problems and Earth Sciences. Analyzes contemporary societal problems involving geoscience. One class period per week is generally devoted to lecture. During class discussions the professor acts as scientific advisor while students debate material they have researched. Prereqs., one year of calculus and one year of natural science (physics, chemistry, biology) or equivalent, or instructor consent.

GEOL 4100-3. 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 instructor consent. Same as GEOL 5100.

GEOL 4110-4. Field Geology. Methods of geologic mapping including plane table surveying and introduction to photogrammetry. Prereq., GEOL 3120.

GEOL 4120-3. Structural Geology 2. 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. Same as GEOL 5120.

GEOL 4130-4. Geophysics and Tectonics. Students are introduced to fundamental geophysics including seismology, geomagnetism, gravity, radiometric dating, and heat flow. Reviews the theory of plate tectonics and outlines its geophysical and geological aspects. The tectonics of orogenic belts such as the North American Cordillera are studied and related to plate tectonic processes. Prereq., any 1000-level sequence in geological sciences; GEOL 3120 recommended.

GEOL 4140-3. Techniques in Glacial Geology. Acquaints students with research techniques. Includes analysis of remote sensing imagery and maps, investigation of seismic records, evaluation of sedimentological techniques and approaches, and statistical evaluation of data. Prereq., GEOL 4360 or instructor consent. Same as GEOL 5140.

GEOL 4200-3. Advanced Mineralogy. Covers topics in 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 or 5100. Same as GEOL 5200.

GEOL 4250-4. Introduction to Ore Deposits. Surveys processes of ore formations, with examples drawn from selected districts. Field trips to representative deposits. Prereq., GEOL 3010 or equivalent. Same as GEOL 5250.

GEOL 4330-3. Planetary Chemistry. Discusses the chemistry of the solar system, especially role of stable and radiogenic isotopes and trace elements in interpreting the formation and magmatic evolution of the planets. Prereq., upper-division standing. Same as GEOL 5330.

GEOL 4350-3. Fold Belts and Extensional Basins. Includes 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 3430, or instructor consent. Same as GEOL 5350.

GEOL 4360-3. Glacial Geology. Introduces glaciology, glacial influence on topography, crustal rebound, and sea level, and glacial chronology for northern North America. Prereq., any 1000-level sequence of geological sciences or instructor consent. Same as GEOL 5360.

GEOL 4470-4. Paleontology of the Lower Vertebrates. Evolution of the nonmammalian vertebrates emphasizing evolutionary development of major vertebrate features. Prereqs., GEOL 3410, one year of biology, and one year of geology. Same as GEOL 5470.

GEOL 4480-4. Paleontology of the Higher Vertebrates. Evolution of mammals and birds emphasizing evolutionary history of modern and prominent fossil orders. Prereqs., GEOL 3410, one year of biology, one year of geology, or instructor consent. Same as GEOL 5480.

GEOL 4530-3. Introduction to the Physics of the Solid Earth. Surveys structure, physical properties of materials, environmental conditions, and processes in the Earth's interior. Emphasizes methods of interpreting geophysical data to determine the state of the interior. Prereqs., MATH 2400 and PHYS 2130.

GEOL 4590-3. Carbonate Diagenesis and Geochemistry. Examines postdepositional alteration of carbonate rocks, emphasizing diagenetic environments and process-response models. Stresses petrographic and geochemical evidence. Prereqs., GEOL 3010, 3020, and 3430. Same as GEOL 5590.

GEOL 4640-3. Glaciology. Ice physics, snow, glaciers, floating ice, ice in the ground and in the solar system. Emphasizes glaciers and ice sheets, including reconstruction of past glaciations and impacts of ice and snow on society. Same as GEOL 5640.

GEOL 4650-3. Carbonate Sedimentary Environments. Examines recognition and interpretation of modern and ancient carbonate sedimentary environments through the analysis of fauna, texture, sedimentary structures, and primary geochemistry. Emphasizes eustatic sea level and climatic controls. Prereqs., GEOL 3410 and 3430. Same as GEOL 5650.

GEOL 4670-3. Isotope Geology. Introduces principles of stable and radiogenic isotope systematics in inorganic and organic geochemistry. Emphasizes application of isotope data to problems in igneous, metamorphic and sedimentary petrology, geobiochemistry, and petroleum genesis. Prereqs., CHEM 1131, MATH 1300, and GEOL 3020. Same as GEOL 5670.

GEOL 4700 (3-4). Special Geological Topics. Studies in selected geological subjects of special current interest (for undergraduates). 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 with department advisor.

GEOL 4940-4. Introduction to Geophysical Prospecting. Lect. and lab. Outlines the principles of geophysical prospecting for oil, other minerals, and water. Discusses seismic, gravity, magnetic and electrical methods. Prereqs., PHYS 1120, MATH 2300, and any 1000-level sequence in geology. Same as GEOL 5940.

GEOL 4950-3. Natural Catastrophes and Geologic Hazards. Surveys 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. Approved for arts and sciences core curriculum: natural science.

GEOL 4960-1. Senior Paper. Preparation and oral presentation of a senior paper based on library research. Emphasizes strategies of literature research, scientific writing, and preparation of an oral presentation. Prereq., 15 hours of upper-division course work in geological sciences or instructor consent.

GEOL 4980-3. Hydrology. Focuses on principles of hydrology, including rainfall, runoff generation, infiltration, subsurface flow, and landforms. Emphasizes space-time variability in measurement modeling over a broad range of scales. Prereq., one year of calculus; GEOG 3511 recommended. Same as GEOL 5980.

GEOL 4990-3. Honors Thesis. 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. Theory and practice of analytical techniques used in determination of rock, mineral, and water chemistries for geological applications.

GEOL 5040-3. Geohydrology. Same as GEOL 4040.

GEOL 5050-3. Earthquakes. Same as GEOL 4050.

GEOL 5070-3. Advanced Sedimentology. Studies fluid flow, particle transport, bedforms, and sedimentary structures. Emphasizes principles and methods of interpreting vertical sequences of sedimentary structures. Prereq., GEOL 3430 or equivalent.

GEOL 5100-3. X-Ray Crystal Chemistry. Same as GEOL 4100.

GEOL 5120-3. Structural Geology 2. Same as GEOL 4120.

GEOL 5140-3. Techniques in Glacial Geology. Same as GEOL 4140.

GEOL 5160-3. Interpretation of Geological Phase Diagrams. Phase diagrams of mineral systems explored in terms of variables: temperature, composition, pressure, oxygen fugacity, and water fugacity. Experimental viewpoint rather than theoretical, and unifying theme is to discover how these diagrams can be related to igneous and metamorphic rocks.

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. Studies modern and ancient continental depositional systems. Emphasizes depositional processes and analysis of vertical sequences and lateral assemblages of facies. Prereq., GEOL 3430 or equivalent.

GEOL 5200-3. Advanced Mineralogy. Same as GEOL 4200.

GEOL 5210-4. Advanced Igneous Petrology. Systematic analysis of petrology of igneous rocks. Emphasizes integrating knowledge obtained from theory, experiment, and field studies. Prereq., GEOL 5170 or equivalent.

GEOL 5240-3. Remote Sensing Image Analysis. Digital image processing emphasizing hands-on computer analysis of space-acquired images. Theory and practice of image enhancement and thematic information extraction. Prereqs., GEOG 4090 or 5090, GEOL 4090 or 5090. Knowledge of multivariate statistics recommended.

GEOL 5250-4. Introduction to Ore Deposits. Same as GEOL 4250.

GEOL 5260-4. Field and Laboratory Study of Mineral Deposits. Field mapping and laboratory studies of ore deposits, emphasizing petrology, wall-rock alteration, and ore mineralogy. Prereq., GEOL 4250 or 5250.

GEOL 5270-4. Thermodynamics for Petrologists. Systematic treatment of thermodynamic fundamentals required in mineralogy and petrology, emphasizing heterogeneous equilibria and data retrieval and evaluation. Thermodynamic properties of gases and supercritical fluids and minerals covered in detail. Prereq., instructor consent.

GEOL 5280-3. Principles of Aqueous Geochemistry. Composition and origin of natural waters. Principles relating to reactions between rock materials and water. Discusses natural waters, ionic equilibria, and computer methods. Prereq., CHEM 1131.

GEOL 5300-3. Low-Temperature Geochemistry. Discusses geochemistry of sedimentary and near-surface environments. Stability diagrams, ion exchange, weathering, geochemical prospecting, and topics in thermodynamics. Prereqs., CHEM 1131 and GEOL 3010.

GEOL 5330-3. Planetary Chemistry. Same as GEOL 4330.

GEOL 5340-3. Ore Microscopy. Emphasizes reflected light microscopic methods for the identification of opaque minerals emphasizing ore minerals and related sulfides. Prereq., GEOL 4250 or 5250.

GEOL 5350-3. Fold Belts and Extensional Basins. Same as GEOL 4350.

GEOL 5360-3. Glacial Geology. Same as GEOL 4360.

GEOL 5370-3. Quantitative Stratigraphy. Evaluates the descriptive, statistical, and graphical approaches to stratigraphy. Emphasizes multivariate approaches to core/outcrop segmentation (cluster analysis, principal components) and correlations between sections (slotting sequences, time-series analysis). Prereqs., college algebra, introduction to statistics, stratigraphy, sedimentology, or geomorphology.

GEOL 5390-3. Rock and Paleomagnetism. Studies the origin of magnetic properties of minerals, survey of principal means of rock magnetization and their use in geologic interpretations, and 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 or 5241 or equivalent.

GEOL 5410-3. Ancient Sedimentary Environments. Analysis of sedimentary rock sequences, biostratigraphy, sedimentary environments, and stratigraphic synthesis. Prereq., GEOL 3430.

GEOL 5420-3. Quaternary Dating Methods. 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., instructor consent.

GEOL 5440-4. Morphology and Genesis of Soils. Effects of climate, vegetation, parent material, topography, and time on development, classification, and chemistry of soils. Prereq., GEOL 4241 or 5241 or equivalent, CHEM 1111 or equivalent, or instructor consent.

GEOL 5450-4. Micropaleontology 1. Classification, occurrence, and interpretation of foraminifera. Prereqs., GEOL 3410 and 3430.

GEOL 5460-4. Micropaleontology 2. Classification, occurrence, and interpretation of microfossil groups other than foraminifera. Prereqs., GEOL 3410 and 3430.

GEOL 5470-4. Paleontology of the Lower Vertebrates. Same as GEOL 4470.

GEOL 5480-4. Paleontology of the Higher Vertebrates. Same as 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 composition, origin, and history of hydrothermal ore deposits. Prereq., GEOL 5250 or equivalent.

GEOL 5500-4. Petroleum Geology. Covers theoretical and applied aspects of petroleum geology and geochemistry. Discusses organic geochemistry, time-temperature models, migration, trapping mechanisms, log analysis, application of facies models in the subsurface, and reservoir geology. Prereqs., course work in structure, stratigraphy/sedimentology, deposits, environment, physics, and chemistry.

GEOL 5510-3. Current Problems in Paleobiology. 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 instructor consent.

GEOL 5520-3. Marine Paleoecology. Studies 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. 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. 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 instructor consent.

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 instructor consent.

GEOL 5590-3. Carbonate Diagenesis and Geochemistry. Same as GEOL 4590. Prereq., graduate standing.

GEOL 5610-2. Mammalian Micropaleontology. Studies mammalian microfossils. Methods of analysis, collection, and use in stratigraphic problems such as correlation, paleoecology, and earth history. Prereq., instructor consent.

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 5630-2. Physics of Remote Sensing. Advanced study of optical and microwave techniques used in remote sensing of the atmosphere, oceans, and land, emphasizing the latter. Studies based on recent literature and text. Intended for those who have completed introductory courses in remote sensing fundamentals and digital image analysis. Prereq., GEOL 4093 or 5093.

GEOL 5640-3. Glaciology. Same as GEOL 4640.

GEOL 5650-3. Carbonate Sedimentary Environments. Same as GEOL 4650.

GEOL 5670-3. Isotope Geology. Same as 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. Studies 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 (1-3). 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 5851 (1-3). Graduate Independent Study.

GEOL 5940-4. Introduction to Geophysical Prospecting. Same as GEOL 4940.

GEOL 5980-3. Hydrology. Same as GEOL 4980.

GEOL 6310-3. Sandstone Petrology. Interpretation of depositional and diagenetic history of sedimentary rocks as determined from thin-section studies. Prereqs., GEOL 3010, 3020, and 3430 or equivalent, and optical mineralogy.

GEOL 6330-4. Seismic Stratigraphy and Basin Analysis. Develops skills in the stratigraphic interpretation of seismic reflection data, recognition of sequence stratigraphy in well logs and outcrop, and their applications to basin analysis in petroleum exploration. Prereq., GEOL 3430 or instructor consent.

GEOL 6340-3. Remote Sensing of Planetary Surfaces. Quantitative description of properties of and geological processes on planetary surfaces, based on remote sensing techniques. Topics include reflection and emission spectroscopy, radar reflection, microwave and infrared radiometry, and high-energy spectroscopy, with application to the planets and their satellites. Prereq., basic undergraduate physics. Same as APAS 6340.

GEOL 6530-3. Seminar: Geomorphology and Quaternary Geology. Recent research topics. Precise title specified in the *Registration Handbook and Schedule of Courses.*

GEOL 6610-3. Earth and Planetary Physics 1. *Offered alternate years.* Mechanics of deformable materials, with applications to earthquake processes. Introduces seismic wave theory. Inversion of seismic data for the structure, composition, and state of the interior of the Earth. Same as APAS 6610 and PHYS 6610.

GEOL 6620-3. Earth and Planetary Physics 2. *Offered alternate years.* Space and surface geodetic techniques, as well as potential theory, are covered. Other topics are definition and geophysical interpretation of the geoid and of surface gravity anomalies; isostasy; post-glacial rebound; tides and the rotation of the Earth. Same as APAS 6620 and PHYS 6620.

GEOL 6630-3. Earth and Planetary Physics 3. *Offered alternate years.* 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. Same as APAS 6630 and PHYS 6630.

GEOL 6640-3. Introduction to Planetary Science. Overview of the nature of the solar system. Topics include geologic processes and histories of solid planets, planetary chemistry, interiors, and atmospheres, the outer planets, planetary rings, comets and asteroids, extrasolar planets, and formation of the solar system. Prereqs., graduate standing in a physical science and basic undergraduate physics. Same as APAS 6640.

GEOL 6650 (1-3). Seminar in Geophysics. Advanced seminar studies in geophysical subjects for graduate students. Same as APAS 6650 and PHYS 6650.

GEOL 6660-3. Geophysical Instrumentation. Introduces principles on which the design of instruments for various geophysical observations is based. Emphasizes seismographic and strain/tilt systems, with some discussion of gravimetric and magnetometric instruments. Same as PHYS 6660.

GEOL 6670-3. Rock Physics. *Not offered every year.* Magnetic, electrical, optical, thermal, and mechanical properties of rocks. Emphasizes basic concepts of solid-state physics and shows 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. Theory of wave motion in continuous media, emphasizing isotropic, elastic materials. Propagation, reflection, refraction, dispersion, and diffraction of body- and surface-waves in infinite and bounded systems, with applications to seismic waves. Same as MCEN 7183 and PHYS 6680.

GEOL 6690-3. Advanced Seismology. 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. Same as PHYS 6690.

GEOL 6940-3. Master's Degree Candidate.

GEOL 6950 (1-6). Master's Thesis.

GEOL 6960-3. Plan II Master's Research.

GEOL 8990 (1-10). 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 this catalog.

Cross Listings

GEOL 3023-3. Statistics for Earth Sciences. Introduces parametric and distribution-free statistics, emphasizing applications to earth science problems. Same as GEOG 3023.

GEOL 4093-3. Remote Sensing of the Environment. Covers acquisition and interpretation of environmental data by remote sensing. Discusses theory and sensors, as well as manual and computerized interpretation methods. Stresses infrared and microwave portions of the spectrum. Same as GEOL 5093.

GEOL 4241-3. Principles of Geomorphology. Systematic study of weathering, mass-wasting, fluvial, and marine processes and the landforms resulting therefrom. Prereqs., any 1000-level geological sciences or GEOG 1001 and 1011. Same as GEOG 4241.

GEOL 4291 (3-4). Mountain Geomorphology. Field course. Includes Front Range glacial geology and glaciology. Prereqs., GEOL 1010 and 1020, MATH 1100, and CHEM 1001. Same as GEOG 4291.

GEOL 5093-3. Remote Sensing of the Environment. Same as GEOL 4093 and GEOG 5093.

GEOL 5183-3. Data Processing in the Earth Sciences. Advanced statistical analysis, multivariate statistics, time series, classification models. Prereq., GEOL 3023 or instructor consent. Same as GEOG 5183.

GEOL 5291 (3-4). Mountain Geomorphology. Same as GEOL 4291.

GEOL 5951-3. Seminar: Climatic Change. Cross-disciplinary survey of the evidence for and theories of climatic change. Same as APAS 5950 and GEOG 5951.

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. Review and continuation of basic skills begun in the first year: reading, writing, speaking, and oral comprehension. Satisfies arts and sciences language requirement.

GRMN 2020-4. Intermediate German.

GRMN 2050-2. Intermediate German: Conversation. For students who wish supplementary conversational practice on the third semester level. Students may take this course concurrently with GRMN 2010. Does not satisfy the arts and sciences foreign language requirement.

GRMN 2220-4. Scientific German. Prereq., GRMN 2010 or equivalent, or placement test.

GRMN 2900 (1-3). Independent Study.

GRMN 3010-3. Advanced Conversation and Grammar. Reviews special grammatical topics, reading, and conversation. Prereq., four semesters of college German or equivalent. Open to freshmen upon consultation only.

GRMN 3020-3. Advanced Conversation and Composition. Continuation of GRMN 3010, emphasizing idiomatic usage of German and composition. Prereq., GRMN 3010 or equivalent, or consultation with instructor.

GRMN 3030-3. Business German 1. Studies 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 3040-3. Business German 2. Extends the range of topics offered in the first course and develops the more sophisticated language skills required by employees of German organizations and foreign businesspersons who wish to transact business with German firms. Prereq., GRMN 3030.

GRMN 3090-2. German Pronunciation and Diction. Introduces phonetics.

GRMN 3110-3. German Literature from 1910 to the Present. Examines selected literary texts. Emphasizes longer unedited texts as well as critical skills. May be taken either before or after GRMN 3120. Prereq., GRMN 2020 or equivalent, or consultation with instructor.

GRMN 3120-3. Modern German Literature from 1750 to 1910. Examines selected literary texts of various periods. Emphasizes longer texts and critical skills. May be taken either before or after GRMN 3110. Prereq., GRMN 2020 or equivalent, or consultation with instructor.

GRMN 3140-3. Current Issues in German Literature. Examines issues pervading contemporary German literature, such as concerns of youth, gender, stereotyping as it affects women and men in their relations with one another, loneliness and sexual frustration, work experiences, and other issues. Prereqs., ability to read unedited German and to speak German.

GRMN 3520-3. Open Topics in the Cultural Context. Examines topics in the cultures of German-speaking central Europe. Contact the departmental office for specific course offerings. Prereq., third-year proficiency in German or instructor consent.

GRMN 3900 (1-3). Independent Study.

GRMN 4010-3. Advanced Composition, Conversation, and Stylistics 1. Designed to improve written expression in German. Detailed study of difficult grammatic points and various stylistic forms. Prereq., GRMN 3020 or instructor consent.

GRMN 4020-3. Advanced Composition, Conversation, and Stylistics 2. Continuation of GRMN 4010, emphasizing idiomatic usage of German and composition.

GRMN 4100-3. Applied Linguistics. Introduces 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 4330-3. The Age of Goethe. German literature from 1770 to 1830. Close examination of representative texts from the periods of Storm and Stress, classicism, and romanticism. Emphasizes philosophical and social background.

GRMN 4340-3. Seminar in German Literature. Intensive study of a particular literary period, author, or genre. Secondary sources are utilized. Course content differs each time.

GRMN 4370-3. Introduction to German Literary History 1. Examines 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 currents of the twentieth century.

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 4550-3. Senior Seminar: The Roles of Intellectuals and Academics in German Culture. Examines the articulation of the German bourgeoisie during critical periods in German history. Looks at specific groups and their participation in German public culture, e.g., writers, artists, journalists, academics, and political figures. Students work closely with a faculty advisor during the semester and are expected to produce a major research paper.

GRMN 4900 (1-3). Independent Study.

GRMN 6940-0. Master's Degree Candidate.

Courses Taught in English

GRMN 1601-3. Introduction to Modern German Culture and Civilization. Introduces the culture of contemporary German-speaking central Europe, examining historical processes, social and political patterns, and the intellectual and artistic responses to problems of the twentieth century.

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." Emphasizes literary themes, their traditions, and their cultural significance.

GRMN 3501-3. German-Jewish Writers: From the Enlightenment to the Present. Provides insight into the German-Jewish identity through essays, autobiographies, fiction, and journalism from the Enlightenment to the post-Holocaust period. Examines the religious and social conflicts that typify the history of Jewish existence in German-speaking lands during the modern epoch. Approved for arts and sciences core curriculum: cultural and gender diversity.

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.

GRMN 4503-3. Issues in German Thought. Provides the opportunity to examine major issues in German philosophical, social, and religious thought from the end of German idealism to existentialism and critical theory. Emphasizes the relationship between ideas and social and political action.

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 1. 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 2250-3. Contemporary Sweden and Norway. Comprehensive overview of Swedish and Norwegian society, emphasizing economic and political life, institutions and organizations, people and culture, and manners and customs. Taught in English.

SCAN 2510-3. Introduction to Norwegian and Swedish Literature in Translation. Comprehensive overview of Norwegian and Swedish literature, emphasizing 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.

SWED 2900 (1-3). Independent Study.

SWED 3900 (1-3). Independent Study.

SWED 4900 (1-3). Independent Study.

History

Note: Preference for all 3000-level readings and research seminar courses except HIST 3000 is given to junior and senior history majors. HIST 3000 is limited to nonmajors.

Methodological and General

HIST 1010-3. Western Civilization 1.[1] 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. Approved for arts and sciences core curriculum: historical context.

HIST 1020-3. Western Civilization 2.[1] 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. Approved for arts and sciences core curriculum: historical context.

HIST 1030-3. Honors: Western Civilization 1. Thematic history of the Western world from the ancient Greeks to the beginnings of modern European society. Designed specifically for freshmen with advanced standing. Emphasizes reading and discussion more than lectures. A student receiving credit for HIST 1010 may not receive credit for HIST 1030. Approved for arts and sciences core curriculum: historical context.

HIST 1040-3. Honors: Western Civilization 2. History of social, political, and cultural development of the Western world from beginning of the Enlightenment to the present. Designed for freshmen with advanced standing. Emphasizes reading and discussion. A student receiving credit for HIST 1020 may not receive credit for HIST 1040. Approved for arts and sciences core curriculum: historical context.

HIST 2170-3. History of Christianity 1: To the Reformation. 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 social and cultural setting.

HIST 2180-3. History of Christianity 2: From the Reformation. General introduction to the history of Christianity from the Reformation to the present. Examines religious life and the church in relation to social and cultural setting.

HIST 2840 (1-3). Independent Study. Methodological and general history.

HIST 3000-3. Selected Readings in History. Encourages students to explore and analyze a problem, topic, or area through selected readings in primary (when feasible) and secondary sources. Exposes students to the way historians view various complex issues. Enrollment limited to nonmajors. Approved for arts and sciences core curriculum: critical thinking.

HIST 3840 (1-3). Independent Study. Methodological and general history.

HIST 4110-3. Canada to 1867. Canadian history from French colonization to 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 and toward the United States.

HIST 4130-3. An Uneasy Relationship: The United States and Canada. History of the evolution of U.S.-Canada relations from colonial times to the present. Emphasizes Canadian concerns caused by two American invasions and brought about by American economic, geographic, and strategic power. Offered through continuing education.

HIST 4840-3. Honors Seminar. Practical historiography for students who wish to write a senior honors thesis. Emphasizes choice of topic, critical methods, research, organization, argumentation, and writing. Approved for arts and sciences curriculum: critical thinking.

HIST 4850-3. Honors Thesis.

HIST 5000-3. Historical Methods: Introduction to the Professional Study of History. 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. Introduces 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. Introduces 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. 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 (1-3). 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 6940-3. Master's Degree Candidate.

HIST 6950 (1-6). Master's Thesis.

HIST 7840 (1-3). Independent Study. Methodological and general history.

HIST 8990 (1-10). 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 this catalog.

Europe: Ancient and Medieval

HIST 1051-3. The World of the Ancient Greeks. Surveys the emergence, major accomplishments, failures and decline of the world of the ancient Greeks, from Bronze Age civilizations of the Minoans and Mycenaeans through the Hellenistic Age (c. 2000-30 B.C.). Same as CLAS 1051. Approved for arts and sciences core curriculum: historical context.

HIST 1061-3. The Rise and Fall of Ancient Rome. Surveys the rise of ancient Rome in the eighth century B.C. to its "fall" in the fifth century A.D. Emphasizes political institutions, foreign policy, leading personalities, and unique cultural accomplishments. Same as CLAS 1061. Approved for arts and sciences core curriculum: historical context.

HIST 2841 (1-3). Independent Study. Europe: ancient and medieval.

HIST 3011-3. Selected Readings in Ancient History. Approved for arts and sciences core curriculum: critical thinking.

HIST 3511-3. Selected Readings in Medieval History. Approved for arts and sciences core curriculum: critical thinking.

HIST 3551-3. Research Seminar: Medieval History.

HIST 3841 (1-3). Independent Study. Europe: ancient and medieval.

HIST 4021-3. Athens and Greek Democracy. Same as CLAS 4021.

HIST 4031-3. Alexander and the Hellenistic World. Same as CLAS 4031. Approved for arts and sciences core curriculum: historical context.

HIST 4041-3. Classical Greek Political Thought. Same as CLAS 4041, PHIL 4210, and PSCI 4094.

[1] Also available through correspondence study.

HIST 4061-3. The Fall of the Roman Empire. Explores the reasons for the fall of the Roman Empire in the western Mediterranean and its survival in the east as Byzantium. Emphasizes Christianity; barbarians; social, economic, and cultural differences; contemporary views of Rome; and modern scholarship. Same as CLAS 4061. Approved for arts and sciences core curriculum: historical context.

HIST 4071-3. History of the Byzantine Empire. 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. Same as CLAS 4071.

HIST 4081-3. The Roman Republic. Studies the Roman Republic from its foundation in 753 B.C. to its conclusion with the career of Augustus. Emphasizes the development of Roman Republic government. Readings are in the primary sources. Same as CLAS 4081. Approved for arts and sciences core curriculum: historical context.

HIST 4091-3. The Roman Empire. Studies Imperial Roman history beginning with the Roman Revolution and ending with examination of the passing of centralized political authority in the western Mediterranean. Emphasizes life, letters, and personalities of the Empire. Same as CLAS 4091.

HIST 4511-3. Social Foundations of European Civilization. Studies social structures of Europe and their relationship to political, religious, and economic institutions, from A.D. 400 to 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. Examines 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." Equal treatment of eastern and western Mediterranean.

HIST 5841 (1-3). Independent Study. Europe: ancient and medieval.

HIST 6011-3. Readings in Ancient History. Same as CLAS 6011.

HIST 6511-3. Readings in Medieval History.

HIST 7551-3. Seminar: Medieval History.

HIST 7581-3. Latin Paleography. Discusses the development of formal scripts from the late Roman Empire to the fifteenth century. Provides practice in identification, transliteration, and translation of medieval manuscripts. Prereq., reading knowledge of Latin.

HIST 7841 (1-3). Independent Study. Europe: ancient and medieval.

Europe: Modern

HIST 2842 (1-3). Independent Study. Europe: modern.

HIST 3012-3. Selected Readings in Modern European History. Approved for arts and sciences core curriculum: critical thinking.

HIST 3052-3. Research Seminar in Modern European History.

HIST 3112-3. Selected Readings in Renaissance and Reformation. Approved for arts and sciences core curriculum: critical thinking.

HIST 3212-3. Selected Readings in Early Modern Europe.

HIST 3842 (1-3). Independent Study. Europe: modern.

HIST 4112-3. Venice and Florence in the Renaissance. Comparative urban study of Florence and Venice from thirteenth through sixteenth centuries. 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 significance of the Renaissance for origins of modern civilization.

HIST 4222-3. War and the European State, 1618-1793. Studies 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. Studies major European intellectual trends from late sixteenth century through the Enlightenment.

HIST 4312-3. Nineteenth-Century Europe. Concerned with 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, emphasizing twentieth-century communism and fascism and developments in the Western European democracies. Prereq., junior or senior standing.

HIST 5842 (1-3). 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 to Eighteenth Centuries.

HIST 7842 (1-3). Independent Study. Europe: modern.

Europe: Specific Countries

HIST 1113-3. The History of England to 1660. Deals with the period from Roman time to the seventeenth century. Covers social, political, and constitutional affairs that contributed to creation of the English nation. Approved for arts and sciences core curriculum: historical context.

HIST 1123-3. The History of England, 1660 to Present. Deals with the period from the seventeenth century to the present. Political, economic, social, and imperial developments that contributed to creation of the modern industrial and democratic state are the major issues covered. Approved for arts and sciences core curriculum: historical context.

HIST 2843 (1-3). Independent Study. Europe: specific countries.

HIST 3113-3. Selected Readings in Early English History.

HIST 3133-3. Selected Readings in Britain since 1688.

HIST 3153-3. Research Seminar: Early English History.

HIST 3163-3. History and Literature of Georgian England. Same as ENGL 3162. Approved for arts and sciences core curriculum: historical context.

HIST 3713-3. Selected Readings in Russian History.

HIST 3753-3. Research Seminar: Russian History.

HIST 3843 (1-3). Independent Study. Europe: specific countries.

HIST 4013-3. Constitutional and Legal History of England to 1485. Origins and development of legal and political institutions and concepts of England. Special reference and emphasis are accorded the implications of those developments to contemporary American and English systems.

HIST 4053-3. Britain and the World, 1815-1914. Examines the external policy of Great Britain from 1815 to 1914 in Europe, the East, and the Americas.

HIST 4063-3. Women in Victorian England. Examines changing roles and 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. Same as WMST 4063.

HIST 4113-3. History and Culture of Medieval England. Explores the major historical, literary, and cultural developments in England from the Anglo-Saxon period through the fifteenth century. Prereq., junior or senior standing. Same as ENGL 4112. Approved for arts and sciences core curriculum: historical context.

HIST 4123-3. Medieval England. Treats the major developments in English history from the Anglo-Saxon period through the fifteenth centu-

ry. Emphasizes late medieval English society during the thirteenth, fourteenth, and fifteenth centuries.

HIST 4133-3. Tudor England. Examines the Tudors and the developments (constitutional, political, imperial, and artistic) of Renaissance England under this remarkable dynasty. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: historical context.

HIST 4143-3. Stuart England. Examines England in its age of greatest political crisis and hurried transformation from nearly absolute monarchy to a parliamentary oligarchical form of government. Approved for arts and sciences core curriculum: historical context.

HIST 4153-3. England in the Age of Revolution, 1688-1832. Deals with 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 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. Analyzes causes of the French Revolution. Covers in detail basic political, economic, and social changes, and the legacy in Europe and the world of the French revolutionary and Napoleonic eras. Approved for arts and sciences core curriculum: historical context.

HIST 4233-3. History of France since 1815. Examines the ongoing struggle between the revolutionary and counter-revolutionary traditions of France and how it shaped the political history and affected the social, cultural, and intellectual character of the nation from 1815 to the present.

HIST 4413-3. German History to 1849. Cultural, political, and social history of Germany up to and including the revolutions of 1848. Emphasizes the political history of Prussia and such cultural phenomena as German romanticism.

HIST 4423-3. German History since 1849. A cultural, political, and social history of Germany since 1849. Emphasizes German unification, Bismarckian foreign policy, the rise of neo-romanticism, Weimar politics, and the rise of national socialism.

HIST 4433-3. Nazi Germany. Examines political, social, cultural, and psychological roots of national socialism, the nature of the national socialist regime, and those policies and actions that came directly out of its challenge to values central to Western civilization. Approved for arts and sciences core curriculum: historical context.

HIST 4613-3. History of East-Central Europe to 1815. History of Eastern theocratic empires of Turks and Hapsburgs from fifteenth to nineteenth centuries, the development of political consciousness of various peoples composing these empires, and 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, formation of the nation states, viability of these states in the twentieth century, and restoration of imperial order after WWII. Approved for arts and sciences core curriculum: historical context.

HIST 4713-3. History of Russia Through the Seventeenth Century.[1] 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.[1] Surveys 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.[1] Soviet Russia from the February Revolution of 1917 to the present. 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. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: historical context.

HIST 4803-3. Special Topics in European History. Covers specialized topics in European history, to be specified in the *Registration Handbook and Schedule of Courses.*

HIST 5843 (1-3). 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 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 7183-1. Interdisciplinary Seminar in British Studies. Exposes students to the sources and methodologies of current work in English, history, theatre, and art history. With a different focus each semester, the seminar may be taken up to three times. Same as ENGL 7883.

HIST 7773-3. Seminar: Modern Russian History.

HIST 7843 (1-3). 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. Emphasizes role of personality in conduct of war, military plans and doctrines, and social and technological change.

HIST 2844 (1-3). Independent Study. Europe: topical.

[1] Also available through correspondence study.

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. Approved for arts and sciences core curriculum: critical thinking.

HIST 3454-3. Research Seminar: European Intellectual History.

HIST 3844 (1-3). Independent Study. Europe: topical.

HIST 4314-3. History of Science From the Ancients to Sir Isaac Newton. History of science from Pre-Socrates to Isaac Newton, underscoring major intellectual themes in scientific thought and the historical context in which they developed. Approved for arts and sciences core curriculum: historical context.

HIST 4414-3. European Intellectual History, 1750-1870. Treats 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. Emphasizes 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-WWII 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. 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 such themes as critical theory, European fascism, and contemporary developments in the philosophy of history.

HIST 4614-3. Women and Society in Industrial Europe. Examines 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. Same as WMST 4614. Approved for arts and sciences core curriculum: cultural and gender diversity.

HIST 5844 (1-3). Independent Study. Europe: topical.

HIST 6414-3. Readings in European Intellectual History.

HIST 7214-3. Seminar: Economic Development. Same as ECON 8764.

HIST 7424-3. Research Methods on Medieval/Early Modern European History. Introduces students to research skills needed to work with historical manuscripts. Students learn to read late medieval/early modern handwriting, explore CU's microfilmed collections of

manuscripts, and write a research paper based on the manuscript materials.

HIST 7464-3. Seminar: European Intellectual History.

HIST 7844 (1-3). Independent Study. Europe: topical.

United States: Chronological Periods

HIST 1015-3. History of the United States to 1865.[1] Surveys American history from first settlement until end of the Civil War. Approved for arts and sciences core curriculum: United States context.

HIST 1025-3. History of the United States since 1865.[1] Surveys social, economic, political, and cultural development of the United States from the close of the American Civil War to the present. Approved for arts and sciences core curriculum: United States context.

HIST 1035-3. Honors: The United States to 1865. Surveys 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. Approved for arts and sciences core curriculum: United States context.

HIST 1045-3. Honors: The United States since 1865. Surveys 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. Approved for arts and sciences core curriculum: United States context.

HIST 2845 (1-3). 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. Approved for arts and sciences core curriculum: critical thinking.

HIST 3455-3. Research Seminar: Recent American History.

HIST 3845 (1-3). Independent Study. United States: chronological periods.

HIST 4115-3. British Colonial America, 1492-1689. Studies exploration, settlement, and early development of the British Colonies in North America from the perspective of the participants themselves: Indian, European, and African. Approved for arts and sciences core curriculum: United States context.

HIST 4125-3. British Colonial America, 1690-1750. Second part of a year-long sequence in early American history. Concentrates on the economic, social, cultural, and political processes under way 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. Approved for arts and sciences core curriculum: United States context.

HIST 4215-3. The American Revolution. Examines the events leading to the War of Independence and the creation of the United States. Approved for arts and sciences core curriculum: United States context.

HIST 4225-3. The New Nation: America, 1789-1828. History of the United States from George Washington's inauguration to the election of Andrew Jackson. Deals with political, social, economic, and cultural currents in the life of postrevolutionary America.

HIST 4235-3. Jacksonian America. Focuses on creation of the American party system and the political events that shaped it: sectionalism, slavery, motal 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; social, economic, and political changes effected by the war; the American agony of reconstruction; and the long-range results of that difficult era. Approved for arts and sciences core curriculum: United States context.

HIST 4325-3. The Gilded Age. Examines social and economic changes that 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, emphasizing social, economic, cultural, and political evolution of the American people and the nation's role in world affairs.

HIST 4425-3. United States History, 1933-1968. Examines American history, 1933-1968, with attention to domestic and foreign policy issues. Emphasizes the Great Depression, WWII, the cold war, the Korean conflict, and the Truman administration's Fair Deal.

HIST 4445-3. United States since 1968. Traces political, diplomatic, economic, and social developments in the United States from 1968 to the present. Approved for arts and sciences core curriculum: contemporary societies.

HIST 5845 (1-3). 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 6415-3. Readings in United States History, 1900-1932.

HIST 6435-3. Readings in United States History, 1948-Present.

HIST 6445-3. Readings in United States History, 1933-1968.

HIST 7155-3. Seminar: Early American History.

HIST 7475-3. Seminar: United States History, 1933-1968.

HIST 7485-3. Seminar: United States History, 1948-Present.

HIST 7845 (1-3). Independent Study. United States: chronological periods.

United States: Topical Courses 1

HIST 2846 (1-3). Independent Study. United States: topical courses 1.

HIST 3116-3. Selected Readings in American Diplomatic History. Approved for arts and sciences core curriculum: critical thinking.

HIST 3156-3. Research Seminar: American Diplomatic History.

HIST 3416-3. Selected Readings in American Society and Thought. Approved for arts and sciences core curriculum: critical thinking.

HIST 3436-3. Selected Readings in American Economic History. Surveys American economic growth and development since colonial times, with special emphasis on their consequences for a changing society. Prereqs., HIST 1015 and 1025. Approved for arts and sciences core curriculum: critical thinking.

HIST 3616-3. Selected Readings in Women's History.

HIST 3656-3. Research Seminar: Women and Peace. Same as WMST 3656.

HIST 3846 (1-3). Independent Study. United States: topical courses 1.

HIST 4026-3. U.S.-Indian Relations. History of United States policy toward Indian tribes from colonial times through the modern era of tribal self-determination. Emphasizes those policies that continue to influence contemporary events on Indian reservations across the American West.

HIST 4116-3. Diplomatic History of the United States to 1920.[1] Traces rise of the United States from the status of a weak new nation to that of an imperial world power with interests everywhere. Approved for arts and sciences core curriculum: United States context.

HIST 4126-3. Diplomatic History of the United States since 1920.[1] 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 economic, social, and intellectual roots of foreign policy. Approved for arts and sciences core curriculum: United States context.

HIST 4146-3. Military History. Examines America's national defense and war efforts from the Spanish American War to the present, emphasizing causes and consequences of modern conflicts.

HIST 4166-3. The War in Vietnam and Its Legacy. Traces diplomatic, military, and political history of the war in Vietnam from the beginning of U.S. involvement in 1950 to its aftermath in the 1980s. Approved for arts and sciences core curriculum: United States context, or contemporary societies.

HIST 4316-3. The Origins of American Culture, 1600-1830. Traces the development of

[1] Also available through correspondence study.

American culture from its colonial roots to the early decades of the nineteenth century. Focuses on regional differences in the colonial period, the creation of a new cultural synthesis during the Revolution, and the cultural implications of the Revolutionary legacy. Prereq., HIST 1015.

HIST 4336-3. Nineteenth-Century American Intellectual History. Examines developing intellectual traditions in their social and political contexts. Addresses democracy, religion, transcendentalism, women, race, union or disunion, the Darwinian revolution, and literary realism and naturalism.

HIST 4346-3. Twentieth-Century American Intellectual History. Traces transit of American ideas from turn-of-the-century reformism to neo-conservatism of the 1980s. Special attention given to interaction of social change, political power, and intellectual life.

HIST 4516-3. U.S. Society in the Nineteenth Century. Concerned with the American family and community in the changing social environments of the nineteenth century. Examines families of different ethnic and class backgrounds, observing how they are changed by new economic conditions, reform, or new political institutions. Approved for arts and sciences core curriculum: United States context.

HIST 4526-3. U.S. Society in the Twentieth Century. Primarily concerned with family roles and community values, and how they are altered by economic, demographic, and intellectual changes during the twentieth century. Discusses acculturation, the idea of success, reform, and the changing structure of opportunity. Approved for arts and sciences core curriculum: United States context.

HIST 4536-3. Popular Culture in America to 1900. Studies cultural predispositions of people as contrasted with high culture in America. Covers popular arts, literature, music, folklore, sports, psychology, religion, and science.

HIST 4546-3. Popular Culture in America: The Twentieth Century. Continuation of HIST 4536.

HIST 4556-3. History of Urban America. Examines growth of American cities and urban lifestyles from eighteenth century to the present. Compares role of cities, their structure and problems, during three stages of growth—commercial, industrial, and modern.

HIST 4566-3. United States Labor History since the Industrial Revolution. Traces development of an industrial labor force in the United States and focuses on gender, ethnicity, and class. Three major themes covered are transformation of the organization of work, everyday lives of workers, and role of 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 lives of immigrants and how they were affected by economic and social developments of the period.

HIST 4616-3. History of Women in the United States to 1890. Examines female experience in the United States from seventeenth-century European colonization to nineteenth-century settlement of the frontier. Emphasizes comparison between classes, regions, and racial/ethnic groups. Women's writings provide the basis for discussions of private and public roles, definitions of femininity, interpersonal relationships, and struggles for survival and self-expression. Same as WMST 4616. Approved for arts and sciences core curriculum: cultural and gender diversity.

HIST 4626-3. History of Women in the United States since 1890. Examines what it means to be female in twentieth-century United States, emphasizing comparison between classes and racial/ethnic groups. Women's writings serve as the basis for discussions of private and public roles, definitions of womanhood, interpersonal relationships, and struggles for autonomy and equality. Same as WMST 4626. Approved for arts and sciences core curriculum: cultural and gender diversity.

HIST 5846 (1-3). Independent Study. United States: topical courses 1.

HIST 6116-3. Readings in American Diplomatic History.

HIST 6326-3. Readings in United States Intellectual History. Examines the history of ideas and the social history of intellectuals in American society during the nineteenth and twentieth centuries. Stresses social and political dimensions and the changing cultural and institutional contexts of intellectual discourse. Prereq., graduate standing or instructor consent.

HIST 6516-3. Readings in United States Society and Thought, 1800-1880.

HIST 6526-3. Readings in U.S. Social History, 1880-1940.

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 7326-3. Seminar: U.S. Intellectual History.

HIST 7556-3. Seminar: American Society and Thought.

HIST 7656-3. Seminar: Women's History.

HIST 7846 (1-3). Independent Study. United States: topical courses 1.

United States: Topical Courses 2

HIST 2117-3. History of Colorado.[1] Emphasizes 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 2127-3. Ethnicity, Culture, and Class in Colorado History.[1] Examines the roles ethnicity, culture, and class have played in the history of Colorado and in current economic development, with a focus on Hispanics, Native Americans, and immigrants. Instructor consent required.

[1] Also available through correspondence study.

HIST 2137-3. Ethnicity, Culture, and Class in Colorado History 2. Research seminar on the roles of ethnicity, culture, and class in Colorado history. Students write a major research paper on Hispanics, Native Americans, or immigrants. Prereq., HIST 2127. Instructor consent required.

HIST 2437-3. African-American History. Surveys African-American history. Studies, interprets, and analyzes major problems, issues, and trends affecting black Americans from about 1600 to the present. Approved for arts and sciences core curriculum: United States context.

HIST 2537-3. Chicano History. Examines social, economic, political, and cultural history of Americans of Mexican descent and focuses on the heritage of Mexican society and thought; the Mexican-U.S. war; Mexican-American society and thought; and the Chicano movement of the 1960s. Same as CHST 2537. Approved for arts and sciences core curriculum: United States context.

HIST 2717-3. Asian-American History. Introductory-level survey of social history of Asians in America from nineteenth century to the present. Primary focus is on delineating and explaining changes that Asian Americans, one of the most visible ethnic groups in our society, have undergone since their arrival in the United States. Same as AAST 2717. Approved for arts and sciences core curriculum: United States context.

HIST 2847 (1-3). Independent Study. United States: topical courses 2.

HIST 3317-3. Selected Readings in the American West.

HIST 3357-3. Research Seminar: The American West.

HIST 3417-3. Selected Readings in African-American History.

HIST 3847 (1-3). Independent Study: United States: topical courses 2.

HIST 4217-3. The Early American Frontier.[1] Examines 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 determination of national policies.

HIST 4227-3. The Later American Frontier.[1] Deals primarily with the Trans-Mississippi west during the nineteenth century, the westward advance of various frontiers, and their influence upon national development. Emphasizes 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), course emphasizes dynamics of interethnic relations. Indian migrations, Spanish conquest and Indian response, Mexican-Indian interaction, and Anglo domination are some of the themes discussed. Approved for arts and sciences core curriculum: cultural and gender diversity.

HIST 4617-3. The Indian in American History: The Eastern Region. Explores pre-European social and cultural developments, longevity, and continuity of human history in

North America. By examining ways in which Indian societies east of the Mississippi River responded to Euro-Americans, the Indians' role in eastern North American history is demonstrated. Approved for arts and sciences core curriculum: cultural and gender diversity.

HIST 4627-3. The Indian in American History: The Western Region. Explores the longevity and continuity of human history in North America by discussing pre-European social and cultural developments. By examining ways in which Indian societies west of the Mississippi River responded to Euro-Americans, the Indians' role in western North American history is demonstrated. Same as AIST 4627. Approved for arts and sciences core curriculum: cultural and gender diversity.

HIST 5847 (1-3). Independent Study. United States: topical courses 2.

HIST 6317-3. Readings in the American West.

HIST 7257-3. Seminar: History of the American Frontier.

HIST 7847 (1-3). Independent Study. United States: topical courses 2.

Third World: Specific Regions

HIST 1038-3. Introduction to Latin American History. Broad survey of the history of that part of the Western Hemisphere now known as Latin America. Chronologically covers pre-historical period to 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 students 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. Latter part of 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. Interdisciplinary course that focuses on 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. Introduces origins of the civilization of India and to historical evolution of India from tradition to modernity. Addresses social, economic, political, artistic, and religious patterns.

HIST 1608-3. Introduction to Chinese History. Introduces student to Chinese civilization and to its historical evolution, from neolithic period to 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. Introduces origins of Japan and to 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. Commercial feature-length films are used as a vehicle for looking at different chronological periods and understanding life and times. The films of Kurosawa, Mizaguchi, Ozu, and other leading directors are featured. Same as FILM 2711.

HIST 2848 (1-3). Independent Study. Third World: specific regions.

HIST 3018-3. Selected Readings in Latin American History. Approved for arts and sciences core curriculum: critical thinking.

HIST 3028-1. Lab in Selected Readings in Latin American History. Gives students the opportunity to learn skills and techniques used in historical research on early Latin America. Teaches basic paleography; students use facsimile materials to acquire working ability to read Spanish documents from the sixteenth, seventeenth, and eighteenth centuries. Prereqs., second-semester Spanish or equivalent.

HIST 3058-3. Colonial Latin American Research Seminar for Undergraduates. Takes place in a Latin American city. Students work collectively on selected problems using colonial documents, especially wills and estate inventories. Focuses on social history; emphasizes questions of social rank and material culture. Prereqs., HIST 3018, 3028, and third-semester Spanish ability.

HIST 3328-3. Selected Readings in Middle Eastern History. Examines selected issues in modern Middle Eastern history. Check with the department concerning the specific subject of the seminar. Prereq., junior or senior standing.

HIST 3628-3. Selected Readings in Recent Chinese History. Approved for arts and sciences core curriculum: critical thinking.

HIST 3718-3. Selected Readings in Japanese History. Approved for arts and sciences core curriculum: critical thinking.

HIST 3848 (1-3). Independent Study. Third World: specific regions.

HIST 4118-3. History of Mexico to 1821. Studies Mexican history beginning with roots and evolution of pre-Columbian civilizations and concluding with the gaining of Mexican independence in 1821. Emphasizes 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. Studies Mexican history continues with the establishment of independence in 1821, examines the upheavals of the Mexican Revolution, and culminates with recent events in Mexico. Approved for arts and sciences core curriculum: contemporary societies.

HIST 4218-3. History of West Africa. Examines the long and rich history of West Africa from the era of ancient West African kingdoms to the modern period. Particular attention placed on understanding of traditional cultural values, the colonial experience, and modern problems.

HIST 4238-3. History of Southern Africa since 1800. Examines history of Southern Africa. Special emphasis placed on history of South Africa. Focuses on the decline of white rule and the region's strategic importance. Same as BLST 4237.

HIST 4318-3. The Medieval Middle East, A.D. 500-1600. Examines Islam to the early modern period. Attention 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 divided equally between the region's political history and international relations and its patterns of economic, social, and cultural modernization in the main countries.

HIST 4338-3. The Arab-Israeli Problem. Examines 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. Examines 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. Examines major traditions in philosophy, art, politics, society, and economy of China during the premodern period.

HIST 4628-3. Rise of Revolutionary China. Examines political, social, and economic events in China since 1750.

HIST 4648-3. History of Modern Chinese Intellectual Thought. Examines major intellectual movements in modern China from Ch'ing neo-Confucianism, empiricism, and nationalism to Chinese communism.

HIST 4718-3. Ancient and Medieval Japanese History. Beginning with the long prehistoric and protohistoric period, 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, emphasizing 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 (1-3). 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 (1-3). 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 (1-3). Independent Study. Third World: comprehensive and general.

HIST 3019-3. Selected Readings in Asian and African History.

HIST 3849 (1-3). Independent Study. Third World: comprehensive and general.

HIST 4019-3. Comparative World History to 1500. First half of a two-semester course on comparative world history. Systematically compares and contrasts central aspects of society, politics, economy, and ideas of different civilizations in the premodern era.

HIST 4029-3. Comparative World History since 1500. Second half of a two-semester course on comparative world history. Systematically compares and contrasts central aspects of society, politics, economy, and ideas of different civilizations in the modern era.

HIST 4619-3. Women in Asian History. Considers 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. Same as WMST 4619.

HIST 5849 (1-3). Independent Study. Third World: comprehensive and general.

HIST 6019-3. Readings in Third-World History.

HIST 6329-3. Readings in Comparative Ethnohistory.

HIST 7849 (1-3). Independent Study. Third World: comprehensive and general.

Humanities

HUMN 1010-6. Introduction to 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 visual arts. From Aegean to Baroque eras, emphasizing structure, content, and style in specific examples. Approved for arts and sciences core curriculum: historical context, or literature and the arts.

HUMN 1020-6. Introduction to Humanities 2. Continuation of HUMN 1010. From Baroque to contemporaty styles. Credit cannot be received for both HUMN 1010-1020 and ENGL 2600-2610. Approved for arts and sciences core curriculum: historical context, or literature and the arts.

HUMN 2052-3. Tolstoy's *War and Peace.* Examines Tolstoy's *War and Peace* in depth, placing it in the historical and cultural context of early nineteenth-century Europe, and examining its connection with other broad themes and figures of Western literature.

HUMN 3000-3. Images of the Twentieth Century. Interdisciplinary study of twentieth-century themes in literature, film, and visual arts. Team taught.

HUMN 3033-3. The Comic Sense. 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. Studies 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 3051-4. Film History 1. 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. Same as FILM 3051. Approved for arts and sciences core curriculum: literature and the arts.

HUMN 3061-4. Film History 2. Starts with the late 1930s and early 1940s films of Renoir, Welles, Cocteau, and Hitchcock and follows historical growth and evolution of film aesthetics to the present. Studies neo-realist, French new wave, and recent experimental films. Same as FILM 3061. Approved for arts and sciences core curriculum: literature and the arts.

HUMN 4003-3. Film and Fiction. Explores similarities and differences between literature and film as narrative arts. Studies several novels, short stories, and plays and the films made from them. Examines problems in point of view, manipulation of time, tone, structure, and setting. Same as FILM 4003.

HUMN 4004-3. Film Theory. Philosophical attempt to define the nature of cinema. Intensive seminar involving a great deal of reading in classic and contemporary film theory, and requiring a working knowledge of silent film history. Limited to 20 students. Prereq., HUMN 3051 or FILM 3051. Same as FILM 4004. Approved for arts and sciences core curriculum: critical thinking.

HUMN 4013-3. Narrative in the Arts. Explores the nature of narrative from *Genesis* to *Jealousy* in literary and visual forms.

HUMN 4023-3. The Hero and Fate in the Epic Tradition and the Modern Novel. Comparative and interdisciplinary study of the figure of the hero and the concept of fate in the epic tradition and the modern novel. Explores literary, religious, philosophical, and ethical issues in works like *Gilgamesh, Iliad, Aeneid, Beowulf, Madame Bovary,* and *Invisible Man.* Prereq., HUMN 1010 or 1020, or equivalent.

HUMN 4032-3. Comparative Study of Modern Poetry. An interdisciplinary and comparative course on modern poetry combining the traditional analytical study of poetic texts and the practice of writing creatively. Authors studied include Apollinaire, Garcia Lorca, Neruda, Mistral, Rilke, Bachmann, Eliot, Pound, Stevens, Lowell, Merwin, and Rich. Prereqs., HUMN 1010 or 1020 or equivalent; creative writing experience desirable.

HUMN 4042-3. Early Modernism: 1857-1922. Comparative, interdisciplinary period course examining some of the major artists and issues that informed the beginnings of modernism from the mid-nineteenth to the early twentieth century. Artists studied include Dostoevsky, Baudelaire, Nietzsche, Van Gogh, and Kafka. Prereqs., HUMN 1010 and 1020.

HUMN 4064-3. "Primitivism" in Art and Literature. Explores cross-cultural encounters in the arts, focusing on the political and aesthetic implications of concepts of the "primitive," especially in the context of Western colonialism. Includes works by Shakespeare, Montaigne, Defoe, Melville, Gauguin, Conrad, Picasso, Achebe, and Walker. Prereq., HUMN 1020 or instructor consent.

HUMN 4072-3. Seventeenth-Century Art and Poetry. Examines English and continental lyric poets of the seventeenth century and their interconnections with European visual art. Discusses the experience of love, religion during an age of religious conflict, and the connection between passion and spirituality. Prereqs., HUMN 1010 and 1020.

HUMN 4082-3. Nineteenth-Century Art and Literature. Interdisciplinary study of English fiction and poetry together with related movements in visual arts. Prereq., HUMN 1020.

HUMN 4092-3. Period Studies.

HUMN 4093-3. Studies in Humanities.

HUMN 4102-3. The Romantic Quest. Interdisciplinary study of literature, art, and music from 1780 to 1830 in France, England, and Germany. Prereq., HUMN 1020.

HUMN 4133-3. The Dramatic Arts. Interdisciplinary course intended to examine and compare various forms of the dramatization of narrative: written texts, audiotapes, videotapes, film, and live performance. Compares different versions of the same narrative or theme, especially if different media are used and different time periods are involved. Prereq., HUMN 1010 or 1020.

HUMN 4135-3. Art and Psychoanalysis. Explores psychoanalytic theory as it relates to our understanding of literature, film, and other arts. After becoming familiar with some essential Freudian notions (repression, narcissism, ego/libido, dream work, etc.), students apply

these ideas to works by surrealist artists (Flaubert, James, Kafka, Hoffman, and Hitchcock). Prereq., HUMN 1020.

HUMN 4160-3. Myth in the Arts. Studies representative myths in the art, music, and literature of ancient and modern worlds. It is recommended that students first take HUMN 1010 and 1020, or CLAS 1100.

HUMN 4425-3. Economics in Literature. Interdisciplinary study of the relationship between economics and literature. Focuses on representation of economic phenomena and criticism and formulation of economic theories in literary works like *Don Quijote, Hard Times, Death of a Salesman,* and *Grapes of Wrath.* Prereqs., HUMN 1010 or 1020, and ECON 2010 or 2020, or equivalent.

HUMN 4522-3. The Art of Courtly Love: The Culture of the Medieval Provencal Troubadours. Comparative, interdisciplinary study of the poetry, music, art, customs, beliefs, and practices of the culture surrounding the medieval Provencal troubadours. Draws from sources including literary texts, music, illuminated manuscripts, and films. Prereq., HUMN 1010 or 1020, or equivalent.

HUMN 4555-3. The Arts of Interpretation. Introduces various hermeneutical methodologies (literary/philosophical criticism, biblical exegesis, art history, etc.) with which to examine the question of interpretation. Methodologies are studied in close conjunction with particular works of art. Prereq., HUMN 1010 or 1020.

HUMN 4825-3. Law and Literature. Explores law as theme and structure in literary texts from different periods, plus readings in legal materials.

HUMN 4840 (1-3). Independent Study.

Kinesiology

KINE 1010-2. Introduction to Kinesiology. Introduces the scientific foundation of kinesiology (the study of human movement and performance). Includes historical development of the discipline and introduces students to its many facets, including anatomy, biomechanics, exercise physiology, motor development, motor learning, motor control, and social psychological aspects of human performance. Career opportunities in kinesiology are also discussed.

KINE 2700-3. Introduction to Statistics and Research in Kinesiology. Introduces types of statistics and research, methods of accomplishing research, and skills necessary to read and interpret research in the field of kinesiology.

KINE 2840 (1-3). 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. Introduces sport as one of the most pervasive human activities in America. Relationship of sport to various social institutions and processes. 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 3250-3. Emergency Medical Techniques.

KINE 3420-3. Nutrition and Health. Basic principles of nutrition and their relationship to health. Students may not receive credit for both KINE 3420 and PSYC 2062.

KINE 3430-3. Nutrition and Physical Performance. Current research relating to nutrition and optimal physical performance. Topics include energy utilization, fluid requirements, vitamin and mineral needs of the athlete, body composition, and other issues.

KINE 3440-3. Theory and Practical Applications of Resistance Exercise and Conditioning Programs. Introduces scientific rationale and practical applications of sport-specific resistance exercise and conditioning programs through both classroom and laboratory experiences. Oriented toward an understanding of methods of enhancing human performance levels. Prereqs., EPOB 3420 and 3430.

KINE 3500-3. Human Development and Movement Behavior. Studies 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, sociocultural practices and interventions. Prereqs., EPOB 3420 and 3430, and KINE 2700.

KINE 3710-3. Social Psychological Aspects of 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., PSYC 1001 and KINE 2700.

KINE 3720-3. Motor Learning and Performance. Covers theories of motor learning and variables affecting motor performance and control. Laboratory sessions are included. Prereqs., PSYC 1001, EPOB 3420, and KINE 2700.

KINE 4460-3. Prevention and Management of Athletic Injuries. Introduces students to basic preventive and treatment techniques associated with athletic injuries. Prereqs., EPOB 3420 and 3430.

KINE 4470-3. Evaluation and Rehabilitation of Athletic Injuries. Introduces students to evaluative and rehabilitative techniques associated with athletic injuries. Emphasizes the etiology and mechanism of injury, recognition of clinical signs and symptoms of each injury, and specific rehabilitative techniques. Prereq., KINE 4460.

KINE 4480-3. Perspectives on Aging. Creates awareness of aging as a developmental process and fosters an understanding of the older person in a changing social milieu. Examines physiological, psychological, and sociological aspects of aging. Prereq., EPOB 3420, 3430, or instructor consent.

KINE 4540-4. Analysis of Human Movement. Studies biomechanical and anatomical concepts serving as basis for analysis of movement. In addition, presents the applications of these principles to work, general physical activity, sports performance, and physical medicine. Prereqs., EPOB 3420, KINE 2700, and PHYS 2010.

KINE 4630-3. Modality Usage in Sports Medicine. Introduces students to those modalities that have special implication to sports injuries. Covers practical application as well as physiological responses and rationales associated with the use of a variety of modalities. Prereq., KINE 4460.

KINE 4650-3. Exercise Physiology. Examines 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., EPOB 3420 and 3430, and KINE 2700.

KINE 4660-3. Selected Topics in Exercise Physiology. Covers specific exercise physiology topics such as cellular cause of fatigue and muscle soreness, heart disease, regulation of blood flow, diabetes, aging, training adaptations, exercise at high altitudes, ergogenic aids, and excitation-contraction of muscles. Prereq., KINE 4650.

KINE 4670-3. Exercise Science Laboratory Techniques. Laboratory procedures and biomedical instrumentation pertinent to measuring and evaluating human performance. Prereq. or coreq., KINE 4650. Same as KINE 5670.

KINE 4680-3. 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. Prereqs., KINE 4540 and 4650. Same as KINE 5680.

KINE 4860 (1-3). Independent Study: Undergraduate.

KINE 4870 (1-3). Honors Thesis. Prereqs., KINE 2700 and acceptance into kinesiology honors program.

KINE 4930 (1-6). Internship. Opportunity for field/laboratory work in a variety of different settings. Prereqs., students must hold junior or senior status and have completed at least four of the major core classes. Consult with faculty for approval.

KINE 5010, 5020, 5030 (1-3). Seminar. Presentation of special topics in kinesiology.

KINE 5520-3. Seminar: Physical Growth and Motor Development. Examines current literature pertaining to changes in motor behavior and skill performance. Prereq., KINE 3500.

KINE 5550-3. Biochemical Basis of Exercise. Examines the underlying biochemical mechanisms that are responsible for the physiological adaptations to short- and long-term dynamic exercise. Prereq., one year of chemistry. Prereq. or coreq., KINE 4650 or instructor consent.

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 5610-3. Neuromuscular Physiology. Deals with neurophysiological mechanisms of body movement and integration of physiological, biomechanical, and biochemical mechanisms of human muscle fatigue.

KINE 5630-3. Sports Medicine. Investigation and demonstration of applied exercise physiology, medicine, biopsychology, and other related disciplines contributing to assessment and improvement of human physical performance. Prereqs., KINE 4650, EPOB 3430 (or equivalent), and college anatomy.

KINE 5640-3. Clinical and Exercise Electrocardiography. Involves lectures and laboratory practice in 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. 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. Advanced Laboratory Techniques in Exercise Science. Laboratory procedures and biomedical instrumentation pertinent to human performance and exercise biochemistry laboratories are presented through lecture and laboratory participation. Prereq. or coreq., KINE 5600.

KINE 5670-3. Exercise Science Laboratory Techniques. Same as KINE 4670.

KINE 5680-3. Exercise Management. Same as KINE 4680.

KINE 5710-3. Advanced Laboratory Techniques in Motor Behavior. Focuses on acquisition and analysis of biokinetic signals associated with human movement, including kinetic and kinematic data. Also discusses psychological measurement techniques. Laboratory and individual research projects required. Prereq., KINE 3720 or instructor consent.

KINE 5720-3. Motor Learning. Critical analysis of theories and conditions affecting motor learning and modification of performance. Prereq., KINE 3720.

KINE 5730-3. Motor Control. Examines central and peripheral neural structures responsible for the control and coordination of human movement, and investigates theories of motor control from a behavioral and mechanical view. Prereq., KINE 3720 or instructor consent.

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. Advanced course dealing in depth with specialized topics relevant to motor performance, exercise, and sport. Critical analysis of theories and research. Prereq., KINE 3710 or 3720.

KINE 5830-3. Applications of Statistics to Kinesiology. Considerations of descriptive, inferential, and correlational statistics, and how they apply specifically to kinesiological data. Introduces related computer programs. Prereq., KINE 2700.

KINE 5840 (1-3). Graduate Independent Study.

KINE 6010, 6020 (1-3). Seminar. Presentation of special topics in kinesiology.

KINE 6620-3. Current Topics in Exercise Science. 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. Focuses on 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.

Latin American Studies

Interdisciplinary Study

LAMS 1000-3. Introduction to Latin American Studies. Introduces Latin American society and culture taught by faculty from several different fields. Explores consistent themes in history, geography, literature and music. Approved for arts and sciences core curriculum: cultural and gender diversity.

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 in U.S. Society. Nontechnical exploration of the ways that language is used in America. Emphasizes language as a social institution and how values and goals of both public institutions and private groups shape and are shaped by language and its use. Approved for arts and sciences core curriculum: United States context, or contemporary societies.

LING 1500-3. Basic Traditional Grammar. Presents fundamentals of grammar in the Western tradition. Emphasizes making concepts and uses of grammar (as exemplified in English and closely related foreign languages) understandable to the nonspecialist.

LING 2000-3. Introduction to Linguistics. Introduces the study of languages as structural systems. Principles of sound patterns, word formation, meaning, and sentence structure. Gives attention to language acquisition, psycholinguistics, language families, dialects, historical change in languages, and different language types.

LING 2200-3. Language in Its Social Context. Explores 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. Develops view that language is a means of social interaction.

LING 2400-3. Language and Gender. Familiarizes students with the effects of gender on language use; discusses popular beliefs and scholarly theories about language and communication. Provides students with tools for exploring the role of language and gender. Approved for arts and sciences core curriculum: cultural and gender diversity.

LING 2800 (1-3). 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. Considers both semantic theories and semantic phenomena from diverse languages. Does not treat techniques for improving the use of language.

LING 3500-3. Language and the Public Interest. Studies language in public and private use, concentrating on semantic devices as found in language of political propaganda, advertising, business, and government, as well as everyday use of language between people.

LING 3800 (1-4). Special Topics in Linguistics. Intensive study of a selected area or problem in linguistics.

LING 4030-3. Linguistic Phonetics. Introduces practical and theoretical aspects of phonetics. Provides training in recognition and production of speech sounds, lectures on fundamentals of articulatory, acoustic, and auditory phonetics. Visits to the sound laboratory. Same as LING 5030.

LING 4100-3. Perspectives on Language. Provides extended critical examination of a few selected issues, chosen each term for their general interest and relevance, e.g., the relation between language and thought, or human language vs. animal languages and computer languages. Prereqs., LING 2000 or equivalent, and junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

LING 4220-3. Psycholinguistics. Studies processes of perceiving speech and interpreting it as meaningful and of expressing communicative intentions as utterances. Emphasizes roles of the brain and of perceptual and motor systems. Writing, gestural, and animal communicative systems are also treated. Prereqs., LING 2000 and PSYC 1001. Same as PSYC 4220.

LING 4410-3. Phonology. Studies sound systems of language. Introduces both principles of organization of sound systems and major kinds of phonological structures found worldwide. Provides extensive practice in applying phonological principles to data analysis. Prereqs., LING 2000 and 4030. Same as LING 5410.

LING 4420-3. Morphology and Syntax. Introduces 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. Same as 5420.

LING 4560-3. Language Development. Emphasizes acquisition of language by young children; development in later years and into adulthood is also treated. Particular attention given to roles of environment and of neurophysiological endowment in learning to communicate with words, sentences, and narratives. Prereqs., LING 2000 and PSYC 1001. Same as CDSS 4560 and PSYC 4560.

LING 4570-3. Introduction to Diachronic Linguistics. Familiarizes students with terminology, methods, and theories dealing with phenomena of language changes through time. Prereqs., LING 4410 and 4420. Same as LING 5570.

LING 4610-3. English Structure for Teachers of English to Speakers of Other Languages. Description of morphological and syntactic categories and structures of English. Prereq., LING 2000 or graduate standing. Same as LING 5610.

LING 4810-3. Senior Seminar in Linguistics. Topics vary from year to year, depending on interest of faculty and prospective students. Offerings are at 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 5030-3. Linguistic Phonetics. Same as LING 4030.

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. Prereq., instructor consent.

LING 5300-3. Research in Psycholinguistics. After a general introduction to issues and research methods in psycholinguistics (language production and comprehension, language and cognition, language acquisition), several major current research topics, such as models of speech production, and theories of brain specialization for language are explored.

LING 5410-3. Phonology. Same as LING 4410.

LING 5420-3. Morphology and Syntax. Same as LING 4420.

LING 5430-3. Semantics and Pragmatics. Explores fundamental concepts of semantics and pragmatics, including theories of communication and meaning representation, conversational implications, speech acts, and discourse structure. Prereq., LING 5420 or instructor consent.

LING 5450-3. Introduction to Formal Syntax. Introduces the use of formal models of syntax in the study of language. Surveys the motivation, claims, and influence of the most widely used models. One model is chosen as a framework for the study of methodology. Prereq., LING 2000.

LING 5570-3. Introduction to Diachronic Linguistics. Same as LING 4570.

LING 5610-3. English Structure for Teachers of English to Speakers of Other Languages. Same as LING 4610.

LING 5900 (1-3.) Independent Study.

LING 6260-3. Knowledge Representation and Language Structures. Examines parallels between natural language structures and categories and knowledge representation formalisms current in cognitive science. Specifically addresses the evidence for a language-like model of knowledge and the distinction between universal and language-particular features.

LING 6300-3. Topics in Language Use. Discusses current issues and research in a selected area related to language use and function. Sample topics include conversational interaction, language policy, language content, and sociolinguistic variation.

LING 6510-3. Language Structures. Surveys the structure of one or more languages, emphasizing understanding how 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 6520-3. Topics in Comparative Linguistics. Students compare and contrast selected structures of languages treated from a typological, genetic, or areal contact perspective. No special prior knowledge of the subject language is required. Prereqs., LING 5410, 5420, and 5570.

LING 6940-3. Master's Degree Candidate.

LING 6950 (1-6.) 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. Introduces the process of discovering structure of a language from data obtained directly from its speakers. Emphasizes effectiveness in the field context, rapid recognition of structural features, and preliminary formulation using computational tools. Prereq., LING 5410, 5420, or equivalent.

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 language structure. 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 or equivalent.

LING 7420-3. Syntactic Theory. Covers various topics in syntactic theory. Prereq., LING 5420 or equivalent.

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 integration of these theories in development of a combined theory of semantics and pragmatics. Prereq., LING 5430 or equivalent.

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 instructor consent.

LING 7570-3. Advanced Diachronic Linguistics. Presents theories of language change. Discusses mechanisms of language, its trajectories over linguistic categories and items, and its relation to theories of grammar and of language variation. Prereqs., LING 5410, 5420, and 5570, or equivalent.

LING 7900 (1-3.) Independent Study.

LING 8100-3. Seminar: Field Methods. Provides students with 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 coherence of linguistic ideas in their historical setting. Prereq., instructor consent.

LING 8410-3. Seminar: Advanced Phonology. Advanced topics in phonological theory. Prereq., LING 7410 or instructor consent.

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 instructor consent.

LING 8430-3. Seminar: Topics in Semantic Theory. Devoted to particular topic in semantic theory, such as 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 instructor consent.

LING 8530-3. Seminar: Areal Linguistics. Studies linguistic features shared by numerous languages or dialects within a given region, usually Africa or North America. Particular area or areas studied, however, depends on the interests of instructor and students. Prereq., instructor consent.

LING 8540-3. Seminar: Language Variation. Selected topics on the systematic variation of language. Relative emphasis on contextual, geographical, stylistic, and social variation differs from offering to offering. Prereq., instructor consent.

LING 8560-3. Seminar: Issues in Language Acquisition. Explores current issues in language acquisition in depth, through readings and through analyses of audio- and videotapes of young children. Course topics vary; sample topics are syllable structure, development of morphological markers, and development of locative structures. Prereq., LING 7560 or instructor consent.

LING 8570-3. Seminar: Diachronic Linguistics. Advanced topics in theory of language change or in reconstruction of language history. Prereq., LING 7570 or instructor consent.

LING 8990 (1-10). 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.

English as a Second Language

Students first enrolled in fall 1989 and thereafter may not apply ESLG course work toward minimum degree requirements. Students may, although they are not required to, take ESLG 1110, 1210, or 1310 as sequences.

ESLG 1110-3. Spoken English for Foreign Students. Oral drills with goal of promoting fluency and listening comprehension. Does not fulfill humanities or major requirements.

ESLG 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.

ESLG 1210-3. Written Composition for Foreign Students. Distinction between spoken and written English emphasizing grammar and vocabulary of the latter. Does not fulfill humanities or major requirements.

ESLG 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.

ESLG 1310-3. Intermediate English for Foreign Students. Instruction and practice at the nonbeginning level in colloquial and written American English. Intended for foreign students requiring additional study to become competent in English for most university needs. Does not fulfill humanities or major requirements.

ESLG 1320-3. Advanced English for Foreign Students. Instruction and practice at the advanced level in colloquial and written American English. Intended for foreign students needing additional study of English to function to the best of their ability in a university. Does not fulfill humanities or major requirements.

Mathematics

After completing one semester of calculus with a grade of *C* (2.00) or better, no math major may receive credit in any mathematics course numbered below 1300. No student may obtain more than 9 hours of credit in mathematics courses numbered below 1300.

MATH 1300-5. Analytic Geometry and Calculus 1. Limits, derivatives of algebraic and trigonometric functions, applications of the derivative, integration and applications of the definite integral. Students with credit in MATH 1080, 1090, and 1100 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. Prereqs., two years of high school algebra, one year of geometry, and 1/2 year of trigonometry or MATH 1000-1040.

MATH 1310-4. Calculus 1 and Combinatorics. Limits, differentiation, integration, elementary combinatorics, and elementary statistics. Designed especially for students in the biological and social sciences and for mathematics majors. Prereq., three years of high school math, including trigonometry.

MATH 1320-4. Calculus 2 and Mathematics of Chance. Introduces probability, integration techniques, iterative procedures, sequences and series, introductory estimation theory, and hypothesis testing and is designed especially for students in the biological and social sciences and for mathematics majors. Prereq., MATH 1300, MATH 1310, or APPM 1350.

MATH 2300-5. Analytic Geometry and Calculus 2. Continuation of MATH 1300. Topics include transcendental functions, methods of integration, polar coordinates, conic sections, improper integrals, and infinite series. Students with credit in MATH 2300 may not receive credit in APPM 1360 or APPM 1380. Prereq., Calculus 1.

MATH 2380-3. Mathematics for the Environment. An interdisciplinary course where analysis of real phenomena such as acid rain, population growth, and road-killed rabbits in Nevada leads to consideration of certain concepts in mathematics, including differentiation, integration, and some finite mathematics. One third of the course consists of individual projects chosen by students. Prereq., proficiency in high school mathematics. Same as QRMS 2380. Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

MATH 2400-4. Analytic Geometry and Calculus 3. Continuation of Calculus 2. Vectors, three-dimensional analytic geometry, partial differentiation and multiple integrals, and vector analysis. Students with credit in MATH 2400 may not receive credit in APPM 2350 or APPM 2370. Prereq., Calculus 2.

MATH 2510-3. Introduction to Statistics. Elementary statistical measures. Introduces statistical distributions, statistical inference, and hypothesis testing. Students may not receive credit for both MATH 2510 and MATH 4570/5570. Prereq., two years of high school algebra.

MATH 3000-3. Introduction to Abstract Mathematics. Bridges 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., Calculus 2. Approved for arts and sciences core curriculum: critical thinking.

MATH 3110-3. Introduction to Theory of Numbers. 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., Calculus 3.

MATH 3130-3. Introduction to Linear Algebra. 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., Calculus 3.

MATH 3140-3. Introduction to Modern Algebra. Careful study of the elementary theory of groups, rings, fields, polynomials, group and ring homomorphisms, and isomorphisms. Prereq., MATH 3000, 3110, 3130, or 3150.

MATH 3150-3 Honors Introduction to Linear Algebra. Subject matter is the same as MATH 3130, but 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. Prereqs., Calculus 3 and instructor consent.

MATH 3170-3. Advanced Finite Mathematics 1. Basic methods and results in combinatorial theory. Enumeration methods, elementary properties of functions and relations, graph theory. Emphasizes applications. Prereq., Calculus 2.

MATH 3210-3. Euclidean and Non-Euclidean Geometries. Axiomatic systems. Foundations of Euclidean and Lobachevskian geometries. Prereq., Calculus 2.

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., Calculus 2.

MATH 3830-3. Communicating Mathematical Ideas. Practicum on acquiring and applying techniques of instruction used in the mathematics module program. Students participate in a seminar on theories of personalized instruction in mathematics and assist in the tutoring, testing, and video facilities of the mathematics module program. Prereqs., two semesters of calculus and permission of the director of the mathematics module program.

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 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., Calculus 3, MATH 3130, CSCI 1200, and instructor consent.

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. Prereqs., Calculus 3 and MATH 3000. MATH 3130 highly 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 4370-3. Honors Advanced Calculus and Related Subjects 1. Completeness of the number system; concepts and theorems that underlie the calculus of functions of one and several variables; and other topics including transfinite cardinal numbers, axiom systems, integration in finite terms, sets of measure zero, and Hausdorff dimension. No credit for both MATH 4310 and 4370. Prereq., MATH 3150 or instructor consent.

MATH 4380-3. Honors Advanced Calculus and Related Subjects 2. Continuation of MATH 4370. Vector analysis and potential theory; Fourier series and integrals; existence and uniqueness of solutions of differential equations; and other topics including probability theory, calculus of variations, introduction to differential geometry, and boundary-value problems of classical potential theory. No credit for both MATH 4320 and 4380. Prereq., MATH 4370.

MATH 4430-3. Ordinary Differential Equations. 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., Calculus 3 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., Calculus 3 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., Calculus 3.

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. Same as MATH 5520, APPM 4520 and 5520.

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. Same as APPM 4650 and 4660.

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. 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., Calculus 3 or MATH 3000.

MATH 4800-3. History of Mathematics. Selection of topics in the history of mathematics from earliest times to present, emphasizing Greek mathematics, development of calculus in the seventeenth century, and history of algebra, analysis, and geometry in the nineteenth and twentieth centuries. Prereq., two upper-division courses in mathematics. Same as MATH 5800.

MATH 4900 (1-3). Independent Study.

MATH 4955-3. Undergraduate Seminar in Mathematics. Introduces undergraduates to mathematical topics and strategies for research. May be repeated once. Prereqs., three semesters of calculus, APPM 2360 or upper-division math course, and instructor consent.

Graduate Courses

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. Surveys 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. Same as PHYS 5030 and 5040.

MATH 5150-3. Linear Algebra 1. Vector spaces, linear transformations, eigenvalues and eigenvectors, canonical forms. Prereq., MATH 3130.

MATH 5430-3. Ordinary Differential Equations. Introduces theory and applications of ordinary differential equations, including existence and uniqueness theorems, qualitative behavior, series solutions, and numerical methods, for scalar equations and systems. Prereqs., MATH 3130 and 4310

MATH 5460-3. Applied Topics in Complex Variables. Same as MATH 4460.

MATH 5470-3. Partial Differential Equations 1. Introduces theory and applications of partial differential equations, including existence, uniqueness, stability, regularity, and solution construction and approximation procedures. Prereq., MATH 4430, or APPM 4350 and APPM 4360, or equivalent.

MATH 5480-3. Partial Differential Equations 2. Continuation of MATH 5470. Connections between partial differential equations and Fourier theory, Green's functions, variational and numerical methods. Applications to fluid dynamics, quantum mechanics, and elsewhere as time permits. Prereq., MATH 5470 or APPM 5470.

MATH 5520-3. Introduction to Mathematical Statistics. Same as MATH 4520 and APPM 4520.

MATH 5600-3. Numerical Analysis 1. Solution of linear systems, least squares approximations, nonlinear algebraic equations, interpolation, and quadrature. Prereqs., calculus, MATH 3130, and CSCI 1200. Same as APPM 5600.

MATH 5610-3. Numerical Analysis 2. Solution of ordinary and partial differential equations; matrix eigenvalue eigenvector problems. Prereq., MATH 5600 or APPM 5600. Same as APPM 5610.

MATH 5800-3. History of Mathematics. Same as 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 Lebesque integration, measure theory, Lebesque function spaces, and Fourier analysis. 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 1 and 2. Classical necessary and sufficient conditions emphasizing the simplest problems; the problem of Lagrange; Hamiltonian and Lagraphical and other quick and approximate procedures emphasizing applications in the behavioral, biological, and physical sciences. Prereq., instructor consent.

MATH 6470-3, 6480-3. Advanced 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 6520-3. Mathematical Statistics. Mathematical theory of statistics. Topics include distribution theory, estimation and testing of hypotheses, multivariate analysis, and nonparametric inference. Prereq., MATH 5520. Same as APPM 6520.

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 instructor consent.

MATH 6550-3. Introduction to Stochastic Processes. 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 instructor consent. Same as APPM 6550.

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, and 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. Prereq., MATH 3130, 4310, 4430, or 4650.

MATH 6640-3. Numerical Methods for the Solution of Eigenvalue Problems. Provides survey of numerical methods useful for the solution of eigenvalue and eigenvector problems. Algorithms studied include Power method, Rutishauser's LR method, the QR and Lanczo's algorithms. Algorithms are applied to various problems. Prereq., MATH 5600.

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 instructor consent.

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 instructor consent.

MATH 6900 (1-3). Independent Study.

MATH 6950 (1-6). Master's Thesis.

MATH 7030-3, 7040-3. Advanced Mathematical Physics 1 and 2. Hilbert space, theory of distributions, L2-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. Same as PHYS 7030 and 7040.

MATH 7050-3, 7060-3. Advanced Mathematical Physics 3 and 4. Further topics in modern mathematical physics with applications. Prereqs., MATH 7030 and 7040. Same as PHYS 7050 and 7060.

MATH 8130-3. Theory of Groups. Abelian groups, homomorphism, permutation groups, Sylow theorems, solvable groups, group representations and characters. Prereqs., MATH 6130 and 6140.

MATH 8230-3, 8240-3. Algebraic Topology 1 and 2. Homology and cohomology theories, homotopy theory, obstruction theory, and applications. Prereqs., MATH 6130 and 6140, MATH 6210 and 6220, or instructor consent.

MATH 8250-3, 8260-3. Mathematical Theory of Relativity 1 and 2. Maxwell equations; Lorentz force; Minkowski space-time; Lorentz, Poincaré, and conformal groups; metric manifolds; covariant differentiation; Einstein space-time; cosmologies; unified field theories. Prereq., instructor consent.

MATH 8270-3, 8380-3. Differential Topology 1 and 2. Differentiable manifolds, tangent bundles, vector fields, differential forms. Frobenius theorem, Riemannian metrics, selected topics. Prereqs., MATH 5150, 6210 and 6220, 6310, and 6320.

MATH 8330-3, 8340-3. Functional Analysis 1 and 2. Introduces 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 1 and 2. Trigonometric series, periodic functions, diophantine approximation, Fourier series. Bohr and Stepanoff almost periodic functions, positive definite functions, the L1 and L2 theory of the Fourier integral. Applications to group theory and differential equations. Prereqs., MATH 5150 and 6320.

MATH 8410-3, 8420-3. Mathematical/ Computational Fluid Dynamics 1 and 2. Mathematical treatment of basic Navier-Stokes partial differential equations describing fluid dynamics, including the Euler and Stokes equations as approximations for high and low speed flows. Emphasizes both analytical considerations and computational methods. Prereq., instructor consent.

MATH 8430-3, 8440-3. Theory of Ordinary Differential Equations 1 and 2. Prereqs., MATH 5150, 6320, and instructor consent.

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 8750-3, 8760-3. Lattices and General Algebra 1 and 2. Modular, distributive, Brouwerian, and Boolean lattices. Applications to algebra and topology. Homomorphism, congruence relations, direct factorization, free algebras, varieties. Prereqs., MATH 4730, 6130, and 6140.

MATH 8900 (1-3). Independent Study.

MATH 8990-10. 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.

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., instructor consent.

MATH 6404-3, 6414-3. Topics in Applied Mathematics 1 and 2. Selected topics in mathematical problems arising from various applied fields such as mechanics, electromagnetic theory, and economics. Prereq., instructor consent.

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 instructor consent.

MATH 8174-3, 8184-3. Topics in Algebra 1 and 2. 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. Advanced topics in analysis include Lie groups, Banach algebras, operator theory, ergodic theory, representation theory, etc. Prereqs., MATH 8330 and 8340, or instructor consent.

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 instructor consent.

MATH 8364-3, 8374-3. Topics in Complex Variables 1 and 2. Advanced topics in complex analysis: Riemann surfaces, several complex variables, special functions, rational approximation, potential theory, etc. Prereq., instructor consent.

MATH 8714-3, 8724-3. Topics in Logic 1 and 2. Selected advanced topics in logic or foundations to be chosen by the instructor. Prereq., instructor consent.

Seminars

Normally, about half of the following seminars are given each year. The same seminar number may be repeated for credit.

MATH 5905-1. Mathematics Teacher Training. Designed to train students to become effective teachers. Students teach a mathematics course, meeting weekly with faculty to discuss problems particular to the teaching of mathematics. Prereqs., graduate standing and experience as a teaching assistant.

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.

Mathematics Module Courses

Courses numbered 1000 through 1100 are self-paced 1-credit minicourses, or "modules," administered by the Mathematics Module Program. Certain combinations of modules are equivalent to conventional courses in college algebra, college trigonometry, and mathematics for business and social sciences, as indicated below.

MATH 1000-1. Fundamentals of College Algebra. Polynomials, lines, systems of linear equations, factoring, rational expressions, and inequalities. Students who elect to follow MATH 1000 with MATH 1010 and MATH 1020 receive the equivalent of a conventional 3-credit course in college algebra. Prereq., one year of high school algebra, or placement exam score.

MATH 1010-1. Techniques of College Algebra. Negative and fractional exponents, radicals, quadratic equations, permutations and combinations, and binomial theorem. Covers the second one-third of a conventional 3-credit course in college algebra. Prereq., MATH 1000 or placement exam score.

MATH 1020-1. Logarithmic and Exponential Functions. Functions and graphs, inverse function, theory and manipulation of logarithms and exponentials, and semi-log graphs. Covers the final one-third of a conventional 3-credit course in college algebra. Prereq., MATH 1010 or placement exam score.

MATH 1030-1. Numerical Trigonometry. Angles, trigonometric functions, numerical calculations, law of sines, law of cosines, and graphs of trigonometric functions. Students who elect to follow MATH 1030 with MATH 1040 receive the equivalent of a conventional 2-credit course in college trigonometry. Prereq., MATH 1020, or placement exam score, or 1 1/2 years of high school algebra and one year of high school geometry.

MATH 1040-1. Analytical Trigonometry. Inverse trigonometric functions, trigonometric identities, and trigonometric equations. Covers the second half of a conventional 2-credit course in college trigonometry. Prereq., MATH 1030 or placement exam score.

MATH 1050-1. Linear Equations and Matrices. Lines and linear equations, matrix methods for solving systems of linear equations, matrix algebra, matrix inversion, and applications. Students who elect to follow MATH 1050 with MATH 1060 and MATH 1070 receive the equivalent of a 3-credit course in finite mathematics for business and social sciences. Prereq., MATH 1000, or placement score for MATH 1010, or 1 1/2 years of high school algebra.

MATH 1060-1. Linear Programming. Linear inequalities, geometric method of linear programming, simplex method of linear programming, and duality principle. MATH 1060 covers the middle one-third of a standard one-semester course in finite mathematics for business and social sciences. However, MATH 1060 by itself forms a self-contained short course in linear programming, suitable for students whose backgrounds and/or placement scores indicate that they are adequately prepared. Prereq., MATH 1050 or MATH 1010, or placement score for MATH 1020, or 1 1/2 years of high school algebra.

MATH 1070-1. Combinatorics and Probability Theory. Sets and counting, permutations, combinations, random experiments, sample spaces, and calculation of probabilities. MATH 1070 provides the final one-third of a standard one-semester course in finite mathematics for business and social sciences. However, MATH 1070 by itself forms a self-contained short course in the theory of probability, which could serve as a foundation for students planning to take courses in statistics. Prereq., MATH 1060 or MATH 1000, or placement score for MATH 1010, or 1 1/2 years of high school algebra.

MATH 1080-1. Functions, Limits, and Derivatives. Functions, graphs, limits and continuity, definition of derivative, derivative formulas, higher order derivatives, and applications. Students who elect to follow MATH 1080 with MATH 1090 and MATH 1100 receive the equivalent of a conventional 3-credit course in calculus for business and social sciences. Prereq., MATH 1070 or MATH 1010, or placement score for MATH 1020, or two years of high school algebra.

MATH 1090-1. Fundamentals of Differential Calculus. Implicit differentiation, relative and absolute extrema, concavity, first and second derivative tests, asymptotes, logarithmic and exponential functions, and applications. MATH 1090 forms the middle one-third of a standard one-semester course in calculus for business and social sciences. Prereq., MATH 1080 or one semester of high school calculus.

MATH 1100-1. Fundamentals of Integral Calculus. The indefinite integral, methods of integration, differential equations, the definite integral, area under a graph, function of several variables, and applications. MATH 1100 forms the final one-third of a standard one-semester course in calculus for business and social sciences. Prereq., MATH 1090.

Spirit and Uses of Mathematics

MATH 1110-3. The Spirit and Uses of Mathematics 1. For liberal arts students and prospective elementary teachers. Includes a study of problem-solving techniques in mathematics, the uses and role of mathematics in our society, and the structure of our familiar number systems. Additional topics are chosen from number theory, ancient numeration systems, computer science, modern geometry and algebra, and elementary logic. Prereqs., one year of high school algebra and one year of geometry.

MATH 1120-3. The Spirit and Uses of Mathematics 2. Continuation of MATH 1110. Prereqs., one year of high school algebra and one year of geometry.

Quantitative Reasoning and Mathematical Skills

QRMS 1010-3. Quantitative Reasoning and Mathematical Skills. Designed to promote mathematical, scientific, and technological literacy among liberal arts students. Teaches basic mathematics and logic in the context of science, technology, and society. QRMS is not a traditional math class, but is designed to stimulate interest in and appreciation of mathematics and quantitative reasoning as valuable tools for comprehending the world in which we live. Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

QRMS 2380-3. Mathematics for the Environment. An interdisciplinary course where analysis of real phenomena such as acid rain, population growth, and road-killed rabbits in Nevada leads to consideration of certain concepts in mathematics, including differentiation, integration, and some finite mathematics. One third of the course consists of individual projects chosen by students. Prereq., proficiency in high school mathematics. Same as MATH 2380. Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

Medieval Studies

MEDV 4020-3. Medieval Studies: Texts and Contexts. Focuses on communities in the Middle Ages, discussing major literary texts and visual monuments associated with each—for example, field and town, monastery and friary, cathedral and university, Pope and emperor, crusade and pilgrimage, time and eternity. Prereqs., CLAS 1110 and 1120 *or* ENGL 2600 and 2610 *or* HIST 1010 and 1020 *or* HUMN 1010 or 1020 *or* instructor consent. Same as MEDV 5020.

MEDV 4030-3. Medieval Studies: Special Topics. Different topics offered by the faculty of the Medieval Studies Program in alternate semesters. Topics include medieval pilgrimage and literature, women in the Middle Ages, the medieval Mediterranean, medieval poetics of conversion, and Latin with laughter. Students should consult the *Registration Handbook and Schedule of Courses* and the Medieval Studies Program for specific course offerings. Prereqs., CLAS 1110 and 1120 *or* ENGL 2600 and 2610 *or* HIST 1010 and 1020 *or* HUMN 1010 or 1020 *or* instructor consent. Same as MEDV 5030.

MEDV 5020-3. Medieval Studies: Texts and Contexts. Same as MEDV 4020. Prereq., graduate standing in comparative literature, theatre, classics, or instructor consent. Recommended prereq., ability to use literary texts in their original language.

MEDV 5030-3. Medieval Studies: Special Topics. Same as MEDV 4030. Prereq., graduate standing in comparative literature, theatre, classics, or instructor consent. Recommended prereq., ability to use literary texts in their original language.

Museum

Independent Study

MUSM 4840 (1-3). Independent Study. Same as MUSM 5840.

MUSM 4900 (1-3). Independent Study. Same as MUSM 5900.

MUSM 5840 (1-3). Graduate Independent Study. Same as MUSM 4840.

MUSM 5900 (1-3). Graduate Independent Study. Same as MUSM 4900.

Museum Studies

MUSM 4011-4. Introduction to Museology. For majors in anthropology, biology, fine arts, geological sciences, history, or other museum-related subjects. Provides background in history and literature of museums, their objectives and methods; laboratory exercises in curatorship, exhibition theory, and administration. Same as MUSM 5011.

MUSM 4021-2. Selected Museum Topics. Provides framework for student projects on varied museum topics, *e.g.*, 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. Same as MUSM 5021.

MUSM 5011-3. Introduction to Museology. Same as MUSM 4011.

MUSM 5021-2. Selected Museum Topics. Same as MUSM 4021.

Anthropology

MUSM 4462-3. Museum Field Methods in Anthropology. Archaeological field techniques including excavation, mapping, recording, photography, interpretation, and field laboratory. Same as MUSM 5462.

MUSM 4932-3. Museum Internship in Anthropology. Students take part in curatorial procedures of the anthropology section of the museum: conservation, cataloguing, collection management, exhibit development, and administration. Prereq., MUSM 4011, 5011, or equivalent. Enrollment is limited: students should make arrangements during previous semester. Same as MUSM 5932.

MUSM 5462-3. Museum Field Methods in Anthropology. Same as MUSM 4462.

MUSM 5932-3. Museum Internship in Anthropology. Same as MUSM 4932.

Botany

MUSM 4933-3. Museum Internship in Botany. Students take part in curatorial procedures of the botany section of the museum: specimen preparation, labelling, identification, cataloguing, conservation, and collection management. Prereq., MUSM 4011, 5011, or equivalent. Enrollment is limited; students should make arrangements during previous semester. Same as MUSM 5933.

MUSM 5933-3. Museum Internship in Botany. Same as MUSM 4933.

Geology

MUSM 4484-3. 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. Designed for individuals who have some background in geology but little or no prior field experience. Same as MUSM 5484.

MUSM 4934-3. Museum Internship in Geology. Students take part in curatorial procedures of the geology section of the museum: field collection, specimen preparation, cataloguing, collection management, and a survey of current laws as they apply to specimens. Prereq., MUSM 4011, 5011, or equivalent. Enrollment is limited; students should make arrangements during previous semester. Same as MUSM 5934.

MUSM 5484-3. Museum Field Methods in Geology. Same as MUSM 4484.

MUSM 5934-3. Museum Internship in Geology. Same as MUSM 4934.

Zoology

MUSM 4795-3. Museum Field Methods in Zoology. Methods for observing, identifying, collecting, and preserving varieties of animal species. Course includes lectures, labs, and field trips to native lake, stream, marsh, forest, and mountain habitats. Students assemble a zoological collection. Same as MUSM 5795.

MUSM 4935-3. Museum Internship in Zoology. Students take part in basic curatorial procedures of the zoology section of the museum: relaxing, fixing, positioning, preserving, cataloguing, storing, and shipping. Also introduces students to the animal kingdom. Prereq., instructor consent. Same as MUSM 5935.

MUSM 5795-3. Museum Field Methods in Zoology. Same as MUSM 4795.

MUSM 5935-3. Museum Internship in Zoology. Same as MUSM 4935.

Entomology

MUSM 4936-3. Museum Internship in Entomology. Students take part in curatorial procedures of the entomology section of the museum: field collection, specimen preparation, labelling, identification, rearing techniques, and exhibit preparation. Prereq., MUSM 4011, 5011, or equivalent. Enrollment is limited; students should make arrangements during previous semester. Same as MUSM 5936.

MUSM 5936-3. Museum Internship in Entomology. Same as MUSM 4936.

Museography

MUSM 4927-3. Museum Internship in Techniques 1. Covers basics of modeling, molding, casting, and restoration of objects related to historical and natural history museums. Requires research, label writing, and construction of a small loan exhibit. Same as MUSM 5927.

MUSM 4937-3. Museum Internship in Techniques 2. Continuation of MUSM 4927. More advanced techniques in restoration, molding, casting, and the making of facsimile reproductions. Students have opportunity to orient their learning more toward their major field. Same as MUSM 5937.

MUSM 5927-3. Museum Internship in Techniques 1. Same as MUSM 4927.

MUSM 5937-3. Museum Internship in Techniques 2. Same as MUSM 4937.

Osteology

MUSM 4498-2. Mammalian Osteology. Identification of modern mammal bones, emphasizing skulls and mandibles of North American terrestrial genera. Same as MUSM 5498.

MUSM 5498-2. Mammalian Osteology. Same as MUSM 4498.

Music

The following courses offered in the College of Music are accepted for arts and sciences credit (see College of Music in Course Description section for full descriptions).

EMUS 1832-3. Appreciation of Music. Approved for arts and sciences core curriculum: literature and the arts.

EMUS 1852-3. Music of the Rock Era.

EMUS 2752-3. History of United States Folk and Popular Music. Approved for arts and sciences core curriculum: United States context.

EMUS 2762-3. Music and Drama. Approved for arts and sciences core curriculum: literature and the arts.

EMUS 2772-3. World Musics. Approved for arts and sciences core curriculum: cultural and gender diversity.

EMUS 3082-3. American Popular Music.

EMUS 3642-3. History of Jazz.

EMUS 3652-3. Music of the Twenty-First Century.

EMUS 3822-3. Music Literature 1. Approved for arts and sciences core curriculum: literature and the arts.

EMUS 3832-3. Music Literature 2. Approved for arts and sciences core curriculum: literature and the arts.

EMUS 4752-3. Women Composers.

EMUS 4892-3. Latin American Music.

Natural Science

NASC 1230-4. Biology: Human Approach 1. Principles of biology and their implications. Central theme is humans and the environment, emphasizing ecology, natural resource conservation, and the interrelatedness of a growing human population. Lectures, recitations, open laboratories, optional field studies. For non-science majors. Approved for arts and sciences core curriculum: natural science.

NASC 1240-4. Biology: Human Approach 2. Continuation of NASC 1230, emphasizing humans as functioning organisms. Studies organ systems including common malfunctions as part of a constant internal environment. Approved for arts and sciences core curriculum: natural science.

NASC 1250-6. Nature and Society. Uses selected general themes involving the human relationship to the environment 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. Approved for arts and sciences core curriculum: natural science.

NASC 1870 (1-3). Independent Study. Individual projects, including the opportunity to aid in staff teaching activities.

NASC 3180-3. Global Ecology. Same as EPOB 3180.

NASC 3510-3. Tropical Marine Ecology. Covers the biology and ecology of marine ecosystems emphasizing those occurring in tropical regions such as coral reefs. Studies how these ecosystems are changing and the future impact of human stress on the marine envitonment. For non-biology majors. Prereq., EPOB 1220, MCDB 1060, or NASC 1240 (equals one year of college biology). Approved for arts and sciences core curriculum: natural science.

NASC 4250-2. Coral Reef Ecology. Two-week, fall semester course beginning after Christmas. Includes one week of lectures in Boulder and one week of field studies on one of the most complex and beautiful ecosystems in the world, the Caribbean reefs at Cozumel, Mexico. Prereqs., college-level ecology course and SCUBA certification.

NASC 4870 (1-3). Independent Study.

NASC 3251-3. History of Biology. Surveys major themes in the development of biological theory from ancient times to present, emphasizing complementary roles of observation, experiment, and technical innovation, and influence of general cultural environment on scientific advance. Lectures, discussions, and readings in primary and secondary sources.

NASC 3261-3. The Darwinian Revolution. Examines origins, development, and influence of evolutionary theory. Reading, discussion, and lectures. Course paper required. Approved for arts and sciences core curriculum: natural science.

Oriental Languages and Literatures

Chinese

CHIN 1010-5. Beginning Chinese 1. Thorough introduction to modern Chinese (Mandarin), emphasizing speaking as well as reading and writing. Students learn both traditional full-form characters and the simplified versions used in mainland China.

CHIN 1020-5. Beginning Chinese 2. Continuation of CHIN 1010. Prereq., CHIN 1010.

CHIN 2020-10. Intensive Intermediate Modern Chinese. An intensive 10-week version of CHIN 2110 and 2120, offered in summer only. Prereq., CHIN 1020 or equivalent.

CHIN 2110-5. 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. Intermediate Chinese 2. Continuation of CHIN 2110. Prereq., CHIN 2110.

CHIN 3020-6. Intensive Advanced Modern Chinese. Intensive 10-week version of CHIN 3110 and 3120, offered in summer only.

CHIN 3110-3. Advanced Chinese 1. Surveys a wide variety of materials written in modern Chinese, including selections from the works of Lu Hsun, and newspaper, scholarly, and literary articles from both Taiwan and mainland China. Extensive use of video materials supplements texts. Equally emphasizes enhanced reading, writing, and oral communication skills. Prereq., CHIN 2120.

CHIN 3120-3. Advanced Chinese 2. Continuation of CHIN 3110. Prereq., CHIN 3110.

CHIN 3210-3. Introduction to Classical Chinese. Systematic introduction to the classical language based on texts from the pre-Han and Han periods. Stresses ptecise 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. Close reading of selected texts of ancient and medieval literature, both prose and poetry. Emphasizes a disciplined, philological approach to the texts, with proper attention to diction, tone, and nuance. Prereq., CHIN 3210.

CHIN 4110-3. Readings in Modern Chinese Literature 1. Surveys 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 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; course may be taken fot credit more than once. Prereq., CHIN 3220.

CHIN 4300-3. Open Topics: Readings in Chinese Literature. Intensive study of selected texts on a particular topic taught by regular or visiting faculty. Topics change each term; course may be repeated for credit once. Prereq., junior standing and instructor consent.

CHIN 4900 (1-3). Independent Study.

CHIN 4950-3. Honors Thesis.

CHIN 5010-3. Sinological Methods. Provides training in research methods for graduate work in sinology. Weekly exercises require students to use standard bibliographic sources and tools. Students use *lei-shu, ts'ung-shu,* dictionaries, dynastic histories, geographical treatises, gazetteers, and private historiography. Prereq., CHIN 3220 or equivalent.

CHIN 5210-3. Ancient Prose. Close study of selected pre-imperial and Han prose texts important in their own time and for the influence they exercised on the later development of Chinese literary history. Focuses on works such as the *Lun yü, Meng tzu, Chuang tzu, Huai-nan tzu, Shih chi, Han shu,* and *Lun heng.* Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5220-3. Ancient Poetry. Close study of selected pre-imperial and Han poetic works important in their own time and for the influence they exercised on the later development of Chinese literary history. Focuses on the *Shih ching* and the *Ch'u tz'u,* as well as the *fu* and *shih* of Han writers. Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5280-3. Topics in Ancient Literature. Close study of a specific problem or issue in ancient literature, e.g., early Chinese views and formulations of language's relationship to reality, or the commentary tradition and the emergence of allegorical and metaphysical approaches to interpreting texts. Topics vary from year to year. May be taken for credit twice. Preteq., CHIN 3220 or equivalent.

CHIN 5410-3. Medieval Prose. Close study of selected Six Dynasties and T'ang prose works, emphasizing major writers and texts. Covers works written in both parallel prose and the *ku-wen* ("old style") form. Individual writers include Wang Hsi-chih, T'ao Ch'ien, Li Hua, Han Yü, Liu Tsung-yuan, and Liu Yü-hsi. In addition, selected works from the anecdotal records are read. Texts and selections vary from year to year.

May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5420-3. Medieval Poetry. Close study of selected works of Six Dynasties and T'ang poetry. Studies major figures, prosodic and stylistic variations, and the culturally revealing relationship of poetry to the natural and supernatural world of medieval China. Focuses on poets such as Hsieh Ling-yün, T'ao Ch'ien, Shen Yüeh, Wang Wei, Li Po, Tu Fu, as well as important medieval anthologies of verse. Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5430-3. Medieval Thought and Religion. Close study of selected works of Six Dynasties and T'ang intellectual and religious inspiration, important in the development of the medieval Chinese world view and for their role in medieval Chinese literature. Focuses on fundamental texts of both literary and religious value from the Taoist and Buddhist canons, such as the *Huang-t'ing ching*, *Chen kao, Miao-fa lien-hua ching,* and *T'an ching.* Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5480-3. Topics in Medieval Literature. Close study of a specific problem or issue in medieval literature, e.g., the role of encyclopedias and anthologies in literary training, the place and forms of literary composition at the imperial court, etc. Topics vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5610-3. Early Modern Prose. Close study of Sung, Ming, and Ch'ing prose texts selected for their inherent literary merit and for their significance in the Chinese literary tradition. Typically focuses on works by major authors such as Ou-yang Hsiu, Su Shih, and Yüan Hung-tao. Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5620-3. Early Modern Poetry. Close study of Sung, Yüan, Ming, and Ch'ing poetry. Stresses major figures, stylistic variations, various "poetry schools," new directions in *shih* verse, and the rise and development of *tz'u.* Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5630-3. Early Modern Fiction. Close study of selected vernacular and classical fiction of the Ming and Ch'ing periods. Normally focuses on long novels such as *Hsi-yu chi, San-kuo yen-i, Shui-hu chuan, Chin P'ing Mei,* as well as short fiction by Feng Meng-lung and Ling Meng-ch'u. Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5680-3. Topics in Early Modern Literature. Close study of a specific problem or issue in early modern literature, e.g., the relationships among religion, folklore, and early fiction; the issue of genre and traditional fiction; the role of elite versus popular cultures in the composition of fiction; and the relationship of the state and censorship and the southern philosophical schools to the publication of fiction. Topics vary from year to year. May be taken for credit twice. Prereq., CHIN 3220 or equivalent.

CHIN 5810-3. Modern Literature. Close study of selected texts in various genres of Chinese literature from the May Fourth period (beginning ca. 1917) to the establishment of the People's Republic of China (1949). Focuses on major and influential works produced in this fertile period of experimentation with Western, modernist types of literature. Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 4120 or equivalent.

CHIN 5820-3. Contemporary Literature. Close study of selected texts in various genres of Chinese literature from 1949 (the establishment of the People's Republic of China) to the present. Focuses on major works from the very different literary worlds of Taiwan and mainland China. Texts and selections vary from year to year. May be taken for credit twice. Prereq., CHIN 4120 or equivalent.

CHIN 5880-3. Topics in Twentieth-Century Literature. Close study of a specific problem or issue in twentieth-century literature, e.g., feminist fiction in China, modernism in fiction and poetry, and the role of literary criticism in modern literature. Topics vary from year to year. May be taken for credit twice. Prereq., CHIN 4120 or equivalent.

CHIN 5900 (1-3). Independent Study.

Chinese Courses in English

The following courses require no knowledge of Chinese.

CHIN 1051-3. Masterpieces of Chinese Literature in Translation. Surveys Chinese thought and culture through careful reading and discussion of selected masterworks of Chinese literature in acceptable translation. Texts include significant works of poetry and fiction, and philosophical and historical writings from various eras. Taught in English. Approved for arts and sciences core curriculum: literature and the arts.

CHIN 4811-3. Worlds of Ancient and Medieval Poetry. Lectures and discussion. Studies ancient and medieval Chinese poetry, with special emphasis on the great masters of the T'ang (618-907) dynasty. Studies the unique cultural setting of the worlds inhabited and created by the poets—particularly relations with Taoism, Buddhism, natural history, and astral domains. Attention is focused on not merely what a poem says, but on how it says it. Taught in English. Prereq., junior standing.

CHIN 4821-3. Chinese Fiction in Translation. Lectures and discussion. Studies representative samples of Chinese fiction, ranging from medieval short stories and anecdotes written in classical language to longer, more involved, vernacular stories and novels of the Ming (1368-1644) and Ch'ing (1644-1911) dynasties. Special emphasis placed on tracing development of fiction in terms of narrative stance, characterization, and plot, as well as on comparisons between different genres of Chinese imaginative writing. Taught in English. Prereq., junior standing.

CHIN 4841-3. Women and the Supernatural in Chinese Literature. Explores the relationship between the worlds of women and the supernatural in Chinese literature, from ancient to modern times. Focuses on selected significant works of classical and vernacular fiction, religious texts, and poetry (read in acceptable translations). Studies the variety of ways in which the folklore of the feminine is shaped and recast in different verbal creations and in different periods. Taught in English. Prereq., junior standing.

CHIN 4851-3. Twentieth-Century Literature in Translation. Explores the world of twentieth-century Chinese literature. Areas of interest include the characteristics of that literature; change in response to the introduction of outside interests and national demands; literature and society; and tradition versus modernization. Studies works in all literary genres. Taught in English. Prereq., junior standing.

Japanese

JPNS 1010-5. Beginning Japanese 1. Thorough introduction to modern Japanese, emphasizing speaking as well as reading and writing.

JPNS 1020-5. Beginning Japanese 2. Continuation of JPNS 1010. Prereq., JPNS 1010.

JPNS 1120-10. Intensive Beginning Japanese. An intensive 10-week version of JPNS 1010 and 1020, offered in summer only.

JPNS 2020-10. Intensive Intermediate Japanese. An intensive 10-week version of JPNS 2110 and 2120, offered in summer only. Prereq., JPNS 1020 or equivalent.

JPNS 2110-5. Intermediate Japanese 1. Reading, speaking, and writing modern Japanese, including continued study of *kanji.* Prereq., JPNS 1020.

JPNS 2120-5. Intermediate Japanese 2. Continuation of JPNS 2110. Prereq., JPNS 2110.

JPNS 3020-6. Intensive Advanced Modern Japanese. Intensive 10-week version of JPNS 3110 and 3120, offered in summer only.

JPNS 3110-3. Advanced Japanese 1. Develops competence in reading and discussing a wide variety of materials by contemporary Japanese writers. Prereq., JPNS 2120.

JPNS 3120-3. Advanced Japanese 2. Continuation of JPNS 3110. Prereq., JPNS 3110.

JPNS 4110-3. Readings in Classical and Modern Japanese 1. Studies 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 (1-3). Independent Study.

JPNS 4950-3. Honors Thesis.

Japanese Courses in English

The following courses require no knowledge of Japanese.

JPNS 1051-3. Masterpieces of Japanese Literature in Translation. Surveys Japanese thought and culture through careful reading and discussion of selected masterworks of Japanese

literature in translation. Texts include significant works of poetry, fiction, drama, diaries, and essays, from ancient times to the Meiji Restoration. Taught in English. Approved for arts and sciences core curriculum: literature and the arts.

JPNS 3441-3. Language and Japanese Society. Deals with major linguistic characteristics of Japanese as a medium of communication. Discusses complex linguistic processing of social status and empathy relationships, for example, with reference to the structure of Japanese society from ancient to contemporary times. Prereq., JPNS 2120.

JPNS 4811-3. Classical Japanese Literature in Translation. Studies major works of classical literature, both poetry and prose, from the earliest period to the mid-nineteenth century. Taught in English. Prereq., junior standing.

JPNS 4821-3. Modern Japanese Literature in Translation. Studies major works of modern literature, both poetry and prose, from the Meiji period (1868-1912) through the postwar period (World War II). Taught in English. Prereq., junior standing.

Philosophy

Specific class content varies by semester. Complete course descriptions are available each semester from the philosophy department, Hellems 169. Courses at the 1000 and 2000 levels have no prerequisites.

PHIL 1000-3. Introduction to Philosophy. Introduces fundamental questions of philosophy. Approved for arts and sciences core curriculum: ideals and values.

PHIL 1010-3. Historical Introduction to Philosophy: Classical Western Thought. Develops three related themes: the emergence in antiquity of a peculiarly scientific mode of thinking; the place of religious belief within this developing scientific world view; and the force of ethical speculation within the culture and political climates of ancient Greece and Rome. PHIL 1010 and 1020 may be taken in either order. Approved for arts and sciences core curriculum: historical context.

PHIL 1020-3. Historical Introduction to Philosophy: Modern Western Thought. Introduces several philosophical texts and doctrines of seventeenth- and eighteenth-century Europe. Gives special attention to the connection between philosophical ideas and the wider historical milieu—social, political, and literary. PHIL 1010 and 1020 may be taken in either order. Approved for arts and sciences core curriculum: historical context.

PHIL 1100-3. Ethics. Introductory study of major philosophies on the nature of the good for humanity, principles of evaluation, and moral choice. Approved for arts and sciences core curriculum: ideals and values.

PHIL 1200-3. Philosophy and Society. Introduces philosophical thought through critical analysis of our own society, its institutions, and principles. Approved for arts and sciences core curriculum: United States context, or ideals and values.

PHIL 1300-3. Ways of Knowing. Introductory study of the nature and sources of knowledge and related topics.

PHIL 1400-3. Philosophy and the Sciences. Considers philosophical topics and concepts related to the natural sciences, such as science and pseudo-science; scientific method; the nature of explanation, theory, confirmation, and falsification; effect of science on basic concepts like mind, freedom, time, and causality; ethics of experimentation; and the relation of science to society. Approved for arts and sciences core curriculum: natural science.

PHIL 1440-3. Introductory Logic. Introductory study of definition, informal fallacies, and the principles and standards of correct reasoning. Provides practice in analyzing, evaluating, and constructing frequently encountered types of arguments. Does not fulfill major requirement in logic.

PHIL 1600-3. Philosophy and Religion. Philosophical introduction to some of the central concepts and beliefs of religious traditions, focusing particularly on the question of the existence of God and on the relation between religious beliefs and moral beliefs. Approved for arts and sciences core curriculum: ideals and values.

PHIL 1700-3. Philosophy and the Arts. Considers 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. Introduces philosophy through literature. Selected novels, plays, and short stories that exemplify traditional problems in philosophy are read and discussed.

PHIL 1800-3. Open Topics in Philosophy. Variety of new courses at the introductory level. See current departmental announcements for specific content.

PHIL 1840 through 1900 (1-3). Independent Study. Prereq., 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. Nature of Law. Examines basic principles and values embodied in the United States legal system. Approved for arts and sciences core curriculum: United States context.

PHIL 2230-3. Law and Morality. Examines selected problems concerning the relation between law and morality, such as capital punishment, pornography, and civil disobedience. Approved for arts and sciences core curriculum: contemporary societies.

PHIL 2290-3. Philosophy and Women. Explores different approaches to the study of women. Same as WMST 2290. Approved for arts and sciences core curriculum: cultural and gender diversity.

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. First course in mathematical logic. Topics include sentential logic, the logic of quantification, and some of the basic concepts and results of metalogic (interpretations, validity, and soundness).

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 (1-3). Independent Study. Prereq., sophomore standing.

All courses at the 3000 level require 6 hours of philosophy unless otherwise indicated.

PHIL 3000-3. History of Ancient Philosophy. Ancient and medieval. Approved for arts and sciences core curriculum: historical context.

PHIL 3010-3. History of Modern Philosophy. Approved for arts and sciences core curriculum: historical context.

PHIL 3100-3. Ethical Theory. Studies major issues and theories in ethics.

PHIL 3140-3. Environmental Ethics. Examines 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. Approved for arts and sciences core curriculum: ideals and values.

PHIL 3160-3. Ethical Issues in Medicine. Analysis of ethical problems involved in such issues as abortion, euthanasia, organ transplants, eugenics, treatment of the patient as a person, and the institutional nature of the health care delivery system. Prereq., upper-division standing.

PHIL 3180-3. Critical Thinking: Contemporary Topics. Looks at a selected topic such as nuclear disarmament, racial and sexual discrimination, animal rights, or abortion and euthanasia by examining issues through the lens of critical philosophical analysis. Reviews the reasoning behind espoused positions and the logical connections and argument forms they contain. Approved for arts and sciences core curriculum: critical thinking.

PHIL 3190-3. War and Morality. Focuses on moral issues raised by war as a human institution. What are the justifications, limits, and alternatives? Does the advent of nuclear weapons change the nature of war? Approved for arts and sciences core curriculum: ideals and values.

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. Examines international human rights movement and the philosophical issues it raises. Topics include history and documents of the human rights movement, nature and grounds of human rights, skeptical doubts about human rights, and relevance of human rights to foreign policy. Prereq., upper-division standing.

PHIL 3360-3. Models of Medicine. Examines such problems as the nature of and evidence for current medical models; the roots of modern medicine in Greek thought; alternative models of medicine (shamanistic, Eastern, holistic); medical model and psychoanalytic therapies; concepts of mental health and physical health; relation of medical and therapeutic models to theories of human nature.

PHIL 3410-3. History of Science: Ancients to Newton. Surveys the history of science up to Newton, including the emergence of scientific modes of thinking from religious and philosophical roots in the Near East and Greece to the development of these modes in the Middle Ages and Renaissance. Culminates with Isaac Newton and the seventeenth-century scientific revolution. Approved for arts and sciences core curriculum: historical context, or natural science.

PHIL 3430-3. History of Science: Newton to Einstein. 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 success of the mechanical philosophy of nature and its problems. Approved for arts and sciences core curriculum: historical context, or natural science.

PHIL 3440-3. Perspectives of Twentieth-Century Science. 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.

PHIL 3480-3. Critical Thinking in Philosophy. Introduces critical reasoning through a discussion of several major philosophical issues and arguments. Stresses rigorous analysis of concepts and evaluation of inferences and arguments. Approved for arts and sciences core curriculum: critical thinking.

PHIL 3600-3. Philosophy of Religion. Philosophical discussion of fundamental issues in religion, such as existence of God, religious experience, faith and reason, evil, immortality, and religious language.

PHIL 3610-3. From Paganism to Christianity. Treats the history of Greek and Roman religion from its Bronze Age origins through the rise of Christianity. Same as CLAS 3610.

PHIL 3700-3. Aesthetic Theory. Introduces major theories of aesthetics and contemporary discussions of problems in aesthetics, e.g., the nature of art, and the problem of evaluations in art.

PHIL 3800-3. Open Topics in Philosophy. Variety of new courses at the 3000 level. See current departmental announcements for specific content.

PHIL 3840 through 3900 (1-3). Independent Study. Prereq., 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. Selections from four or five major nineteenth-century figures such as Hegel, Schopenhauer, Marx, J. S. Mill, Kierkegaard, Nietzsche, and Dostoevsky.

PHIL 4040-3. Studies in Twentieth-Century Philosophy. Studies two or three major philosophies prominent during the present century.

PHIL 4070-3. Existentialist Philosophy. Examines central figures and texts in the existential tradition, from Kierkegaard and Nietzsche to Heidegger and Sartre.

PHIL 4080-3. Introduction to Phenomenology. Examines the contribution of phenomenology to selected topics in theory of meaning, philosophy of mind, ontology, and epistemology through a study of such philosophers as Husserl, Heidegger, Sartre, and Merleau-Ponty.

PHIL 4090-3. 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. Same as PHIL 5090.

PHIL 4210-3. Ancient Political Thought. Same as CLAS 4041, HIST 4041, and PSCI 4094.

PHIL 4250-3. Marxism. Historical and systematic study of principal themes of Marxist thought, from its Hegelian origins to its contemporary varieties, emphasizing in particular the works of Marx and Engels themselves.

PHIL 4260-3. Philosophy of Law. Considers various views of the nature of law, its role in society, and its relation to other disciplines. Investigation of philosophic commitments that underlie and affect legal conceptions and procedures. Same as PHIL 5260.

PHIL 4300-3. Philosophy of Mind. Discusses problems in the philosophy of mind, including the mind-body problem, knowledge of other minds, compatibility of free will and determinism, with such concepts as action, intention, desire, enjoyment, memory, imagination, dreaming, and knowledge. Same as PHIL 5300.

PHIL 4340-3. Epistemology. Studies some of the main topics of theory of knowledge, such as evidence, justification, prediction, explanation, skepticism, and concept acquisition. Prereq., six hours of philosophy, including one of the following, PHIL 2440, 3000, or 3010. Same as PHIL 5340.

PHIL 4360-3. Metaphysics. Traditional and contemporary theories of the basic categories of reality and the human relationship to it, including universals, substance identity, change, mind and body, free will, and modality. Prereq., six hours of philosophy, including one of the following: PHIL 2440, 3000, or 3010. Same as PHIL 5360.

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 4390-3. 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. Same as PHIL 5390.

PHIL 4400-3. Philosophy of Science. Examines major concepts and problems of scientific thought: explanation, confirmation, causality, measurement, and theory construction. Same as PHIL 5400.

PHIL 4440-3. Mathematical Logic. Introduces the fundamental concepts and procedures of mathematical logic. Prereq., PHIL 2440 or equivalent. Same as PHIL 5440.

PHIL 4450-3. History and Philosophy of Physics. Investigates the role of experiment in physics. Uses case studies in the history and philosophy of physics and in scientific methodology. Prereq., one year of physics or instructor consent. Same as PHIL 5450 and PHYS 4450. Approved for arts and sciences core curriculum: critical thinking.

PHIL 4490-3. Philosophy of Language. Examines 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. Relevant literature includes readings in Frege, Russell, Quine, Putnam, Kripke, and Chomsky. Same as PHIL 5490.

PHIL 4600-1. Theology Forum Seminar. Discusses 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 4730-3. Philosophy and Literature. Examines various relations between philosophy and literature, ranging from the direct incorporation of philosophical doctrine into literature to literature as a distinctive way of practicing philosophy.

PHIL 4800-3. Open Topics in Philosophy. A variety of new courses at the 4000 level. See current departmental announcements for specific content.

PHIL 4830-3. Senior Seminar in Philosophy. Critical in-depth examination of a selected philosophical topic. Prereq., 15 hours in philosophy. Approved for arts and sciences core curriculum: critical thinking.

PHIL 4840 through 4900 (1-3). Independent Study. Prereq., senior standing.

PHIL 4930-3. Honors Thesis.

PHIL 4950-3. Honors Thesis.

All courses at the 5000 and 6000 levels require graduate standing unless otherwise indicated.

PHIL 5020-3. Topics in the History of Philosophy.

PHIL 5080-3. Philosophy of Plato. Same as CLAS 5800.

PHIL 5081-3. Philosophy of Aristotle. Same as 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 5090-3. Kierkegaard. Same as PHIL 4090.

PHIL 5091-3. Philosophy of St. Thomas Aquinas. Studies the major writings of St. Thomas.

PHIL 5092-3. Philosophy of Husserl.

PHIL 5100-3. Ethics. Presents representative positions in normative ethics and metaethics.

PHIL 5200-3. Social and Political Philosophy. Systematic study of traditional and current theories of philosophical justification of kinds of social and political orders.

PHIL 5210-3. Philosophy and Social Policy. Studies philosophical approaches to social and political issues such as abortion, bioethics, environmental preservation, human rights, and reverse discrimination. Gives attention to 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 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: Philosophical examination of several different approaches to environmental problems: economic, juridical, political, and ecological. Discusses specific environmental problems, focusing on their moral dimensions, e.g., wilderness preservation, animal rights, and land use and urban planning.

PHIL 5260-3. Philosophy of Law. Same as PHIL 4260.

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. Same as PHIL 4300.

PHIL 5340-3. Epistemology. Same as PHIL 4340.

PHIL 5350-3. Analytic Philosophy. Surveys representative philosophers, methods, or problems in the twentieth-century analytic tradition.

PHIL 5360-3. Metaphysics. Same as PHIL 4360.

PHIL 5390-3. Philosophy and Psychological Theory. Same as PHIL 4390.

PHIL 5400-3. Philosophy of Science. Same as PHIL 4400.

PHIL 5440-3. Mathematical Logic. Same as PHIL 4440.

PHIL 5450-3. History and Philosophy of Physics. Same as PHIL 4450 and PHYS 5450.

PHIL 5490-3. Philosophy of Language. Same as PHIL 4490.

PHIL 5600-3. Philosophy of Religion. Studies topics falling under 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. Analyzes the principal topics of aesthetics, including such issues as formal structure of aesthetics, the nature of critical judgments, and the status of the work of art.

PHIL 5800-3. Open Topics in Philosophy. Variety of new courses at the 5000 level. See current departmental announcements for specific content.

PHIL 5810-3. Special Topics in Philosophy. Instructor meets regularly with three or more students to discuss special topics in philosophy.

PHIL 5840 through 5900 (1-3). Graduate Independent Study.

PHIL 6040-3. Seminar: Phenomenology.

PHIL 6050-3. Seminar in Continental Philosophy.

PHIL 6340-3. Seminar in Epistemology. Studies some of the main topics of epistemology, such as skepticism, foundations of knowledge, perception, introspection, belief, certainty, and analytic-synthetic distinctions.

PHIL 6360-3. Seminar in 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 6400-3. Seminar in Philosophy of Science. Topics connected with development of 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 6490-3. Seminar in Philosophy of Language. Studies 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 6940-3. Master's Candidate for Degree.

PHIL 6950 (1-6). Master's Thesis.

PHIL 6960-3. Master's Research.

PHIL 7840 through 7900 (1-3). Doctoral Independent Study.

PHIL 8990-10. 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.

Physics

PHYS 1000-3. Preparatory Physics. Introduces basic physics, emphasizing an analytical approach that prepares students for PHYS 1110, 1120, and 1140, *or* PHYS 2010 and 2020. Satisfies the MAPS requirement in natural science. Prereq., one year of high school algebra or equivalent. Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

PHYS 1010-3. Physical Science for Nonscientists 1. Lect. Topics range from Newtonian mechanics to modern physics. Requires quantitative work and laboratory experience. Prereq., high school algebra. Approved for arts and sciences core curriculum: natural science.

PHYS 1020-4. Physical Science for Nonscientists 2. Three lect., one two-hour lab per week. Covers waves, electromagnetism, light, relativity, origins of atomic theory, quantum physics, and subatomic physics. Requires quantitative work and laboratory experience. Prereqs., high school algebra and PHYS 1010. Approved for arts and sciences core curriculum: natural science.

PHYS 1110-4. General Physics 1. Three lect., one rec. per week, plus three evening exams in the semester. First semester of three-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. Approved for arts and sciences core curriculum: natural science.

PHYS 1120-4. General Physics 2. Three lect., one rec. per week, plus three evening exams in the semester. Second semester of three-semester introductory sequence for science and engineering students. Covers electricity and magnetism, wave motion, and optics. Normally is taken concurrently with PHYS 1140, but not required. Prereq., PHYS 1110; coreq., MATH 2300 or APPM 1360 or 1362. Approved for arts and sciences core curriculum: natural science.

PHYS 1140-1. Experimental Physics 1. One lect., one 2-hour lab per week. Normally is taken concurrently with PHYS 1120, but not required. Approved for arts and sciences core curriculum: natural science.

PHYS 1150-1. Experimental Physics 2. One lect., one 2-hour lab per week. To be taken concurrently with PHYS 1140 and PHYS 1120. For physics majors in plan 3. Registration by special arrangement with lecturer in PHYS 1140.

PHYS 2010-5, 2020-5. General Physics 1 and 2. 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. Elementary but thorough presentation of fundamental facts and principles of physics. Natural science majors with a knowledge of calculus 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. Approved for arts and sciences core curriculum: natural science.

PHYS 2130-3. General Physics 3. Lect. Third semester of introductory sequence for science and engineering students except physics majors and those studying computer applications in physics (for these, see PHYS 2170 below). Covers special relativity, quantum theory, atomic physics, solid state, and nuclear physics. Physics majors should take the PHYS 2140-2170 sequence instead of the PHYS 2130-2140 sequence. Prereqs., PHYS 1120 and PHYS 1140; coreq., MATH 2400. Normally taken with PHYS 2150, but not required.

PHYS 2140-3. Methods of Theoretical Physics. Lect. Introduces mathematical techniques required for a quantitative understanding of phenomena of modern physics, including vector algebra and vector calculus, Fourier analysis, and some differential equations of physics. Prereq., PHYS 1120; coreq., MATH 2400 or APPM 2350.

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. Normally taken concurrently with PHYS 2130, but not required.

PHYS 2160-1. Experimental Physics. One lect., one 2-hour lab per week. To be taken concurrently with PHYS 2150 and PHYS 2130. For physics majors in plan 3. Registration by special arrangement with lecturer in PHYS 2150.

PHYS 2170-3. Foundations of Modern Physics. Three lect. per week. For physics majors in plans 1 & 2 and those studying computer applications in physics. Completes the three-semester sequence of general physics. Emphasizes developing skills for physics majors. Includes relativity, quantum mechanics, atomic structure. Normally taken with the laboratory PHYS 2150. Prereq., PHYS 2140. Coreq., MATH 2400 or APPM 2350.

PHYS 2810, 2820, 2830 (1-3). 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 (1-3). Independent Study. Selected topics for undergraduate independent study. Subject matter to be arranged.

PHYS 3070-3. Energy in a Technical Society. Lect. Various aspects of energy: the physics involved in 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. Approved for arts and sciences core curriculum: natural science.

PHYS 3080-3. The Physics of Contemporary Social Problems. Lect. Various contemporary areas of concern such as air and water pollution, transportation, resources, and communications are discussed from the point of view of physical principles involved and impact on society. Course object is to understand scientific questions involved in making decisions in these areas. No background in physics is required. Approved for arts and sciences core curriculum: natural science.

PHYS 3210-3. Analytical Mechanics. Lect. Covers Newtonian mechanics, including rigid body motion, coupled oscillators, central forces and scattering, and provides introduction to Lagrange's and Hamilton's equations. Prereqs., PHYS 2140 and APPM 2360 or equivalent.

PHYS 3220-3. Quantum Mechanics. Lect. Provides introduction to quantum mechanics with simple solutions to the Schroedinger 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. Covers mathematical theory of electricity and magnetism, including electrostatics, magnetostatics, and polarized media, and provides an introduction to electromagnetic fields, waves, and special relativity. Prereq., for PHYS 3310 is PHYS 2130 or 2140, or instructor consent; coreq., PHYS 3210. Prereq. for PHYS 3320 is PHYS 3310.

PHYS 3330-2, 3340-3. 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. Emphasizes developing basic skills and design of experiments. Each student conducts 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 3340 approved for arts and sciences core curriculum: critical thinking.

PHYS 4150-3. Introduction to Plasma Physics. Same as APAS 4150.

PHYS 4230-3. Thermodynamics and Statistical Mechanics. Statistical mechanics applied to macroscopic physical systems; statistical thermodynamics, classical thermodynamic systems; applications to simple systems. Examines relationship of statistical to thermodynamic points of view. Prereqs., PHYS 3210 and APPM 2360.

PHYS 4300-3. Dynamics of Fluids. Same as APAS 4300.

PHYS 4340-3. Solid-State Physics. Primarily for senior physics majors. Discusses crystal structure lattice dynamics, band theory, semiconductors, and ferromagnetism. Prereqs., PHYS 3220 and 4230.

PHYS 4410-3, 4420-3. Atomic and Nuclear Physics 1 and 2. Topics include 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. Prereqs. for PHYS 4410 are *C* or better in PHYS 3220 and PHYS 3320, or instructor consent. Prereq. for PHYS 4420 is PHYS 4410. PHYS 4420 approved for arts and sciences core curriculum: critical thinking.

PHYS 4430-2. Senior Laboratory. One lect., one lab per week to be taken with PHYS 4410. Experiments introduce students to realities of experimental physics so that they gain a better understanding of theory and an appreciation of the vast amount of experimental work done in the physical sciences today. Prereq., PHYS 3330; coreq., PHYS 4410.

PHYS 4450-3. History and Philosophy of Physics. Investigates the role of experiment in physics. Includes case studies in the history and philosophy of physics and in scientific methodology. Prereq., one year of physics or instructor consent. Same as PHYS 5450 and PHIL 4450. Approved for arts and sciences core curriculum: critical thinking.

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 4610-2, 4620-2. Physics Honors.

PHYS 4810, 4820, 4830 (1-3). 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 (1-3). Independent Study. Selected topics for undergraduate independent study. Subject matter to be arranged.

PHYS 4970-2. Seminar on Physical Methods in Biology. Same as PHYS 5970, MCDB 4970, and MCDB 5970.

PHYS 5000-1. Seminar in Plasma Physics. Same as APAS 5000.

PHYS 5030-3, 5040-3. Intermediate Mathematical Physics 1 and 2. Surveys 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. Same as MATH 5030 and MATH 5040.

PHYS 5150-3. Introductory Plasma Physics. Same as APAS 5150.

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. Same as APAS 5220.

PHYS 5250-3, 5260-3. Introduction to Quantum Mechanics 1 and 2. Quantum phenomena, relation to classical physics, Schroedinger 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 7310.

PHYS 5430-2. Modern Physics Laboratory. One lect., one lab per week. Experiments in nuclear physics, atomic physics, and condensed matter introduce student to variery of techniques useful in contemporary research.

Recommended fot students with limited background in lab work.

PHYS 5450-3. History and Philosophy of Physics. Same as PHYS 4450 and PHIL 5450.

PHYS 5770-3. Gravitational Theory (Theory of General Relativity). Lect. Presents Einstein's relativistic theory of gravitation from geometric viewpoint; gives applications to astrophysical problems (gravitational waves, stellar collapse, etc.).

PHYS 5840, 5850, 5860 (1-3). Selected Topics for Graduate Independent Study. Subject matter to be arranged.

PHYS 5970-2. Seminar: Physical Methods in Biology. Same as PHYS 4970.

PHYS 6610-3. Earth and Planetary Physics 1. Same as GEOL 6610 and APAS 6610.

PHYS 6620-3. Earth and Planetary Physics 2. Same as GEOL 6620 and APAS 6620.

PHYS 6630-3. Earth and Planetary Physics 3. Same as GEOL 6630 and APAS 6630.

PHYS 6650 (1-3). Seminar in Geophysics. Same as GEOL 6650 and APAS 6650.

PHYS 6660-3. Geophysical Instrumentation. Same as GEOL 6660.

PHYS 6680-3. Dynamics of Continuous Media. Same as MCEN 7183 and GEOL 6680.

PHYS 6690-3. Advanced Seismology. Same as GEOL 6690.

PHYS 6940 (1-3). Master's Degree Candidate.

PHYS 6950 (4-6). Master's Thesis. 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 expected.

PHYS 7030-3, 7040-3. Advanced Mathematical Physics 1 and 2. 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. Same as MATH 7030, 7040.

PHYS 7160-3. Intermediate Plasma Physics. 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. Same as APAS 7160.

PHYS 7230-3. Statistical Mechanics. Classical and quantum statistical theory, including study of both equilibrium and nonequilibrium systems. Topics covered include kinetic theory, degenerate gases, macrocanonical and grand canonical ensembles, and irreversible processes. Prereqs., PHYS 5250 and 5260.

PHYS 7240-3. Advanced Statistical Mechanics. Introduces 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 7230.

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. Prereq. for PHYS 7310 is PHYS 7030.

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 7530-3. Topics in Chemical Physics. Broad survey 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. Nuclear Physics. Intrinsic properties of nuclei 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 (1-3). 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 (1-3). Selected Topics for Graduate Independent Study. Subject matter to be arranged.

PHYS 8990 (1-10). 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.

Political Science

American

PSCI 1101-3. The American Political System. Emphasizes interrelations among levels and branches of government, formal and informal institutions, processes, and behavior. Approved for arts and sciences core curriculum: contemporary societies, or United States context.

PSCI 2101-3. Introduction to Public Policy Analysis. Studies policy-making processes in American government, factors shaping public decision, and issues and questions relevant to political inquiry.

PSCI 2111-3. Introduction to Urban Studies. Surveys different perspectives on urbanization and urban life from an interdisciplinary perspective, emphasizing the economic, spatial, and political dimensions of urban conditions and their planning and policy implications. Required for the certificate in urban studies.

PSCI 2481-3. Introduction to the Legal Process. Basic legal concepts and processes emphasizing the American system. Special attention to political functions of law. Recommended as preparation for PSCI 4241, 4251, 4261.

PSCI 4001-3. Government Regulation of Business. Considers 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 constitutional and institutional foundations and historical development of the presidency; roles, powers, selection, recent modifications, and institutionalization. Utilizes lectures and class discussion.

PSCI 4021-3. Legislatures and Legislation. Structure and organization of legislatures and process of statute lawmaking. Approved for arts and sciences core curriculum: United States context.

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 intensive examination of the role of Congress in American government, including congressional elections, representation, the organization of Congress, and congressional policy making. Examines larger context of congressional politics, including political parties, the president, and interest groups.

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 given to the government of Colorado. Approved for arts and sciences core curriculum: United States context.

PSCI 4071-3. Urban Politics. Examines structure of political, social, and economic influence in urban areas; relationship of the political system to governmental, social, and economic institutions; and the contemporary policy processes in American cities. Approved for arts and sciences core curriculum: United States context.

PSCI 4091-3. Comparative Urban Politics. Comparative analysis of the major metropolitan system in advanced industrial, socialist, and Third World countries. Special attention given to political and economic factors shaping urbanization processes and distinctive policy issues in these different settings.

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. Same as BLST 4101. Approved for arts and sciences core curriculum: cultural and gender diversity, or contemporary societies.

PSCI 4111-3. Urban Policy Analysis. Examines 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 economic vitality.

PSCI 4121-3. War, Peace, and Strategic Defense. Role of force in American foreign policy, especially in relation to other superpowers. Particular emphasis placed on political and economic analysis of strategic forces and their effects. Studies arms control treaties and negotiations.

PSCI 4131-3. Latinos and the American Political System. Examines the political status and activities of Mexican Americans and other Latino groups (Cuban Americans and Puerto Ricans) in the U.S. Presents theoretical frameworks. Also covers historical experiences and socioeconomic status of several Latino groups; Latino political attitudes and behaviors; Latino efforts to influence the major national, state, and local institutions of the American government; and public policy concerns of Latinos. Same as CHST 4133. Approved for arts and sciences core curriculum: cultural and gender diversity.

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 4151-3. Political Socialization. Examines the social and cultural forces that teach people their status in society along with appropriate values, norms, and behaviors.

PSCI 4161-3. Political Ethics in Policy Analysis. Explores alternative ways of understanding public problems and their solutions, and exposes underlying ethical principles to critical examination.

PSCI 4171-3. Government and Capitalism in the United States. Examines competing theoretical approaches to questions related to origins, development, and purposes of modern government in the United States; particular attention paid to impact of transformations in the underlying structure of the capitalist economy. Approved for arts and sciences core curriculum: United States context.

PSCI 4181-3. Public Administration. Considers power of organization, problem of bureaucracy, determination of organizational objectives, decision making, allocation of resources, organizational structure, staffing problems, and the evaluation of institutional performance.

PSCI 4191-3. National Security Organization and Policy Making. Analyzes how the American governmental and political system is structured to define, select, and implement national security policies. Examines roles of President, Congress, bureaucracy, interest groups, and other actors. Prereq., PSCI 1101 or instructor consent.

PSCI 4201-3. The Environment and Public Policy. Considers constitutional, political, and geographic factors in development of public policy affecting 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. Discusses how governments in the American political system raise revenues, and for what purposes these revenues are spent. Roles of executives, legislatures, interest groups, bureaucracies, and public opinion. Prereq., PSCI 1101 or instructor consent.

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, and 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 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 instructor consent.

PSCI 4261-3. The Judicial System. Examines principal actors in the legal system—police, lawyers, judges, citizens—and roles they play in the political process. Examines differential treatment of varying economic groups.

PSCI 4271-3. Sex Discrimination: Constitutional Issues. Examines continuity and change in 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. Same as WMST 4271.

PSCI 4291-3. Sex Discrimination: Federal and State Law. Examines continuity and change in legal treatment of sex and gender. Using the case method, course focuses on family law, education equity, employment law, and gender-related criminal law. Same as WMST 4291.

PSCI 4301-3. Symbolic Politics. Introduces uses and abuses of symbols as instruments and indicators of political change. Prereq., PSCI 1101.

PSCI 4311-3. Space Policy. Provides an introduction to selected current problems in U.S. space policy (such as the space station), based on documents from the space policy arena and literature from several disciplines. Students are expected to recommend courses of action. Prereq., upper-division standing.

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 form must be obtained from the department.

PSCI 5011-3. 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. Emphasizes preparation of research papers and literature in the field. Same as PSCI 7011.

PSCI 5031-3. 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 methodology of behavioral research and introduction to ICPSR data archive and computer-based research. Same as PSCI 7031.

PSCI 5041-3. Seminar: The Presidency. Intensive examination and preparation of research papers on historical, functional, and constitutional aspects of the presidency. Broad attention given to literature on the presidential system and to analytical comparisons with other executive systems. Same as PSCI 7041.

PSCI 5051-3. Seminar: The United States Congress. Comprehensive examination of literature and selected research topics concerning the United States Congress. Same as PSCI 7051.

PSCI 5061-3. Seminar: Urban Public Policy. Focuses on formulation, revision, and outcomes of public policy in American urban communi-

ties. Some comparative Canadian and European literature also used. Same as PSCI 7061.

PSCI 5071-3. Public Policy Analysis 1. Provides an overview of the policy sciences as a distinctive tradition within the policy movement. Emphasizes how policy analyses fail, why, and what can be done to improve them in practice. Introduces central theory, including a conceptual framework. Same as PSCI 7071.

PSCI 5081-3. Public Policy Analysis 2. Elaborates central theory of the policy sciences to guide the appraisal of policy alternatives and policy processes and the development of improvements in each. Emphasizes applications of central theory to problems selected by students for term projects. Same as PSCI 7081.

PSCI 5091-3. Politics of Social Movements and Interest Groups. Examines theoretical and empirical research on American interest groups and social movements. Emphasizes relative power of such interests and their ability to bring about changes in national policy and political institutions. Same as PSCI 7091.

PSCI 5141-3. The State in American Politics. Intensive examination of pluralist, voter-centered, rational choice, and neo-Marxist literature on the American state. Same as PSCI 7141.

PSCI 5901 (1-3). Topics in Political Science. Same as PSCI 7901.

PSCI 6901 (1-3). Graduate Research Topic. Independent research in a topic of special interest. Arrangements made to suit needs of each student. Not a free option; must be approved by student's advisor and department chair. Does not count as a seminar. Same as PSCI 8901.

PSCI 6951-4. Master's Thesis.

PSCI 7011-3. Seminar: American Politics. Same as PSCI 5011.

PSCI 7031-3. Seminar: Political Attitudes and Behavior. Same as PSCI 5031.

PSCI 7041-3. Seminar: The Presidency. Same as PSCI 5041.

PSCI 7051-3. Seminar: The United States Congress. Same as PSCI 5051.

PSCI 7061-3. Seminar: Urban Public Policy. Same as PSCI 5061.

PSCI 7071-3. Public Policy Analysis 1 (Decision Process). Same as PSCI 5071.

PSCI 7081-3. Public Policy Analysis 2 (Problem Orientation). Same as PSCI 5081.

PSCI 7091-3. Politics of Social Movements and Interest Groups. Same as PSCI 5091.

PSCI 7141-3. The State in American Politics. Same as PSCI 5141.

PSCI 7901 (1-3). Topics in Political Science. Same as PSCI 5901.

PSCI 8901 (1-3). Graduate Research Project. Same as PSCI 6901.

PSCI 8991-10. 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.

Comparative

PSCI 2012-3. Introduction to Comparative Politics: Developed Political Systems. Compares legal-institutional features; social, economic, and ideological forces; patterns of recruitment and decision making; and implications of planned socioeconomic and political change in Western systems. Geographical emphasis varies with instructor, but there is a balanced comparison of several countries representing a broad cross section of the Western world. Students may not receive credit for both PSCI 2012 and 2112 *or* PSCI 2012 and 2122. Approved for arts and sciences core curriculum: contemporary societies.

PSCI 2022-3. Introduction to Comparative Politics: Developing Political Systems. Compares 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 instructor, but there is a balanced comparison of several countries representing a broad cross section of the non-Western world. Approved for arts and sciences core curriculum: contemporary societies.

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. Emphasizes postwar reform legislation in the U.K. and recent party politics in France. Students may not receive credit for both PSCI 2112 and 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. Students may not receive credit for both PSCI 2122 and 2012.

PSCI 4002-3. Advanced Comparative Politics—Western Europe. Intensive comparative analysis of the political systems and processes of Western European democracies. Focuses on political culture and constitutionalism; executive-legislative relationships; parties and interest groups; administrative processes; and the impact of social changes on political institutions. Approved for arts and sciences core curriculum: contemporary societies.

PSCI 4012-3. Global Development. Examines 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. Approved for arts and sciences core curriculum: contemporary societies. Same as CPST 4012.

PSCI 4032-3. Latin American Political Systems. Introduces Latin American politics, stressing different perspectives and key political actors and processes in several different countries. Approved for arts and sciences core curriculum: contemporary societies.

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 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 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. Surveys historical and contemporary forces shaping relations among states in Southeast Asia. Special attention 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. Analyzes 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. Approved for arts and sciences core curriculum: contemporary societies.

PSCI 4092-3. Governments of South Asia. Studies the political systems of India, Pakistan, Ceylon, and Nepal. Considers impact of British rule on development of political institutions on the subcontinent as well as problems of political development at all levels.

PSCI 4102-3. The Government and Politics of Israel. Studies historical and contemporary responses by Jews to conditions of diaspora and statehood. 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. Emphasizes political change and conflict.

PSCI 4122-3. The Military in Politics. Analysis of sources and uses of the political power of the armed forces, causes and consequences of military intervention in politics, and contrasting patterns of civil-military relationships in Western and non-Western societies. Focuses on the Latin American military, with secondary attention to the U.S. military.

PSCI 4282-3. Global Issues. Studies the principal issues confronting humanity which affect stability and "survivability." These issues all have economic, social, and political implications. Approved for arts and sciences core curriculum: critical thinking.

PSCI 4842 (1-3). Independent Study—Comparative. Subjects chosen and arrangements made to suit 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 GPA 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 form must be obtained from the department.

PSCI 5012-3. Seminar: Comparative Political Systems. Discusses current literature on comparative politics including theoretical and methodological issues. Same as PSCI 7012.

PSCI 5032-3. Seminar: Latin American Politics. Stresses intensive study of the political process in Latin America with special emphasis on variables that affect Latin American political behavior and development. Same as PSCI 7032.

PSCI 5042-3. Seminar: Comparative Politics—Western Europe. Examination and writing of research papers on selected topics of industrial democracies, especially those of Western Europe. Focuses on comparative analysis of changes in political institutions and processes and their impact on macroeconomic policies, e.g., growth, employment, redistribution, and welfare. Required of all Ph.D. students majoring in political science during first year of residence. Same as PSCI 7042.

PSCI 5072-3. 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. Stresses comparisons among African political systems as well as with other areas of the world, and on explanation of change. Same as PSCI 7072.

PSCI 5112-3. 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. Role of groups and the determinants of group politics. Same as PSCI 7112.

PSCI 5122-3. Seminar: The Middle East. Advanced comparative study and critical examination of the modern Middle East. Stresses analysis of political consequences of modernization, the Arab-Israeli problem, pan-Arabism, and petroleum politics. Requires seminar papers reflecting a research design. Same as PSCI 7122.

PSCI 5132-3. 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, newspaper professionals, the clergy, and radio and television commentators. Same as PSCI 7132.

PSCI 5142-3. Political Economy in Industrial Democracies. Advanced seminar that examines the structure of political and economic relations in several advanced democracies. Specifically examines a series of historical, institutional, and cultural theories that purport to explain these differences.

PSCI 5902 (1-3). Topics in Political Science. Same as PSCI 7902.

PSCI 6902 (1-3). Graduate Research Topic. Independent research in a topic of special interest. Arrangements made to suit needs of each student. Not a free option; must be approved by student's advisor and department chair. Does not count as a seminar. Same as PSCI 8902.

PSCI 6952-4. Master's Thesis.

PSCI 7012-3. Seminar: Comparative Political Systems. Same as PSCI 5012.

PSCI 7032-3. Seminar: Latin American Politics. Same as PSCI 5032.

PSCI 7042-3. Seminar: Comparative Politics—Western Europe. Same as PSCI 5042.

PSCI 7072-3. Seminar: Comparative Politics—Sub-Saharan Africa. Same as PSCI 5072.

PSCI 7112-3. Seminar: Comparative Political Parties and Interest Groups. Same as PSCI 5112.

PSCI 7122-3. Seminar: The Middle East. Same as PSCI 5122.

PSCI 7132-3. Comparative Politics and Ideologies. Same as PSCI 5132.

PSCI 7902 (1-3). Topics in Political Science. Same as PSCI 5902.

PSCI 8902 (1-3). Graduate Research Topic. Same as PSCI 6902.

PSCI 8992-10. 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 this catalog.

International Relations

PSCI 2222-3. Introduction to International Relations. Introductory conceptual approaches, national and international dynamics of the international environment, problems, and issues. Approved for arts and sciences core curriculum: contemporary societies.

PSCI 2702-3. International Violence. Introduces knowledge about international violence. Emphasizes causes of war and peace and ways in which decision makers and ordinary citizens can choose peace.

PSCI 4142-3. International Relations. Readings and discussion of the actors, international interaction, and the international system. Emphasizes assessment of relationships between concepts, approaches, goals, methods, and substance of relations among states and on trends that transcend sovereignty. Approved for arts and sciences core curriculum: contemporary societies.

PSCI 4152-3. Seminar: Control of Foreign News Coverage—International Perspectives. Addresses press freedom as an absolute and relative good. Special attention to the changing international news system, and on opportunities for substantive/conceptual and empirical research with domestic and foreign materials.

PSCI 4162-3. American Foreign Policy. Examines foundations, assumptions, objectives, and methods of U.S. foreign policy. Special attention to domestic and external problems of adapting U.S. policy to the changing world environment. Approved for arts and sciences core curriculum: United States context.

PSCI 4172-3. International Organization. Analyzes 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. Investigates the body of law that regulates relations between nation states and provides a framework for the solving of common problems. Its nature and effectiveness are explored as well as its adaptability to a changing environment.

PSCI 4192-3. International Behavior. Presents 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. Approved for arts and sciences core curriculum: critical thinking.

PSCI 4212-3. Europe in the International System. European and Atlantic regionalism. Discusses such communities as the Council of Europe, NATO, EFTA, and OECD, and a detailed examination of the European community. Theories of integration, problems of partnership and interdependence, rival nationalisms and strategic doctrines. Problems of the post-cold war era.

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 in 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 4262-3. Senior Seminar: International Affairs. 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; instructor consent required.

PSCI 4272-3. The Political Economy of Industrial Societies. Considers how political power is used to achieve economic ends and to shape the operations of market economics. Focuses on economic conflicts as political contests, and explores how politics shape the course of economic development as well as the basis of social and political life. Approved for arts and sciences core curriculum: contemporary societies.

PSCI 4843 (1-3). Independent Study—International Relations. Subjects chosen and arrangements made to suit 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 form must be obtained from the department.

PSCI 5013-3. Seminar: International Relations. Review of salient literature on international relations, and subsequent presentation and critical discussion of analytical studies. Students have wide latitude in substantive and methodological approaches. Emphasizes changing trends and 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. Same as PSCI 7013.

PSCI 5023-3. Seminar: American Foreign Relations. Critical review of select conceptual, prescriptive, and methodological literature; examination of select foreign policy problems; discussion of seminar papers. Emphasizes student contribution and participation. Same as PSCI 7023.

PSCI 5043-3. Seminar: Problems of International Organization. Studies selected problems concerning administration and operation of public international organizations, including the United Nations and its specialized agencies. Considers decision making, executive leadership, internal organization, personnel policies, coordination of activities, and financing. Same as PSCI 7043.

PSCI 5053-3. Seminar: The Causes of International Violence. Systematic treatment of the causes of war from perspective of recent findings in international relations. Historical and contemporary examples used in analysis of war-like behavior. Models of war are applied to other conflict phenomena such as urban violence. Same as PSCI 7053.

PSCI 5063-3. International Violence and Political Psychology. Seeks to explore the relationship between knowledge and action in international violence. Considers the contributions and perspectives of science, engineering, and ethics. Same as PSCI 7063.

PSCI 5073-3. Seminar: Global Political Economy. Introduces graduate students to 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 operation of the exchange and power relationship within the contemporary world system. Same as PSCI 7073.

PSCI 5083-3. Soviet Foreign Policy. Covers the foreign policy of the Soviet Union, its relation to Marxism-Leninism and/or Russian nationalism, and the international communist movement. Special attention to the impact of domestic and foreign factors and science and technology on policy formation. Same as PSCI 7083.

PSCI 5903 (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. Same as PSCI 7903.

PSCI 6903 (1-3). Graduate Research Topic. Independent research in a topic of special interest. Arrangements made to suit needs of each student. Not a free option; must be approved by student's advisor and department chair. Does not count as a seminar. Same as PSCI 8903.

PSCI 6953-4. Master's Thesis.

PSCI 7013-3. Seminar: International Relations. Same as PSCI 5013.

PSCI 7023-3. Seminar: American Foreign Relations. Same as PSCI 5023.

PSCI 7043-3. Seminar: Problems of International Organization. Same as PSCI 5043.

PSCI 7053-3. Seminar: The Causes of International Violence. Same as PSCI 5053.

PSCI 7063-3. International Violence and Political Psychology. Same as PSCI 5063.

PSCI 7073-3. Seminar: Global Political Economy. Same as PSCI 5073.

PSCI 7083-3. Soviet Foreign Policy. Same as PSCI 5083.

PSCI 7903 (1-3). Topics in Political Science. Same as PSCI 5903.

PSCI 8903 (1-3). Graduate Research Topic. Same as PSCI 6903.

PSCI 8993-10. 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.

Political Theory

PSCI 2404-3. Introduction to Political Theory. Introduces students to main issues and concepts of both political philosophy/ethics and empirical theories as they try to deal with contemporary political realities. Approved for arts and sciences core curriculum: ideals and values.

PSCI 4004-3. History of Political Philosophy. Studies main political philosophies and political issues of Western culture, from antiquity to twentieth century. Approved for arts and sciences core curriculum: ideals and values.

PSCI 4024-3. Senior Seminar—Theory. Intensive analysis and discussion of 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. Emphasizes advanced discussion plus individual research. Approved for arts and sciences core curriculum: critical thinking.

PSCI 4034-3. Politics and Literature. Broadly examines political topics as they are presented in important literary works and analyzes the possibilities involved in using the literary mode to present political teachings. Approved for arts and sciences core curriculum: critical thinking.

PSCI 4044-3. Jurisprudence. Development of different legal theories and their social significance. Special attention to modern jurisprudential concepts and to political parameters of their formation.

PSCI 4054-3. American Political Thought. Development of American political theories and ideas from colonial period to present. Can also be taken for American field credit. Approved for arts and sciences core curriculum: United States context, or ideals and values.

PSCI 4064-3. Revolution and Political Violence. Study, discussion, and evaluation of alternative frameworks for analysis of revolution and political violence. 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. Introduces 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. Applies 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. Types of research methods used and the speed of their introduction depend on substantive problem areas chosen for research.

PSCI 4094-3. Classical Greek Political Thought. Studies the main representatives of political philosophy in antiquity (Plato, Aristotle, Cicero) and of the most important concepts and values of ancient political thought. Same as CLAS 4041, HIST 4041, PHIL 4210. Prereq., PSCI 2404.

PSCI 4104-3. Politics and Language. Explores the use of language in politics. Examines in depth the political nature and meaning of language, including its significance, philosophy, and practice.

PSCI 4224-3. Rationality, Democracy, and Policy. Philosophical and political approaches to an understanding of social decision making; examines possibilities for choosing rational courses of action and concrete problems of rational decision making.

PSCI 4284-3. General History of Law. Comparative survey of the development of written law and case law systems in the Western world. Special attention to historical bases of contemporary Anglo-American, French, German, and Soviet legal concepts and institutions.

PSCI 4844 (1-3). Independent Study—Theory. Subjects chosen and arrangements made to suit 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 form must be obtained from the department.

PSCI 5024-3. Seminar: Selected Political Theories. Selected political philosophies or theories in classical or modern political thought. Same as PSCI 7024.

PSCI 5044-3. Law and Politics Core Seminar. Same as PSCI 7044.

PSCI 5054-3. 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. Same as PSCI 7054.

PSCI 5084-3. 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. Same as PSCI 7084.

PSCI 5904 (1-3). Topics in Political Science. Same as PSCI 7904.

PSCI 6904 (1-3). Graduate Research Topic. Independent research in a topic of special interest. Arrangements made to suit needs of each student. Not a free option; must be approved by student's advisor and department chair. Does not count as a seminar. Same as PSCI 8904.

PSCI 6954-4. Master's Thesis.

PSCI 7024-3. Seminar: Selected Political Theories. Same as PSCI 5024.

PSCI 7044-3. Law and Politics Core Seminar. Same as PSCI 5044.

PSCI 7054-3. Seminar: American Political Thought. Same as PSCI 5054.

PSCI 7084-3. Seminar: Political Theory. Same as PSCI 5084.

PSCI 7104-3. The Analysis of Political Systems. Same as PSCI 5104.

PSCI 7904 (1-3). Topics in Political Science. Same as PSCI 5904.

PSCI 8904 (1-3). Graduate Research Topic. Same as PSCI 6904.

PSCI 8994-10. 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.

Empirical Theory and Research Methodology

PSCI 5025-3. Seminar: Conflict Behavior—The Politics of Violence. Surveys historical, theoretical, and empirical analyses of violent conflict behavior, including causes and consequences of riots, terrorism, revolution, international war, and intervention. Enrollment recommended in both semesters of the two semester sequence. Same as PSCI 7025.

PSCI 5035-3. Seminar: Conflict Behavior—The Politics of Violence. Surveys historical, theoretical, and empirical analyses of violent conflict behavior, including causes and consequences of riots, terrorism, revolution, international war, and intervention. Enrollment recommended in both semesters of the two semester sequence. Same as PSCI 7035.

PSCI 5075-3. Introduction to Professional Political Science. Introduces graduate students to intellectual foundations and historical development of political science; epistomologies, subfields, intellectual approaches, methodological strategies of the discipline; and ethics and norms of professional conduct. Same as PSCI 7075.

PSCI 5085-4. Introduction to Political Science Data Analysis. Provides intensive experience with quantitative techniques commonly employed in political science research. Examines fundamental design issues comparing experimental and post-hoc observational design; builds on a review of multivariate regression, inferential statistics, and causal modeling. Students undertake substantive research projects employing cross-sectional and times series data generated via different methodologies. Requires lab instruction in the use of the computer in quantitative applications of political science research. Prereq., graduate standing in social science or history. Same as PSCI 7085.

PSCI 5095-3. Advanced Political Data Analysis. Provides advanced training in empirical and analytic methods of political analysis. Covers general multivariate linear (regression) model as it is employed in political science. Also covers variety of dynamic approaches to empirical analysis (stochastic models, time series, and simulation). Prereq., instructor consent. Same as PSCI 7095.

PSCI 5905 (1-3). Topics in Political Science. Same as PSCI 7905.

PSCI 6905 (1-3). Graduate Research Topic. Independent research in a topic of special interest. Arrangements made to suit needs of each student. Not a free option; must be approved by student's advisor and department chair. Does not count as a seminar. Same as PSCI 8905.

PSCI 6955-4. Master's Thesis.

PSCI 7025-3. Seminar: Conflict Behavior—The Politics of Violence. Same as PSCI 5025.

PSCI 7035-3. Seminar: Conflict Behavior—The Politics of Violence. Same as PSCI 5035.

PSCI 7075-3. Introduction to Professional Political Science. Same as PSCI 5075.

PSCI 7085-4. Introduction to Political Science Data Analysis. Same as PSCI 5085.

PSCI 7095-3. Advanced Political Data Analysis. Same as PSCI 5095.

PSCI 7905 (1-3). Topics in Political Science. Same as PSCI 5905.

PSCI 8905 (1-3). Graduate Research Topic. Same as PSCI 6905.

PSCI 8995-10. 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 this catalog.

Public Administration

PSCI 5056-3. 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. Same as PSCI 7056.

PSCI 5106-3. The Political System and Telecommunications. Introduces roles played by political institutions in the utilization of telecommunications for the common good. Emphasizes American regulatory agencies, such as the Federal Communications Commission, and agencies of international cooperation, such as the International Telecommunications Union. Same as PSCI 7106 and TLEN 5106.

PSCI 5906 (1-3). Topics in Political Science. Same as PSCI 7906.

PSCI 6906 (1-3). Graduate Research Topic. Independent research in a topic of special interest. Arrangements made to suit needs of each student. Not a free option; must be approved by student's advisor and department chair. Does not count as a seminar. Same as PSCI 8906.

PSCI 6956-4. Master's Thesis.

PSCI 7056-3. Seminar: Natural Resources Policy and Administration. Same as PSCI 5056.

PSCI 7106-3. The Political System and Telecommunications. Same as PSCI 5106.

PSCI 7906 (1-3). Topics in Political Science. Same as PSCI 5906.

PSCI 8906 (1-3). Graduate Research Topic. Same as PSCI 6906.

PSCI 8996-10. 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 this catalog.

Law and Politics

PSCI 5057-3. 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. Same as PSCI 7057.

PSCI 5067-3. Seminar: American Constitutional Law. Intensive analysis of the most recent doctrinal developments in key areas of constitutional law. Designed primarily for graduate students who intend to offer American government as a field of examination for an advanced degree. Same as PSCI 7067.

PSCI 5077-3. 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. Emphasizes empirical approach and quantitative methods. Requires research papers. Same as PSCI 7077.

PSCI 5907 (1-3). Topics in Political Science. Same as PSCI 7907.

PSCI 6907 (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. Same as PSCI 8907.

PSCI 6957-4. Master's Thesis.

PSCI 7057-3. Seminar: Selected Constitutional Issues. Same as PSCI 5057.

PSCI 7067-3. Seminar: American Constitutional Law. Same as PSCI 5067.

PSCI 7077-3. Seminar: Behavioral Study of Public Law. Same as PSCI 5077.

PSCI 7907 (1-3). Topics in Political Science. Same as PSCI 5907.

PSCI 8907 (1-3). Graduate Research Topic. Same as PSCI 6907.

PSCI 8997-10. 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 this catalog.

General

PSCI 4018-3. Honors 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 begin 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 chosen and arrangements made to suit 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 form 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 and value to the official. 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 (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. Same as PSCI 7098.

PSCI 5108-3. Special Topics in Political Science. Various topics not normally offered in the curriculum. Students should check with the department for specific topics. May be taken up to three times for credit in different topics. Same as PSCI 7108.

PSCI 5228-2. Intellectual Origins of the Constitution. Same as PSCI 7228 and HIST 6816.

PSCI 6908 (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. Same as PSCI 8908.

PSCI 7098 (1-3). Topics in Political Science. Same as PSCI 5098.

PSCI 7108-3. Special Topics in Political Science. Same as PSCI 5108.

PSCI 7228-2. Intellectual Origins of the Constitution. Same as PSCI 5228 and LAWS 7228.

PSCI 7908-4. Master's Thesis.

PSCI 8908 (1-3). Graduate Research Topic. Same as PSCI 6908.

PSCI 8998-10. 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 this catalog.

Psychology

PSYC 2700-3. Psychology of Contemporary American Women. Surveys 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. Same as WMST 2700.

PSYC 4030-4. Applications of Computers in Psychology. Covers theory and practice of applications of computers in psychological research. Introduces basic computing skills, use of statistical packages, and a programming language. Recommended prereq., undergraduate statistics course. Same as PSYC 5030.

PSYC 4220-3. Psycholinguistics. Studies processes of perceiving speech and interpreting it as meaningful and of expressing intentions to communicate as utterances. Emphasizes roles of the brain and of perceptual and motor systems. Writing, gestural, and animal communicative systems are also treated. Prereq., PSYC 1001 and LING 2000. Same as LING 4220.

PSYC 4560-3. Language Development. Same as CDSS 4560 and LING 4560.

PSYC 4700-3. Women and Mental Health. Examines mental health issues of women by focusing on theories of female personality development. Examines theory and research pertaining to women and psychopathology and to women as patients in traditional and nontraditional forms of treatment. Prereq., PSYC 2700, WMST 2700, WMST 2000, or WMST 2010. Same as WMST 4700.

PSYC 4740-3. Biology of Amphibians and Reptiles. Comparative morphology, taxonomy, ecology, behavior, and geographic distribution of amphibians and reptiles. Prereq., EPOB 1210 and 1220 *or* PSYC 1001 and 2012. Same as EPOB 4740.

PSYC 5030 (1-4). Seminar: Applications of Computers in Psychology. Discusses theory and practice of applications of computers in psychological research. Introduces basic computing skills, use of statistical packages, and a programming language. Same as PSYC 4030.

PSYC 5740-3. Biology of Amphibians and Reptiles. Same as PSYC 4740.

PSYC 5800-5. Neuroscience Research Lab. 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. Same as EPOB 5830 and MCDB 5800.

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. Surveys major topics in psychology: perception, development, personality, learning and memory, and biological bases of behavior. Students 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. Introduces descriptive and inferential statistics and their roles in psychological research. Topics include correlation, regression, *t*- test, analysis of variance, and selected nonparametric statistics. Prereq., MATH 1000 or equivalent is highly recommended.

PSYC 2841 (1-3). Independent Study (Lower Division). Prereq., 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. Prereq., consent of psychology honors director.

PSYC 4001-3. Honors Seminar. Surveys and integrates general psychology for seniors majoring in psychology. Open only to juniors and seniors who have been accepted into the psychology department honors program. Prereq., consent of psychology honors director.

PSYC 4011 (1-6). Senior Thesis. An honors thesis consists of critical review of some aspect of psychological literature, scholarly analysis of a major psychological issue, and/or an empirical research project. See the psychology honors director for further information.

PSYC 4511-3. History of Psychology. Includes outline of 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. Enrollment restricted to juniors and seniors.

PSYC 4521-3. Critical Thinking in Psychology Allows students to "expand their powers" as they think about psychological problems, or about how psychological knowledge and techniques

can be applied to pressing political, economic, biological, quantitative and social issues. Encourages intellectual discipline and critical thinking about concepts and ideas; enables students to participate in oral and written discussion. Enrollment restricted to juniors and seniors. Approved for arts and sciences core curriculum: critical thinking.

PSYC 4541 (1-6). Special Topics in Psychology. Special interest topics from the broad and diversified field of psychology are studied and analyzed in depth. Particular section content is determined by instructor. Same as PSYC 5541.

PSYC 4551-3. Practicum in Peer Advising. Students train and participate, under faculty supervision, in an academic peer advising program. Students must submit an application to the director of undergraduate studies.

PSYC 4841 (1-6). Independent Study (Upper Division). Pass/fail only. Prereq., junior or senior standing.

PSYC 4851 (1-3). Independent Study (Upper Division). Pass/fail only. Prereq., junior or senior standing.

PSYC 4911-3. Teaching of Psychology. Students receive concrete experience in teaching general psychology under supervision of a psychology faculty member. Alternative pedagogical strategies are discussed. Prereq., 16 hours of psychology. Students must submit an application to the director of undergraduate studies.

PSYC 5541 (1-6). Special Topics in Psychology. Same as PSYC 4541.

PSYC 5741-4. General Statistics. Surveys probability and statistics in psychology.

PSYC 5751-4. General Statistics. Continuation of PSYC 5741.

PSYC 6841 (1-3). Independent Study. Graduate student standing.

PSYC 6851 (1-3). Independent Study. Graduate student standing.

PSYC 6911-2. Research Practicum.

PSYC 6941-3. Master's Degree Candidate.

PSYC 6951 (1-6). Master's Thesis.

PSYC 7021-2. Research Problems.

PSYC 7051-2. Research Practicum. Discusses ongoing, current research projects, and students formulate and complete an empirical study of their own. For cognitive and social psychology graduate students.

PSYC 7061-2. Research Practicum. Continuation of PSYC 7051.

PSYC 7271-3. Causal Models and Correlational Data. Construction, estimation, and testing of causal models for correlational data. Particular attention 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. Emphasizes research technology rather than mathematical theory.

PSYC 7521-3. History and Theory. Brief survey of chronological development of psychology, emphasizing theories. Provides opportunity for intensive examination of a few selected topics, which differ from year to year.

PSYC 8991-10. 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 section.

Biological

PSYC 2012-3. Biological Psychology 1. Broad survey of biological bases of learning, motivation, emotion, sensory processes and perception, movement, comparative animal behavior, sexual and reproductive activity, instinctual behavior, neurobiology of language and thought, and neurophysiology and neuroanatomy in relation to behavior. Prereq., completion of 12 or more hours of college work. Approved for arts and sciences core curriculum: natural science.

PSYC 2022-3. Biological Psychology 2. Continuation of PSYC 2012. Integrates knowledge and facts presented in PSYC 2012 into current topics in biopsychology. Prereqs., PSYC 2012 and completion of 12 or more hours of college work. Approved for arts and sciences core curriculum: natural science.

PSYC 2062-3. Nutrition and Behavior. Introduces the science of nutrition together with an examination of its relarionship to biochemical and physiological foundations of behavior. Cannot be taken for credit if KINE 3420 has been taken.

PSYC 4052-4. Physiological Psychology. Intensive survey of the morphological, neurochemical, and physiological aspects of behavior. One lab./rec. section per week required. Prereqs., PSYC 2012 and 2022 *or* MCDB 1050 and 1060 *or* EPOB 1210 and 1220 *or* a full year of chemistry or physics, *or* a year-long combination of the above. Same as PSYC 5052.

PSYC 4072-3. Clinical Neuroscience: A Clinical and Pathological Perspective. Provides basic science background for understanding the mechanism of behavioral disturbances resulting from brain damage. Special emphasis on pathological neuroanatomy, neurophysiology, and neuropharmacology, which is essential for understanding problems related to health and disease. Prereqs., PSYC 2012 and 2022 *or* EPOB 1210 and 1220 *or* MCDB 1050 and 1060. Same as PSYC 5072.

PSYC 4082-4. Advanced Neurobiology Laboratory. Advanced course in neurobiology methods. Exercises involve hands-on demonstrations of the mechanisms of neurotransmission, focusing on peptide-mediated events. Peripheral nervous system physiology is followed by consideration of central processes using electrophysiology. Prereq., instructor consent.

PSYC 4092-3. Hormones and Behavior. Represents application of endocrinological concepts and techniques to problems of motivation and behavior. Prereqs., junior standing and one year of biology. Same as PSYC 5092.

PSYC 4102-3. Behavioral Genetics. Inheritance of behavioral characteristics. PSYC 2101 or equivalent is recommended. Same as PSYC 5102.

PSYC 4112 (2-5). Behavioral Genetics Laboratory. Demonstrations and experiments in behavioral genetics. Employs basic behavioral and genetic techniques in studying the inheritance of behavior in laboratory animals. Emphasizes individual projects. Coreq., PSYC 4102. This is a controlled enrollment course.

PSYC 4122-3. Quantitative Genetics. Surveys 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. Coreq., PSYC 2101. This is a controlled enrollment course. Same as PSYC 5122.

PSYC 4132-3. Behavioral Neuropharmacology. Advanced course in neuroscience; considers chemical transmission in detail. Topics include endocrinology as well as the mechanism of action of psychoactive drugs, cellular neurochemistry, and special topics in neuroscience research. Explains how psychologists use drugs to study learning, attention, motivation, and abnormal behavior. Prereq., PSYC 4052 or 5052. Same as PSYC 5132.

PSYC 4212-3. Gerontology: A Multidisciplinary Perspective. Covers biological, psychological, and social issues in gerontology. Topics include brain changes with age, learning/memory changes with age, and social impact of increasingly older population distribution. Prereq., PSYC 4052 or 4205 or 4406 or 4145, or instructor consent. Same as PSYC 5212.

PSYC 4672-3. Principles of Developmental Psychobiology. Presents principles useful in understanding biobehavioral development, together with critical analysis of theories and research methodologies. Perspective is comparative, focusing on both human and animal research and on diverse cultures and ecologies. Prereqs., PSYC 2052, 4052, EPOB 1410 and 1420, EPOB 4420, or EPOB 4200.

PSYC 5042-3. Mammalian Neurophysiology. Examines selected topics in 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, EPOB 4205, or MCDB 4190.

PSYC 5052-4. Physiological Psychology. Same as PSYC 4052.

PSYC 5062-4. Functional Neurochemistry. Examines mechanisms of neuronal signaling in experimental literature in areas of transmitter synthesis, transport, secretion, turnover, reuprake, and postsynaptic effect. Other special topics included. Prereq., PSYC 4052, MCDB 4190, or EPOB 4220.

PSYC 5072-3. Clinical Neuroscience. Same as PSYC 4072.

PSYC 5082-2. Seminar: Biological Psychology. Special topics concerning biological bases of behavior. Prereq., PSYC 4052.

PSYC 5092-3. Hormones and Behavior. Same as PSYC 4092.

PSYC 5102-3. Behavioral Genetics. Same as PSYC 4102.

PSYC 5112-3. Concepts in Behavioral Genetics. Examines selected topics in greater detail than is possible in the comprehensive undergraduate course in behavioral genetics (PSYC 4102). Topics covered may include inheritance of behavioral characteristics from perspectives of pharmacogenetics, transmission genetics, biochemical genetics, and evolutionary genetics. Course may be repeated.

PSYC 5122-3. Quantitative Genetics. Same as PSYC 4122.

PSYC 5132-3. Behavioral Neuropharmacology. Same as PSYC 4132.

PSYC 5162-3. Developmental Behavioral Genetics. Applies behavioral genetic strategies to study of individual differences in development, primarily human development.

PSYC 5212-3. Gerontology: A Multidisciplinary Perspective. Same as PSYC 4212.

PSYC 5232-3. Molecular Genetics and Behavior. Covers fundamental mechanisms of gene action, including DNA structure and regulation of gene expression. Discusses 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 development of structural models appropriate to behavioral genetics and the estimation procedures necessary for their application.

PSYC 5262-3. Mammalian Neuroanatomy. Covers microscopic anatomy and function of different brain regions. Emphasizes correlation between structure and function, particularly at cellular and synaptic level. Course includes brain dissection, description of neuroanatomical and neurohistological techniques, and introduction to the ultrastructure of neurons. Prereq., PSYC 4052, MCDB 4190, or EPOB 4220.

PSYC 5272-3. Neuronal Plasticity. Describes changes that occur in the nervous systems as a result of lesions, altered environment, and during development. These changes are examined relative to their significance for the organism, and to underlying mechanisms. Helps in understanding of behavioral plasticity and recovery of function.

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. Emphasizes recent research. Attention to both human and animal studies.

Clinical

PSYC 2303-3. Psychology of Adjustment. Surveys concepts bearing upon processes of normal psychological adjustment, with emphasis on using the concepts to understand common human problems in personal growth and relationships with others.

PSYC 2643-3. Child and Adolescent Psychology. Covers 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 lab per week. Analyzes 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. Covers 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 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 production of emotional disorders, and technologies of community change. Prereq., PSYC 4303 or 4313.

PSYC 4733-4. Principles of Psychological Testing. Studies test design, construction, and analysis through active student participation in ungraded interest inventories, and personality and achievement tests. Emphasizes application of testing results and principles to personal career goals and interests. Prereq., PSYC 2101.

PSYC 7483-2. Systems of Personality. Considers foundation issues in construction of theories of the person: appraisal of structure and content of representative theories of personality; analysis of implications for theory of various current ideas of personality research.

PSYC 7493-2. Developmental Psychopathology. Presents childhood psychopathology as deviations from normal development. Reviews both normal development and childhood psychopathology from dynamic, cognitive, and behavioristic theoretical perspectives.

PSYC 7503-2. Developmental Child Clinical Assessment. Provides clinical psychology students with a theroetical understanding and skills to conduct a comprehensive review of psychological and developmental functioning. Includes assessment from a variety of sources and contexts, including testing. Prereqs., PSYC 7643 and enrollment in the clinical psychology graduate program.

PSYC 7593-2. Research Problems in Clinical Psychology. Examines 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 7643-2. Proseminar in Developmental Child Clinical Psychology 1. The first semester of this year-long course provides an integration of child development, developmental psychopathology, and clinical interventions for children. Focuses on the conceptual convergence between applied developmental psychology and child clinical psychology.

PSYC 7653-2. Proseminar in Developmental Child Clinical Psychology 2. The second semester in this year-long course builds upon concepts in PSYC 7643 to explore the theoretical and empirical bases for understanding child psychopathology and intervention. Prereq., PSYC 7643.

PSYC 7673-3. Seminar: Psychotherapy. Discusses 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 objective test results commonly used in clinical psychology practice. Probable inventories used are MMPI, SCII, WISC, WAIS, plus other objective measures where relevant. Uses case study format.

PSYC 7693-2. Personality Measurement. Covers theory and practice primarily in areas of individual intelligence testing. Involves intensive field work and report writing.

PSYC 7703-2, 7733-2. 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. Surveys factors at work in the United States that have culminated in the community mental health movement and of current factors considered in future developments in the field.

PSYC 7773-2. Professional Issues and Ethics. Focuses on ideographic study of attitudes, values, and personality characteristics of individuals using data obtained from personal interviews. Covers theory and practice of various interviewing approaches. Open to Ph.D. candidates in clinical psychology only.

PSYC 7783-2. Advanced Psychopathology. Intensively surveys major theories, research findings, and behavioral characteristics associated with deviant reaction patterns.

Developmental

PSYC 4684-3. Developmental Psychology. Overview of major theories concerning the development of knowledge in children. Emphasizes 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. Examines 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. First half of the semester includes background lectures on perception, physiology, and philosophical questions of how humans know their world. Second half focuses on current research in development of perception and information ptocessing capacities.

PSYC 5304-3. Proseminar: Developmental Psychology—Theory and Issues. Surveys issues in theoretical approaches to developmental psychology. Open to graduate students and senior undergraduate psychology majors with instructor consent.

PSYC 5314-3. Proseminar: Developmental Psychology—Sensory Development. Covers selected topics in sensory development. Emphasizes role of experience in development of neural mechanisms of human sensory systems. Considerable attention to understanding historical foundations of current problems. Open to graduate students or senior undergraduate majors with instructor consent.

Experimental

PSYC 4145-4. Cognitive Psychology. One lab, three lect. per week. Introduces the study of cognitive processes of human beings: memory, conceprual behavior, and thinking. Emphasis of the course varies with instructor. Prereqs., PSYC 1001 and 2101.

PSYC 4165-4. Psychology of Perception. One lab, three lect. per week. Analyzes peripheral and central mechanisms involved in the transduction and interpretation of experience. Special attention to vision and audition; major theories in these areas are discussed in terms of research they have inspited. Prereqs., PSYC 1001 and 2101.

PSYC 4175-3. Introduction to Cognitive Simulation. Surveys 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 and CSCI 1210. Same as PSYC 5175.

PSYC 4205-4. Psychology of Learning. One lab per week. Discusses conditions of learning in animals and humans as found in experimental literature. Prereqs., PSYC 1001 and 2101.

PSYC 4385-3. Ethology and Comparative Psychology. Discusses behavior of representative members of each animal phylum. Emphasizes ontogeny of behavior as well as phylogeny. Prereq., PSYC 1001 or general biology. Same as PSYC 5385.

PSYC 4505-4. Behavior of Zoo Animals. Examines behavioral research conducted at zoos of the world. Emphasizes courtship and copulation, offspring development, socialization, intellectual processes, and animal communications. Classes and labs held at the Denver Zoo. Prereqs., PSYC 1001, 2101, EPOB 1210, and 1220. Same as PSYC 5505.

PSYC 5175-3. Introduction to Cognitive Stimulation. Same as PSYC 4175.

PSYC 5385-3. Ethology and Comparative Psychology. Same as PSYC 4385.

PSYC 5505-4. Behavior of Zoo Animals. Same as PSYC 4505.

PSYC 5665-3, 5675-3. Proseminar: Advanced Experimental Psychology. 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. Advanced and intensive survey of topics in experimental psychology. General areas include sensation and perception, and history and theory.

PSYC 5765 (2-3). Issues and Methods in Cognitive Psychology. Provides an introduction to research in cognitive psychology. Designed for graduate students in departments other than psychology. Includes basic experimental methodology, knowledge representation in human memory, reasoning, problem solving, knowledge acquisition, and expertise. Prereq., graduate enrollment in a department other than psychology.

PSYC 5815-3. Proseminar: Thinking and Problem Solving. Introduces graduate students to the empirical and theoretical analysis of higher mental processes, such as problem solving; deductive, inductive, and analogical reasoning; choice; and decision making. Prereq., instructor consent.

PSYC 7205-2. Seminar: Learning. 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. Advanced seminar dealing with different specialized topics, at the discretion of the instructor, in different years. Topics chosen are within the broad range of experimental psychology.

PSYC 7315-2. Advanced Research Seminar on Human Memory. Addresses topics in the experimental psychology of human memory. Content varies from semester to semester, depending on interests of faculty and students. A sample topic is the long-term retention of skills. Prereq., graduate standing in psychology or related disciplines.

Social

PSYC 2406-3. Social Psychology of Ethnic Groups. Focuses on social-psychological approaches to 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. Examines social psychological aspects of a variety of issues, ranging from problems of poverty or minority status to topics such as prejudice, drug use, student protest, and patterns of sexual behavior.

PSYC 4376-4. Research Methods in Social Psychology. Designed primarily for psychology majors interested in learning about research methodology. Topics include research design, data collection and data analysis, and written research reports. Prereqs., PSYC 1001 and 2101.

PSYC 4406-3. Social Psychology. Covers general psychological principles underlying social behavior. Overview and analysis of 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. Enrollment restricted to juniors and seniors. Approved for arts and sciences core curriculum: contemporary societies.

PSYC 4436-3. Human Judgment and Decision Making. A systematic introduction to the psychology of judgment and decision making.

PSYC 4456-3. Psychology of Personality. Psychological study of structure, organization, and development of the person as a whole. Analysis of major theories, methods, and research, including topics such as emotion, motivation, temperament, inner experience, identity and the self, personality change, and the influence of sociocultural context. Prereqs., 12 hours of psychology. Enrollment restricted to juniors and seniors.

PSYC 4486-3. Women in Cross-Cultural Perspective. Reviews contemporary theory and research on the psychology of women. Material drawn from the fields of anthropology, social psychology, clinical psychology, and sociology. Open only to juniors and seniors who are psychology, anthropology, and sociology majors. Same as PSYC 5486.

PSYC 4496-3. Cross-Cultural Psychology. Covers social factors in development of personality. Social and cultural variations in mental illness. Psychology of cultural and social change, including revolutions and economic growth. Prereq., 12 semesrer hours of courses from psychology, sociology, and anthropology. Open only to majors in those fields.

PSYC 5486-3. Women in Cross-Cultural Perspective. Same as PSYC 4486.

PSYC 5546-3. Cultural Aspects of Language. Examines how different languages structure human experience and intetaction, 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 Americans, and Blacks.

PSYC 5556-3. Personality in Cultural Contexts. Ideally, cultural influences in child-training would prepare the person for optimal, stress-free, adult participation in the culture. Explores factors in individual personality and in cultural contexts rhat 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 existing literature, and plan to utilize various methods in researching that topic. Students are graded on participation and a term paper.

PSYC 5606-3. Proseminar: Social-Personality Psychology. Provides a thorough introduction to methods and theories in social psychology con-

cerned with topics such as social motivation, social cognition, judgment and decision making, attitude formation and change, small group processes, inter-group relations, and others. Instructor consent required.

PSYC 5616-2, 5626-2, 5636-2. Proseminar: Social-Personality Psychology. Provides systematic introduction to the area of social-personality psychology. Two courses are offered each semester on a rotating basis. Topics are as follows: 5616, cognitive social psychology; 5626, social interaction; 5636, social psychology of the individual.

PSYC 5646-3. Multicultural Psychology. Applies principles of descriptive psychology to issues of ethnic and cultural diversity, and to the study of community settings and agencies in which such diversity exists. Prereq., instructor consent.

PSYC 7536-2. Personality and Social Psychology. Selected topics in the area of social-personality psychology. Students may register for more than one section of this course within the term and/or within their graduate career. Maximum of 8 hours.

Religious Studies

RLST 1620-3. Religious Dimension in Human Experience. Studies religion as individual experience and social phenomenon. Examines varieties of religious language (symbol, myth, ritual, scripture) and of religious experience (Asian, Western, archaic). Approved for arts and sciences core curriculum: ideals and values.

RLST 2250-3. The Ethics of Ambition. Webster's Dictionary defines ambition as "an ardent desire for rank, fame, or power." Course answers these questions: is ambition blind to the needs of others, of society? Or is it rather, as one author puts it, simply "the fuel of achievement"? Methods of contemporary "character ethics" are employed to address these and related questions. Approved for arts and sciences core curriculum: ideals and values.

RLST 2300-3. Religions of Traditional Peoples. Thematic and topical study of the religions of tribal peoples of Africa, the Americas, Australia, Oceania, Indonesia, and Asia, including their role in the development of the academic study of religion. Approved for arts and sciences core curriculum: ideals and values.

RLST 2600-3. World Religions: Western. Introduces literature, beliefs, practices, and institutions of Judaism, Christianity, and Islam, in historical perspective. Approved for arts and sciences core curriculum: ideals and values.

RLST 2610-3. World Religion: India. Introduces the literature, beliefs, practices and institutions of Hinduism, Buddhism, Jainism, and Sikhism, in historical perspective. Approved for arts and sciences core curriculum: ideals and values.

RLST 2620-3. World Religions: China and Japan. Introduces literature, beliefs, practices, and institutions of Taoism, Confucianism, Buddhism, and Shintoism in historical perspective. Approved for arts and sciences core curriculum: ideals and values.

RLST 2700-3. American Indian Religions. Introduces religions of the peoples indigenous to the Americas. Concerns include ritual, mythology, and symbolism occurring throughout these many cultures in such areas as art, architecture, cosmology, shamanism, sustenance modes, trade, and history. Approved for arts and sciences core curriculum: ideals and values.

RLST 2800-3. Women and Religion. Examines roles of women in a variety of religious traditions including Judaism, Christianity, Hinduism, Buddhism, and goddess traditions. Same as WMST 2800. Approved for arts and sciences core curriculum: cultural and gender diversity.

RLST 2840 (1-3). Independent Study.

RLST 3000-3. The Christian Tradition. Studies origins and development of various aspects of Christian tradition as expressed through scripture, theology, ritual, church order, ethics, and the arts. Approved for arts and sciences core curriculum: historical context.

RLST 3050-3. Religion and Literature in America. Studies religious dimensions of American culture through representative literature, beginning with the Puritans and focusing on diversity in the nineteenth and twentieth centuries. Approved for arts and sciences core curriculum: United States context.

RLST 3100-3. Judaism. Explores Jewish religious experience and its expression in thought, ritual, ethics, and social institutions. Approved for arts and sciences core curriculum: historical context.

RLST 3200-3. Hinduism. Studies literature, beliefs, practices, and institutions of Hinduism, in historical perspective.

RLST 3250-3. Gandhi: Life and Teaching. Studies the life and teaching of Mohandas K. Gandhi, through reading and discussion of primary sources. Focuses on Gandhi's religion and his impact as a religious leader. Approved for arts and sciences core curriculum: ideals and values.

RLST 3300-3. Indian Buddhism. Studies selected aspects of Buddhist tradition in India, including the life of the Buddha, development of the early community, Buddhist contemplative tradition, early Buddhist philosophy and psychology, and origins and development of Indian Mahayana Buddhism.

RLST 3400-3. Japanese Religions. Studies the literature, beliefs, practices, and institutions of Shinto, Buddhism, and Confucianism within the development of Japanese culture.

RLST 3500-3. Religion and Play. Examines critically theories of play in the fields of philosophy, sociology, anthropology, psychology, natural sciences, and religion as foundations for the construction, application, and testing of play theories pertaining to religion. Approved for arts and sciences core curriculum: critical thinking.

RLST 3600-3. Islam. Introduces 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. Examines the relation between religion and psychology in the understanding of human nature. Considers a variety of contemporary theories and models in both psychology and religious studies. Approved for arts and sciences core curriculum: critical thinking.

RLST 3800-3. Chinese Religion. Studies 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 4010-3. Biblical Christianity. Studies Christian origins. 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. Emphasizes methodology, e.g., textual criticism, literary criticism, and form criticism. Same as RLST 5010.

RLST 4050-3. Topics in Christian Studies. Studies a particular topic in Christian theology and culture such as early Christianity, medieval Christianity, Christianity in the United States, women and Christianity, liberation theologies, Christianity and literature, and modern Christian thought. Same as RLST 5050.

RLST 4100-3. Biblical Judaism. Studies development of Jewish religious thought and institutions in the Biblical period, with special emphasis on litetature of the Bible as a source for study of religious experience. Same as RLST 5100.

RLST 4150-3. Topics in Jewish Thought. Intensively studies a selected topic in Jewish theology, philosophy, or mysticism in the post-Biblical period. Same as RLST 5150.

RLST 4200-3. 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. Same as RLST 5200.

RLST 4250-3. 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. Same as RLST 5250.

RLST 4270-3. Zen Buddhism. Inquires into 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. Same as RLST 5270.

RLST 4300-3. Topics in Native American Religions. Examines a topic (to vaty at different offerings) focusing on 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. Same as RLST 5300.

RLST 4350-3. Native American Religions: Regional Studies. Studies religion(s) of a single native North American tribe or geographic region within context of history and culture of the tribe(s). Same as RLST 5350 and AIST 4350.

RLST 4400-3. Topics in Mesoamerican Religions. Studies various topics in Mesoameri-

can religions such as Nahuatl sources in translation, rhetorical structure and ritual, Aztec and Maya religion, and human and animal sacrifice. Same as RLST 5400.

RLST 4500-3. City and Symbol in Mesoamerican Religion. 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. Same as RLST 5500.

RLST 4600-3. Crisis Cults and Millenarian Movements. Examines crisis cults from the variety of perspectives that constitute millenarian studies. Focuses on causes, charismatic leaders, millenarian visions, and impact of prophecies that fall on cult members.

RLST 4650-3. Islam in the Modern World. Globally surveys Islam, covering 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. Same as RLST 5650.

RLST 4700-3. Confucianism. Studies 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. Same as RLST 5700.

RLST 4750-3. Taoism. Covers historical development and influence of Taoist tradition in Chinese culture, focusing on classical philosophical Taoism, religious Taoism, and neo-Taoism. Same as RLST 5750.

RLST 4760-3. Sufism. Studies origins and aims of Islamic mysticism, with concentration on the thought and practice of Al-Hujwiri, Al-Ghazali, Rumi, and others. Same as RLST 5760.

RLST 4810-3. 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.

RLST 4820-3. Interdisciplinary Seminar on Religion: Topics. Variable topics in religion, drawing from a variety of disciplines and methodologies as they shed light on specific traditions and issues. Same as RLST 5820.

RLST 4830-3. Senior Majors Seminar. Topics and instructors vary. Brings advanced majors together in order to focus their major experience on significant topics and issues of common interest. Required of all majors.

RLST 4840 (1-6). Independent Study.

RLST 5010-3. Biblical Christianity. Same as RLST 4010.

RLST 5050-3. Topics in Christian Studies. Same as RLST 4050.

RLST 5100-3. Biblical Judaism. Same as RLST 4100.

RLST 5150-3. Topics in Jewish Thought. Same as RLST 4150.

RLST 5200-3. Topics in Hinduism. Same as RLST 4200.

RLST 5250-3. Topics in Buddhism. Same as RLST 4250.

RLST 5270-3. Zen Buddhism. Same as RLST 4270.

RLST 5300-3. Topics in Native American Religions. Same as RLST 4300.

RLST 5350-3. Native American Religions: Regional Studies. Same as RLST 4350.

RLST 5400-3. Topics in Mesoamerican Religions. Same as RLST 4400.

RLST 5500-3. City and Symbol in Mesoamerican Religion. Same as RLST 4500.

RLST 5650-3. Islam in the Modern World. Same as RLST 4650.

RLST 5700-3. Confucianism. Same as RLST 4700.

RLST 5750-3. Taoism. Same as RLST 4750.

RLST 5760-3. Sufism. Same as 4760.

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, Confucian canon and state orthodoxy, and others.

RLST 5810-3. Religious Dimensions of Space and Time. Examines symbols, myths, rites, and contexts in which categories of 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 5820-3. Interdisciplinary Seminar on Religion. Same as RLST 4820.

RLST 5840 (1-6). Independent Study.

RLST 6830-3. Approaches to the Study of Religion. Provides advanced orientation in academic study of religion, focusing on methods and theories. Historical, phenomenological, and social scientific approaches are examined, in context of history and present state of the discipline.

RLST 6840 (1-6). Independent Study.

RLST 6940-3. Master's Degree Candidate.

RLST 6950 (1-6). Master's Thesis.

Slavic Languages and Literatures

Polish

PLSH 1010-5. Beginning Polish 1. Elementary description and analysis of pronunciation, morphology, grammar, and usage of modern standard Polish, supported by contemporary readings in Polish. Not designed to fulfill the arts and sciences foreign language requirement.

PLSH 1020-5. Beginning Polish 2. Continuation of PLSH 1010. Prereq., PLSH 1010.

Russian

RUSS 1010-5. Beginning Russian 1. Introduces 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. Approaches Russian through 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 1510-5. Russian Reading 1. Provides a systematic introduction to Russian for nonmajors who primarily need to acquire reading proficiency. Completion of four-semester sequence should enable motivated students to develop skills adequate for use in scholarly or professional reading. Offered in alternate years. Does not satisfy arts and sciences language requirement.

RUSS 1520-5. Russian Reading 2. Continuation of RUSS 1510. Systematic introduction to Russian for nonmajors who primarily need to acquire reading proficiency. Offered in alternate years. Does not satisfy arts and sciences language requirement. Prereq., RUSS 1510, one year of Russian, or instructor consent.

RUSS 1900 (1-3). 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 with a grade of *C-* or better.

RUSS 2020-3. Second-Year Russian Grammar and Composition 2. Continuation of RUSS 2010. Prereq., RUSS 2010 with a grade of *C-* or better.

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 2510-3. Russian Reading 3. Continuation of RUSS 1510 and 1520. Designed for nonmajors who primarily need to acquire reading proficiency. Thorough grounding in grammatical, syntactical, and functional analysis of the principal sentence types used in Russian exposition, supported by readings from current Soviet sources. Offered in alternate years. Does nor satisfy arts and sciences language requirement. Prereq., RUSS 1520, three semesters of Russian, or instructor consent.

RUSS 2520-3. Russian Reading 4. Continuation of RUSS 2510. Designed for nonmajors who primarily need to acquire reading proficiency. Offered in alternate years. Does not satisfy arts and sciences language requirement. Prereq., RUSS 2510, two years of Russian, or instructor consent.

RUSS 2900 (1-3). Independent Study.

RUSS 3010-3. Third-Year Russian 1. Review of Russian grammar coordinated with reading,

speaking, writing, and understanding modern Russian. Uses some texts from modern and nineteenth-century Russian literature. 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 3510-3. Advanced Russian Reading 1. An intensive course for majors or nonmajors who wish to concentrate their efforts on acquiring advanced proficiency in reading. Thorough grammatical, syntactical, and functional analysis of required reading from Soviet periodical literature, supplemented by supervised independent reading in fields of interest. Prereq., five semesters of Russian or instructor consent.

RUSS 3520-3. Advanced Russian Reading 2. Continuation of RUSS 3510. Offers majors and nonmajors an opportunity to acquire advanced proficiency in reading. Grammatical, syntactical, and functional analysis supported by required readings in Soviet periodical literature and supervised reading in fields of interest. Prereq., six semesters of Russian or instructor consent.

RUSS 3900 (1-3). 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 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 4310-3. Pushkin and His Time. Surveys Pushkin's major works and a study of his influence on Russian literature. Prereq., RUSS 3020.

RUSS 4440-3. Tolstoy. Noteworthy short stories, short novels, and novels. Prereq., RUSS 3020.

RUSS 4510-3. Twentieth-Century Russian Poetry. Surveys the major figures in this period, with particular emphasis on Modernist poets active between 1895 and 1930. Prereq., RUSS 3020.

RUSS 4610-3. Twentieth-Century Russian Literature: Prose in the Soviet Union. Surveys short stories and novels written in Russian for citizens of the Soviet Union between 1917 and the present. Prereq., RUSS 3020.

RUSS 4810-3. Pre-Revolutionary Russian Literature. Surveys major works of Russian literature from the beginnings to the Revolution. Readings are in Russian. Prereq., RUSS 3020.

RUSS 4900 (1-3). Independent Study.

RUSS 5310-3. Pushkin and His Time. Same as RUSS 4310.

RUSS 5440-3. Tolstoy. Same as RUSS 4440.

RUSS 5510-3. Twentieth-Century Russian Poetry. Same as RUSS 4510.

RUSS 5610-3. Twentieth-Century Russian Literature: Prose in the Soviet Union. Same as RUSS 4610.

RUSS 5720-3. History of the Russian Language. Same as RUSS 4720.

RUSS 5900 (1-3). Independent Study.

RUSS 6900 (1-3). 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. Approved for arts and sciences core curriculum: historical context.

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. Approved for arts and sciences core curriculum: contemporary societies.

RUSS 4421-3. Gogol. Same as RUSS 5421.

RUSS 4431-3. Dostoevsky. Selected short novels and novels. Same as RUSS 5431.

RUSS 4451-3. Chekhov. Major plays and short stories. Same as RUSS 5451.

RUSS 4461-3. Solzhenitsyn. Significant short novels and novels. Same as RUSS 5461.

RUSS 4811-3. Nineteenth-Century Russian Literature. Surveys background of Russian literature from 1800 to 1900. Russian writers and literary problems in the nineteenth century emphasizing major authors: Pushkin, Lermontov, Gogol, Dostoevsky, Turgenev, Tolstoy, and Chekhov. Approved fot arts and sciences core curriculum: literature and the arts.

RUSS 4821-3. Twentieth-Century Russian Literature. Emphasizes Soviet literature, major writers and problems, the theory and practice of Socialist Realism. Approved for arts and sciences core curriculum: literature and the arts.

RUSS 5421-3. Gogol. Same as RUSS 4421.

RUSS 5431-3. Dostoevsky. Same as RUSS 4431.

RUSS 5451-3. Chekhov. Same as RUSS 4451.

RUSS 5461-3. Solzhenitsyn. Same as RUSS 4461.

Slavic

SLAV 1900 (1-3). Independent Study.

SLAV 2900 (1-3). Independent Study.

SLAV 3900 (1-3). 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. Surveys Ukrainian history and culture from prehistoric to present times. Prereq., junior standing.

SLAV 4900 (1-3). Independent Study.

SLAV 5900 (1-3). Independent Study.

SLAV 6900 (1-3). Independent Study.

Sociology

SOCY 1001-3. Analyzing Society. Examines U.S. society in global context, using basic sociological ideas. Focuses on the nature of group life, social and moral order, social institutions, social disorganization, social problems, and social change. Approved for arts and sciences core curriculum: contemporary societies.

SOCY 1011-3. Introduction to Sociological Ideas. Reviews important studies that have shaped the field of sociology and produced essential theory and methods of the sociologist at work. Recommended prereq., SOCY 1001.

SOCY 1021-3. Twentieth-Century Social Theory. Reviews major sociological theorists of the twentieth century such as Duncan, Garfinkel, Goffman, Merton, and Parsons.

SOCY 1031-3. Introduction to Social Psychology. Surveys social psychology with special attention given to theories such as psychoanalysis, symbolic interactionism, culture and personality, and structural-functionalism.

SOCY 1041-3. Honors Introduction to Sociological Theory and Social Criticism. Introduces sociological theory for honors students majoring in the social sciences. Emphasizes modern social theory and social criticism and their application to analysis of contemporary social issues.

SOCY 1841 (1-3). Independent Study in Sociology. Lower-division variable credit. Prereq., instructor consent.

SOCY 2001-3. Mass Society. Analyzes features of modern society such as technology, bureaucracy, urban life, mass communication and social disorganization, and how individuals adapt to societal conditions.

SOCY 2011-3. Contemporary Social Issues and Human Values. Explores contemporary societies on a global scale. Focuses on such issues as capitalism, socialism, race and ethnic problems, sex discrimination, poverty and the concentration of wealth, crime and deviance, human rights and human values, peace and war. Approved for arts and sciences core curriculum: ideals and values.

SOCY 2021-3. Social Movements. Social origins and patterns of development of modern social and political movements.

SOCY 2031-3. U.S. Values, Social Problems, and Change. Examines U.S. society from the perspective of values and theories of social change. Considers such problems as distribution of power, unemployment, poverty, racism and

sexism, the changing role of the family, and drugs. Approved for arts and sciences core curriculum: ideals and values.

SOCY 2041-3. The Social Construction of Reality. Analyzes the human environment as a human product. Studies how all things that construct 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. Analyzes 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 mid-nineteenth century to present.

SOCY 3021-3. Urban Sociology. Analyzes the social structure and problems of modern metropolitan areas.

SOCY 3031-3. Perspectives on Alienation. Examines, explains, and compares different historical and sociological theories of alienation to define problems confronting people in modern society.

SOCY 3041-3. Self and Consciousness. Explores human development from a psychosocial 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. Considers community as a basic unit of society, with analysis of the range of communities from village to metropolitan area.

SOCY 3061-3. Statistics. Introduces 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. Examines adolescence historically and cross-culturally, giving special emphasis to adolescence in the U.S. Analyzes the relationship between social climates and patterns of behavior, such as academic performance and dating.

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 influences of both natural and man-made environments upon human behavior and social organization. Considers both microenvironments and their influence on individuals, as well as the impact of macroenvironments on societal organization. Same as ENVD 3091.

SOCY 3101-3. Social Control. Studies 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. Studies historically and crossculturally 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. Course focuses on language in its social context, and what happens when people talk.

SOCY 4001-6. Research Methods in Sociology. Teaches quantitative research methods emphasizing 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. Limited to SOCY majors only.

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. Limited to SOCY majors only. Same as CHST 4015.

SOCY 4031-3. Social Psychology. Studies 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, and the relation between attitudes and overt behavior.

SOCY 4041-3. The Creative Self. 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. Examines use of computer models to enhance sociological reasoning and to help solve social problems. Students learn how to write programs that simulate social structures, processes, and complex systems such as friendship networks, social mobility, and world systems.

SOCY 4061-3. Statistics through Computers. Introduces 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. Same as SOCY 5061.

SOCY 4071-3. Technology and Modernization. Analyzes social structures and social relationships that change in response to technological innovation. Emphasis also given to the role of technology in the development of countries other than the United States.

SOCY 4081 (1-3). Sociology of Education. Analyzes the school as a social organization. Among 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. Same as SOCY 5081.

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 4101-3. Education in Multilingual Communities. Examines roles of language and social inequality in educational achievement, particularly among students with differing mother tongues, and analyzes politics and pedagogy of bilingual education. Same as SOCY 5101.

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. Discusses 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 4151-3. Sociology of the Future. Systematic analysis of future societies. A variety of possible social arrangements are examined, and the social, economic, and political consequences of each are assessed. Computer simulation taught as an optional method. Same as SOCY 5151.

SOCY 4441-3. Senior Honors Seminar 1. Critical assessment of major accomplishments of sociology and contemporary challenges to the field. Seminar 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 4461-3. Critical Thinking in Sociology. Examines a sociological topic in depth, covering such issues as theory, methods, social structure, social processes, social change, and social policy, emphasizing writing, reading, and critical thinking. Prereqs., SOCY 1001 and 1011 and senior standing. Approved for arts and sciences core curriculum: critical thinking.

SOCY 4841 (1-3). Independent Study in Sociology. Upper-division variable credit. Instructor consent required.

SOCY 5001-3. Classical Theory. Surveys sociological theory into the early twentieth century and its influence in the emergence of major contemporary theoretical perspectives.

SOCY 5011-3. Contemporary Theory. Surveys post-World War II sociological theory emphasizing such theories as functionalism, symbolic interactionism, exchange theory, conflict theory, and phenomenology.

SOCY 5021-3. Data Analysis. Principles and practice of quantitative and qualitative research, including the nature of scientific explanation; the relationship between theory and research, research design, measurement problems, sampling questionnaire construction, interviewing, ethnographic methods, and statistical analysis.

SOCY 5031-3. Research Design. Examines modern methods of quantitative and qualitative data analysis such as regression analysis, causal 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. Applies basic principles of research design, measurement, and administration in the behavioral sciences to situations likely to be encountered when social research is conducted in an action setting.

SOCY 5051-3. Sociology of Religion. Comparative analysis of religion as a social institution.

SOCY 5061-3. Statistics through Computers. Same as 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. Unites perspectives from the sociology of knowledge and science with those from the sociology of language.

SOCY 5081 (1-3). Sociology of Education. Same as SOCY 4081.

SOCY 5091-3. Sociological Analysis of Organizations. Examines theory and research in the field of formal organization. Gives special attention 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. Same as 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. Ethnographic Research 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 that allows intimate observations of their behavior, and reporting it in ways useful to social science but not harmful to those observed.

SOCY 5141-3. Sociolinguistics. 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. Same as SOCY 4151.

SOCY 5221-3. Ethnographic Analysis. Drawing on data gathered through participation, observation, and in-depth interviewing, students focus on developing theoretical analyses and exploring classical and post-modern ethnographic writing formats. Students present and revise their papers as well as review journal articles. Prereq., SOCY 5121 or instructor consent.

SOCY 5321-3. Sociology of Ideas. Examines how social structures and beliefs mutually influence each other through a critical analysis of classical and modern sociological theories and methods. Prereqs., graduate standing and instructor consent.

SOCY 5531-3. Seminar in Social Psychology. Studies the individual in social context. Focuses on theoretical perspectives and substantive issues specific to sociological and social psychology, including socialization, the self, social roles, language, deviance, gender, collective behavior, group processes, attitudes and behavior, social norms, and conformity. Prereq., graduate standing.

SOCY 5841 (1-3). Independent Study in Sociology. Graduate variable credit. Prereq., instructor consent.

SOCY 6841 (1-6). Guided Research in Sociology.

SOCY 6941 (1-3). Candidate for Degree for Master's Thesis.

SOCY 6951 (1-4). Master's Thesis.

SOCY 8991-10. 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 and Health Issues

SOCY 1002-3. Global Human Ecology. Examines global survival issues and human values. Focuses on such problems as overpopulation, world hunger and poverty, pollution, resource shortages, environmental impact of technology and population dynamics, public policy, and strategies for change. Same as CPST 1002. Approved for arts and sciences core curriculum: contemporary societies.

SOCY 1012-3. Population Issues in the United States. Introduces the sociological study of human populations in contemporary societies: their size, composition, and distribution. Examines changes in these factors as they occur through processes of mortality, fertility, and migration. Approved for arts and sciences core curriculum: United States context.

SOCY 3002-3. Population and Society. Examines population, its structure and processes, and its relationships to selected areas of the social structure. Examines Malthusian, neo-Malthusian, and Marxist perspectives.

SOCY 3012-3. Women, Development, and Fertility. Investigates the status of women and fertility in context of social and economic development. Same as WMST 3012. Approved for arts and sciences core curriculum: cultural and gender diversity.

SOCY 3022-3. Sociology of Chicanos and Mexican Americans. Surveys contemporary sociological studies of Chicanos, and theories used to understand and explain their status. Issues covered include population growth, socioeconomic status, reverse discrimination, Chicana feminism, and U.S.-Mexico relations. Same as CHST 3023.

SOCY 4012-3. Population Control and Family Planning. Examines determinants of population and economic growth in developing countries to assess the adequacy of current population policies. Considers determinants of fertility, family size, childlessness, and the changing nature of reproductive freedom sociologically and from a feminist standpoint. Open to juniors and seniors only. Same as WMST 4012.

SOCY 4022-3. Population Studies: Fertility and Mortality. Examines sociological causes and consequences of different levels of fertility, mortality, and population growth. Emphasizes methods, theory, policy, and practical applications. Same as SOCY 5022.

SOCY 4032-3. Population Studies: Migration and Distribution. Examines migration as 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. Same as SOCY 5032.

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. Same as SOCY 4022.

SOCY 5032-3. Population Studies: Migration and Distribution. Same as SOCY 4032.

SOCY 5042-3. Sociology of the Family. Examines recent trends in research and theory, emphasizing the American family.

SOCY 5052-3. Research in Demographic Methods. Surveys 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. Ethics and Social Issues in U.S. Health and Medicine. Explores current ethical and policy issues in U.S. health and medical practices. Includes such issues as alcohol and drug abuse, organ transplants and substitutes, genetic engineering, contraception, abortion, occupational safety and health, and euthanasia. Approved for arts and sciences core curriculum: ideals and values.

SOCY 2003-3. Sociology of Death and Dying. Examines 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. Examines 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 Gender, Health, and Aging. Examines 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. Analyzes 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. Studies present and future roles of the aged in the family, the community, and the economic, political, health, and retirement systems. Approved for arts and sciences core curriculum: contemporary societies.

Criminology

SOCY 1004-3. Deviance in U.S. Society. Examines deviant groups in the U.S., emphasizing existing theory and research about such issues as deviant careers, deviant lifestyles and behavior, and processes of social control. Approved for arts and sciences core curriculum: ideals and values.

SOCY 2004-3. Topics in Criminology. Variety of courses in criminology taught by visiting lecturers. See current departmental announcements for specific content.

SOCY 2014-3. The Criminal Justice System in the United States. Explores power, socioeconomic status, race, age, and gender issues in law enactment and enforcement, judicial practice, and correctional policy and practice. Examines historical changes in these structures. SOCY 1001 recommended prereq.

SOCY 4004-3. Topics in Criminology. Variety of courses in criminology to be taught by visiting lecturers. See current departmental announcements for specific content. Students may receive credit for this course up to three times for different topics.

SOCY 4014-3. Criminology. Scientifically studies criminal behavior with special attention given to development of criminal law and its use to define crime, the cause of law violation, and methods used to control criminal behavior.

SOCY 4024-3. Juvenile Delinquency. Studies factors involved in causes and distribution of delinquent behavior; problems of adjustment of delinquents; and factors in treatment and in post-treatment adjustment. Approved for arts and sciences core curriculum: contemporary societies.

SOCY 4034-3. The Treatment of Offenders. Studies principles of treating offenders, including attitude formation and change, group dynamics, behavior modification, skill development, work programs, and social reeducation.

SOCY 4044-3. Women and Crime. Examines gender and criminality by focusing on women as criminals, women as victims (sexual and domestic abuse), and women as workers in the criminal justice system (police, prison guards, attorneys, and judges). Prereqs., SOCY 1004 and 4014, and 56 credit hours or more.

SOCY 4934-3. Internship in Community Corrections 1. Students gain professional experience with offender treatment practices and evaluation research approaches in community correctional settings. Seminar topics include theory and practice in probation and parole programming, half-way house program structure and management, and other community correction options.

SOCY 4944-3. Internship in Community Corrections 2. Designed to continue the training received in SOCY 4934. Students may receive credit for this course up to two times when necessary to complete their obligations to the internship organization. Prereq., SOCY 4934.

SOCY 5004-3. Topics in Criminology. Variety of courses in criminology to be taught by visiting lecturers. See current departmental announcements for specific content. Students may receive credit for this course up to three times for different topics.

SOCY 5014-3. Seminar in Criminology. Examines theories of social causation of crime and crime control policies.

SOCY 5024-3. Deviant Behavior. Examines current theory and research on deviant behavior emphasizing interrelationships between various forms of deviance and social responses to deviance.

SOCY 5034-3. Prevention and Control of Delinquency and Crime. Examines and evaluates policies and programs for prevention and control of delinquency and crime, and principles and theories underlying them.

Social Conflict

SOCY 1005-3. Social Conflict and Social Values. Explores origin, escalation, and resolution of social conflict. Focuses on major conflict theories, human values and social action, and use of simulation and negotiation exercises for learning conflict management skills. Approved for arts and sciences core curriculum: contemporary societies or ideals and values.

SOCY 1015-3. U.S. Race and Ethnic Relations. Examines race and minority problems in U.S. society, including psychological, social, and cultural sources of prejudice and discrimination. Same as CHST 1013. Approved for arts and sciences core curriculum: United States context.

SOCY 2015-3. Sociology of Natural and Social Environments. 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. Nonviolence and the Ethics of Social Action. Examines nonviolence as a strategy of social action. Focuses on ethics of action; racial and economic movement of social justice; and nonmilitary national defense, civil disobedience, and conscientious objection to war. Approved for arts and sciences core curriculum: contemporary societies.

SOCY 3005-3. Sociological Analysis of Revolution. Comparative analysis of major revolutions emphasizing causation, revolutionary process, and long-term consequences. Attention given to social stratification, political organization, economic processes, ideological systems, and international relations.

SOCY 3015-3. Sociology of Peacemaking. Analyzes institutions of war and of the forces emerging to counter them, such as negotiation, nonviolent national defense strategies, and peace movements.

SOCY 4005-3. Sociology of War. Considers the questions war raises by applying modern sociological theory and methods to armed conflicts from the ancient Peloponnesian War to Vietnam. Same as SOCY 5005.

SOCY 4015-3. Theories of Conflict. Discusses 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. Explores relationship between theory of conflict resolution and practices, such as mediation. Same as SOCY 5015.

SOCY 4025-3. Conflict Management in Social Systems. Explores conflict resolution theory and method as applied to interpersonal, intergroup, and interorganization conflict. Same as SOCY 5025.

SOCY 4035-3. Social Stratification. Studies theories of social, ethnic, sex, and age stratification. Examines social inequality in the United States, emphasizing analysis of resulting conflicts. Same as SOCY 5035.

SOCY 4105-3. Sociology of Modern Soviet Society. Examines important dimensions of contemporary Soviet society sociologically: social stratification, urbanization, population, family, the status of women, welfare, and social problems. Emphasizes the sociological analysis of social structures, processes, conflict, and change. Prereq., junior or senior standing.

SOCY 5005-3. Sociology of War. Same as SOCY 4005.

SOCY 5015-3. Theories of Conflict. Same as SOCY 4015.

SOCY 5025-3. Conflict Management in Social Systems. Same as SOCY 4025.

SOCY 5035-3. Social Stratification. Same as SOCY 4035.

SOCY 5055-3. Modern Marxist Social Theory. Analyzes 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 (1-3). Topics in Social Conflict. Visiting conflict management specialists examine the theory/practice relationship from the perspective of the professional third-party neutral. Explores family disputes, environmental and resource conflict, and international and civil wars. Graduate students may receive credit for this course up to three times for different topics. Course can be repeated in any given semester.

SOCY 5105-3. Sociology of Modern Soviet Society. Same as SOCY 4105.

SOCY 5205-3. Collective Action. Studies collective action in its primary forms: movement for social change; religious movements; and civil resistance to military occupation and political

repression. Emphasizes movement leadership, ideology, organizational process and structure, and use of nonviolent action. Prereq., graduate standing or instructor consent.

SOCY 5215-3. Sociology of Nonviolence. Examines the sociological phenomenon of nonviolence as a critical dynamic of social change. Emphasizes theories and methods of nonviolence throughout history; contemporary research in and application of nonviolence; and case studies of nonviolent conflict. Prereq., graduate standing or instructor consent.

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. Discusses current perspectives on the social determinants of sexuality. Emphasizes sociological critique, and analyzes the interfacing of societal, psychological, and cultural influences. Interactional perspective of human sexuality is presented. Same as WMST 1006.

SOCY 1016-3. Sex, Gender, and Society 1. Examines status and power differences between the sexes at individual and societal levels. Emphasizes historical cross-cultural context of gender roles and status, and reviews major theories of gender stratification. Same as WMST 1016. Approved for arts and sciences core curriculum: cultural and gender diversity.

SOCY 2016-3. Sex and Gender in Futuristic Literature. Examines 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. Same as WMST 2016. Approved for arts and sciences core curriculum: cultural and gender diversity.

SOCY 3016-3. Marriage and the Family in U.S. Society. Examines marriage and the family historically and cross-culturally within the U.S. Emphasizes changing roles and family structures. Also examines alternatives to the nuclear family and traditional marriage to explore new definitions of family. Prereqs., SOCY 1001 and junior standing.

SOCY 3026-3. Women of Color: Chicanas in U.S. Society. Critically explores the Chicana experience and identity. Examines issues arising from the intersection of class, race, and gender. Focuses on controversies surrounding culture and gender through an analysis of feminism and feminismo.

SOCY 3046-3. Topics in Sex and Gender. Visiting faculty present courses based on their area of expertise and specialization in the field of sex and gender. Students should check current sociology department notices of course offerings for specific topics. Students may receive credit for this course up to three times for different topics.

SOCY 4016-3. Sex, Gender, and Society 2. Studies status and power differences between the sexes at individual, group, and societal levels. Examines empirically established psychological sex differences, and reviews biological, psychological, and sociological explanations for gender differences. Same as WMST 4016.

SOCY 4026-3. Sociology of Mental Health: Gender, Race, and Class Issues. Considers historical, social, and normative determinants of mental illness with particular attention to mental hospitals, social-therapy, and mental health services.

SOCY 4046-3. Men and Masculinity. Studies the historical development, cross-cultural definition, and social construction of masculinity. Emphasizes contemporary definitions of masculinity and the impact on these definitions.

SOCY 4086-3. Family and Society. Studies the changing relationship between the family and the economic structure, historically and sociologically. Examines households that differ from the nuclear family, taking into account the political, social, ideological, demographic, and economic determinants of family formation. Open to juniors and seniors only. Same as SOCY 5086 and WMST 4086.

SOCY 5006-3. Sociology of Sex and Gender. Provides 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. Same as SOCY 4086.

Spanish and Portuguese

Spanish

SPAN 1010-5. Beginning Spanish 1. Offers students a firm command of Spanish grammat. Grammar is used as a point of departure for development of oral skills. Reading and writing are stressed to a lesser degree. Attendance at the language laboratory may be mandatory.

SPAN 1020-5. Beginning Spanish 2. Continuation of SPAN 1010. Attendance at the language laboratory may be mandatory. Prereq., SPAN 1010 or placement.

SPAN 1150-8. Intensive First-Year Spanish. An intensive beginning course covering the same material as SPAN 1010 and 1020. Not open to students with credit in SPAN 1010 and 1020. Attendance at the language laboratory may be mandatory. Prereqs., placement and departmental approval.

SPAN 1180-3. Literature and Culture: Modern Spanish-American Fiction in Translation. Students read and discuss translations of works by outstanding contemporary Spanish-American writers, including Borges, Cortazar, Fuentes, García Marquez, Puig, and Allende. Emphasizes contrasts between the Hispanic perception of reality and perceptions of other ethnicities. Requirements include papers, extensive class discussion, and two examinations.

SPAN 2110-3. Second-Year Spanish 1. Includes grammar review and 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 study of Hispanic culture, civilization, literature, and art. Prereq., SPAN 2110 or placement.

SPAN 2150-5. Intensive Second-Year Spanish. Intensive review of structures normally covered in SPAN 2110 and 2120, including 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 3000-5. Advanced Spanish Language Skills. 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 study of terminology and techniques used in business transactions and the interpretation and understanding of 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 given to 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 important contrasts between 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 identification of basic ideological and formalistic issues within texts being studied. Prereq., SPAN 3000 or instructor consent. Approved for arts and sciences core curriculum: critical thinking.

SPAN 3120-3. Advanced Spanish Grammar. Analysis of texts from morphological and syntactic perspectives. Structural and semantic characteristics of major features of Spanish are studied at the sentence level. Use of these grammatical features is then studied in selected literary texts. Prereq., SPAN 3000 or equivalent.

SPAN 3200-3. Spanish Culture. Examines 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 pre-Columbian indigenous cultures and continuing to the present. Prereq., SPAN 3000.

SPAN 3310-3. Twentieth-Century Spanish Literature. Surveys leading writers of Spain from 1898 until the present. Prereq., SPAN 3100.

SPAN 3340-3. Twentieth-Century Spanish-American Literature. Introduces contemporary Spanish-American literature. Prereq., SPAN 3100.

SPAN 3700-3. Selected Readings: Spanish Literature in Translation. Introduces selected Spanish literature masterpieces. Taught in English. Will not count toward major requirements. Approved for arts and sciences core curriculum: literature and the arts.

SPAN 4000-3. Hispanic and Native American Culture of the Southwest. Does not count for major. Taught in English. Same as SPAN 5000 and CHST 4000.

SPAN 4010-3. Advanced Rhetoric and Composition. Designed to improve written expression in Spanish. Detailed study of nuances of grammar points most difficult for students. Attention to errors in student compositions and to various styles of written Spanish. Prereqs., SPAN 3100 and 3120 or equivalent.

SPAN 4060-3. Problems of Business Translation in Spanish 1. 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 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 major works of Spanish-American literature from the colonial period to the late nineteenth century. Emphasizes 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 major works of Spanish-American literature from late nineteenth century to 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. Examines 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. Knowledge and study of the body of literature written in Spanish by Hispanos living in the United States give 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 4650-3. Methods of Teaching Spanish. Familiarizes students with current methodology and techniques in foreign language teaching. Peer-teaching coupled with 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. Same as SPAN 5650.

SPAN 4660-6. High School Spanish Teaching. Part of 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. Instructor consent required. Prereqs., SPAN 3100, 3200, an additional course above SPAN 3000, and departmental approval.

SPAN 4970-1. Bibliography and Methods of Literary Research. Designed to provide a background in fundamental literary bibliographical research tools. Considers standard library works on the subject and others that are little-known to facilitate research efforts of students insofar as location and identification of critical studies are concerned. Predominant style sheets available to Spanish researchers are also discussed in detail. Prereq., graduate standing or departmental consent.

SPAN 4980-1. Theories and Methods of Language Learning and Pedagogy for Teaching Assistants and Graduate Part-Time Instructors. Required, intensive mini-course for teaching assistants in Spanish and Portuguese. Provides teachers with the opportunity to learn about language learning theory and pedagogy. Prereq., graduate standing or departmental consent.

SPAN 4990-3. Spanish Honors Thesis. Prereqs., 18 hours of upper-division Spanish (3.00 GPA overall and 3.50 GPA in Spanish).

SPAN 5000-3. Hispanic and Native American Culture of the Southwest. Same as SPAN 4000.

Note: All Spanish seminars may be retaken for credit, provided the subject differs from one course to another.

SPAN 5120 (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. Same as SPAN 7120.

SPAN 5130 (1-3). Seminar: Critical Approaches to Hispanic Literature. Treats various topics and genres, as needs and resources dictate. Special attention to theoretical and critical analysis of Hispanic literature with greatest emphasis on contemporary trends. Genres might include narrative, poetry, and theatre. Prereq., graduate standing or departmental consent. Same as SPAN 7130.

SPAN 5140 (2-4). Seminar: Spanish Literature, Medieval Period. Studies medieval works, authors, and themes, with consideration of principal influences from other literatures. Reading in Old Spanish. Prereqs., graduate standing and SPAN 5420 or 7420. Same as SPAN 7140.

SPAN 5200 (2-4). Seminar: Spanish Literature, Renaissance and Baroque. Treats various topics, as needs and resources dictate. Special attention to developing 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. Same as SPAN 7200.

SPAN 5210 (2-4). Seminar: Spanish Literature, Eighteenth and/or Nineteenth Centuries. Treats various topics, as needs and resources dictate. Special attention to developing 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. Same as SPAN 7210.

SPAN 5220 (2-4). Seminar: Spanish Literature, Twentieth Century. Treats various topics, as needs and resources dictate. Special attention to developing 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. Same as SPAN 7220.

SPAN 5300 (2-4). Seminar: Spanish-American Literature, Colonial Period and/or Nineteenth Century. Treats various topics, as needs and resources dictate. Special attention to developing 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. Same as SPAN 7300.

SPAN 5320 (2-4). Seminar: Twentieth-Century Spanish-American Literature. Treats various topics, as needs and resources dictate. Special attention to developing 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 department consent. Same as SPAN 7320.

SPAN 5400 (2-4). Seminar: Spanish Phonology. Topics within Spanish phonology are treated, as needs and resources dictate.

Special attention 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. Same as SPAN 7400.

SPAN 5410 (2-4). Seminar: Spanish Syntax. Treats topics within Spanish syntax, each requiring a semester's study, as needs and resources dictate. Special attention 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. Same as SPAN 7410.

SPAN 5420 (2-4). Seminar: History of the Spanish Language. Treats topics within the history of the Spanish language, as needs and resources dictate. Concerned with linguistic evolution of Spanish from neo-Latin to its present status as a world language; considers important historic, linguistic, literary, and cultural currents. 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., graduate standing or departmental consent. Same as SPAN 7420.

SPAN 5430 (2-4). Seminar: Hispanic Linguistics. Studies a major topic from an area such as phonology, syntax, history of the Spanish language, Hispanic linguistics and literature, or applied Hispanic linguistics. Prereq., graduate standing or departmental consent. Same as SPAN 7430.

SPAN 5440-3. Seminar: Trends in Hispanic Linguistics. Overview of major trends and issues in Hispanic linguistics, including phonology, syntax, dialectology, sociolinguistics, discourse analysis, text linguistics, semiotics, history of the Spanish language, language acquisition, and applied linguistics. Prereq., graduate standing or departmental consent. Same as SPAN 7440.

SPAN 5650-3. Methods of Teaching Spanish. Same as SPAN 4650.

SPAN 6840 (1-3). Independent Study. Prereqs., graduate standing and departmental approval.

SPAN 6940-variable credit. Master's Degree Candidate. Prereqs., graduate standing and departmental approval.

SPAN 6950-4. Master's Thesis. Prereqs., graduate standing and departmental approval.

SPAN 7120 (1-3). Seminar: Spanish Literature and/or Spanish-American Literature. Same as SPAN 5120.

SPAN 7130 (1-3). Seminar: Critical Approaches to Hispanic Literature. Same as SPAN 5130.

SPAN 7140 (2-4). Seminar: Spanish Literature, Medieval Period. Same as SPAN 5140.

SPAN 7200 (2-4). Seminar: Spanish Literature, Renaissance and Baroque. Same as SPAN 5200.

SPAN 7210 (2-4). Seminar: Spanish Literature, Eighteenth and/or Nineteenth Centuries. Same as SPAN 5210.

SPAN 7220 (2-4). Seminar: Spanish Literature, Twentieth Century. Same as SPAN 5220.

SPAN 7300 (2-4). Seminar: Spanish-American Literature, Colonial Period and/or Nineteenth Century. Same as SPAN 5300.

SPAN 7320 (2-4). Seminar: Twentieth Century Spanish-American Literature. Same as SPAN 5320.

SPAN 7400 (2-4). Seminar: Spanish Phonology. Same as SPAN 5400.

SPAN 7410 (2-4). Seminar: Spanish Syntax. Same as SPAN 5410.

SPAN 7420 (2-4). Seminar: History of the Spanish Language. Same as SPAN 5420.

SPAN 7430 (2-4). Seminar: Hispanic Linguistics. Same as SPAN 5430.

SPAN 7440-3. Seminar: Trends in Hispanic Linguistics. Same as SPAN 5440.

SPAN 8840 (1-3). Independent Study. Prereqs., graduate standing and departmental approval.

SPAN 8990-10. 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 section of this catalog. Prereqs., graduate standing and departmental approval.

Portuguese

PORT 1010-5. Beginning Portuguese 1. Offers students a firm command of Portuguese grammar. Grammar used as point of departure for development of oral skills. Reading and writing stressed to lesser degree. Attendance at language laboratory may be mandatory.

PORT 1020-5. Beginning Portuguese 2. Continuation of PORT 1010. Prereq., PORT 1010 or placement.

PORT 1150-8. Intensive Beginning Portuguese. Intensive review of the structures normally covered in PORT 1010 and 1020. Attendance at language laboratory may be mandatory. Not open to students with credit in PORT 1010 and 1020. 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 2150-5. Intensive Second-Year Portuguese. Intensive review of 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 2350-3. Portuguese for Spanish Speakers. Intensive introduction to the Portuguese language for those able to speak Spanish. Prereq., five semesters of college Spanish or equivalent, or departmental approval.

PORT 4030-3. 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. Same as PORT 5030.

PORT 4110-3. Survey of Brazilian Literature. Examines major works of Brazilian literature. Prereq., PORT 2120 or 2150 or 2350 or equivalent. Same as PORT 5110.

PORT 4150-3. Survey of Portuguese Literature. Examines major works of Portuguese literature. Prereq., PORT 2120 or 2150 or 2350 or equivalent. Same as PORT 5150.

PORT 4220-3. 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. Same as PORT 5220.

PORT 4840 (1-3). Independent Study. Prereq., departmental approval.

PORT 5030-3. Topics: Luso-Brazilian Civilization. Same as PORT 4030.

PORT 5110-3. Survey of Brazilian Literature. Same as PORT 4110.

PORT 5150-3. Survey of Portuguese Literature. Same as PORT 4150.

PORT 5220-3. Special Topics in Luso-Brazilian and/or African Literature. Same as PORT 4220.

PORT 5850 (1-3). Independent Study. Prereqs., graduate standing and departmental approval.

Theatre and Dance

History/Dramaturgy/Directing

THTR 1011-3. Development of Theatre and Drama 1. Examines interaction of dramatic literature and theatre in performance from the Greeks to the eighteenth century. Introduces theatrical styles and artists, basic repertoire of world drama, and analysis of drama in performance. Approved for arts and sciences core curriculum: literature and the arts.

THTR 1021-3. Development of Theatre and Drama 2. Continuation of THTR 1011. Examines interaction of dramatic literature and theatre in performance from eighteenth century to ptesent. Introduces theatrical styles and artists, basic repertoire of world drama, and analysis of drama in performance.

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. Prereqs., THTR 2003, 2005, 2013, 2035, and junior or senior standing.

THTR 4001-3. American Theatre Studies. Examines theatre in America from its beginning to the present; particular attention to theatres, plays, and players since 1800, including frontier theatres, regional repertory theatres, music theatre, and the evolution of Broadway and off-

Broadway. Approved for arts and sciences core curriculum: literature and the arts.

THTR 4011-3. Seminar: Theory and Criticism. Studies theories and criticism of dramaturgy and theatrical performance from Aristotle to Schechner. Allows practical application through assignments in writing theatre critiques and play analyses. Same as THTR 5011.

THTR 4031-3. European Theatre Studies. Examines 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. Introductory course in craft of playwriting; primary focus on technique of developing short plays.

THTR 4071-3. Advanced Directing. Advanced study of theory and practice of play direction through the preparation of a one-act play. Prereq., THTR 3071. Same as THTR 5071.

THTR 4081-3. Senior Seminar. In this capstone course, students examine the relationship between theatre and dance, their relationship to other aesthetic phenomena, and their interaction with society. Prereq., senior standing with major in theatre or dance. Approved for arts and sciences core curriculum: critical thinking.

THTR 5011-3. Seminar: Theory and Criticism. Same as THTR 4011.

THTR 5021-3. Seminar: Perspectives on Acting. The art of acting is examined through study of acting theories and practices developed during major periods of theatre history. Examines the variery of theories about acting that remain today.

THTR 5051-3. Special Topics in Theatre History. Detailed study of a particular topic in theatre history: e.g., an era, a style, a country, or an organization. Topic specified in *Registration Handbook and Schedule of Courses*

THTR 5061-3. Asian Theatre Studies. Studies 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 5071-3. Advanced Directing. Graduate students required to prepare a full-length play or two one-acts. Prereq., THTR 3071 or instructor consent. Same as THTR 4071.

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 study of 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. Studies 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. Studies Elizabethan and Jacobean drama in performance, with particular attention to nineteenth- and twentieth-century productions, and the critical and scholarly responses to these productions. Examines landmark productions of selected plays by Shakespeare and his contemporaries.

THTR 6031-3. On-Stage Studies: American Theatre and Drama. Studies 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. Studies 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 students to undertake a production project, normally within the major theatre season, that requires detailed preparatory research, testing of ideas, and public presentation of theories and concepts in ptactice. Students work under faculty supervision and prepare a documented written report and evaluation of the research, rehearsal, and performance process. Prereqs., advanced course work in directing, and approval by the student's committee.

THTR 6061-3. On-Stage Studies: Contemporary British and American Drama. Studies contemporary British and American drama since 1950, with particular attention to nontraditional plays and production styles that distinguish contemporary theatre from earlier forms of modernism.

Performance

THTR 1003-3. Introduction to Acting for Nonmajors. Teaches the basic principles of acting to nontheatre majors, focusing on relaxation, concentration, improvisation, use of imagination, actions, objectives, initial monologue and scene work, the audition process, and basic terms and concepts of process work for the actor.

THTR 2003-3. Acting: Beginning. Emphasizes principles of acting, focusing on exercises in relaxation, talking and listening, use of images, actions and objectives, and basic concepts of process work. In addition to required texts, there is a required reading list of plays.

THTR 2013-3. Performance of Literature. Students learn 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: Intermediate. Continuation of the techniques introduced in the beginning acting course (THTR 2003). Emphasizes monologues and scene study of contemporary plays. Explores basic techniques in developing a character. In addition to required texts, there is a required reading list. Prereqs., THTR 2003 and 2013.

THTR 2043-3. Vocal and Physical Preparation. 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 3003-3. Acting: Advanced. Acting principles and techniques learned in prerequisite courses are adapted and applied to a range of selected scenes of both contemporary and period plays. Emphasizes developing the necessary craft elements to fulfill textual demands. Prereqs., THTR 2003, 2013, and 2023.

THTR 3013-4. Studio 1—Acting Process: Technique. In-depth study of the acting process. Focuses on developing the actor's technique. Explores the craft elements of acting, as well as text analysis. Prereqs., sophomore standing and admission to the B.F.A. program in acting.

THTR 4003-3. Studio 2: Ensemble Performance of Literature. Analysis and performance of fiction and nonfiction. Research into life and times of a historical personage, culminating in creation of a script and one-person performance. Emphasizes scripting and ensemble performance. Prereq., THTR 2013.

THTR 4013-4. Studio 3: 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 4023-4. Studio 4: Acting Process. Develops the actor's ability to use rechnique in the analysis and performance of selected scenes, focusing on realism. Prereq., THTR 3013.

THTR 4033-3. Advanced Vocal and Physical Preparation. Continues the work begun in THTR 2043. Studies advanced vocal and physical techniques with the goal of integrating these skills into the working process of the performing artist. Prereqs., THTR 2043 and theatre major, or instructor consent.

THTR 4043-4. Studio 5: Contemporary British and American Theatre.

THTR 4053-4. Studio 6: Senior Repertory. 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 students to undertake an acting project, normally within the major theatre season, that requires detailed preparatory research, testing of ideas, and public presentation of theories and concepts in practice. Students work under faculty supervision and prepare a documented written report and evaluation of the research, rehearsal, and performance process. For graduate students only. Prereqs., advanced studies in acting and approval by the student's committee.

Design and Technical Theatre

THTR 2005-3. Stagecraft. Introduces technical elements and procedures, including materials, organization, and equipment used to realize theattical 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 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 students to basic principles of stage makeup, and through a structured lab provides practical application of these techniques. Further practical experience gained through work on University Theatre productions.

THTR 2085-3. History of Fashion 1. Detailed study of the history of fashion from 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. 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 two-dimensional presentation of ideas.

THTR 3015-3. Scene Design 1. Study and practice of scene design emphasizing study of design theory, color, and space. Special emphasis 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 evolution of theatre structure: stage, audience area, and backstage equipment. Particular attention paid to development of 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 major season productions. Course may be repeated to a maximum of eight credits. Graded on a pass/fail basis; to pass, students must put in required hours, meet all calls, and satisfactorily complete required work.

THTR 3065-3. Theatre Management. Introduces theory and practice of 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. Emphasizes 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. Studies architectural design elements and the methods of representation on stage through painting. Prereq., THTR 3015.

THTR 4045-3. Stage Lighting Design. Study and practice of lighting and design, emphasizing principles of electricity, optics, color theory, instrumentation, and their aesthetic application to the stage.

THTR 4065 (1-3). Advanced Design Projects. Practical course in the application of design theory in which students undertake design of major costume, lighting, or scenic elements in a major season production. Design concept and process must be explained and defended. Repeatable to a maximum of 6 credits. Prereq., instructor consent.

THTR 4075 (1-3). Advanced Technical Projects. Students assume responsibility, under faculty supervision, for planning and executing specific technical responses to a design concept in the department's major season productions. Course may be repeated to a maximum of 6 credits. Prereq., instructor consent.

THTR 6005 (1-3). Production Research and Practicum: Designing. Allows students to undertake a design project, normally within the major theatre season, that requires detailed preparatory research, testing of ideas, and public presentation of theories and concepts in practice. Students work under faculty supervision, and prepare 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 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 4037 (1-2). Advanced Problems in Producing Shakespeare. Provides exploration, through practical experience and research, of the nature and solution of a complex problem in production of a Shakespeare play. Same as THTR 5037.

THTR 4047 (1-5). Shakespeare in Production. Detailed study of script analysis, directing concepts, staging and criticism of three plays being produced by the Colorado Shakespeare Festival. Same as THTR 5047.

THTR 5037 (1-2). Advanced Problems in Producing Shakespeare. Same as THTR 4037.

THTR 5047 (1-3). Shakespeare in Production. Same as THTR 4047.

Special Courses in Theatre

THTR 1009-3. Introduction to Theatre. Introduces 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. Approved for arts and sciences core curriculum: literature and the arts.

THTR 2849 (1-3). Independent Study.

THTR 3849 (1-3). Independent Study.

THTR 3009-3. Development of the American Musical Theatre. Studies the American musical theatre heritage and its relation to the continually changing social milieu. Examines productions, their creators, and performers. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: literature and the arts.

THTR 4009-3. Methods of Teaching Theatre. Curriculum, materials, methods, evaluation, and related aspects of instruction. Secondary level.

THTR 4019 (3-12). Touring Theatre. Participation in Colorado Caravan Touring Theatre Program.

THTR 4029 (3-12). Touring Theatre Dance. Participation in Colorado Caravan Touring Theatre Dance Program.

THTR 4039-3. Musical Theatre Repertory. Developed around the learning of complete scenes, songs and dances that are representative of the periods and styles within musical comedy from the 1920s to the present. Emphasizes in-class performance. Admission by audition. Same as THTR 5039.

THTR 4049 (1-4). Problems in Theatre. Opportunity for students to explore, upon consultation with the instructor, areas in theatre that the normal sequence of offerings may not allow. Same as THTR 5049.

THTR 4059-3. Open Topics in Theatre and Drama. Covers topics nor otherwise listed in the curriculum. Topics for each semester are specified in the *Registration Handbook and 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 students with the basis for comparing British and American theatre techniques. *Course may be taken abroad only.*

THTR 4849 (1-3). Independent Study.

THTR 5039-3. Musical Theatre Repertory. Same as THTR 4039.

THTR 5049 (1-4). Problems in Theatre. Same as THTR 4049.

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 aimed at familiarizing graduate students with the library and other resources, and the development of thesis and dissertation prospectuses. Same as DNCE 6009.

THTR 6019-3. Professional Orientation. Prepares doctoral students in theatre to meet successfully the responsibilities of a college faculty member. Topics include examination and evaluation of texts, teaching methodologies, profes-

sional 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 8999-10. 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 this catalog.

Dance

Nonmajor Technique

DNCE 1000-2. Beginning Modern Dance. Introduces the basic concepts and skills of modern dance. In-class technique work increases muscle strength, flexibility, and coordination. Lectures focus on various aspects of modern dance including history, composition, and criticism. A limited amount of written work is required.

DNCE 1020-1. Beginning Modern Dance with Experience. Studio course; continues work from the beginning level on basic concepts and skills of modern dance technique to increase strength, flexibility, and coordination.

DNCE 1100, 1110-1. Beginning Ballet. Repeatable for up to 2 credit hours.

DNCE 1120, 1130-1. Beginning Ballet with Experience. Prereq., DNCE 1100 or 1110. Repeatable for up to 2 credit hours.

DNCE 1160-1. Dance Techniques: Recreational Dance Forms.

DNCE 1200, 1210-1. Beginning Jazz Dance. Repeatable for up to 2 credit hours.

DNCE 1220, 1230-1. Beginning Jazz with Experience. Prereq., DNCE 1200 or 1210. Repeatable for up to 2 credit hours.

DNCE 2040, 2050-1. Intermediate Modern Dance. See DNCE 1020. In-depth study of modern dance concepts. Class technique work more advanced than in DNCE 1020. Prereq., DNCE 1020. Repeatable for up to 2 credit hours.

DNCE 2140, 2150-1. Low Intermediate Ballet. Prereqs., DNCE 1120 or 1130, and DNCE 1100 or 1110. Repeatable for up to 2 credit hours.

DNCE 2240, 2250-1. Intermediate Jazz. Repeatable for up to 2 credit hours.

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 2500-2. African-American Dance 1. Same as BLST 2400.

DNCE 2510-2. African-American Dance 2. Same as BLST 2410.

DNCE 3160, 3170-1. Intermediate Ballet. Repeatable for up to 2 credit hours.

DNCE 4180, 4190-1. Advanced Ballet. Repeatable for up to 2 credit hours.

Major Technique

The following undergraduate dance courses are open to dance majors. Other students are 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 students with theoretical knowledge and practical experience in producing a dance concert. Areas of study include lighting, sound, costuming, publicity, budget, and management.

DNCE 5052 (1-3). Studio Concert.

Composition

DNCE 2013-2. Dance Improvisation. Explores the aesthetic elements of movement through improvisational structure. Guided dance experiences are designed to allow for individual response and group instruction while providing opportunity for spontaneous self expression.

DNCE 2033-3. Beginning Composition. Introduces the basic elements of dance composition through compositional studies evolved from readings, discussion, and improvisation.

DNCE 3043-3. Intermediate Dance Composition. Opportunity for students to increase knowledge and understanding of dance composition elements as they relate to group forms, theme, development, and phrase manipulation. Prereqs., DNCE 1011 and 2033.

DNCE 4053-3. Advanced Dance Composition. In-depth approach to composition emphasizing personal invention, solo and group forms; styles based on historical art forms; exploration of the evaluative process. Prereqs., DNCE 3041 and 3043. Same as DNCE 5053.

DNCE 5053-3. Advanced Dance Composition. Same as DNCE 4053 with the addition of graduate papers and/or a project.

DNCE 6073-3. Choreography. Advanced composition choreographed and presented for public performance and criticism. May be repeated for up to 6 credit hours with different instructors.

Music

DNCE 2014-2. Rhythmic Analysis and Accompaniment. Emphasizes 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, elements and forms of music, and historical styles, supported by guided listening to representative works. Special emphasis on twentieth-century techniques and on the relationship of various music to dance. Coreq., DNCE 2014 or instructor consent.

DNCE 5064-3. Graduate Music Seminar. Investigates selected aspects of rhythm, accompaniment, and musical resources for dance and applications to performance, choreography, and teaching. Topics may include movement analysis and rhythmic clarity, self-accompaniment, working with accompanist/composers, relationship of music to dance, and survey of twentieth-century compositional techniques. Prereq., DNCE 2014, 3024, or equivalent dance/music experience, or instructor consent.

Movement Analysis

DNCE 1005-3. Movement Awareness and Injury Prevention for the Performing Artist. Helps performing artists, concerned with movement in their creative endeavors, understand the prevention and care of common injuries associated with their art. Through various body therapy techniques, anatomy, and kinesiology, students

learn to reduce tension, improve body usage, and enhance their performance.

DNCE 3015-3. Movement Analysis. 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.

DNCE 5055-2. Applied Labananalysis. Body, effort, space, and shape components of the Laban movement analysis framework considered in relation to dance technique, composition, style analysis, and individual movement styles. Emphasizes application of theory.

Education

DNCE 4016-3. Creative Dance for Children. Methods course for prospective teachers of creative dance for children. Lectures, readings, and laboratory experiences are followed by observation and teaching in primary grades. Same as DNCE 5016.

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 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. Same as DNCE 5036.

DNCE 5016-3. Creative Dance for Children. Same as DNCE 4016 with 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 addition of a paper developed in consultation with the teacher.

DNCE 6016-2. Teaching Lab: Modern Dance. Provides opportunity to apply principles and skills introduced in DNCE 5015. Participating students share the responsibility for teaching a lab class that meets twice a week. Focuses on analysis and evaluation of teaching skills.

DNCE 6056-2. Problems in Dance Administration and Curriculum. Examines current problems in 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. History and philosophy of dance from primitive times to 1900. Same as DNCE 5017. Approved for arts and sciences core curriculum: literature and the arts.

DNCE 4027-3. Dance in the Twentieth Century. Covers the development of modern dance and ballet from 1900 to the present through lectures, discussions, critical reviews, and films. Same as DNCE 5027.

DNCE 5017-3. History and Philosophy of Dance. Same as DNCE 4017 with addition of graduate papers and/or a project.

DNCE 5027-3. Dance in the Twentieth Century. Same as DNCE 4027 with addition of graduate papers and/or a project.

Performance

DNCE 4018-2. Performance Improvisation Techniques. Interdisciplinary approach to dance, theatre, and music performance. Improvisational techniques utilized to enhance creative skills. Objective is to help the individual discover and make accessible the diversity of the human instrument and develop practical tools to broaden expressive range. Same as DNCE 5018.

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. Same as DNCE 5038. Dance majors may repeat for up to 6 credit hours with different instructors.

DNCE 4068-2. Composition/Repertory. Students explore the improvisational and choreographic style of the artist-in-residence; repertory may also be taught. Same as DNCE 5068.

DNCE 5018-2. Performance Improvisation Techniques. Same as DNCE 4018 with the addition of exams and a performance piece.

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. Dance majors may repeat for up to 6 credit hours with different instructors.

DNCE 5048-3. Touring Dance Theatre. Provides students with practical performing and teaching experience. Students design a lecture/demonstration to be performed at primary and secondary schools throughout the state. In addition, Touring Dance Theatre members teach creative movement classes at the schools. Undergraduate students: see THTR 4029.

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 1029-3. Dance as a Universal Language. Introduces students to dance as a universal, cross-cultural and relevant contemporary form through an investigation of the development of dance. Explores interpretation and criticism, an historical survey, and the concepts of dance in American society as well as the creative process through an analysis of the basic elements of dance.

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. Same as DNCE 5909.

DNCE 4919 (1-3). Dance Practicum. Project in dance under supervision of senior faculty. Same as DNCE 5919.

DNCE 5849 (1-3). Independent Study.

DNCE 5909-2. Problems in Dance. Same as DNCE 4909.

DNCE 5919 (1-3). Dance Practicum. Same as DNCE 4919.

DNCE 6009-3. Research Strategies and Techniques. Same as THTR 6009.

DNCE 6019-3. Readings in Dance. Surveys dance literature including an opportunity for graduate students to familiarize themselves with resources, current publications, theoretical materials, and professional organizations in dance.

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), emphasizing the avant-garde.

DNCE 6949 (1-4). Candidate for Degree.

DNCE 6959 (1-4). Master's Thesis.

DNCE 6969 (3-6). 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. 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 expository material and presenting it coherently. All sections 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 conducted as workshops; that is, student papers are discussed at every class meeting. Students are required to revise their papers frequently throughout the term. (Students who wish to take UWRP 1250 must register for UWRP 1150; they will be placed in UWRP 1250 if they write at an advanced level on a diagnostic examination administered during the first class session.)

UWRP 1840 (1-3). Independent Study.

UWRP 2050-3. Intermediate Composition: Prose Strategies. Addresses matters of style, tone, and audience in both expository and argumentative writing. All sections conducted as writing workshops; that is, student papers are discussed at every class meeting. Prereq., instructor consent.

UWRP 3020-3. Topics in Writing. Each instructor assigns two or three nonfiction essays on a given topic. Students choose an essay, abstract its argument, analyze it, and agree or disagree with the author. They thus learn the principal modes of academic rhetoric: description, anal-

ysis, and argument. Approved for arts and sciences core curriculum: written communication.

UWRP 3030-3. Advanced Composition: Writing on Science and Society. Through selected readings and daily writing assignments, students examine ethical and social issues that arise in science and technology. Focusing on critical thinking, analytic and argumentative writing, and oral presentation, course emphasizes effective communication with non-technical audiences. Classes are conducted as workshops.

UWRP 3050-3. Advanced Composition: Argument. 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 parts of a complicated proof, how to qualify a problematic thesis, and how to discover and challenge fallacies in the arguments of others. Prereq., instructor consent.

UWRP 3150-3. Advanced Composition: Style. Second of four intensive writing workshops, this course introduces students to major prose stylists in the English language, both classic and contemporary. While exploring characteristics, uses, and limitations of different stylistic devices, students set about fashioning and refining a style of their own. Prereq., instructor consent.

UWRP 3840 (1-3). Independent Study.

UWRP 4050-3. Advanced Composition: Form. 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 different organizational principles displayed in these texts, students can explore strengths and weaknesses inherent in particular structural devices. Prereq., instructor consent.

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. Prereq., instructor consent.

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. The courses do not apply to the minimum number of hours required for graduate degrees on the Boulder campus. Prereq., instructor consent.

Women Studies

WMST 2000-3. Introduction to Women Studies. Examines women's roles from interdisciplinary and cross-cultural perspective with goal of evaluating theoretical explanations for the differential access to power among men and women. Topics include psychology, socialization, family, work and the economy, history and social change. Approved for arts and sciences core curriculum: cultural and gender diversity.

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 2050-3. Women and Society. Examines theories that explain the social construction of gender and the subordination of women in a multicultural context. Topics include Black women and feminism, language constructs, reality, motherhood—U.S., Japan, and Italy, purdah in India, female "circumcision," and women in developing countries. For nonmajors. Approved for arts and sciences core curriculum: cultural and gender diversity.

WMST 2300-3, 2310-3. Topics in Women Studies. Examines, at an introductory level, selected topics in women studies. Content varies by semester and reflects relevant contemporary issues in women studies scholatship, e.g., women and crime, women in film, sex and gender in futuristic literature, and women and technology.

WMST 2500-3. History of the Feminist Movement in the U.S. Provides a historical survey of the U.S. feminist movement. Covers nineteenth century endeavors for women's rights, the woman sufferage and progressive reform efforts during the early twentieth century, the resurgence of feminist thought and activism during the 1960s, and continuing feminist efforts. Approved for arts and sciences core curriculum: United States context.

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. Examines topics from both traditional and feminist perspectives for the purposes of comparison and in-depth analysis. Prereq., WMST 2000 or 2010 or PSYC 1001 or SOCY 1001.

WMST 3550-3. Male/Female Relationships. Explores 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 and changing roles and changing arrangements. Cross-disciplinary course that draws from sociology, psychology, and communication. Prereq., one course in sociology, psychology, or women studies.

WMST 3700-3, 3710-3. Topics in Women Studies. Examines selected topics in women studies. Content varies by semester and reflects relevant contemporary issues in women studies scholarship, e.g., historical and contemporary issues of Black women; religion and feminist thought; mothers and daughters in literature; and women, war, and peace in literature. Prereq., WMST 2000 or 2010. May be repeated for up to 6 credit hours for different topics.

WMST 3730-3. Women in International Development. Examines women's contributions to household and national economies. Includes women in the home and the work force, women in agricultural production, women's health as a development concept, migration and urbanization, women and education, political and historical aspects of development, and the status of women, development policy, and planning. While the course examines women in general, it focuses primarily on African women. Prereqs., WMST 2000 and 2010.

WMST 3930 (1-6). Women Studies Internship. Selected students are matched with supervised internships in local businesses and human service and government agencies. Internships focus on women's issues (e.g., affirmative action, services to abused women). Students meet a minimum of twice monthly with the instructor, keep a journal, and submit a final paper.

WMST 4000-3. Senior Seminar: Special Topics. Advanced interdisciplinary course organized around specific topic, problem, or issue relating to women in culture and society (such as feminist theology, women and the law, and the international women's peace movement). Course work includes discussion, reading, and written projects. Prereqs., WMST 2000 and 2010. May be repeated for up to 6 credit hours for different topics.

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 designed to introduce students to basic research techniques, to develop research skills, and to contribute to knowledge of contemporary and historical Rocky Mountain women. Prereqs., WMST 2000 and 2010.

WMST 4090-3. Feminist Theory. Examines major theoretical writings on feminist theory, including both historical and contemporary works. Discusses major divisions within contemporary feminist thought. Topics include philosophical notions of equality, development of feminist thought, and social-historical analysis of feminism as a social movement. Prereqs., WMST 2000 and 2010.

WMST 4840 (1-6). Independent Study.

Cross-Listed Courses

WMST 1006-3. The Social Construction of Sexuality. Same as SOCY 1006.

WMST 1016-3. Sex, Gender, and Society 1. Same as SOCY 1016.

WMST 1260-3. Introduction to Women's Literature. Same as ENGL 1260.

WMST 2016-3. Sex and Gender in Futuristic Literature. Same as SOCY 2016.

WMST 2080-3. Anthropology of Gender. Same as ANTH 2080.

WMST 2100-3. Women in Antiquity: Greece. Same as CLAS 2100.

WMST 2110-3. Women in Antiquity: Rome. Same as CLAS 2110.

WMST 2260-3. Images of Women in Literature. Same as ENGL 2260.

WMST 2290-3. Philosophy and Women. Same as PHIL 2290.

WMST 2700-3. The Psychology of Contemporary American Women. Same as PSYC 2700.

WMST 2800-3. Women and Religion. Same as RLST 2800.

WMST 3012-3. Women, Development, and Fertility. Same as SOCY 3012.

WMST 3016-3. Marriage and the Family in the United States. Same as SOCY 3016.

WMST 3135-3. Study of Chicanas. Same as CHST 3135.

WMST 3262-3. Women Writers. Same as ENGL 3262.

WMST 3505-3. Historical and Contemporary Issues of Black Women. Explores the social, economic, political, historical, and cultural role of African-American women from an interdisciplinary perspective. Prereq., WMST 2000 or 2010 or BLST 2000. Same as BLST 3505.

WMST 3656-3. Research on Women and Peace. Students learn research methods by using the Women's International League for Peace and Freedom (WILPF) papers or related microfilm collections and then write an original research paper. Students then explore women's involvement in international peace endeavors during the course of the twentieth century, focusing upon the history of the WILPF. Prereq., WMST 2000 or 2010; HIST 1015 and 1025. Same as HIST 3656.

WMST 4012-3. Population Control and Family Planning. Same as SOCY 4012.

WMST 4016-2. Sex, Gender, and Society 2. Same as SOCY 4016.

WMST 4063-3. Women in Victorian England. Same as HIST 4063.

WMST 4086-3. Family and Society. Same as SOCY 4086.

WMST 4271-3. Sex Discrimination: Constitutional Issues. Same as PSCI 4271.

WMST 4272-3. Topics in Women's Literature. Same as ENGL 4272.

WMST 4291-3. Sex Discrimination: Federal and State Laws. Same as PSCI 4291.

WMST 4614-3. Women and Society in Industrial Europe. Same as HIST 4614.

WMST 4616-3. History of Women in the United States to 1890. Same as HIST 4616.

WMST 4619-3. Women in Asian History. Same as HIST 4619.

WMST 4626-3. History of Women in the United States since 1890. Same as HIST 4626.

WMST 4700-3. Women and Mental Health. Same as PSYC 4700.

WMST 4710-3. The Black Female: A Feminist Analysis. Same as BLST 4710.

WMST 4809-3. Women Artists from the Middle Ages to the Present. Same as FINE 4809.

FACULTY

American Studies

LYNN ROSS-BRYANT, Co-Director; Associate Professor of Religious Studies. B.A., Occidental College; M.A. Ph.D., University of Chicago.

ERIKA L. DOSS, Co-Director; Assistant Professor of Fine Arts. B.A., Ripon College; M.A., Ph.D., University of Minnesota.

RUTH HELM, Instructor. B.A., M.A., Ph.D., University of Colorado.

Anthropology

MICHAEL BREED, Acting Chair; Professor of Environmental, Population, and Organismic Biology. B.A., Grinnell College; M.A., Ph.D., University of Kansas.

ANNE ALLISON, Assistant Professor. B.A., University of Illinois; M.A., Ph.D., University of Chicago.

BOULOS AYAD, Professor. B.A., M.A., Ph.D., Cairo University (Egypt); M.A., University of Einshams (Egypt).

DOUGLAS B. BAMFORTH, Assistant Professor. B.A., University of Pennsylvania; M.A., Ph.D., University of California, Santa Barbara.

DAVID A. BRETERNITZ, Professor Emeritus.

ALICE M. BRUES, Professor Emerita.

HELEN CANNON, Professor Emerita.

HERBERT H. COVERT, Assistant Professor. B.A., University of Massachusetts; M.A., Arizona State University; Ph.D., Duke University.

DARNA L. DUFOUR, Associate Professor. B.S., Northeastern University; M.A., Ph.D., State University of New York at Binghamton.

FRANK W. EDDY, Associate Professor. B.A., University of New Mexico; M.A., University of Arizona; Ph.D., University of Colorado.

MARGARET A. EISENHART, Associate Professor (joint with School of Education). B.A., Emory University; M.A., Ph.D., University of North Carolina.

DAVID LEE GREENE, Professor. B.A., M.A., Ph.D., University of Colorado.

ROBERT A. HACKENBERG, Professor. B.A., M.A., University of Minnesota; Ph.D., Cornell University.

WARREN M. HERN, Assistant Professor Adjunct. M.A, M.D., University of Colorado; Ph.D., University of North Carolina.

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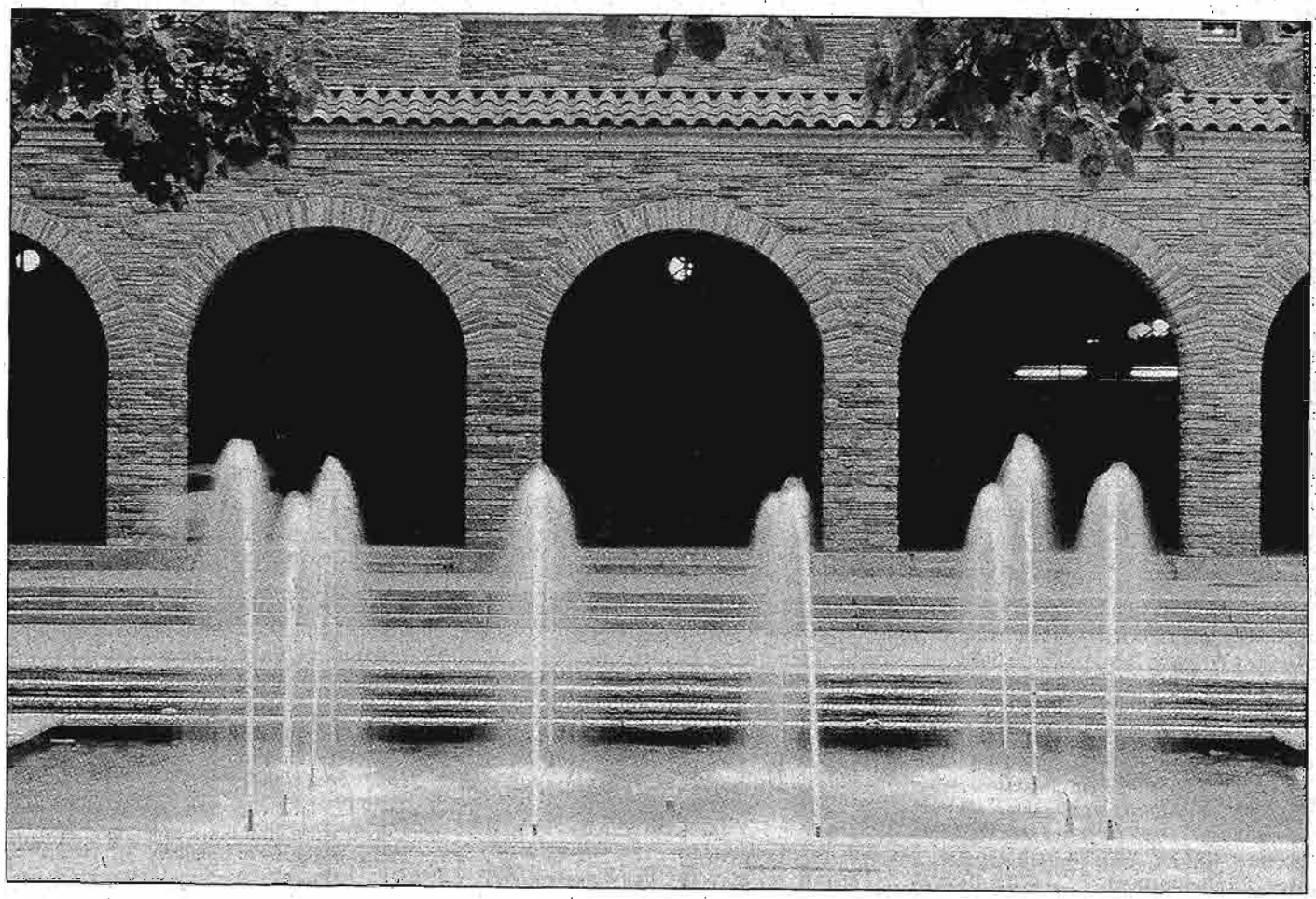

College of Business and Administration and Graduate School of Business Administration

J. Russell Nelson, Dean

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: the bachelor of science in business administration (B.S.), the master of science in business administration (M.S.), the master of business administration (M.B.A.), and the doctor of philosophy in business administration (Ph.D.).

The college participates on a continuing basis in the Executive Education Program for the Gas Industry, the Colorado School of Banking, the School of Bank Marketing, and many other activities. Faculty members participate in continuing education, government, and corporate educational programs.

The Visiting Executive 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 Dean's 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.

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 M. White Business Library, the Douglas H. Buck Electronic Media Center, organizational laboratories, lounges, varied classrooms, all faculty and administrative offices, and the Business Research Division.

The White Library covers 14,500 square feet on the third floor of the college. It contains financial reference works, directories, looseleaf services, and corporate annual reports on microfiche for all companies on the New York and American stock exchanges. Company reports are also available on Compact Disclosure, Compustat, and Lexis-Nexis. Bibliographic information is available on ABI-Inform, InfoTrac, the CARL system, and Lexis-Nexis.

The White Library has 66,308 volumes, which include monographs and bound serials. Subscriptions to over 600 serials and access to 350 more are available on the Business Collection.

The Douglas H. Buck Electronic Media Center measures 1,000 square feet and is devoted to online resources and compact disk subscriptions such as InfoTrac, Compact Disclosure, PC Compustat, Lexis-Nexis, and some census material. These resources can be accessed by the center's 23 work stations as well as by the entire campus via the campus Ethernet.

The business library LAN is connected to the campus information network and all Internet resources are accessible. The White Library is part of the University of Colorado library system, which serves the entire campus with nearly two million volumes, an equal number of microforms, and 13,000 periodicals. The library system is also a regional depository for state, U.S. government, United Nations, and international documents.

The college houses three computer classrooms and a large microcomputer lab equipped with IBM PCs and Macintosh computers. All resources are connected to the campus Ethernet network and our file servers. Computing resources on the Boulder campus include several microcomputer labs, a VAX workstation lab, a DEC VAX/VMS cluster, a Sequent Symmetry S81 computer, and an Alliant FX-80/Concentrix computer.

Business Research Division

Established in 1915, the Business Research Division was one of the earliest organized state service-oriented bureaus in the country. The division acts as a research arm of the college. Its primary functions are to provide business executives, city managers, planners, association executives, and others with information useful in the operation of their organizations; to compile, present, and interpret information on current business and economic developments in the state and nation; to make business and economic studies that contribute to the most efficient use of Colorado's resources; to encourage and assist faculty and students in research that will contribute to general knowledge in the areas of business, economics, and the related social sciences; to train students in research methodology; and to obtain and hold copyrights and to publish research results.

The Business Research Division has four centers—the Center for Recreation and Tourism Development; the Technology and Innovation Management Research Center, the Rocky Mountain Trade Adjustment Assistance Center, and the CU Business Advancement Center. Funding for center activities comes from various sources, including the college, the University, state agencies, the federal government, state and local business firms, and from the sale of research products and services.

Four general categories make up the research efforts of the division—state services, publications, contract research, and faculty research. Research activities consist of theoretical and applied research, outreach and community service actions, and consulting support to small- and medium-sized businesses in Colorado.

Research results are distributed through a combination of presentations and seminars and a wide variety of pamphlets, reports, proceedings, and books. Through its annual *Business Economic Outlook Forum* and quarterly retail sales tax reports, the division provides basic business information concerning Colorado.

Research Centers

The Center for Recreation and Tourism Development is dedicated to research and program development in recreation and tourism throughout Colorado and the West. Faculty and students from the University and from universities across the country participate in funded research efforts that contribute to both technical and scholarly publications.

The center continues its original efforts to assist rural communities in recreation and tourism development. Additionally, the staff is developing a hospitality training model for Colorado, and providing technical assistance and training to public and private sector clients throughout the Rocky

Mountain region. Ongoing research is being conducted on the social, environmental, and economic impacts of recreation and tourism development on community life.

The Technology and Innovation Management Research Center conducts research on issues related to managing high technology organizations. The center disseminates innovative research nationally and internationally through publications and conferences. The center also develops collaborative projects between high-tech firms and college faculty.

In 1992, the center will help support the college's Hispanic Business Conference. Additional roles will include developing corporate sponsorship, assisting faculty in the preparation of research proposals, developing a publications exchange, and developing a closer working relationship with other colleges and CU research centers.

The Rocky Mountain Trade Adjustment Assistance Center was established in 1978 along with nine other Trade Adjustment Assistance Centers. The purpose of these centers is to provide Trade Adjustment Assistance (TAA), authorized by the Trade Act of 1974, to eligible trade-impacted firms.

The Assistance Center's territory includes the states of Colorado, Nebraska, New Mexico, North Dakota, South Dakota, Utah, and Wyoming. It provides information about the TAA program to appropriate parties, assists eligible firms to apply for certification, and provides technical and financial assistance to certified firms.

The CU Business Advancement Center operates as an external outreach service to business and industry. Statewide services are delivered through six office locations: Boulder, Denver, Colorado Springs, Durango, Grand Junction, and Burlington. Specialized business consulting, federal procurement assistance, and computerized information retrieval and technology capabilities are offered. The center also helps small research and development firms to compete for federal contracts through information, printed materials, and advice.

Career Opportunities

Graduates are prepared for positions in the following fields:

Accounting—financial
Accounting—management
Accounting—public
Advertising
Banking
Consumer credit and mortgage financing
Credit administration
Financial management
Industrial selling and purchasing
Information systems
Insurance
International business
Investments
Management consulting
Marketing management
Marketing research
Operations research
Personnel management
Production management
Real estate
Recreation
Retailing
Selling and sales management
Tourism
Traffic and distribution
Transportation
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.

Study Abroad

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 and Business, a month-long, 6-credit-hour program held each summer in the financial district of London. 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.

Student Organizations

Organizations that stimulate professional interests and that provide recognition of scholastic attainment are listed below.

AAS, Association of Accounting Students
AIESEC, 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
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

As the student governing body of the College of Business and Administration, the Student Board 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 and Administration Academic Ethics Committee.

Graduation Recognition Ceremony

Each December and May the Office of the Dean and the Student Board sponsor a recognition ceremony honoring the graduating class, in addition to the University-wide commencement. Graduates and their families are invited to attend.

ACADEMIC EXCELLENCE

Honors

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.*

Students who achieve an overall grade point average of 3.80 and a grade point average of 3.85 in business courses and who complete at least 60 credit hours at the University of Colorado at Boulder will be considered for *summa cum laude.*

Dean's List

Students in the College of Business and Administration who complete at least 12 semester hours of graded work in the fall or spring semester and earn a GPA of 3.50 or better on the Boulder campus (excluding continuing education) are included on the dean's list, which is posted outside the Office of Undergraduate Studies.

Beta Gamma Sigma

Membership in Beta Gamma Sigma is an honor that 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 be among 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.

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 STANDARDS

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. Any reported act of academic dishonesty may be referred to the College of Business and Administration 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.

Standards of Performance

Students are held to basic standards of performance 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.

Any student earning all failing grades or no academic credit for a semester will not be permitted to register without the dean's approval.

Official double-degree students are required to maintain the same standards of performance as College of Business and Administration students in order to continue in their program.

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 listed below.

Probation. 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.

A student may remain on probation for up to four terms as long as the student maintains normal degree progress each semester as determined by the college *and* obtains no grade below a *C*.

Note: Students may be on probation a maximum of four terms during their entire academic career at the College of Business and Administration, regardless of whether or not the probationary terms are consecutive. Summer is considered a term. Failure to meet probationary provisions will result in suspension.

Suspension. Suspended students may attend summer session at any campus of the University of Colorado 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.

A student who has been under suspension for one calendar year may apply for readmission to the College of Business and Administration. Generally, a suspended student must attend CU (at any campus) and remove all grade deficiencies before being considered for readmission for the regular academic year. If readmitted, admission will be on probationary status.

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

Students who have been suspended once and then readmitted by the College of Business and Administration will be permanently suspended if their overall grade point average, or business grade point average, again falls below a 2.00.

Any student who is placed on suspension more than once will be permanently suspended from the College of Business and Administration and may not attend any campus of the University of Colorado as a business student.

ADMISSION AND ENROLLMENT POLICIES

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 *Registration Handbook and Schedule of Courses.* All rules and regulations are subject to change. Any questions

should be directed to the Office of Undergraduate Studies, Business room 227, (303) 492-1807.

Admission to the Business Program

Prospective freshman 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 of this catalog.

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 on page 214.

Intrauniversity Transfer

A large number of students admitted to the College of Business and Administration 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 and Administration may submit a completed intrauniversity transfer application to the college after completing at least 12 semester hours of specific 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 nonbusiness course requirements completed, the college looks 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 or physical handicaps; and unique situations.

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.

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 their courses.

Attendance Regulations

Classroom attendance is left to the discretion of the instructor. Students are responsible for understanding each instructor's policy on attendance.

Students enrolled in one section of a business course but who attend 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 final schedule adjustment period is over.

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 a prerequisite sequence may also be allowed to use this option. The course must be required for graduation and must 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.

Scholastic Load

The normal scholastic load of an undergraduate in the college is 15 semester hours, with a maximum of 18 hours during the fall and spring semesters. A maximum of 6 hours may be taken during a five-week summer term with not more than 12 hours total during the 10-week summer session.

Credit Policies

To receive credit, all courses must be listed on the student's unofficial transcript by the Office of the Registrar. Credit is then evaluated by the College of Business and Administration to determine degree acceptability.

Courses completed at any University of Colorado campus are credited toward degree requirements, if appropriate to the degree program.

Correspondence Credit

Required business courses and area of emphasis courses cannot be taken by correspondence. All correspondence courses must have prior approval and be evaluated to determine their acceptability.

Credit by Examination

Advanced Placement (College Board). For students who make scores of 3, 4, or 5, college credit will be given where appropriate. See page 40 for a comprehensive chart on AP credit.

College-Level Examination Program (CLEP). College credit for approved CLEP subject examinations 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 prebusiness requirements and 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.

Before a CLEP examination can be taken, students must have prior approval in writing by the Office of Undergraduate Studies.

No Credit

Because of space limitations, business classes may not be taken on a no-credit basis.

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 administration. 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

kinesiology, 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 the model degree program, curriculum note 5 (page 214).

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 the model degree program curriculum notes for additional information concerning elective credit.

Study Abroad Credit

Transfer credit from study abroad programs is applied as business or 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.

Transfer Credit

The college reserves the right to disallow any credit that it determines is not appropriate degree credit.

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 administration must have prior approval of the College of Business and Administration. 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 (see page 215) must be taken at the University of Colorado (Boulder or Colorado Springs) unless written approval is given by the associate dean of undergraduate studies. Transfer students must take a minimum of 30 hours of business courses in residence after admission to the college. For a detailed explanation of transfer credit, see the Undergraduate Admission section.

Grading Policies

In addition to the campuswide grading system and pass/fail policy listed in the University Policies, Programs, and Services section, the college enforces the following policies.

Pass/Fail. Students in the College of Business and Administration 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 administration; 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.

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 REQUIREMENTS

Knowledge and Abilities of Business Students

The following areas of knowledge are central to the undergraduate degree in business administration:

- knowledge of the basic business core that provides students with a comprehensive understanding of the basic functional areas of the discipline;
- knowledge in one or more areas of emphasis, in which students are exposed to in-depth study that provides them with the tools necessary to solve complex business problems;
- awareness of the interrelations between academic theory and practice in order for students to be fully equipped to make effective decisions under conditions of uncertainty;
- knowledge of basic communication skills, computer use, and the international environment in which business currently operates;
- knowledge of mathematics sufficient to facilitate the application of quantitative principles; and
- awareness of the importance of academic fields in the area of arts and sciences, with special emphasis placed on the study of

economics, political science, and other related fields.

In addition, students completing a degree in business administration are expected to acquire:

- the ability to solve problems involving the application of basic business principles to new and recurring situations;
- the ability to conceptualize and analyze decision-making situations to facilitate solutions in an effective and timely manner; and
- the ability to communicate the results of problem-solving situations, both verbally and in writing.

Having acquired these skills and knowledge, students are able to conceptualize and analyze the concept of business and problem solving as a system. They have the ability to present solutions to business problems in an understandable and useful form. Their education provides them with excellent working knowledge, not only in the field of business, but in related academic disciplines as well.

Advising and Records

Business students receive 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 a.m. to 4:00 p.m. During registration periods, advisors are available to answer registration questions. Individual advising and scheduling are not possible during registration periods; they should be obtained instead throughout the semester.

Students may look at their individual progress sheet any time during advising hours, and a copy will be provided upon request. Students are expected to assume responsibility for planning their program in accordance with college rules and policies.

Students are encouraged to discuss the various emphases available as well as career opportunities with the faculty of the college.

Requirements for the B.S. (Business Administration) Degree

The bachelor of science degree requires:

Total Credits. A minimum of 120 acceptable semester hours of credit as follows:

	Semester Hours
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 it determines is not appropriate academic credit.

Residence. Completion of at least 30 semester hours of business classes, usually in the senior year, after admission to the College of Business and Administration, including the 12 hours in the area of emphasis.

Grade Point Average. A minimum scholastic cumulative grade point average of 2.00 (*C*) for all courses attempted at the University acceptable toward the bachelor's degree, 2.00 cumulative for all business courses, and 2.00 in the required areas of emphasis courses.

Model 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.

Freshman Year	*Semester Hours*
UWRP 1150 or 1250 Introductory Composition (Note 1)	3
Oral communication (Note 2)	3
MATH modules 1050, 1060, 1070, and college calculus (Note 3)	6
PSCI 1101 The American Political System	3
Additional political science, 1000-4000 level	3
SOCY 1001 Analyzing Society, SOCY 1004, 2011, 2031, or ANTH 1040	3
Natural science (Note 4)	6
Nonbusiness electives (Note 5)	3
Sophomore Year	
ECON 2010 Microeconomics (Note 6)	4
ECON 2020 Macroeconomics (Note 6)	4
PSYC 1001 General Psychology (Note 6)	4
Social science or humanities elective (Note 7)	3
INFS 2000 Business Information Systems and the Computer	3
OPMG 2010 Business Statistics	3
ACCT 2000 Introduction to Financial Accounting	3
Nonbusiness electives (Note 5)	6
Junior Year	
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 Production and Operations Management	3
Nonbusiness electives (Note 5)	3
Business electives	6
Either business or nonbusiness electives (Note 5)	6
Senior Year	
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
Minimum to graduate	120

Curriculum Notes

1. Recommended for freshmen, but due to space limitations may have to be taken during the sophomore year. No credit is given for UWRP 1050.
2. The following courses will fulfill this requirement: COMM 2000, 2030, 2240, and 3200.
3. MATH modules 1080, 1090, and 1100, MATH 1300, APPM 1350, and APPM 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. ANTH 2010-2020 (Introduction to Physical Anthropology 1 and 2) and GEOG 1001-1011 (Environmental Systems 1 and 2) are also acceptable.
5. Elective credits should be selected carefully, as not all classes are acceptable. Generally, to be acceptable, electives must be taught by regulat 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, must not be 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 theory courses in kinesiology, physical education, or dance.
   b. a maximum of 12 hours of advanced ROTC credit, 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 and Administration reserves the right to disallow any credit that it determines is not appropriate academic credit. For further information, contact the Office of Undergraduate Studies.
6. A minimum of 3 semester hours each of microeconomics and macroeconomics and introductoty 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 Analyzing Society; SOCY 1004 Deviance in U.S. Society; SOCY 2011 Contemporary Social Issues and Human Values; SOCY 2031 U.S. Values, Social Problems, and Change; ANTH 1040 Principles of Anthropology 2

Senior Audit

Prospective graduates must make an appointment with the Office of Undergraduate Studies the semester before they plan to graduate to complete a senior audit. Students planning to graduate in May must complete a senior audit by the previous December 14. August graduates must complete a senior audit by the previous March 2; December graduates must complete a senior audit by the previous March 16. 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 advisor no later than the first week of class of their final semester. Changes after that time will delay graduation.

Double-Degree Programs

Numerous career opportunities exist for persons trained in both a specialized field and management. For this reason students may be interested in a double-degree program leading to completion of degree requirements concurrently in two fields. Such double-degree programs have been arranged for engineering, environmental design, journalism, and 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 to complete a double-degree program. No substitutions are allowed in this program. A minimum of 150 semester hours is required for all double-degree programs.

Students desiring to transfer from double-degree programs to the College of Business and Administration must submit an application to the Office of Undergraduate Studies.

For students in double-degree programs, the requirements for the degree in business administration are as follows:

1. An application for admission to the double-degree program, which must be filed with the College of Business and Administration and approved by the deans of both colleges.

2. Completion of at least 51 semester credits in business and economics, to include ECON 2020 and 2010 (8 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 and Administration.

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 and Administration. For some courses and areas of emphasis, there are prerequisite requirements which must also be met.

5. At least a 2.00 grade point average must be earned in all courses undertaken in the College of Business and Administration, the area of emphasis, and the University of Colorado.

6. Any double-degree student who does not make reasonable progress toward completing the business degree requirements, as determined by the College of Business and Administration, may be dropped from the program.

7. The number of students accepted in any double-degree program may be limited and is dependent upon space availability each semester.

The double-degree program in engineering and business is shown below. For other combinations, students must consult with the business dean's office.

	Semester Hours
Required Nonbusiness Courses	
PHYS 1110, 1120 General Physics	8
MATH 1300 Analytic Geometry and Calculus 1	5
APPM 2360 Introduction to Linear Algebra and Differential Equations	4
ECON 2010 Principles of Microeconomics	4
ECON 2020 Principles of Macroeconomics	4
ENGL 1200, 1300, 1400 Introduction to Fiction, Drama, Poetry	9
Political science elective (1000-2000 level)	3
PSCI 1101 The American Political System	3
PSYC 1001 General Psychology	3
Social science or humanities elective selected from business list	3
Total hours	45
Required Business Courses	
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 Productions and 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, operations management, organizational management, personnel-human resource management, 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 and Administration.	
Areas of emphasis (minimum)	12
Total hours	42

AREAS OF EMPHASIS

Each candidate for the bachelor of science 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 grade point 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, 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, which enables 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 communication skills are indispensable to the professional accountant. Thus, course work in English composition, report writing, and speech is highly recommended.

The undergraduate area of emphasis in accounting consists of 27 hours in addition to ACCT 2000.

Required Courses	*Semester Hours*
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 3410 Income Tax Accounting 3
ACCT 4620 Auditing 3

Elective Courses
(9 hours chosen from among the following courses)
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 consider Advanced Business Law (BSLW 4120) as an 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. 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 the understanding, knowledge, and skills for creating, organizing, and managing a new venture or small business. It emphasizes managerial aspects of the wide range of activities required of the entrepreneur.

A second area of emphasis in business is highly recommended. Course requirements for the second area can be included as part of business or nonbusiness electives.

Students must take BPOL 4520 (Small Business Strategy, Policy, and Entrepreneurship) when satisfying their business policy requirement. Additional courses in management, finance, accounting, and marketing should be planned in consultation with an advisor in order to serve individual career needs.

Required Courses *Semester Hours*
ESBM 4700 Entrepreneurship and Small Business Management 3
FNCE 4570 New Venture Funding 3
Two 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
BSLW 4120 Advanced Business Law 3
FNCE 4410 International Business Seminar in Finance (Note 1) 6

Recommended Electives
MKTG 3100 Personal Selling 3
MKTG 3400 Marketing Institutions and Retailing 3
MKTG 4650 Physical Distribution Management 3
MKTG 4700 Sales Management 3
MKTG 4800 Marketing Strategies and Policies 3
OPMG 4400 Production and Inventory Planning and Control 3
TRMG 4500 Transportation Operation and Management 3

Curriculum Note
1. Three hours will apply to the area of emphasis and 3 hours will apply as business elective credit.

Finance

The finance emphasis area is designed to provide students with in-depth exposure to the theoretical concepts and applied tools and techniques 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 students' 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 emphasis area are applicable to nonprofit and governmental organizations.

Required Courses *Semester Hours*
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 4410 International Business Seminar in Finance (Note 1) 6
FNCE 4530 Bank Management 3
FNCE 4570 New Venture Funding (Note 1) 6
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

Curriculum Note:
1. Three hours will apply to the area of emphasis and 3 hours will apply as business elective credit.

Information Systems

The information systems emphasis area of emphasis prepares students for professional careers in information systems in business and government. Students develop the technical skills and organizational insights required to analyze, design, implement, and manage information systems. The degree focuses on systems for the collection, organization, accessing, and analysis of information for planning and control.

Prerequisite Courses *Semester Hours*
INFS 2000 Business Information Systems and the Computer 3
OPMG 2010 Business Statistics 3
Courses in computer programming and/or data structures totaling a minimum of 6 semester hours ..... minimum 6

Required Courses
INFS 3500 Logical Data Structures and Database Management Systems 3
INFS 4650 System Analysis and Design 1 3
INFS 4660 System Analysis and Design 2 3
Plus one of the following courses:
OPMG 3200 Intermediate Statistics 3
INFS 3300 Decision Support Systems 3
INFS 4200 Introduction to Expert Systems 3
INFS 4700 Computer and Information Technology 3
OPMG 4400 Production and Inventory Planning and Control 3
INFS 4820 Management of Information Systems 3

International Business

In recent years, companies have 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 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 take 6 hours of the required courses before enrolling in MKTG 4400.

Required Courses	*Semester Hours*
ECON 3403 International Economics and Policy	3
Plus *three* of the following courses:	
FNCE 4400 International Financial Management	3
FNCE 4410 International Business Seminar in Finance (Note 1)	6
MKTG 4100 International Marketing	3
MKTG 4400 International Business Seminar	3
TRMG 4580 International Transportation	3

Curriculum Note:

1. Three hours will apply to the area of emphasis and 3 hours will apply as business elective credit.

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 nonbusiness 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 a study abroad program. Information on study abroad programs may be obtained from the Office of International Education. The College of Business and Administration will evaluate credit earned in such programs and determine degree acceptability.

Marketing

The marketing emphasis prepares students for careers in such fields as advertising, selling and sales management, marketing research, retailing, wholesaling, industrial marketing, international marketing, marketing of services, and nonprofit marketing. Key concepts and methods of analysis in marketing focus on understanding the customer, identifying customer needs, guiding the development of products or services, planning and implementing ways to market products or services, securing the customer's order, and monitoring customer response in order to guide future activities. Marketing activities cut across tangible products, services, and ideas, across consumer and industrial marketplaces, and across local, regional, national, and international boundaries.

Required Courses	*Semester Hours*
MKTG 3300 Marketing Research	3
Marketing electives (beyond MKTG 3000)	9

Operations Management

The operations management emphasis area is designed to prepate students for professional careers in operations planning and control, inventory management, and purchasing, in both manufacturing and service organizations. The importance of operations management can be seen in the revival of interest in productivity and quality, and through increasing world competition in manufacturing and services.

The program emphasizes current practices and 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.

Required Courses	*Semester Hours*
INFS 3300 Decision Support Systems	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
Recommended Electives	
ACCT 3320 Managerial Cost Accounting 2	3
MKTG 4650 Physical Distribution Management	3
OPMG 3200 Intermediate Statistics	3
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

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 and personnel–human resource management.

Required Courses	*Semester Hours*
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
FNCE 4410 International Business Seminar in Finance (Note 1)	6
PHRM 4410 Labor and Employee Relations	3
PHRM 4420 Employment Staffing and Development	3
PHRM 4430 Compensation and Benefits	3
Recommended Electives in Addition to the Above	
ACCT 3320 Managerial Cost Accounting 2	3
ESBM 4700 Entrepreneurship and Small Business Management	3
OPMG 4440 Work Design, Measurement, and Productivity Management	3
OPMG 4470 Policy Analysis in Production and Operations Management	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

Curriculum Note:

1. Three hours apply to the area of emphasis and 3 hours will apply as business elective credit.

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 in union-management relations.

Required Courses	*Semester Hours*
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
Recommended Electives	
FNCE 4410 International Business Seminar in Finance (Note 1)	6
ORMG 3350 Managing Individuals and Work Groups	3
ORMG 4320 Managing Complex Organizations	3
OPMG 3200 Intermediate Statistics	3
OPMG 4440 Work Design, Measurement, and Productivity Management	3
ACCT 3320 Managetial Cost Accounting 2	3
ECON 4616 Labor Economics	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
PSYC 4733 Principles of Psychological Testing 4

Curriculum Note:
1. Three hours apply to the area of emphasis and 3 hours will apply as business elective credit.

Real Estate

A career in 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, property managers, consultants, or investors.

Required Courses	*Semester Hours*
REAL 3000 Principles of Real Estate Practice	3
REAL 4010 Real Estate Development *or* REAL 4330 Real Estate Investments	3
REAL 4300 Residential and Income Property Appraising	3
REAL 4540 Real Estate Finance	3
REAL 4730 Legal Aspects of Real Estate Transactions	3

Any student planning to sit for the Colorado sales or broker's examination should consult with the college's real estate advisor. Additional preparatory courses for a real estate career are:

ACCT 4410 Income Tax Accounting 3
COMM 1010 Public Speaking 3
COMM 3200 Principles and Practices of Argumentation 3
ESBM 4700 Entrepreneurship and Small Business Management 3
FNCE 4330 Investment and Portfolio Management 3
FNCE 4550 Financial Markets and Institutions 3
MKTG 3100 Personal Selling 3
MKTG 3200 Consumer Behavior 3
MKTG 3300 Marketing Research 3
MKTG 4700 Sales Management 3

Tourism Management

Tourism, including both business and pleasure travel, is one of the most rapidly growing industries in Colorado, the United States, and internationally. It is projected to be the largest industry in the world by the year 2000. The tourism management emphasis is designed to prepare students to take advantage of the opportunities provided by this growth, including the management and operation of tourism attractions, the various businesses that serve travelers, and the government and quasi-government organizations devoted to tourism industry development.

The tourism management emphasis combines academic and practical experiences. Students are required to complete a professional internship with a tourism business, typically during the summer preceding their senior year.

As with other speciality areas of emphasis in the college, tourism management students are strongly encouraged to complete a second area of emphasis in business. Areas of particular value include marketing, international business, real estate, and transportation management.

Required Courses	*Semester Hours*
TOMG 3400 Principles of Tourism	3
TOMG 4070 Tourism Management	3
TOMG 4930 Internship	6
Tourism electives	6

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, international shiplines, trucking firms, and railroads. International transportation management problems and policies are analyzed.

One of the recommended elective courses may be substituted with advisor permission 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.

Required Courses	*Semester Hours*
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
Recommended Electives	
FNCE 4410 International Business Seminar in Finance (Note 1)	6
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

Curriculum Note:
1. Three hours will apply to the area of emphasis and 3 hours will apply as business elective credit.

GRADUATE DEGREE PROGRAMS

The Graduate School of Business Administration offers programs leading to the master of business administration (M.B.A.), master of science in business administration (M.S.), juris doctor/master of business administration (J.D./M.B.A.), and doctor of philosophy in business administration (Ph.D.) degrees. These programs are open to qualified individuals who hold a bachelor's degree from a regionally accredited college or university, or a recognized international university, without regard to their undergraduate major.

As this catalog went to press, the Graduate School of Business Administration was implementing major changes in its structure of M.B.A., M.S., and Ph.D. programs. Please check with the Graduate School of Business Administration office for more information.

Master of Business Administration and Master of Science

Requirements for Admission

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, or a recognized international university).

2. The applicant's scores on the Graduate Management Admission Test (GMAT). This test is given four times each year at numerous centers around the world. For information and to make application for the test, write to the Educational Testing Service, P.O. Box 6103, Princeton, NJ 08541-6103.

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), and a nonrefundable application fee must be submitted. Personal interviews are required for M.B.A. applicants. A typed (or word-processed) essay of 1-2 pages is required of each prospective student. Individuals with a minimum of two to three years of work experience are encouraged to apply.

The address for all graduate applications is:

Graduate School of Business
Administration
Campus Box 419
University of Colorado at Boulder
Boulder, CO 80309-0419
(303) 492-1831 (general information)

Diversity

In addition to grade point average requirements, hours taken, and nonbusiness course requirements completed, the Graduate School of Business Administration looks 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 or physical handicaps; and unique situations.

Requirements for Degrees

Advising. All graduate students should report first to graduate office staff in the Office of Graduate Studies to ascertain deficiencies and a principal field of interest. Faculty members then serve as advisors for specific fields.

During the first term of residence, each student must prepare a degree plan. This plan, with appropriate signatures, is filed in the Office of Graduate Studies and becomes the student's contract for the program.

Minimum Hours Required. Master of science in business administration students take a minimum of 30 semester hours of graduate credit in addition to any unfulfilled fundamental courses.

Entering master of business administration students take a prescribed sequence of classes in the first and second semesters of study. Thirteen credit hours of core courses are taken the first semester and 15 hours of core courses the second semester. In the second year, students must take 9 hours of core courses and choose four elective courses in their major field of study, and select one additional 3-hour elective course. A minimum of 52 credit hours is needed to graduate.

Students accepted into the M.B.A. program are required to attend an orientation, held during the week before classes begin. The agenda includes introductions in case methodology, study/time management techniques, computer lab diagnostic testing, faculty mentor/small group assignments; individual meetings, class meetings (including goal setting setting for the year and class officer elections), and campus and city tours. Additional group outdoor activities and a class banquet are also planned.

Transfers. The M.B.A. program is a full-time day program and requires two years to complete. Part-time study is not an option. Academic credit completed in other programs will be reviewed by the Office of Admissions for credit transfer consideration. Two or more years of significant work experience is strongly preferred for M.B.A. applicants. M.B.A. applicants directly out of an undergraduate program should have full-time work experience or military service prior to or in addition to their undergraduate program.

The M.S. program accepts a maximum of 6 semester hours of graduate work from another AACSB-accredited master's program to be applied toward the requirements for the degree.

Comprehensive Examination. A comprehensive examination is not required for students in the M.B.A. program. Each candidate for a M.S. degree, however, is required to take a comprehensive final examination and/or defend a thesis during the final semester. The exam can be taken after course work is completed, and repeated once if failed, but the student must be registered as a candidate for degree. 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 course work taken after admission to the graduate program. If the cumulative grade point average falls below 3.00, a student is 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 must repeat a course once for which they have received a grade below *C-*. Both the original grade and the grade for the repeated course count in the computation of the grade point average.

To withdraw from a course and receive a grade of *W*, 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 the semester 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 and the comprehensive final examination should be completed within four years for M.S. students. Candidates for the M.S. degree are expected to complete their work with reasonable continuity. M.B.A. students must complete their program in two years.

Master of Business Administration

The breadth of training that master of business administration graduates receive prepares them well to become high-level managers of resources and people in a challenging and evolving business environment. The targeted entering class size of 100 students (two sections of 50 students) creates a sense of community between students and faculty. Active student participation is encouraged at all levels, and the environment is one of interaction, integration, and cooperation.

The two-year full-time program is rigorous and comprehensive, and demands student commitment. Entering classes begin each fall semester. The core curriculum provides a set of broad-based, integrative skills, rather than narrowly focused, highly specialized skills.

Core courses provide a sound foundation in both business management and analytical disciplines, a foundation that fosters continued career growth. In addition to core courses stressing key functional areas of business, students can choose electives specific to their chosen major. Each major addresses different goals, and all provide in-depth management study.

The case study method is used across core courses, and common areas of study such as ethics, technology, communications, and international issues are spread throughout much of the curriculum. Students learn about management theory and its practical applications in "real world" situations. Lectures, seminars, team teaching, team study groups, guest lectures, and videotaped critique sessions are all approaches taken by the faculty to generate new ideas and allow student input.

M.B.A. Curriculum

Semester Hours

First Year
First Semester
MBAC 6010 Managerial Economics.....3
MBAC 6020 Financial Accounting.....3
MBAC 6030 Quantitative Methods 1.....3
MBAC 6040 Managing Behavior in Organizations.....3
MBAC 6050 Management Communications.1

Second Semester
MBAC 6060 Corporate Finance.....3

MBAC 6070 Management Accounting.....3
MBAC 6080 Quantitative Methods 2.....3
MBAC 6090 Marketing Management 3
MBAC 6100 Information Systems for Management 3

Second Year
First Semester
MBAC 6110 Public Policies toward Business.3
MBAC 6120 Operations Management 3
Major field course.....3
Major field course 3

Second Semester
MBAC 6130 Business Policy 3
Major field course 3
Major field course 3
Elective (open).....3

Total Credit Hours 52

Major Fields

The following major fields of study are offered:

Finance Major (four courses required)
MBAF 6200 Advanced Corporate Finance
MBAF 6300 Applied Financial Management
MBAF 6330 Investment Management and Analysis
MBAF 6550 Financial Markets and Institutions
MBAF 6600 Special Topics in Finance

Marketing Major (four courses required)
MBAM 6050 Marketing Research
MBAM 6150 Marketing Field Project
MBAM 6200 International Marketing Management
MBAM 6300 Strategic Marketing Management
MBAM 6600 Special Topics in Marketing Management

Organization Management Major (four courses required)
MBAO 6200 Developing Leadership Skills
MBAO 6320 Designing and Managing Organizational Systems
MBAO 6400 Management of Human Resources
MBAO 6450 Management of Organizational Change
MBAO 6600 Special Topics in Organization Management

Technology and Innovation Management Major (four courses required)
MBAT 6100 Management of Technology and Innovation
MBAT 6200 Marketing of Technology and Innovation
MBAT 6300 Management of Information Technology
MBAT 6400 Modern Manufacturing Systems
MBAT 6600 Special Topics in Technology and Innovation Management

Self-designed Major (four courses plus special topics required)
Must be approved—courses may be elected within or outside the Graduate School of Business Administration.

Double-Degree Program (J.D./M.B.A.)

The purpose of this double-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 double-degree program.

Admission. To be eligible for the double J.D./M.B.A. degree program of the School of Law and the Graduate School of Business Administration, 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 double-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 first year of study under the degree program of that school, apply for admission to the other school and elect to be enrolled under the program.

Course of Study. A student enrolled in the double-degree program may commence studies under the program in either the School of Law or the Graduate School of Business Administration. However, a student must 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 Graduate School of Business Administration or in the School of Law, 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 double-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.

Termination of Double-Degree Enrollment or of Good Standing. Students in the double-degree program who do not maintain the academic or ethical standards of either school may be terminated from the 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 double-degree program will be required to meet the regular degree requirements (J.D. or M.B.A.) that were in effect when they entered the program for that degree.

For additional information concerning the double-degree program, see the program advisors in the School of Law and the Graduate School of Business Administration.

Master of Science in Business Administration

The master of science in business administration program provides students the opportunity to study a major field in depth and the option to declare a minor. Three major fields of study are offered—accounting, taxation, and information systems. Master of science students take a minimum of 30 semester hours of graduate credit.

For detailed information concerning requirements and recommended programs for each of the major fields, students should consult the following professors:

Accounting: Professor Schattke
Information Systems: Professor Monarchi
Taxation: Professor Jackson

With the approval of the student's faculty advisor and the M.B.A./M.S. programs director, minor fields may be chosen from business areas or from other graduate departments.

Minimum Requirements

The minimum requirements for the M.S. degree, if all undergraduate requirements have been met, are as follows:

Accounting and taxation majors must complete a minimum of 30 semester hours of graduate-level course work. No thesis is required. All students must pass a written comprehensive examination during the last semester they are enrolled. Students may be required to complete an oral final comprehensive examination subsequent to their written examination.

Many states now require 150 semester hours for the Certified Public Accountant certificate. In response to this requirement, accounting and taxation programs offer a diverse selection of courses that prepare the student for high-level professional careers.

Information systems majors must complete 30 semester hours of graduate credit, including a thesis (6 hours credit) based on original research. If a minor is declared, a minimum of 21 semester hours credit (including thesis) must be earned in the major field, and not fewer than three.

courses (normally 9 semester hours) must be completed in the minor field. Information systems majors have an oral examination covering the thesis and course work for the degree.

Accounting Major

The expanding role and increased level of technical knowledge expected of accountants make graduate study in accounting highly desirable. Courses offered for the accounting major prepare students for high-level professional careers in accounting. Degree requirements include 30 hours of course work and a comprehensive exam (no thesis).

The accounting major is designed to enhance an undergraduate degree in accounting or supplement a business degree with substantial course work in accounting. Students from other disciplines are encouraged to apply, but must make up prerequisites by enrolling in equivalent courses at the undergraduate or graduate level.

Taxation Major

With today's complex income tax laws, accounting professionals must have a specialized knowledge of taxation principles. The Graduate School of Business Administration and the University's School of Law jointly offer course work to complete the major in taxation. Degree requirements include 30 hours of course work and a comprehensive exam (no thesis).

The taxation major is designed to enhance an undergraduate degree in accounting, or other majors that include intermediate and cost accounting and introductory taxation. Students may make up prerequisites by enrolling in equivalent courses at the undergraduate or graduate level.

Information Systems Major

Organizations are increasingly dependent upon informations systems for their administration, operations, sales, and service. Incorporating advanced information technology into business procedures requires in-depth knowledge of both business and technology. Degree requirements include 24 hours of course work and 6 hours of written thesis with an oral defense.

The information systems major is designed to enhance an undergraduate degree in business. However, students from other disciplines, whether technical or nontechnical, are also encouraged to apply. Students may make up prerequisites by enrolling in equivalent courses at the undergraduate or graduate level.

Doctor of Philosophy in Business Administration

The Ph.D. program in the Graduate School of Business Administration provides the highest quality curriculum, research, and teaching experiences requiring a combination of standardized requirements and individualized programming. The ultimate goal of the business Ph.D. program is to develop students who can produce state-of-the-art research publishable in top academic journals, and to prepare students to perform as outstanding teachers in their fields of study.

Field requirements for the Ph.D. degree at the University of Colorado are broadly conceived and are designed to encourage study in 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

To preserve the individualized character of the Ph.D. program and its quality, the number of candidates is limited, and candidates are admitted only after careful screening. Applicants must submit a nonrefundable fee with their application.

In reviewing applications, the following criteria are most important:

1. Each applicant's undergraduate and graduate academic record.
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, P.O. Box 6101, Princeton, NJ 08541-6101.
3. Recommendations from three or more 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 area for doctoral work.* The Ph.D. is a research-oriented degree program. Applicants should address explicitly their research interests and plans for the future.
5. The mailing address and telephone number of the school are:

Graduate School of Business Administration
Campus Box 419
University of Colorado at Boulder
Boulder, CO 80309-0419
(303) 492-1831 (general information)

Requirements for Degree

The newly accepted Ph.D. student should consult with the area doctoral advisor to develop a specific degree plan. Ideally the student's doctoral faculty committee, which works with the area doctoral advisor, should be decided upon by the end of the first semester. Each student's advisory committee shall include at least two members from the student's expected dissertation area. One faculty member, normally from the dissertation field, acts as chair.

The signatures of the area doctoral advisor and the Ph.D. program director are required on all degree plans and applications for candidacy for Ph.D. students.

Qualifying Examinations. These exams may be 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.

Areas of Study. Students must become proficient in two or more fields of study, selected from the areas below.

1. One of the following fields in business, which must be the dissertation area:
   - accounting
   - finance
   - information systems
   - marketing
   - operations management
   - organization management
   - strategy
2. One or more other fields, which may be in the above business fields or an approved and cognate field outside the Graduate School of Business Administration.

Core Courses.

1. Quantitative Analysis: a minimum of three courses. Several sequences are acceptable.

Econometrics
ECON 7808 Seminar: Quantitative Methods in Economics
ECON 7818 Seminar: Intermediate Econometrics
ECON 8828 Seminar: Econometrics 1
ECON 8838 Seminar: Econometrics 2

Psychology
PSYC 5741 General Statistics
PSYC 5751 General Statistics
MKTG 7300 Multivariate Statistical Methods

Education
EDUC 7316 Intermediate Statistical Methods
EDUC 7326 Experimental Design and Analysis 1
EDUC 7366 Experimental Design and Analysis 2
MKTG 7300 Multivariate Statistical Methods

Each area faculty and the area doctoral advisor will determine the appropriate sequence, depending on the background and academic objectives of the student. To meet unique needs, different sequences

may be approved by the Ph.D. program director (to meet distinctive, individualized faculty and student program objectives).

2. Research Methods: a minimum of one course taught in the Graduate School of Business Administration. The course will be a combination of the philosophy of science and a survey of different research methods employed by researchers in graduate schools of business.

3. Either two graduate-level courses in economics or two graduate-level courses in the behavioral sciences.

Background, Prerequisites, and Deficiencies.

1. Each student must have a background in mathematics at or beyond calculus.

2. Based on experience, background, and at the discretion of the area faculty, the area doctoral advisor, and the Ph.D. program director, course work in the following areas may be required of the Ph.D. student:

accounting
marketing
organizational management
finance
information systems
economics (intermediate or graduate-level microeconomics or macroeconomics)

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 is made available to all faculty members in the student's major field.

Credit by Transfer. Resident graduate work of high quality earned in another institution of approved standing is not 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 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 that 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 semesters on the Boulder campus (not summer), 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 satisfies 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.

Time Limit. All work for the doctoral degree must be completed within six years from the first term the student is enrolled in the doctoral program. However, all doctoral students are encouraged to complete their program in four years, which is possible with full-time effort and careful planning.

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.

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. Each Ph.D. student must sit for a written and an oral comprehensive exam. These written and oral exams are to be evaluated as one continuous exam process.

Satisfactoty completion of the written exam is a necessary condition for proceeding on to the oral exam. Each area will determine the required content, length, and standards of evaluation for the exam. The preferred pattern is to schedule comprehensive exams in October and April of each academic year.

The second field, when completed outside of the Graduate School of Business Administration, may be tested by an exam or other process used in that department. The department must provide a letter certifying that the Ph.D. student has completed the outside field requirement. A second field in the Graduate School of Business Administration will normally require a written exam.

Dissertation. A dissertation (thesis) 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 study. 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, 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 course work, 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 con-

ducted. 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.

COURSE DESCRIPTIONS

The following courses are offered in the College of Business and Administration and the Graduate School of Business Administration on the Boulder campus. *This listing does not constitute a guarantee or contract that any particular course will be offered during a given term.*

For current information on times, days, and instructors of courses, students should consult the *Registration Handbook and Schedule of Courses* issued at the beginning of each term.

Courses specific to the new M.B.A. program are listed at the end of these descriptions.

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. Courses at the 6000, 7000, and 8000 level are open only to graduate students.

Courses are organized by subject matter and are listed numerically *by last digit* (courses ending in the number "0" are listed before courses ending in "1," and so on). The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:

Prereq.—Prerequisite
Coreq.—Corequisite
Lab—Laboratory
Rec.—Recitation
Lect.—Lecture

Accounting

ACCT 2000-3. Introduction to Financial Accounting. Preparation and interpretation of financial statements of the business enterprise, emphasizing 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 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, and junior standing.

ACCT 3410-3. Income Tax Accounting. Provisions and procedures of federal income tax laws and requirements affecting individuals and business organizations. Prereq., ACCT 2000 or 5010.

ACCT 4240-3. Advanced Financial Accounting. Advanced financial accounting theory and practice, emphasizing accounting for partnerships, business combinations, and consolidations. Prereqs., ACCT 3230 or 6220. Same as ACCT 5240.

ACCT 4250-3. 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. Same as ACCT 5250.

ACCT 4330-3. Managerial Accounting Issues and Cases. Critical analysis of advanced topics in managerial accounting. Considerable use of cases and current readings. Prereq., ACCT 3320. Same as ACCT 5330.

ACCT 4420-3. Advanced Income Tax Accounting. Continuation of ACCT 4410, with special emphasis on the income tax problems of partnerships and corporations. Prereq., ACCT 4410. Same as ACCT 5420.

ACCT 4540-3. Accounting Systems and Data Processing. 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. Same as ACCT 5540.

ACCT 4620-3. Auditing. Generally accepted auditing standards, professional ethics, and auditing techniques. Stresses authoritative pronouncements of the AICPA. Prereq., ACCT 3230 or 6220.

ACCT 4800-3. 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 with a GPA of not less than 3.30 and who have received instructor consent.

ACCT 4900-variable credit. Independent Study. Student must have 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. Financial Accounting. Provides basic understanding of financial accounting and financial statements. Open only to graduate degree candidates.

ACCT 5240-3. Advanced Financial Accounting. Same as ACCT 4240.

ACCT 5250-3. Financial Accounting Issues and Cases. Same as ACCT 4250.

ACCT 5330-3. Managerial Accounting Issues and Cases. Same as ACCT 4330.

ACCT 5420-3. Advanced Income Tax Accounting. Same as ACCT 4420.

ACCT 5540-3. Accounting Systems and Data Processing. Same as ACCT 4540.

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 equivalents. 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 equivalents 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. Analyzes development and current problems of the managerial accounting function. Prereqs., ACCT 2000, 2310, 3220, 3230, and 3320, or equivalents, 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. Gives special attention to current issues and problems. Prereq., ACCT 3230 or ACCT 6220 or equivalent, or instructor consent.

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. Study and application of the methodology used in tax research and in tax planning, with a goal of developing tax research and writing skills. Prereq., ACCT 4410, or instructor consent.

ACCT 6430-3. Taxation of Partnerships and S Corporations. Examines in depth 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, with special emphasis on entity choice. Prereq., ACCT 4410 or equivalent, or instructor consent.

ACCT 6440-3. Tax Policy. Research seminar exploring policy issues of taxation. Areas reviewed include recent legislative proposals on tax simplification, and consumption taxes. Students are expected to prepare a publishable research paper on a tax policy topic mutually agreed upon with the instructor. Prereq., ACCT 4410 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 and ACCT 4410 or equivalent, or instructor consent.

ACCT 6500-variable credit. Special Topics in Taxation. Covers a diverse array of issues in taxation. Designed to highlight areas of particular current interest and to draw on strengths of leading outside authorities as guest lecturers 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. Emphasizes critical analysis of current standards and practices. Prereq., ACCT 4620 or equivalent.

ACCT 6700-4. Income Taxation. See LAWS 6007.

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. Taxation of Natural Resources. See LAWS 7307.

ACCT 6780-3. International Taxation. See LAWS 7617.

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. Student must have 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. Analyzes current theories, tests of theories, and alternative research methods. Requires a final research proposal. Prereq., ACCT 7300.

ACCT 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 accounting. Gives special attention to 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 (taught as doctoral seminar).

ACCT 8990 (1-10). Doctoral Thesis.

Business Economics

BECN 4100-3. Business and Government. Studies 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 recommended before taking this course. Prereqs., ECON 2010 and 2020. Business seniors only.

BECN 5080-3. Economic Theory and Application for Managers. Introduces microeconomic 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.

BECN 6150-3. Managerial Economics. Presents concepts, tools, and methods of economic analysis relevant to a broad cross-section of decisions within the business firm. Particular attention given to market demands and the interrelationships between price policy, costs, and production. Prereqs., INFS 5020 and microeconomics, or OPMG 5020 and BECN 5080. Open only to business graduate students.

BECN 6180-3. Business, Government, and Society. Studies 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: BECN 6150 should be completed before enrolling in this course.) Prereq., BECN 5080 or equivalent, or 12 hours of 5000-level fundamentals. Open only to business graduate students.

Business Environment and Policy

BPOL 1500-3. Introduction to Business. Explores the nature of business enterprise, the role of business in society, and the problems confronting business management. Discusses career opportunities in business. Business students are advised to take this course during the freshman year. Open only to freshmen and sophomores.

BPOL 4500-3. Cases and Concepts in Business Policy. Emphasizes integration of economic, market, social-political, technological, and competition components of the external environment with the internal characteristics of the firm. Through analysis, discusses derivation of appropriate interaction between the firm and its environment to facilitate accomplishment of the firm's objectives. 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. Emphasizes planning, organizing, and operating small business firms, and examines the role of the entrepreneur in conception, organization, and development of firms. Extensive use made of small business cases. Prereqs., FNCE 3050, MKTG 3000, OPMG 2010 and 3000, and ORMG 3300. For graduating seniors only.

BPOL 4550-3. Business and Society. Examines interrelationships between business, society, and the environment. Topics include perspectives on the socioeconomic 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. Emphasizes 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. Provides 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. Student must have consent of instructor under whose direction study is taken. Departmental form required.

BPOL 8990 (1-10). Doctoral Thesis.

Business Law

BSLW 3000-3. Business Law. Studies the legal significance of business transaction as part of the decision-making process in business. Covers problem resolution procedures, both in and out of court, and consequences of current trends in civil tort law and criminal law in the business community. Basic contract law, the Uniform Commercial Code sales section, and property rights are also reviewed. Prereq., junior standing. Students enrolled in BSLW large lecture sections 3000-100 or 3000-200 must request a recitation section.

BSLW 4120-3. Advanced Business Law. Continuation of BSLW 3000. Covers secured transactions, agency, bankruptcy, partnerships, corporations, suretyship, and guaranties. Prereq., BSLW 3000 or 5060. Same as BSLW 5120.

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 5120-3. Advanced Business Law. Same as BSLW 4120.

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, national legislation, and the roles of federal agencies.

Entrepreneurship and Small Business Management

ESBM 4700-3. Entrepreneurship and Small Business Management. Exposes students to the environment of entrepreneurship within firms varying in size from startups through later stages of organization life cycles. Course assignments give students the opportunity to develop greater self-awareness of their fit with entrepreneurial environments and learn the process of business planning. Case studies and practitioner guests highlight the course process. Course is a feeder course for ESBM 4830: Business Plan Preparation. Prereq., senior standing, INFS 2000, ACCT 2000, FNCE 3050, and BSLW 3000.

ESBM 4830-3. Business Plan Preparation. Completion of a sophisticated business plan is developed within task groups from concept through all elements of a professionally written business plan. Prereq., ESBM 4700 or ESBM 6700. Course restricted to those students who have demonstrated the aptitude to do this level of study and application.

ESBM 4900-variable credit. Independent Study. Student must have 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 6700-3. Entrepreneurship and Small Business Management. Examines the development of emerging ventures from the entrepreneur perspective. An advanced graduate-level version of ESBM 4700, with a significant component of doing research in entrepreneurial companies.

ESBM 6900-variable credit. Independent Study. Student must have consent of instructor under whose direction study is taken. Departmental form required.

Finance

FNCE 3050-3. Basic Finance. Emphasizes basic concepts, tools, and techniques used by the financial manager. Also includes study of the financial manager's role in business and sources of capital for financing required asset investments. Prereqs., ECON 2010 and 2020, ACCT 2000, OPMG 2010, INFS 2000, and junior standing.

FNCE 3210-3. Personal Finance. Discusses 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. Studies basic problems concerning development and implementation of a personal investment program. Includes analyzing 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.

FNCE 3550-3. Financial Markets. Discusses major operating characteristics and problems of money and capital markets, both national and international. Emphasizes sources and availability of money and capital for financing business and 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.

FNCE 4010-3. Business Finance 1. Covers the basic principles and practices governing management of capital in the business firm. Examines determinants of capital requirements, methods of obtaining capital, problems of internal financial management, and methods of financial analysis. Emphasizes financing the business corporation. Prereq., FNCE 3050; coreq., ACCT 2310.

FNCE 4020-3. Business Finance 2. Develops analytical and decision-making skills in relation to problems that confront financial management. Topics 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 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 4340-3. Security Analysis. Applies theories and methodology for selecting investment media and for implementing an investment portfolio. Prereq., FNCE 4330. Same as FNCE 5340.

FNCE 4400-3. 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. Same as FNCE 5400.

FNCE 4410-variable credit. International Business Seminar in Finance. Special topics in international business. Interested students should contact the College of Business and Administration Office of Undergraduate Studies.

FNCE 4530-3. Bank Management. Analyzes structure, markets, regulation, and chartering of commercial banks. Studies problems and policies of internal management of funds, loan practices and procedures, investment behavior, deposit and capital adequacy, liquidity, and solvency. Develops analytical methodology for these problems. Prereq., FNCE 4550. Same as FNCE 5530.

FNCE 4550-3. Financial Markets and Institutions. Emphasizes economics of financial markets and business management of financial institutions. Gives additional emphasis to impact of monetary and fiscal policy on international and domestic financial market conditions. Prereq., FNCE 3050.

FNCE 4570-3. New Venture Funding. Focuses on 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 4740-3. Principles of Insurance. Covers 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. Same as FNCE 5740.

FNCE 4770-3. Risk Control in the Corporate Enterprise. Systematic approach to risk control in industrial and commercial enterprises. Concerns 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. Same as FNCE 5770.

FNCE 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 with

not less than a 3.30 grade point average, and who have received instructor consent.

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. Student must have 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 5340-3. Security Analysis. Same as FNCE 4340.

FNCE 5400-3. International Financial Management. Prereq., FNCE 5050 or equivalent. Same as FNCE 4400.

FNCE 5530-3. Bank Management. Prereq., FNCE 6010. Same as FNCE 4530.

FNCE 5740-3. Principles of Insurance. Same as FNCE 4740.

FNCE 5770-3. Risk Control in the Corporate Enterprise. Same as FNCE 4770.

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 6330-3. Investment Management and Analysis. Theory of investment management and security values; portfolio management including analysis of investment risks and constraints on investment policies and objectives; analysis and use of investment information; and development and application of tools for determining values. Prereq., FNCE 6010.

FNCE 6550-3. Economics of Financial Markets. Emphasizes economic analysis of domestic and international financial markets. Considerable emphasis placed on developing an understanding of various factors that influence 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. Student must have consent of instructor under whose direction study is taken. Departmental form required.

FNCE 6940-variable credit. Master's Candidate. Departmental form required.

FNCE 6950 (4-6). Master's Thesis.

FNCE 7100-3. Financial Theory and Corporate Policy. Devoted to developing an understanding of major theoretical aspects of corporate finance and financial economics. Reviews each of the seminal theories upon which modern finance is based, including empirical evidence. Prereqs., FNCE 5050, 6010, and 6330.

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 7830-1. Doctoral Seminar: Dissertation Research. Designed to assist the doctoral student in integrating courses and fields of study in order to apply knowledge and skills to problems in finance. Gives special attention to development of thesis topics. Continuous enrollment required of all finance doctoral students while doing course work.

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 consent and departmental form required.

FNCE 8990 (1-10). Doctoral Thesis.

Information Systems

INFS 2000-3. Business Information Systems and the Computer. Studies business information systems, focusing on computer hardware and software as they relate to business information. Includes information and decision-making concepts, computer systems, and computer applications. Introduces students to 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 3300-3. Decision Support Systems. Nature and role of information technology for supporting decision-making processes in organizations. Covers concepts of information, models of decision making, underlying technology for decision support, and the development, implementation, and evaluation of decision support systems. Includes concept, impact, and future role of group decision support systems in organizations. Prereq., INFS 2000.

INFS 3500-3. Logical Data Structures and Database Management Systems. 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 for both technical and managerial concerns.

INFS 4200-3. Introduction to Intelligent Systems. Covers a variety of approaches to building intelligent systems (systems exhibiting behavior that appears intelligent). These approaches include rule-based systems, logic-based systems, case-based reasoners, neural nets, and blackboard architectures. Students build a system as group project. Same as INFS 5200.

INFS 4650-3. Systems Analysis and Design 1. Introduces students to basic system analysis tools and the procedures for conducting a system analysis. Topics may include system requirements, initial analysis, general feasibility study, structured analysis, detailed analysis, logical design, and 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, logical data modeling, physical system design, detailed feasibility analysis, specification of human-computer interface, 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 4700-3. Computer and Information Technology. Provides students with a conceptual foundation in the areas of computer architecture, operating systems, language translation, and telecommunications. Course intended to facilitate communication between students and other members of the data processing community. Same as INFS 5700.

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 with not less than a 3.30 grade point average and have received instructor consent.

INFS 4820-3. Management of Information Systems. Presents basic knowledge essential to managing an information technology function within a larger enterprise. Considers the strategic and tactical nature of information technology; the management considerations surrounding hardware, software, and telecommunications systems; and the human and organizational dimensions related to the introduction and implementation of the technology. Prereq., two courses in information systems, computer science, or telecommunications, or instructor consent. Same as INFS 5820.

INFS 4900-variable credit. Independent Study. Student must have prior consent of the dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors who desire to study an advanced topic. Departmental form required.

INFS 5000-3. Introduction to Computing. Introduces students to use of computers in 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 5200-3. Introduction to Intelligent Systems. Same as INFS 4200.

INFS 5700-3. Computer and Information Technology. Same as INFS 4700.

INFS 5820-3. Management of Information Systems. For graduate students. Same as INFS 4820.

INFS 6040-3. Telecommunications and Networking. Analysis and design of networks to support management information systems. Objective is to familiarize students with concepts and terminology of data communications, network design, and distributed information systems. Heavily slanted toward managerial considerations in space systems environment. Instructor consent required.

INFS 6450-3. Information Systems for Management. Information processing, analysis and design of information systems, management query systems, and database design and management. Provides an overview of data processing functions and management in a business setting. Designed for nonmajors.

INFS 6500-3. Database Management Systems. Introduces database management systems and logical database design. Discusses hierarchical, network, and relational models, and emphasizes design. Approaches may include the ER model, the semantic data model, and the object model. Design guidelines include normalization criteria.

INFS 6650-3. Systems Analysis and Design. Introduces basic systems analysis and design tools and the procedures for conducting analysis and design. Analysis topics may include system requirements, initial analysis, general feasibility study, structured analysis, joint application design, logical design, and process modeling. Also covers structured design, logical data modeling, physical system design, detailed feasibility analysis, specification of human-computer interface, 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.

INFS 6700-3. Artificial Intelligence Programming. Introduces symbolic programming, using Scheme. One-third to one-half of the course is spent on language, the remainder on techniques. AI programming techniques covered may include discrimination nets, control structures, production systems, slot and filler databases, chronological backtracking, reason maintenance systems, and deductive information retrieval. Prereq., instructor consent.

INFS 6800-3. Object Systems. Explores the object paradigm. Topics include object analysis and design, object database systems, object programming languages, object-base environments, and the management of software activities in these areas. Smalltalk is used as the backbone of the course. A group project demonstrates mastery of the concepts.

INFS 6820-variable credit. Graduate Seminar. Experimental seminar offered irregularly to provide opportunity for investigating new frontiers in information systems.

INFS 6900-variable credit. Independent Study. Student must have consent of instructor under whose direction study is taken. Intended only for exceptionally well-qualified business graduate students who desire to study advanced topics. 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 investigating new frontiers in information systems.

INFS 8900-variable credit. Independent Study. Student must have consent of instructor under whose direction study is taken. Departmental form required.

INFS 8990 (1-10). Doctoral Thesis.

Marketing

MKTG 3000-3. Principles of Marketing. Introduces essentials of marketing, including 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. Covers principles and methods of personal selling with attention to development and demonstration of effective sales presentation techniques. Prereq., junior standing.

MKTG 3200-3. Consumer Behavior. Surveys contributions of behavioral sciences to understanding and predicting consumer behavior. Examines research techniques in social sciences that lead to understanding consumer decision making and purchasing. Surveys consumer purchasing behavior, brand loyalty, and product cycles. Prereq., MKTG 3000.

MKTG 3300-3. Marketing Research. Explores fundamental techniques of data collection and analysis used to solve marketing problems. Specific topics include planning an investigation, developing questionnaires, sampling, interpreting results, and preparing a report. Discusses research techniques that support product planning, marketing segmentation, pricing, and advertising research. Prereqs., MKTG 3000 and OPMG 2010. Students without proper prerequisites may be administratively dropped.

MKTG 3400-3. Marketing Institutions and Retailing. Studies macroeconomic foundations of marketing intermediaries, middlemen, and institutional alignments. Emphasizes 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 and Promotion. Analyzes principles and practices in advertising and promotion from the executive's viewpoint. Considers whether a firm should advertise; product and market analysis as a planning phase of advertising program; media; creation and production of advertisements; advertising budgets, copy testing, and organization. Prereq., MKTG 3000.

MKTG 4100-3. International Marketing. Studies policies and practices of firms marketing products and services in foreign countries. An analytical survey of institutions, functions, policies, and practices in international marketing. Relates marketing activities to market structure and marketing environment. Prereq., MKTG 3000 or 5030. Same as MKTG 5100.

MKTG 4400-3. International Business Seminar. Examines the international business environment as it affects company policy and procedures. Integrates all functions undertaken in international operations through in-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. Covers special topics in international business. Interested students should contact the College of Business and Administration Office of Undergraduate Studies. Prereq. varies.

MKTG 4500-3. Advertising Management. Discusses advertising problems from management point of view. Topics include stimulating primary and selective demand, selecting media, building promotional programs, advertising appropriations and campaigns, evaluations of results, and agency relations. Prereq., MKTG 3500 or instructor consent. Same as MKTG 5500.

MKTG 4600-3. Business to Business Marketing. Surveys activities involved in marketing goods and services to businesses and institutions. Topics include analysis of market structures, habits and motives of purchasers, types of products, pricing problems, distribution channels, and issues frequently encountered in marketing to businesses. Also covers problems in selling to government agencies. Prereq., MKTG 3000 or 5030. Same as MKTG 5600.

MKTG 4650-3. Physical Distribution Management. Investigates and analyzes 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 to attain distribution goals of the firm. Prereq., MKTG 3000 or equivalent, or MKTG 5030. Same as MKTG 5650.

MKTG 4700-3. Sales Management. Discusses 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), and sales analysis and control. Prereq., MKTG 3000 or 5030. Same as MKTG 5700.

MKTG 4750-3. Pricing and Price Policies. Appraises 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. Same as MKTG 5750.

MKTG 4800-3. Marketing Strategies and Policies. Provides 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 with not less than a 3.30 grade point average and have instructor consent. 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. Student must have 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 essentials for graduate study of business. Emphasizes marketing management. Open only to graduate degree candidates.

MKTG 5100-3. International Marketing. Same as MKTG 4100.

MKTG 5500-3. Advertising Management. Same as MKTG 4500.

MKTG 5600-3. Business to Business Marketing. Same as MKTG 4600.

MKTG 5650-3. Physical Distribution Management. Same as MKTG 4650.

MKTG 5700-3. Sales Management. Same as MKTG 4700.

MKTG 5750-3. Pricing and Price Policies. Same as MKTG 4750.

MKTG 6000-3. Marketing Management. An in-depth inquiry into marketing decision making. Emphasizes strategic planning and analytical procedures for marketing decisions. Integrates all areas of marketing management and relates marketing activities to other functional areas of the firm. Prereq., MKTG 5030 or equivalent. Graduate students only.

MKTG 6050-3. Marketing Research. Examines problem/opportunity definition, survey and causal research designs, and reporting of research results from the viewpoints of practicing researchers and managers. Topics include secondary data sources, measurement of beliefs and behaviors, sampling plans, and data analysis. Emphasizes managerial applications. Prereq., MKTG 5030.

MKTG 6100-3. Seminar: Marketing. Develops behavioral perspectives in marketing management decision making from study of consumer and industrial buyer behaviors. Prereq., MKTG 5030.

MKTG 6820-variable credit. Graduate Seminar. Experimental seminar offered irregularly to provide opportunity for investigation of current topics in marketing.

MKTG 6900-variable credit. Independent Study. Student must have consent of instructor under whose direction 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. Doctoral Seminar: Consumer Behavior. Studies 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. Covers influence of demographic factors, motivation, personality, culture, and purchasing behavior. Prereq., MKTG 3200 or instructor consent.

MKTG 7100-3. Doctoral Seminar: Product and Price. Studies marketing literature dealing with product and price topics. Includes product topics such as management of new products, product elimination, product life cycles, and product portfolios. Includes pricing topics such as pricing models and price perceptions.

MKTG 7200-3. Doctoral Seminar: Marketing Theory. Investigates development and current state of theoretical and conceptual aspects of marketing principles, institutions, and processes. Develops an understanding of functioning, measurement, and efficiency of total distribution process. Analyzes and evaluates frontiers of marketing thought. 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. Emphasizes computer applications. Prereqs., graduate courses in regression and ANOVA.

MKTG 7400-3. Doctoral Seminar: Channels of Distribution. Studies marketing literature in channels of distribution. Includes topics of channel structure, channel power, channel conflict and leadership, physical distribution systems, and regulation.

MKTG 7500-3. Doctoral Seminar: Promotion. Studies marketing literature dealing with advertising, selling, sales promotion, and sales management. Includes topics of advertising decision models, advertising effects, salesforce performance models, and promotion management.

MKTG 7600-3. Doctoral Seminar: Services Marketing. Studies marketing literature dealing with services. Includes such topics as service management, theoretical issues in the study of services, and strategies in travel, tourism, recreation, and financial services industries.

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. Gives special attention to development of thesis topics.

MKTG 8820-variable credit. Doctoral Seminar: Special Topics. Study of marketing literature on a topic or topics selected by instructor. Examples of topics include marketing history, international marketing management, marketing environment, marketing of high technology products, and marketing models.

MKTG 8900-variable credit. Independent Study. Student must have consent of instructor under whose direction study is taken. Departmental form required.

MKTG 8990 (1-10). Doctoral Thesis.

Operations Management

OPMG 2010-3. Business Statistics. Foundations for statistical reasoning and statistical applications in business. Topics include descriptive statistics, probability, probability distributions, sampling theory and sampling distributions, statistical inference (estimation and hypothesis testing). Provides an introduction to regression analysis, analysis of variance, time series forecasting, decision analysis, index numbers, and non-parametric methods. Prereqs., MATH 1050 through 1100.

OPMG 3000-3. Production and Operations Management. Introduces 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 management; simulation; waiting line analysis; and linear programming. Prereq., OPMG 2010.

OPMG 3200-3. Intermediate Statistics. Provides an intermediate-level working knowledge of multiple regression, analysis of variance, statistical forecasting techniques, sampling, survey sampling, parametric and non-parametric statistical inferences, and decision analysis under uncertainty. Also includes an introduction to multivariate data analysis. Develops statistical theory and applications for business and research. Prereq., OPMG 2010.

OPMG 4300-3. Business Forecasting. Examines a collection of qualitative and quantitative business forecasting methods such as judgmental forecasting methods, exponential smoothing techniques, time series composition, ARIMA models, and an introduction to the Box-Jenkins methodology. Students construct planning and simulation models, and analyze and understand factors responsible for fluctuations in business activity. Prereq., OPMG 2010. Same as OPMG 5300.

OPMG 4400-3. Japanese Business and Operations Management. Compares the Japanese system of production/operations management in the manufacturing and service sectors with that of the U.S. (and to a lesser extent, Europe and Asia). Course material contrasts Japanese and Western approaches to business, quality management, labor practices, management styles, international competitiveness, productivity, distribution systems, trade practices and strategies for penetrating foreign markets, and the techniques and methods commonly used to support manufacturing and service activities.

Examines the Japanese sociocultural environment, government-business relationship, banking industry, operations strategy, and formula for success, as well as the potential for transferring Japanese industrial management practices and manufacturing techniques to other countries. Prereq., OPMG 3000. Same as OPMG 5400.

OPMG 4440-3. Quality, Productivity, and Competitiveness. Examines from both managerial and operational perspectives the concepts, tools, and techniques used in the management and measurement of quality, productivity, and competitiveness in an international environment. Topics include total quality control, total quality management, statistical process control, Deming management methods, Taguchi methods, quality control circles, relationship between quality and productivity, quality and costs, technology change and quality, operations strategy and quality, quality and international competition. Emphasizes developing decision-making skills through the use of case analysis, field study, consultations with local organizations, and other experimental activities. Prereq., OPMG 3000. Same as OPMG 5440.

OPMG 4470-3. Policy Analysis and Operations Strategy. Studies production and operations management strategy, policy formulation, and analysis in both domestic and international environments. Emphasizes developing decision-making skills through the use of case analysis, field study, consultations with local organizations, and other experiential activities. Prereq. OPMG 3000 and at least one of the following: OPMG 4400, OPMG 4440, OPMG 4600, or instructor consent. Same as OPMG 5470.

OPMG 4600-3. Purchasing and Materials Management. Studies 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 alternarives, bid systems, and legal aspects. Prereq., OPMG 3000. Same as OPMG 5600.

OPMG 4810-3. Honors Seminar. Business decision-making with quantitative analysis. Explores several quantitative concepts, principles, and techniques to demonstrate their application to real-world management problems. Applications of mathematical programming, network analysis, stochastic processes, and decision theory will be drawn from the functional fields of marketing, finance, operations management, transportation and logistics, information systems, and organizational management. Open to seniors who have completed at least 30 semester hours of business courses with not less than a 3.30 grade point average. Requires instructor consent.

OPMG 4820-variable credit. Topics in Business. Experimental course offered irregularly for purpose of presenting new subject marter.

OPMG 4900-variable credit. Independent Study. Students must have prior consent of the dean and instructor under whose direction study is taken. Intended only for exceptionally well-qualified business seniors who desire to study advanced topics. Departmental form required.

OPMG 5020-3. Fundamentals of Business Statistics. Foundations for statistical reasoning and statistical applications in business. Topics include graduate-level treatment of descriptive statistics, probability, probability distributions, sampling theory and sampling distributions, statistical inference (estimation and hypothesis testing). Provides an introduction to regression analysis, analysis of variance, time series forecasting, decision analysis, index numbers, and nonparametric methods. Prereq., Open only to graduate degree students. Students must have an undergraduate-level knowledge of mathematics.

OPMG 5300-3. Business Forecasting. Same as OPMG 4300. Prereq., OPMG 5200 or equivalent.

OPMG 5400-3. Japanese Business and Operations Management. Same as OPMG 4400. Prereq., OPMG 6400 or instructor consent.

OPMG 5440-3. Quality, Productivity, and Competitiveness. Same as OPMG 4440. Prereq., OPMG 6400.

OPMG 5470-3. Policy Analysis and Operations Strategy. Prereq., OPMG 6400 and at least one of the following: OPMG 5400, OPMG 5440, OPMG 5600, or instructor consent. Same as OPMG 4470.

OPMG 5600-3. Purchasing and Materials Management. Prereq., OPMG 6400. Same as OPMG 4600.

OPMG 6010-3. Deterministic Models. Covers linear programming and its application, network analysis (including scheduling models), dynamic programming, integer programming, goal programming, quadratic programming, and nonlinear programming. Prereq., instructor consent.

OPMG 6020-3. Stochastic Models. Examines commonly used stochastic models and their areas of application. Emphasizes probability theory, decision analysis under uncertainty, Bernoulli processes, Markov chain models and Markovian decision processes, Poisson processes and queuing theory, simulation, and inventory theory. Prereq., OPMG 5020.

OPMG 6400-3. Logistics, Production, and Inventory Management. Explores international and domestic aspects of production and operations management. Covers traditional topics such as quality control and management, product design and process selection, capacity and aggregate planning, scheduling, project planning and control, inventory planning and management, materials requirements planning, Just-in-Time production systems, demand forecasting, and the quantitative techniques needed for operations decision-making. International topics include the international operations environment, exporting vs. manufacturing overseas, starting international operations, transfer of technology, offshore production, export processing zones, international productivity and competitiveness, operations strategies, cultural differences, international location decisions, overseas research, and procurement and logistics. Prereq., OPMG 5020.

OPMG 6820-variable credit. Graduate Seminar. Experimental seminar offered irregularly to provide opportunity for investigating new frontiers in operations management. Prereq., instructor consent.

OPMG 6900-variable credit. Independent Study. Students must have consent of instructor under whose direction study is taken. Intended only for exceptionally well-qualified business graduate students who desire to study advanced topics. 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 investigating new frontiers in operations management.

OPMG 8900-variable credit. Independent Study. Students must have consent of instructor under whose direction study is taken. Departmental form required.

OPMG 8990 (1-10). Doctoral Thesis.

Organization Management

ORMG 3300-3. Introduction to Management and Organization. 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. Covers 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 with not less than a 3.30 grade point average and have instructor consent.

ORMG 4820-variable credit. Topics in Business. Experimental course offered irregularly to present new subject matter in organization management.

ORMG 4900-variable credit. Independent Study. Students must have 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. Applies 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 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. Discusses design of organization structure and its impact on organizational processes. Analyzes alternative organization patterns and factors affecting organization design. Prereq., ORMG 5040 or equivalent.

ORMG 6330-3. The Development of Groups and Organizations. Introductory study of the dynamics involved in managing and facilitating change in groups and organizations by application of behavioral science knowledge. Emphasizes both cognitive and experiential learning and requires a background in organization theory and administrative behavior. Prereq., ORMG 5040 or equivalent.

ORMG 6340-3. Consultation Skills. Seminar for doctoral and advanced master's students, oriented toward 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. Strong emphasis 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 investigating new frontiers in organization management.

ORMG 6900-variable credit. Independent Study. Students must have consent of instructor under whose direction study is taken. Departmental form required.

ORMG 6940-variable credit. Master's Candidate. Departmental form required.

ORMG 6950 (4-6). Master's Thesis.

ORMG 7310-3. Seminar on Organizational Behavior. Doctoral-level seminar covering such issues as leadership, job attitudes, motivation, absenteeism, turnover, goal-setting, and group dynamics. Prereq., instructor consent.

ORMG 7320-3. Seminar in Organization Theory. Critically investigates major issues in organization theory and provides students with experience in comprehensively surveying 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. Doctoral-level seminar emphasizing 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 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. Gives special attention to the development of thesis topics.

ORMG 8820-variable credit. Graduate Seminar. Experimental seminar offered irregularly to provide opportunity for investigating new frontiers in organization management.

ORMG 8900-variable credit. Independent Study. Student must have consent of instructor under whose direction study is taken. Departmental form required.

ORMG 8990 (1-10). Doctoral Thesis.

Personnel–Human Resource Management

PHRM 4400-3. Management of Human Resources. Introduces modern personnel management policies and practices. Provides 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. Same as PHRM 5400.

PHRM 4410-3. Labor and Employee Relations. Analyzes legal, political, social, and managerial aspects of collective bargaining and employee relations. Prereq., ORMG 3300 or 5040 or equivalent. Same as PHRM 5410.

PHRM 4420-3. Employment Staffing and Development. Examines issues relating to selection, placement, development, and retention of employees. Provides advanced treatment of strategies for conducting job analyses, planning staffing needs, evaluating recruitment sources, and using alternative selection techniques. Covers 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. Same as PHRM 5420.

PHRM 4430-3. Compensation and Benefits. Analyzes compensation systems and applied motivation theory. Covers job evaluation, wage surveys, performance appraisal, and motivational theories. Discusses 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. Same as PHRM 5430.

PHRM 4810-3. Honors Seminar. Discusses 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 with not less than a 3.30 grade point average and have received consent of instructor. Departmental form required.

PHRM 4820-variable credit. Topics in Business. Experimental course offered irregularly to present new subject matter in personnel–human resource management.

PHRM 4900-variable credit. Independent Study. Students must have 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 5400-3. Management of Human Resources. Same as PHRM 4400.

PHRM 5410-3. Labor and Employee Relations. Same as PHRM 4410.

PHRM 5420-3. Employment Staffing and Development. Same as PHRM 4420.

PHRM 5430-3. Compensation and Benefits. Same as PHRM 4430.

PHRM 6400-3. Seminar: Personnel Administration. Covers issues in all areas of personnel administration. Emphasizes research findings on human resources applications through applied models, survey methods, and other applied behavioral concepts.

PHRM 6410-3. Seminar: Labor and Employee Relations. Covers issues in all areas of industrial, labor, and employee relations. Emphasizes 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 investigating new frontiers in personnel–human resource management.

PHRM 6900-variable credit. Independent Study. Students must have consent of instructor under whose direction study is taken. Departmental form required.

PHRM 7400-3. Seminar in Personnel Human Resource Management. Intensive research-based survey of contemporary issues in personnel–human resource management. Students survey literature and conduct research in personnel–human resource subject areas such as performance appraisal, pay strategy, human resource strategy, union impact on compensation, labor relations and human capital. Instructor consent required.

Real Estate

REAL 3000-3. Principles of Real Estate Practice. Covers principles of real estate law, finance, brokerage, appraising, and investments, plus current activities in these fields. Prereq., junior standing.

REAL 4010-3. Real Estate Development. Studies methods of analyzing real estate opportunities. Includes urban economic, market, and location analyses. Studies local government controls and leasing from the developer's viewpoint. Prereq., REAL 3000. Same as REAL 5010.

REAL 4300-3. Residential and Income Property Appraising. Studies principles and techniques of estimating value of residences, investment, and income property. Prereqs., REAL 3000 and FNCE 3050. Same as REAL 5300.

REAL 4330-3. 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 forms of ownership. Prereqs., REAL 3000 and FNCE 3050. Same as REAL 5330.

REAL 4540-3. Real Estate Finance. Discusses 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. Same as REAL 5540.

REAL 4730-3. Legal Aspects of Real Estate Transactions. Topics include estates in land, purchase and sales contracts, conveyances, mortgage and trust deed transactions, property taxes, and leases. Prereqs., BSLW 3000 and REAL 3000. Same as REAL 5730.

REAL 4820-variable credit. Topics in Business. Experimental course offered irregularly to present new subject matter in real estate.

REAL 4900-variable credit. Independent Study. Students must have 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 5010-3. Real Estate Development. Same as REAL 4010. Restricted to MBA students.

REAL 5300-3. Residential and Income Property Appraising. Prereq., may be limited to students who have completed FNCE 5050. Same as REAL 4300. Restricted to MBA students.

REAL 5330-3. Real Estate Investments. Prereq., FNCE 5050 or equivalent. Same as REAL 4330.

REAL 5540-3. Real Estate Finance. Prereq., may be limited to students who have completed FNCE 5050 or equivalent. Same as REAL 4540. Restricted to MBA students.

REAL 5730-3. Legal Aspects of Real Estate Transactions. Prereq., may be limited to students who have completed BSLW 5060 and REAL 3000. Same as REAL 4730. Restricted to MBA students.

REAL 6820-variable credit. Graduate Seminar. Experimental seminar offered irregularly to provide opportunity for investigating new frontiers in real estate.

REAL 6900-variable credit. Independent Study. Students must have consent of instructor under whose direction study is taken. Departmental form required.

Tourism Management

TOMG 3400-3. Principles of Tourism. Introduces the basic concepts, tools, and techniques of tourism management. Also introduces the tourism industry, the effects of tourism on society, and curtent developments in the field. Prereq., junior standing.

TOMG 3410-3. Conventions and Meetings Management. Examines basic principles of marketing management in the conventions and meeting sector of the tourism industry. Focuses on group tourism programming and management. Prereq., TOMG 3400 or instructor consent.

TOMG 3440-3. Resort and Hospitality Operations. Examines the evolution of the resort industry, elements of resort management, marketing, and finance. Includes front and heart of the house management, recreational real estate management, and the environmental issues of resort development. Prereq., TOMG 3400 or instructor consent.

TOMG 4020-3. Tourism Impacts, Planning, and Policy. Examines the economic, social, and environmental impacts of tourism development and the planning and policy implications of those impacts. Special consideration given to the impact of tourism and tourism development in rural communities and environments. Prereq., TOMG 3400 or instructor consent.

TOMG 4030-3. Tourism Marketing. Concepts, tools, and techniques of services marketing with specific application to tourism attractions and facilities. Emphasizes product development, channels of distribution, promotion, and pricing techniques. Prereq., TOMG 3400 or instructor consent.

TOMG 4040-3. Special Topics in Tourism Management. Focuses on contemporary topics and concerns of the tourism industry. Emphasizes the development opportunities and constraints of the industry.

TOMG 4070-3. Tourism Management. Advanced concepts and techniques for developing and managing tourism attractions and hospitality resources. Case approach used for detailed consideration of the process of developing and implementing management strategies. Prereq., TOMG 3400 and 3 additional hours of tourism management course work.

TOMG 4930-6. Internship. A ten-week placement with a tourism business. Exposes students to a broad scope of activities with particular attention to the creation, delivery, and management of service opportunities. Prereq., TOMG 3400 and 3 additional hours of tourism management course work.

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 and Administration Office of Undergraduate Studies.

TRMG 4500-3. 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. Same as TRMG 5500.

TRMG 4510-3. Survey of Transportation Law and Freight Claims Procedures. Analyzes the legal aspects of 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. Same as TRMG 5510.

TRMG 4520-3. Problems in Surface Transportation Management. Analyzes 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 used to develop decision-making skills. Prereq., TRMG 4500, 5500, or instructor consent. Same as TRMG 5520.

TRMG 4560-3. Air Transportation. Covers 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. Same as TRMG 5560.

TRMG 4570-3. Urban Transportation. Analyzes the two aspects of urban transportation—freight and people. Covers issues in policy, modes, governmental actions and structure, investment and costs, and effect upon urban environment. Prereq., TRMG 4500, 5500, or instructor consent. Same as TRMG 5570.

TRMG 4580-3. International Transportation. Analyzes international transportation (primarily sea and air) in the world economy. Detailed study of cargo documentation and freight rate patterns. Includes liability patterns, logistics, economics, and national policies of transportation. Prereq., TRMG 4500, 5500, or instructor consent. Same as TRMG 5580.

TRMG 4820-variable credit. Topics in Business. Experimental course offered irregularly to present new subject matter in transportation.

TRMG 4900-variable credit. Independent Study. Students must have 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 5500-3. Transportation Operation and Management. Same as TRMG 4500.

TRMG 5510-3. Survey of Transportation Law and Freight Claims Procedures. Same as TRMG 4510.

TRMG 5520-3. Problems in Surface Transportation Management. Same as TRMG 4520.

TRMG 5560-3. Air Transportation. Same as TRMG 4560.

TRMG 5570-3. Urban Transportation. Same as TRMG 4570.

TRMG 5580-3. International Transportation. Same as TRMG 4580.

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 investigating new frontiers in transportation. Prereq. varies.

TRMG 6900-variable credit. Independent Study. Students must have consent of instructor under whose direction study is taken. Departmental form required.

M.B.A. Courses

The following courses are open only to M.B.A. students entering the program begun in 1992-93.

M.B.A. Core Courses

MBAC 6010-3. Managerial Economics. Studies the elements of the business firm's fundamental problem—how to maximize profits. Develops for each element managerial theory based upon introductory and intermediate-level microeconomics. Analyzes various business applications and misapplications of the relevant concept, primarily through case studies. Differential calculus, statistics, and spreadsheets are used throughout the course.

MBAC 6020-3. Financial Accounting. Introduces the financial reporting system used by business organizations to convey information about their economic affairs. Develops an understanding of the financial reports and what they tell about a business enterprise. Focuses on how alternative accounting measurement rules represent different economic events in financial reports.

MBAC 6030-3. Quantitative Methods 1. Covers foundations for statistical reasoning and statistical applications in business. Topics include graduate-level treatment of descriptive statistics, probability, probability distributions, sampling theory and sampling distributions, and statistical inference (estimation and hypothesis testing). Provides an introduction to regression analysis, analysis of variance, time series forecasting, decision analysis, index numbers, and nonparametric methods.

MBAC 6040-3. Managing Behavior in Organizations. Develops an awareness of the impact of organizational design, management systems, and interpersonal behavior on effective organizational functioning. Develops understanding of the impact of behavioral concepts and practices their application through discussion, experiential learning, and working with organizations.

MBAC 6050-1. Management Communications. Develops communication competence and confidence by focusing on speaking, writing, interpersonal communication, and leadership in a variety of one-to-one, small group, and one-to-many business contexts. Students learn to analyze communication situations; to formulate ethical, effective strategies geared to the communication demands of those situations; to create and deliver clear, concise, and credible messages well-suited to business audiences; and to critique communication in ways that promote ongoing improvement. Frequent opportunities for assessment, application and feedback, coupled with knowledge of communication theory and strategies.

MBAC 6060-3. Corporate Finance. Analyzes the implications of modern finance theory for the major decisions faced by corporate financial managers. Develops the basic skills necessary to apply financial concepts to the various problems faced by a firm. Includes capital budgeting, capital structure, long-term financing, short-term financial management, and financial planning topics.

MBAC 6070-3. Management Accounting. Develops the essential elements of management accounting and control systems, and links these to the strategic planning function of the firm.

MBAC 6080-3. Quantitative Methods 2. Considers the application of the scientific method to an area basic to all managers and administrators—decision-making. Explores several quantitative principles and demonstrates their application through real-world management problems. Applications are drawn from the fields of marketing, finance, operations management, transportation, information systems, and organizational management.

MBAC 6090-3. Marketing Management. Provides a solid foundation of marketing knowledge by focusing on principles of marketing. Introduces the role that marketing cases play in advancing understanding and skill development in the field of marketing. Case discussions illustrate concepts discussed, and case studies are used to introduce the marketing decision-making process. Empha-sizes the international nature of marketing, as well as the importance of analysis and the understanding of the economic, demographic, political-legal-regulatory, sociocultural, technological, and natural environments in any particular country. Stresses international applicability of fundamental marketing concepts along with the need to understand environmental adaptation.

MBAC 6100-3. Information Systems for Management. Focuses on the relationship between the information systems organization and the functional organizations in the firm. Presents basic knowledge about information systems in business and industry. Emphasizes topics of importance to business managers, and considers the role of information and communications in modern business enterprises. Introduces contemporary hardware, software, and telecommunication technologies, and stresses the importance of technology trends. Covers acquisition use and management of business applications, personal and office systems, and information resource management through readings, lectures, and several case discussions.

MBAC 6110-3. Public Policies toward Business. Provides understanding of the various roles of business and government in aiding societies attain their goals. Examines various roles and functions of government, businesses, and the markets. Case issues are integrated into substantive law areas involving ethical dilemmas that managers are likely to face.

MBAC 6120-3. Operations Management. Explores international and domestic aspects of production and operations management. Covers traditional topics such as quality control and management, product design and process selection, capacity and aggregate planning, scheduling, project planning and control, inventory planning and management, materials requirements planning, Just-in-Time production systems, demand forecasting, and the quantitative techniques needed for operations decision making. International topics include the international operations environment, exporting vs. manufacturing overseas, starting international operations, transfer of technology, off-shore production, export processing zones, international productivity and competitiveness, operations strategies, cultural differences, international location decisions, overseas research, and procurement and logistics.

MBAC 6130-3. Business Policy. Develops individual problem-solving approaches to real-world business problems in strategic management. Applies methods and concepts from this and previous classes to real problems, and presents the best ideas and techniques in strategic management.

M.B.A.–Finance

MBAF 6200-3. Advanced Corporate Finance. Covers at a more advanced level capital budgeting techniques employed in the option pricing model, financial engineering, hedging strategies, and pension fund management. Emphasizes theoretical concepts and their practical applications.

MBAF 6300-3. Applied Financial Management. Emphasizes analysis of financial condition, planning and control of current assets and current liabilities, and long-term financial arrangements. Topics include management of working capital, short- and long-term financing, capital budgeting, valuation, and capital structure policies.

MBAF 6330-3. Investment Management and Analysis. Focuses on management of investment portfolios. Process is documented by blending academic theories and evidence with practitioner experience. Topics include risk and return relationships, types of securities, securities markets, value theory (capital asset pricing, arbitrage pricing, and option pricing), portfolio construction, performance evaluation theory and techniques, and international portfolio management.

MBAF 6550-3. Financial Markets and Institutions. Focuses on the analysis of domestic and international markets. Considerable emphasis is placed on developing and understanding various factors that influence the cost and availability of capital for financing business enterprise.

MBAF 6600-3. Special Topics in Finance. Emphasizes current state-of-the-art developments in the area of financial management. Topics include capital budgeting, capital structure, theory, financial signaling, valuation, dividend policy, mergers, restructuring, financial distress, and corporate control.

M.B.A.–Marketing

MBAM 6050-3. Marketing Research. Develops skills in designing, executing, and evaluating research on applied problems and opportunities in marketing. Topics include research problem formulation, selection of research designs, search for and analysis of secondary data, measurement theory, design of data collection forms, sampling procedures, management of data collection activities, data analysis, and reporting of research results.

MBAM 6150-3. Marketing Field Project. Develops skills in marketing decision making. Teams design and complete a project located at a client business or other organization in the metropolitan area. Team members organize and assign responsibilities, interact with middle- and top-level managers, apply quantitative and behavioral tools presented in marketing and other courses, meet deadlines, and present results of project activities.

MBAM 6200-3. International Marketing Management. Addresses three fundamental decisions confronting a company whose operations extend beyond the home market—choosing which international markets to enter, determining the mode of market entry, and devising the international marketing plan. Topics include global marketing planning; environmental and cultural influences on international marketing decisions; organizational and control issues in international marketing decisions; and ethics, technology, and communication issues.

MBAM 6300-3. Strategic Marketing Management. Develops decision-making skills with topics including concepts of marketing strategy; analysis of strategic marketing opportunities; dominant themes in strategic marketing planning; and the design, implementation, and control of strategic marketing plans. Analyses focus on segmentation procedures, competitive analyses, portfolio lectures, cases analyses, and a computer-based simulation of strategic marketing management.

MBAM 6600-3. Special Topics in Marketing Management. Provides students with exposure to diverse subject matter in marketing management.

M.B.A.–Organization Management

MBAO 6200-3. Developing Leadership Skills. Improves human and social abilities through knowledge of personal and interpersonal behavior. Develops skills in dealing effectively with people in organizations.

MBAO 6320-3. Designing and Managing Organizational Systems. Analyzes the effectiveness of organizations under different conditions, such as growth and decline. Examines alternative ways to organize firms, including high technology and multinational corporations, and explores the strengths and weaknesses of each structure. Focuses on how firms effectively manage innovation, creativity, and technological change. Explores from both a theoretical and applied perspective corporate philosophy and culture, ethical issues, power and influence, and behavioral and organizational decision making within organizations.

MBAO 6400-3. Management of Human Resources. Explores effective management of a firm's resources, human as well as financial and capital. Provides a review of concepts and techniques that can help any manager recruit, develop, compensate, and retain the best employees. Covers conceptual issues and technical procedures as well as skills from the perspective of the general manager.

MBAO 6450-3. Management of Organizational Change. Explores ways to change organizations, whether a start-up company or an established institution, and to meet the demands of ever-changing environments. Teaches a better understanding of the challenge of change through analysis of the theory, research, and practice of organization development.

MBAO 6600-3. Special Topics in Organization Management. Provides students with exposure to diverse subject matter in organization management.

M.B.A.–Technology nd Innovation Management

MBAT 6100-3. Management of Technology and Innovation. Examines a variety of specific problems common to management technology, with the intent of developing both an understanding of the underlying issues as well as ideas for better management practices. Explores several specific topics such as corporate research and development management, technology transfer, technology based strategies, project management, career management of technology professionals, and rewarding and encouraging innovation.

MBAT 6200-3. Marketing of Technology and Innovation. Exposes students to the uniqueness and vagaries of marketing issues in high technology industries. Covers two distinct sections—high technology products sold to the consumer market, and high technology products in the business-to-business arena. Teams focus on the consumer and business-to-business arenas.

MBAT 6300-3. Management of Information Technology. Examines information technology from the perspective of managers at several levels—from the CEO to the first-line manager. Presents principles and knowledge, and provides frameworks that managers or aspiring managers can use to cope with the challenges of rapidly advancing technology. Considers strategic and operational issues, covers fundamental technology trends, and deals with management systems and organizational issues inherent in technology introduction and use.

MBAT 6400-3. Modern Manufacturing Systems. Compares the Japanese system of production and operations management in the manufacturing and service sectors with that of the U.S. (and to a lesser extent, Europe and Asia). Contrasts Japanese and Western approaches to business, quality management, labor practices, international competitiveness, productivity, trade practices and strategies for penetrating foreign markets, and the techniques and methods commonly used to support manufacturing and service activities. Examines the Japanese formula for success and the potential for transferring Japanese industrial management practices and manufacturing techniques to other countries.

MBAT 6600-3. Special Topics in Technology and Innovation Management. Provides students with exposure to diverse subject matter in technology and innovation management.

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FRANK SELTO, Professor of Accounting. B.S.M.E., Gonzaga University; M.S.M.E., University of Utah; M.B.A., Ph.D., University of Washington.

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ROBERT S. WASLEY, Professor of Accounting Emeritus.

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WILLIAM D. WILSTED, Professor of Business Administration. B.S., Brigham Young University; M.B.A., D.B.A., Indiana University.

DARYL WINN, Associate Professor of Business Economics. B.S., Arizona State University; M.B.A., Ph.D., University of Michigan.

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School of Education

Philip P. DiStefano, Dean

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 that develops new knowledge and understanding of the educational process.

Accreditation

The certification programs, both undergraduate and graduate, are fully accredited by the North Central Association of Colleges and Schools, by the National Council for Accreditation of Teacher Education, and by the Colorado Department of Education.

Student Organizations

The Student Advisory Board in Education represents undergraduate students seeking certification. 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 Education Graduate Student Action Committee 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.

ACADEMIC EXCELLENCE

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 Lillian Gutierrez Scholarship Fund. Awarded each year to an outstanding minority teacher certification student.

The Judy Crites Herron Scholarship Fund. Awarded each year to an outstanding minority student in secondary education.

The Elizabeth Anne Wilson Memorial Assistantship. Awarded each year to an outstanding graduate student whose emphasis area is 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 following summer or academic year.

ACADEMIC STANDARDS

Any student registered in the teacher certification program who fails to maintain a 2.75 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.

CERTIFICATION REQUIREMENTS

The School of Education awards the diploma in education to students who simultaneously complete their bachelor's degree and a certification program at the University of Colorado. The certificate in education is awarded to students who complete a certification program.

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 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 (Colorado Type A) in:

- Elementary education
- Secondary education
  - Drama
  - English
  - Foreign language (French, German, Italian, Japanese, Latin, Russian, Spanish)
  - Mathematics
  - Sciences
  - Social studies
- Elementary/Secondary (K-12)
  - Art
  - Music

Teacher certification at the University of Colorado, while administered by the School of Education, is a University-wide function. Many academic departments provide course work that supports 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.

Students simultaneously completing teacher certification and an undergraduate degree at CU-Boulder must complete 30 to 45 hours of education courses (including student teaching) in addition to their major course work. Generally, four and one half years are typical for completion of both a B.A. degree and certification requirements. No professional education course work taken more than 10 years ago may count for teacher certification requirements.

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 future outstanding teachers 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.

Admission

Students should be aware that enrollment limits for the program have been established; therefore, there may be times when students who meet minimum requirements will not be admitted to the certification program. Students seeking certification (both at the elementary and secondary levels) will be required to pass screening examinations in prescribed areas.

Students Entering or Currently Enrolled at the University of Colorado

Undergraduate students seeking certification in the School of Education must be enrolled in a degree program in one of the colleges or schools of the University. Freshmen interested in teaching should seek certification advising at the time they enter the University and each semester thereafter. Students should pick up advising materials in Education 151 and make an appointment with one of the faculty advisors listed in the materials.

Transfer Students

Students who seek to transfer to the University of Colorado from another accredited institution must apply for admission through the Office of Admissions. They must enroll in a degree program in one of the colleges or schools of the University and also apply for admission to the teacher certification program 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 who have not completed an undergraduate degree may reenter the University according to general University policies; however, they must apply separately for entry into the teacher certification program. Students previously admitted to an education program must reapply for acceptance in the present certification program. Students are required to complete the program 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.

Requirements for Application

At the time of publication, new requirements for teacher certification were being established. The official requirements and application forms may be obtained in Education 151.

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 2.75 overall, in the teaching field, at CU-Boulder, and in the most recent 30 semester hours.

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. Postbaccalaureate students and currently enrolled students in schools or colleges other than arts and sciences are required to have 40 semester hours in the humanities, the natural sciences, and the social sciences, with no less than 6 hours in each.

5. Students who hold degrees should apply to the teacher certification program by March 1 for fall or summer admission and October 1 for spring admission.

Formal admission to a certification program may be granted when the student has been admitted to the University by the Office of Admissions, has passed all parts of the basic skills tests and the oral competency requirement (see below), provided verification of experience with youth, has sent all transcripts and application forms to the teacher certification office, and has received a recommendation from one of the program's faculty advisors. There may also be a processing fee required for formal admission. Students are notified in writing of formal admission once this process is completed.

Once an undergraduate student enrolled in a teacher certification program graduates, the student will have to reapply to the University for admission as a postbaccalaureate student to continue in the certification program.

Prerequisites to the Certification Program

Basic Skills Tests. All students must pass the California Achievement Tests (CAT) in spelling, English, and mathematics as mandated by the Colorado Department of Education. 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.

1. 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.

2. Students must pass the tests before they are permitted to go to any public school to complete requirements for the teacher education courses.

3. Students should sign up for the tests in person (in Education 151) at least two weeks before the testing date, or until registration limits are reached.

Oral Competency Requirement. 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 formal admission to the program. Alternate courses are listed in the advising manual.

Application for Admission

Individuals interested in completing a certification program at the University of Colorado at Boulder should request application materials from the teacher certification office, Education 151. Students currently enrolled in a degree program at Boulder will need to complete an application and submit official transcripts from all previous colleges.

Individuals who have completed a baccalaureate degree at an accredited institution and are not currently enrolled at the University will have to complete a program application, apply for admission to the University, and submit official ttanscripts from all previous colleges directly to the School of Education. Applications cannot be processed until all materials are received in the teacher certification office, and applicants may not be admitted if enrollment levels have been reached before the processing of their application.

Advising

Students are responsible for obtaining an advising manual in Education 151 and becoming familiar with its contents. Specific information for all certification areas as well as a list of advisors is included in the manual.

Off-campus students may obtain a manual by writing to the Teacher Certification Office, Campus Box 249, University of Colorado at Boulder, Boulder, CO 80309-0249. Appropriate information can be sent only when a specific teaching field is indicated.

At CU-Boulder, degree requirements vary among the schools and colleges. Students seeking a degree 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.

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, Japanese, Latin, Russian, Spanish, art, or music must see the designated advisor in their major department.

Group advising sessions, available once each semester for all students at all levels in the program, are the recommended mode for seeking advising. Newly admitted students are also expected to attend an education orientation at the beginning of the fall or spring semester.

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 students in the College of Arts and Sciences, 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 120 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. *Students interested in teaching at the secondary level 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 all programs are explained in the advising manual available in Education 151.

Certification in some secondary fields is not offered at the University of Colorado. For example, there are no programs in business education, home economics, physical education, or industrial arts. Students interested in a particular major should consult an advisor in the School of Education.

GRADUATE STUDY

Graduate study in education at the University of Colorado is administered through the Office of Graduate Study, School of Education, and all inquiries regarding programs should be directed to the following address:

Office of Graduate Study
School of Education
Campus Box 249
University of Colorado at Boulder
Boulder, CO 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, Education 153. The degrees available in the various areas of graduate study are listed below:

Instruction and Curriculum in the Content Areas
(mathematics education; science education; English education; social studies education; language arts; reading; secondary experiential education; and general curriculum in elementary and secondary education)
Master of Arts
Doctor of Philosophy

Educational-Psychological Studies
(educational psychology)
Master of Arts
Doctor of Philosophy

Research and Evaluation Methodology
(methods of educational research and evaluation, including statistics, measurement, and qualitative methods)
Doctor of Philosophy

Social and Multicultural Bilingual Foundations
(education and cultural diversity; foundations; policy and practice; international/comparative education; philosophical foundations and social policy; English as a second language; bilingual and multicultural education; and bilingual/special education)
Master of Arts
Doctor of Philosophy

Certification at the Graduate Level

Through the School of Education, the University of Colorado at Boulder offers course work leading to certification in the following areas:

Reading teacher
Special education
Special services
Audiologist
Speech/language pathologist
Linguistically different
Type B certification: elementary or secondary education
Art, bilingual/ESL, drama, English, foreign languages, mathematics, music, physical education, science, social studies, and speech

Special programs leading to Type A endorsement in elementary education and secondary English, science, and social studies are available through the master of arts programs in instruction and curriculum in the content area.

These graduate certification programs are approved by all the accrediting groups.

Admission

Prospective students seeking admission to a graduate degree program should request application forms from the Education Graduate Office, Campus Box 249. The completed forms should be returned to that office. Prospective graduate students should also read the Graduate School portion of this catalog for additional admission information. 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.

Admission to all programs and degrees in the School of Education is selective. Meeting minimal admission requirements does not guarantee admission.

Application papers and all supporting documents, including GRE test scores, must be in the School of Education Graduate Office by April 1 for spring semester and February 1 for summer session and fall semester.

Advising

Graduate students are assigned an individual advisor and are required to submit a formal program of study, approved by their advisor, before the end of the first full term of study. Graduate students may obtain program information from the School of Education Graduate Office, Education 153, or from their advisor.

General Information

Maximum Load and Part-Time Study

A maximum of 15 hours in any one semester may be applied toward degree requirements. During the summer, 9 semester hours may be taken in the 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 when calculating grade averages.

A mark of *C* may not be credited toward the 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 in 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 terms, 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 at another institution or as a nondegree student at CU-Boulder.

Most program areas have outlined a recommended or required program of study, 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 study in education are available from faculty or the School of Education Graduate Office.

In the final term of study (at least 10 weeks prior to graduation) each student must submit a form titled "application for admission to candidacy for an advanced degree." These forms are available in the education graduate office. If a minor is included, the form must first be signed by a representative of the student's minor department or program area. The form 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, prospective Ph.D. students should see 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.

Effective for all Ph.D. students admitted for the summer of 1992 and thereafter, the school requires at least two semesters of full-time study in residence (one semester must be during the first two years of doctoral study). The School of Education expects that students will not hold a full-time job during their two semesters of residence.

In addition to course work requirements, doctoral students should be immersed in ongoing research with the faculty as early in their program as possible. Beginning in the 1992-93 academic year, all doctoral students in the school will be required to complete, at a minimum, one publishable scholarly project prior to taking comprehensive examinations; other research endeavors prior to the dissertation are desirable. Each of the program committees has established a structure for implementing this requirement. For example, some programs expect students to work individually with their advisors; others make the research project an extra course requirement attached to a professional seminar.

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 or a master's degree in education, and an undergraduate grade point average of 2.75 or above on a 4.00 scale. A GPA of 3.00 or above is expected on all graduate work completed. Ph.D. applicants are not required in all cases 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 completed 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 doctoral students have not had such courses, advisors may require one or more of these courses *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 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 area, and students are expected to follow that program unless they have arranged appropriate substitutions in advance with their advisor. Pamphlets outlining the recommended programs of study 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 program.

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 advisor approves, they take 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 dissertation for 30 semester hours of credit is required of each student. A student registers for EDUC 8994 (Ph.D. Doctoral Dissertation) 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 satisfactory completion of the comprehensive examination, the student must continuously register for 3, 7, or 10 hours during fall and spring semesters until the final defense. Registration for 3 hours requires permission of the associate dean of the Graduate School at least two months in advance. The student must be registered for 7 or 10 hours during the semester the defense is completed.

During the research for and the writing of a dissertation (thesis), a grade of *IP* (in progress) is reported; if the dissertation is completed and accepted as satisfactory, a grade is reported for the student's record. When the student and the chair of the advisory committee agree on a subject for the dissertation, the student prepares a detailed prospectus and arranges for a meeting with the committee. (As a rule the advisory committee constitutes the dissertation 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 is attained, and pay the standard fee as announced by the Graduate School.

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 administered by the Dean of the School of Education on the recommendations of faculty and the 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.

COURSE DESCRIPTIONS

The following courses are offered in the School of Education 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 current information on times, days, and instructors of courses, 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.

Courses are organized by subject matter and are listed numerically *by last digit* (courses ending in the number "0" are listed before courses ending in "1," and so on). The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:

Prereq.—Prerequisite
Coreq.—Corequisite
Lab—Laboratory
Rec.—Recitation
Lect.—Lecture

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 4410-3. Theory and Practice of Experiential Education. Introduces the theoretical underpinnings in philosophy, psychology, and the natural and social sciences of the experiential and alternative education movements. Observes and analyzes practical applications in schools and public and private agencies.

EDUC 4570-3. Microcomputers in Education. Introductory course to programming basic language and use of software.

EDUC 4800 (1-3). Special Topics. Designed to meet needs of students with topics of pertinent interest.

EDUC 4820 (1-6). Workshop in Curricular and Instructional Development. Considers current trends in curriculum development and in organization for instruction. In-depth study of one or more specific plans for classroom procedure.

EDUC 4830 (1-3). Instructional Workshop. Considers current instructional approaches. Focuses on classroom applications with in-depth study of selected topics. Advanced-level work, but credited toward graduate degrees only as a minor.

EDUC 4840 (1-4). Independent Study.

Elementary Certification

EDUC 3091-2. Social Foundations of Education. Studies American education in its cultural setting and its nature, tole, 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. Coreq., EDUC 4501. Open only to formally admitted elementary education students.

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.

EDUC 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. Coreqs., EDUC 4191 and 4221.

EDUC 4181-2. 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 elementary school level. Includes teaching basic reading programs, language experience, individualized reading, content reading, study skills, diagnosis, and remediation. Coreqs., EDUC 4161 and 4221.

EDUC 4201-2. Methods in Elementary Mathematics. Preparation in the teaching and content of mathematics at elementary school level.

EDUC 4211-2. Methods in Elementary Science. Covers methods and materials available for teaching science in the elementary school.

EDUC 4221-2. 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. Coreqs., EDUC 4161 and 4191.

EDUC 4501-1. Media/Computers/University Aide Workshop. Workshop in media and computers, including 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. Coreq., EDUC 3101.

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. Coreqs., EDUC 4601 and 4691.

EDUC 4601-2. Instructional Assistant Laboratory—Elementary. A variety of experiences and assignments in public schools. Coreqs., EDUC 4511 and 4691.

EDUC 4691-14. Student Teaching—Elementary School 1. Kindergarten and grades one through six. Coreqs., EDUC 4511 and 4601.

EDUC 4701-8. Student Teaching—Elementary School 2. Kindergarten and grades one through six in art and music. Should be taken concurrently with student teaching in home department.

Secondary Certification

EDUC 4102-3. Foundations of American Education. 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 students in secondary education.

EDUC 4112-3. Educational Psychology and Adolescent Development. Analyzes fundamental psychological concepts underlying classroom instruction, as well as adolescent growth and development.

EDUC 4122-2. Principles and Methods of Secondary Education. Emphasizes objectives, functions, modern philosophy, curriculum, discipline, planning, learning styles, and educational media. For junior and senior high school levels. Concurrent experience in schools required. Coreq., EDUC 4912.

EDUC 4232-3. Teaching Reading in the Content Areas. Methods and materials for content area reading, including vocabulary, comprehension, and study skills strategies.

EDUC 4322-3. Literature for Adolescents. Reading and evaluation of books for junior and senior high school pupils. Emphasizes modern literature.

EDUC 4342-3. Composition for Teachers. Strategies for evaluating and teaching written composition in the secondary schools. Emphasizes structure of prose, invention, motivation, audience, and other rhetorical considerations, as well as teaching methodologies.

EDUC 4352-3. Methods and Materials in Social Studies. Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Secondary level.

EDUC 4362-3. Methods and Materials in English. Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Secondary level.

EDUC 4372-3. Methods and Materials in Mathematics. Curriculum, materials, methods, evaluation, and related subjects of instruction. Integration of content and methodology. Secondary level.

EDUC 4382-3. Methods and Materials in Science. Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Secondary level.

EDUC 4712-14. Student Teaching—Secondary School 1. Student teacher attends a junior or senior high school in the Boulder-Denver metropolitan area.

EDUC 4722-8. Student Teaching—Secondary School 2. Student teacher attends a junior or senior high school class in kinesiology, foreign language, art, or music in the Boulder-Denver metropolitan area. Should be taken concurrently with student teaching in home department.

EDUC 4732 (8-14). Student Teaching—K-12. Required experience for art and music students seeking certification at both elementary and secondary levels.

EDUC 4912-1. Practicum in Teacher Education. Designed for students taking the graduate equivalent of EDUC 4122. Requires 100 hours of observation and in-school experience. Coreq., EDUC 4122. Also must be taken with EDUC 5105 or 6318 if student is seeking initial teacher certification.

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 oral competency requirement.

EDUC 4463-2. Teaching Exceptional Children in the Regular Classroom. Introduction to students who are handicapped in one or more of the traditional categories. Emphasizes working with these students in the least restrictive environment. Students observe model classrooms where handicapped students are being mainstreamed. Gives special emphasis to various modifications in curriculum and teaching approaches. Meets Colorado exceptional child certification requirements.

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 (1-4). Special Topics. Designed to meet needs of graduate students with topics of pertinent interest.

EDUC 6844 (1-4). Master's Independent Study.

EDUC 6944-3. Master's Degree Candidate.

EDUC 6954-4. Master's Thesis.

EDUC 8004-3. Doctoral Research Seminar. Gives beginning doctoral students an overview of the fields of educational research, with special attention to the research programs of education faculty. Programs include work based in psychology, sociology, anthropology, sociolinguistics, philosophy, and political science.

EDUC 8804 (1-3). Special Topics. Designed to meet needs of graduate students with topics of pertinent interest.

EDUC 8844 (1-4). Doctoral Independent Study.

EDUC 8984 (1-10). Ed.D. Doctoral Dissertation.

EDUC 8994 (1-10). Ph.D. Doctoral Dissertation.

Curriculum, Foundations, and Instruction

EDUC 5005-3. Social Foundations of Education. Evaluation of social values and forces in American society that shape or influence aims, philosophies, methods, content, issues, and problems of the American educational enterprise.

EDUC 5015-3. International and Comparative Education. Comparative study of education in other countries, emphasizing 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. Study of the future: implications for global society, U.S. society, and education; dealing with several ways of imagining the future, value dimensions, schools and curricula of the future, and future studies and global studies as school subjects.

EDUC 5035-3. Proseminar: Parent and Community Involvement. Focuses on models and strategies for improving parent and community involvement in the schools. Discusses administrative concerns, such as parent advisory councils, and instructional concerns, such as helping children with school assignments. Prereq., EDUC 5425.

EDUC 5045-3. Research and Evaluation in Social and Multicultural Foundations. Designed to meet the evaluation and research needs of practicing educators, emphasizing 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 present day, emphasizing contemporary philosophies and trends.

EDUC 5105-3. Effective Instruction. 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. Children's Literature. Reading and evaluation of books, children's interests, authors and illustrators, folk literature, multicultural literature, modern fanciful tales, and trends.

EDUC 5175-3. Elementary Mathematics Curriculum. In-depth study of curriculum building in mathematics at the elementary school level (K-8). Particular attention given to selection of materials, establishment of content, and evaluation of programs.

EDUC 5185-3. Elementary Social Studies Theory and Methods. 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 Reading Theory and Methods. Understanding and acquisition of basic methods in the teaching of reading at the elementary level. Includes basic approach, literature approach, and individualized instruction.

EDUC 5205-3. Elementary Mathematics Theory and Methods. Deals with contemporary mathematical content and teaching techniques. Emphasizes mathematical background for the teacher and experimental projects.

EDUC 5215-3. Elementary Science Theory and Methods. Emphasizes experimental programs and their implementation. Supervision and curriculum development considered.

EDUC 5225-3. Elementary Language Arts Theory and Methods. 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 5235-3. 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. 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 5255-3. 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. Prereq., EDUC 5245.

EDUC 5265-3. Processes in Writing. Investigates processes writers use from early ages to maturity as they compose prose. Considers several process models; surveys current research; and proposes and evaluates research designs.

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; and case study approach.

EDUC 5325-3. Literature for Adolescents. Reading and evaluation of books for junior and senior high school pupils. Emphasizes modern literature.

EDUC 5345-3. Composition for Teachers. Strategies for evaluating and teaching written composition in the secondary schools. Emphasizes structure of prose, invention, motivation, audience, and other rhetorical considerations, as well as teaching methodologies.

EDUC 5355-3. Advanced Methods in Social Studies Education. Designed to meet the needs of experienced teachers and those who will teach in public schools. Examines recent developments in theory and materials in the social studies and analyzes current practices 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 5375-3. 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 5385-3. 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. Curriculum in Secondary Mathematics. Investigation of curriculum projects in secondary school mathematics; program development; history and trends, program and course objectives; and pertinent research.

EDUC 5405-3. Skill Development in Experiential Education. Field-based course designed to upgrade outdoor skills and 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 5415-3. Theory and Practice of Experiential Education. Introduction to the theoretical underpinnings in philosophy, psychology, and the natural and social sciences of the experiential and alternative education movements. Observes and analyzes practical applications in schools and public and private agencies.

EDUC 5425-3. Introduction to Bilingual/ Multicultural Education. Provides a comprehensive survey of bilingual-multicultural education programs for language minority students. Includes an overview of the history and legislation related to bilingual education. Presents vari-

ous models, philosophies, and theoretical underpinnings of bilingual education. Discusses strategies and important considerations for teaching the LEP-handicapped.

EDUC 5435-3. Materials and Methods in Bilingual/Multicultural Education. Provides an in-depth study of curriculum options available for the bilingual classroom. Presents, reviews, and critiques specific methods and strategies for teaching language minority students. Emphasizes methods for implementing cooperative learning strategies. Teaching units are developed and presented in Spanish or in ESL methodology, as appropriate. Prereq., EDUC 5425.

EDUC 5445-3. Curriculum for Multicultural Education. Analysis of curriculum programs and application of principles and innovation for education of ethnic-racial students at all school levels.

EDUC 5455-3. Literacy for Linguistically Different Learners. Current and emerging philosophies and methods on teaching reading to culturally diverse second-language learners. Includes review of materials, strategies for teaching reading and writing skills, and important considerations for transference from L1 to L2 reading. Prereq., EDUC 5425 or reading course at 5000 level.

EDUC 5465-3. Needs and Education of Exceptional Children. Discusses characteristics and needs of various types of handicapped and gifted students. Special attention given to procedures used for diagnosis and the suggested educational adjustments and care required by these students. Discusses successful teaching techniques and instructional approaches including individualization, least restrictive environment transition, and career education. Meets Colorado exceptional child certification requirements.

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. Introduction to students who are handicapped in one or more of the traditional categories. Emphasizes working with these students in the least restrictive environment. Students observe model classrooms where handicapped students are being mainstreamed. Special emphasis given to various modifications that can be made in curriculum and teaching approaches. Meets Colorado exceptional child certification requirement.

EDUC 5505-3. Education of Students with Learning and Behavior Disorders. Discusses unique learning needs of students who are mentally retarded, learning disabled, and behavior disordered. Particular emphasis given to development of a systems model for diagnosis, programming, and remediation. Stresses data-based individualization of instruction with emphasis on intervention in the least restrictive environment.

EDUC 5515-3. Curriculum and Methods for Moderately Handicapped 2. Emphasizes development of skills for teaching the moderately handicapped student. Includes designing of classrooms and curriculum. Reviews variety of behavior management and crisis intervention strategies, as well as the use of affective materials for socio-emotional behavior changes.

EDUC 5525-3. Research and Evaluation in Special Education. Practical experience in the review, critique, conceptualization, and writing of research studies in special education. Experience in design of evaluation systems for classroom practice.

EDUC 5535-3. Diagnostic Testing in Bilingual and Special Education. Includes both theoretical and applied aspects of diagnostic testing. Reviews administration and interpretation of current educational tests (intelligence, achievement, language proficiency, and adjustment scales). Emphasizes practices for equitable testing and assessment of special populations.

EDUC 5545-3. Curriculum and Methods for the Moderately Handicapped. Reviews the various educational curricula currently in use with moderately handicapped students. Emphasizes different teaching methods, instructional materials and learning strategies that have proven effective in working with students with cognitive learning needs.

EDUC 5555-4. Elementary Moderate Needs Practicum. Supervised field experience in special education with moderate needs handicapped students. Full time for eight weeks (300 clock hours). Prereqs., EDUC 5465, 5505, 5545, and 5515.

EDUC 5565-4. Secondary Moderate Needs Practicum. Supervised field experience in special education with cognitive needs handicapped students. Full time for eight weeks (300 clock hours). Prereqs., EDUC 5465, 5505, 5545, and 5515.

EDUC 5575 (1-4). Workshop in Instruction and Curriculum in Content Areas.

EDUC 5585 (1-4). Workshop in Social, Multicultural, and Bilingual Foundations.

EDUC 5605-3. Research Issues in Bilingual Education. Practical experience in the review, critique, conceptualization, and writing of the research studies in bilingual/ESL education. Provides experience in the design of classroom evaluation systems. Prereq., EDUC 5425.

EDUC 5615-3. Second Language Acquisition. Presents a broad survey of second-language acquisition research. While theoretical concerns and research findings are stressed, practical applications to teaching second languages are made. Special emphasis given to second-language acquisition.

EDUC 5625-3. Methods of Teaching English as a Second Language. Prepares teachers to teach English as a second language in American public schools. Covers both theoretical and applied aspects of language learning and teaching. EDUC 5615 is recommended as prerequisite.

EDUC 6325-3. Anthropology and Education. Applies anthropological perspectives to research in educational settings. Focuses on theories of culture, cultural transmission and acquisition, and cultural reproduction and production for understanding schooling and its outcomes.

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. Analysis of research in the foundations area.

EDUC 7015-3. Teaching Internship in Teacher Education. 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. Issues and Consultation in Bilingual Special Education. Covers fundamental issues of bilingual special education and describes effective consultation practices between the special education teacher and other educational personnel. Utilizes cooperative learning teams to develop program and curriculum models for identifying and instructing minority handicapped students.

EDUC 8855 (1-4). Independent Study in Instruction and Curriculum in Content Areas—Doctoral Level.

EDUC 8935 (1-6). Internship in Instruction and Curriculum in Content Areas.

Research, Evaluation, and Methodology

EDUC 5706-3. Development of Educational Measures. Covers 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. Introduces 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. Considers 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 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. Prereq., EDUC 5716.

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. Prereqs., EDUC 5726 and 7316.

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. Prereqs., EDUC 5726 and 7316.

EDUC 7346-3. Methods of Naturalistic Research. Explores the history of ethnography in cultural anthropology and its translation into educational research. Students learn about and practice participant observation, interviewing, journal writing, artifact searches, strategies for qualitative analysis and interpretation, and styles of ethnographic reporting. Prereq., EDUC 6325 or equivalent doctoral-level course in anthropological theory, sociological theory, or sociology of education.

EDUC 7356-3. Research Seminar for Doctoral Candidates. Development of the thesis prospectus, including problem development, hypothesis formulation, literature review, research design, statistical analysis, related measurement, and computer considerations. Prereq., EDUC 5706.

EDUC 7366-3. Experimental Design and Analysis 2. Intensive study of advanced experimental design and analysis. Topics 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. Prereq., EDUC 7326.

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. Prereqs., EDUC 5706 and 5716.

EDUC 7386-3. Educational Evaluation. Study of models and methods for 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. Multivariate Analysis. Introduction to the theory of advanced multivariate techniques and their application in educational research. Topics include 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, and 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—Doctoral Level.

EDUC 8936 (1-6). Internship in Research and Evaluation Methodology.

Educational Psychological Studies

EDUC 6318-3. Psychological Foundations of Education. Surveys results of psychological inquiry, emphasizing applications to educational practices. Major topics include motivation, behavior, learning, development, and individual differences.

EDUC 6328-3. Advanced Child Growth and Educational Development. Emphasizes developmental theories and their educational implications.

EDUC 6338-3. Cognitive Processes in Education. Reviews methods and results of experimental investigation of memory and cognition with implications for instruction and other educational practices. Prereq., EDUC 6318.

EDUC 6348-3. Instructional Psychology. Systematically surveys current theory in instructional design psychology, emphasizing analysis of classroom behavior. Prereq., EDUC 6318.

EDUC 6358-3. Children's Thinking. Covers the experimental psychology of thinking, emphasizing differences between children and adults in modes of thought. Topics include memory, concept acquisition, strategies, problem solving, and originality. Prereq., EDUC 6318.

EDUC 6378-3. The Student in Higher Education. Considers research and theory pertaining to the college student as a learner and the effects of environmental differences on changing student behavior.

EDUC 6388-3. Foundations of Personnel Services. Introduces 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, 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. Discusses theories of counseling and skills needed to facilitate interpersonal relationships. Interviewing techniques and other specific helping skills. Twenty hours of microcounseling in a laboratory required in addition to classroom instruction. Prereqs., EDUC 6388 and 6398.

EDUC 6418-3. Advanced Theory and Techniques of Counseling. Applies counseling techniques to group counseling. Emphasizes group dynamics and group process. Twenty hours of participation in an intensive group experience required in addition to classroom instruction. Prereqs., EDUC 6388, 6398, and 6408.

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 students and instructor. Prereqs., EDUC 6388, 6398, and 6408.

EDUC 6438-3. Counseling Strategies in Agency Settings. Explores role and function of the counselor in agency settings with emphasis on underlying historical and theoretical concepts. Explores use of DSM III.

EDUC 6448-3. Diagnosis and Treatment of Alcoholism. Covers 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. Emphasizes directed observational experience in various counseling and personnel service settings. Experiences help students familiarize themselves with counseling techniques used in these settings. Ten hours in field setting in addition to class sessions. Prereqs., EDUC 6388, 6398, and 6408.

EDUC 6478-3. Field Work in Agency Counseling. Provides 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. Prereqs., EDUC 6388, 6398, and 6408.

EDUC 6488-3. Field Work in College Student Personnel. Provides 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. Prereqs., EDUC 6388, 6398, and 6408.

EDUC 6528 (1-4). Workshop in Educational and Psychological Studies.

EDUC 6888 (1-4). Independent Study in Educational and Psychological Studies—Master's Level.

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, and interpretation and application of individual intelligence data in the school setting.

EDUC 8328-3. Psycho-Educational Diagnostics 2. Personal appraisal of the individual emphasizing 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. Reviews in-depth a limited number of currently active topics in cognitive psychology 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. Consultation in Schools. Covers consultation definitional issues. Defines participant roles, and explores process and outcome goals. The success of consultation depends on the use of Carkhuff interpersonal skills throughout the process.

EDUC 8428-3. Advanced Practicum in Counseling. Provides supervised counseling experience, report writing, and case staffing procedures emphasizing 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. 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. Advanced course for doctoral students preparing for teaching, consulting, and leadership roles in counseling and facilitating behavior change.

EDUC 8488-3. Seminar: Human Behavior. Explores the cognitive, affective, and psychomotor aspects of human behavior. Emphasizes both causation and consequences of various modes of human behavior.

EDUC 8498-6. Practicum in Secondary Guidance. 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 8538-3. Advanced Computer-Assisted Instruction. Focuses on design of interactive video, interactive slide-tape, micro- and mainframe authoring systems, and advanced CAI design techniques. Emphasizes applications in both educational and training settings.

EDUC 8548-3. Instructional Systems Design I. Systematic design of instruction in traditional settings using a variety of models. Covers 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. Provides opportunities for in-depth study in areas of individual interest.

EDUC 8888 (1-4). Independent Study in Educational and Psychological Studies—Doctoral Level.

EDUC 8938 (1-6). Internship in Educational and Psychological Studies.

Social, Multicultural, and Bilingual Foundations

EDUC 6899 (1-4). Independent Study in Social, Multicultural, and Bilingual Foundations—Master's Level. Instructor consent required.

EDUC 6919 (1-4). Practicum in Social, Multicultural, and Bilingual Foundations. Instructor consent required.

EDUC 6929 (1-4). Readings in Social, Multicultural, and Bilingual Foundations. Instructor consent required.

EDUC 8899 (1-4). Independent Study in Social, Multicultural, and Bilingual Foundations—Doctoral Level. Instructor consent required.

EDUC 8939 (1-6). Internship in Social, Multicultural, and Bilingual Foundations. Instructor consent required.

FACULTY

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STEPHEN ROMINE, Professor Emeritus.

JAMES S. ROSE, Professor Emeritus.

DARYL L. SANDER, Professor Emeritus.

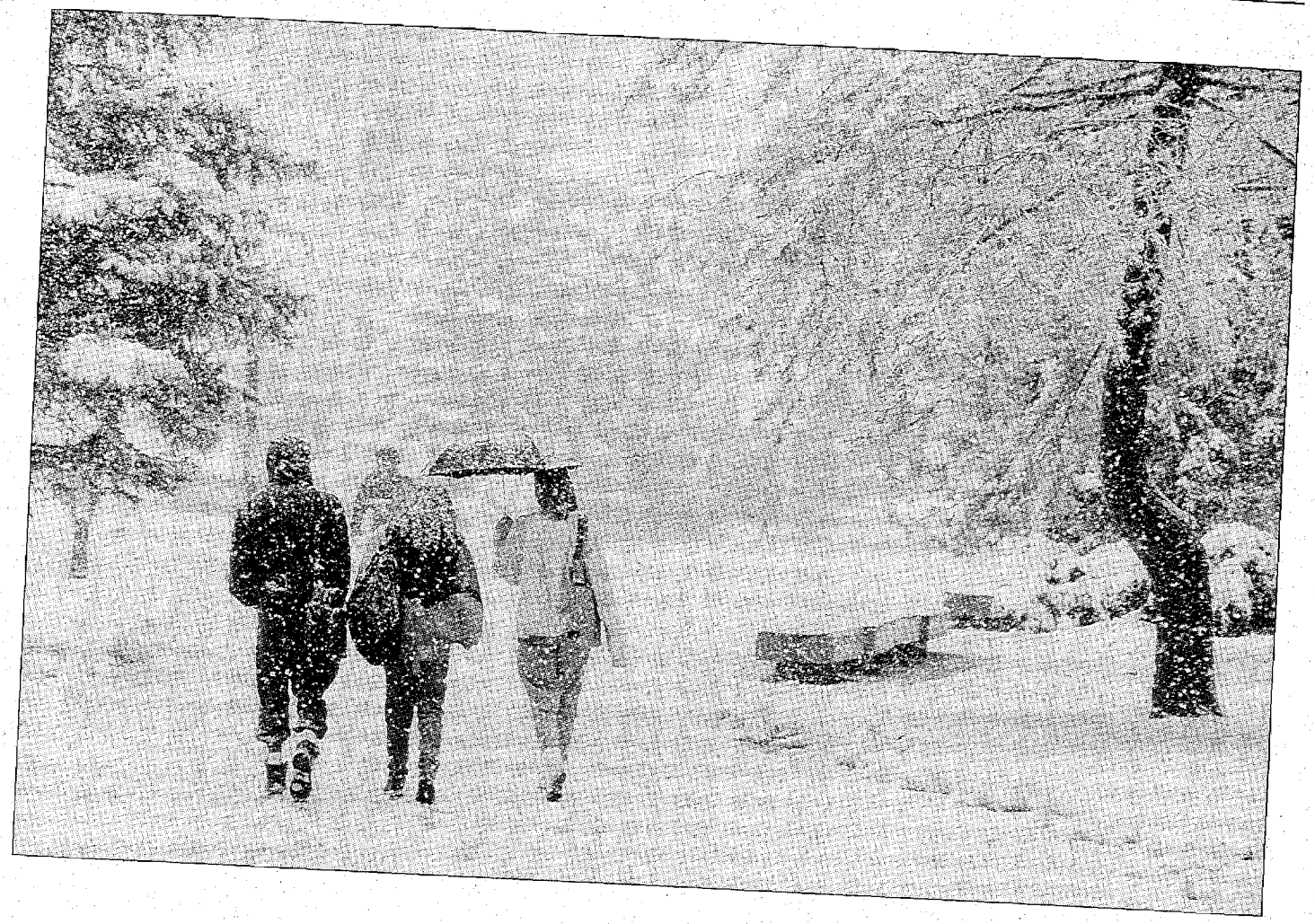
LORETTA A. SHEPARD, Director of Graduate Studies and Professor. B.A., Pomona College; M.A., Ph.D., University of Colorado.

NANCY BUTLER SONGER, Assistant Professor. B.A., University of California at Davis; M.S., Tufts University; Ph.D., University of California at Berkeley.

MARC SWADENER, Associate Dean and 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 Emeritus.



College of Engineering and Applied Science

Richard Seebass, Dean

The College of Engineering and Applied Science was established by the Board of Regents in 1893. The following bachelor of science degrees are offered by the college and are accredited by the Accreditation Board for Engineering and Technology (ABET): aerospace engineering sciences, architectural engineering, chemical engineering, civil engineering, electrical engineering, electrical and computer engineering, and mechanical engineering. The college also offers three B.S. degrees not under the accreditation jurisdiction of ABET. These are the bachelor of science degrees in computer science, applied mathematics, and engineering physics. The degrees in applied mathematics and engineering physics are offered in cooperation with the Applied Mathematics Program and the mathematics and physics departments of the College of Arts and Sciences.

Facilities

Students have an opportunity to study engineering with faculty members of national and international reputation and work within the superior facilities of the College of Engineering and Applied Science. 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.

Computing

The application of microcomputers and CAD/CAM (computer-aided design and computer-aided manufacturing) is progressing rapidly in engineering. Classes in all departments of the college place strong emphasis on the use of computers. All entering freshmen receive instruction in and undertake academic projects involving computers. Many students choose to obtain personal computers, although the college has no requirement to do so. Several hundred personal computers are available in open laboratories on campus for student use. Many of these labs are located in the engineering center.

Further information on computing can be found in this catalog under Campus Facilities and Resources, engineering department summaries, and the description of research facilities found in the Graduate School section.

Degree Programs

Within most departments several degree options are offered. Most departments offer options emphasizing bioengineering, pre-medicine, or computing aspects of their disciplines. Some options are oriented toward graduate study, others toward engineering practice.

Engineers work in a wide variety of disciplines, and the 10 degree programs of the college reflect this diversity. The following descriptions summarize these areas.

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. Most industries that engage 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 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 chemical 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.

This 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 also works effectively on energy problems and stresses in its instructional program problems of energy conversion, such as coal gasification.

Civil and environmental engineering offers a challenging career to students 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 the fields of programming languages, artificial intelligence software engineering, operating systems, numerical analysis, database systems, and the theory 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.

Electrical engineering leads to professional opportunities that include teaching and research in a university; research and 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. Design specialties within electrical engineering include computer interfaces and computer software; electromagnetic fields and electives 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 robotics.

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 parallel processing. This degree program is open only to juniors and seniors; admission must be approved by the department.

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. Students are then prepared for careers 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 is especially appropriate to space technology and research.

Mechanical engineering is not specifically identified with a particular technology. Mechanical engineers deal with internal combustion engines, jet engines, and rockets; automobiles, airplanes, and space vehicles; and power plants, marine structures, and space platforms. They invent devices for research, industrial, and medical applications, and contribute to the manufacture of machinery, appliances, and computers. Because of its interdisciplinary nature, mechanical engineering occupies a central position in modern science and technology, and mechanical engineers are sought by a wide variety of industrial and governmental organizations, from mining to aerospace. In those organizations they conduct basic and applied research, develop new devices and processes, and carry out design and manufacturing operations.

Telecommunications is an interdisciplinary graduate program that integrates courses in electrical engineering, computer science, political science, information systems, management, and economics. Through such an approach, and a world-class telecommunications laboratory, students are equipped to design, plan, analyze, and manage telecommunications systems, networks, and the many advanced and innovative uses of interactive communications today. Students enter the program with a wide variety of technical or liberal arts undergraduate degrees and expand their knowledge through individually tailored combinations of courses from the various disciplines. This ensures balanced, specialized capabilities necessary for a comprehensive understanding of the technological and sociocultural aspects of telecommunications. For detailed information, see the Interdisciplinary Programs listing in the Graduate School section of this catalog.

Professional Registration

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 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 most states and territories.

Study Abroad

In today's international environment, engineers frequently work and travel in foreign nations or with foreign engineers. Therefore, it is desirable that engineering students familiarize themselves with foreign cultures by selecting appropriate courses or by studying abroad. Cooperative programs in engineering education are maintained by the University of Colorado and the Ecole National des Ponts et Chaussées in Paris; the Ecole Polytechnique Feminine in Paris; the Instituto Technológico y de Estudios Superiores de Monterrey in Mexico; the Universities of Lancaster and East Anglia 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).

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
- Epsilon Lambda Chi, engineering leadership circle
- 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 meet frequently to present papers, speakers, films, and other programs of technical interest:

- American Indian Science Engineering Society
- American Institute of Aeronautics and Astronautics
- 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 Energy Engineers
- Associated General Contractors
- Association for Computing Machinery
- Biomedical Engineering Society
- Illuminating Engineering Society
- Institute of Electrical and Electronics Engineers
- National Society of Architectural Engineers
- National Society for Black Engineers
- Sigma Xi, Scientific Research Society
- Society of Hispanic Professional Engineers and Scientists
- Society of Manufacturing Engineers
- Society of Mexican-American Engineers and Scientists
- Society of Physics Students
- Society of Women Engineers

A representative student organization, the Associated Engineering Students (AES), comprises 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* magazine.

Minority Engineering Program

The College of Engineering and Applied Science is committed to increasing minority enrollment and retention through graduation. This commitment is carried out through the Minority Engineering Program (MEP) and support of its activities. The MEP recruits underrepresented minority students (American Indian, Black, and Hispanic) into the college and offers specialized advising, counseling, tutoring, and other support services. This effort is steadily increasing minority repre-

sentation in the College of Engineering and Applied Science. MEP is funded primarily by donations from industry and the college.

ACADEMIC EXCELLENCE

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 by the college. These honors are recorded on the diploma and the official transcript of the graduate and are indicated in the commencement program. For additional information on this honors system, contact the college dean's office.

For students admitted to the college fall semester 1987 and thereafter:

In recognition of high scholastic achievement, the designation "With High Distinction" or "With Distinction" will be awarded at graduation and will be recorded on the diploma and official transcript of the graduate and indicated in the commencement program. To qualify for the "With High Distinction" designation, the student's cumulative University of Colorado GPA must be at least a 3.90. For the "With Distinction" designation, the student's cumulative GPA must be at least a 3.75 but less than a 3.90. In addition, for these designations at least 50 semester hours must have been earned at the Boulder campus. Grades earned during the semester immediately prior to graduation will not be considered.

Qualified students are encouraged to participate in the honors program of 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.

Scholarships

Money contributed to the University Foundation for scholarship assistance to engineering students is 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 the Financial Aid section of this catalog). For additional information, students may contact the Office of Financial Aid at (303) 492-5091 or the college dean's office at (303) 492-5071.

Those interested in contributing may contact the Engineering Development Office in the College of Engineering and Applied Science, (303) 492-7335, Campus Box 422.

ACADEMIC STANDARDS

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; illegal possession and distribution of examinations or answers to specific questions; the presentation of another student's work as one's own; performing work or taking an examination for another student; or the alteration, forging, or falsification of official records. This listing is not complete and includes only some types of academic dishonesty recently brought before the Undergraduate Academic Affairs Committee. Additional information on honesty, ethics, and student discipline is found in the college's *Student Survival Guide*. (See also Academic Integrity and Student Conduct in the University Policies, Programs, and Services section.)

Policy on Academic Progress

To remain in good standing in the College of Engineering and Applied Science, a student must maintain satisfactory academic performance, as measured by grades reported to and calculated by the Office of the Registrar, 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 then 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 the student's academic performance must improve or the student will be subject to suspension from the college. Once placed on academic probation, a student remains in that status for a minimum of two consecutive semesters of enrollment as an undergraduate student in the college.

If a student's *cumulative* University of Colorado grade point average (GPA) drops below 2.00, or the student's *semester* GPA is less than 2.00 for two consecutive semesters at the University of Colorado, the student is placed on academic probation. After being placed on probation, the student must immediately correct all academic deficiencies or be subsequently suspended from the College of Engineering and Applied Science.

Students placed on academic probation by cumulative grade point average must raise their cumulative University of Colorado GPA to at least 2.00 during the next semester of enrollment and keep it above a 2.00 for at least the two following consecutive semesters. Additionally, the student is subject to probation by consecutive semester GPA rule.

Students placed on academic probation by the consecutive University of Colorado semester grade point average rule must maintain a semester GPA of at least 2.00 for the two following consecutive semesters.

If probation is due to both cumulative and semester GPAs, the student is required to maintain both cumulative and semester GPAs above 2.00 for the two following consecutive semesters.

While on academic probation, a 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 a student from the college. *It reflects the college's position that the student is unable to meet minimum academic requirements for a bachelor of science degree.*

If, after a period of academic probation, a student does not maintain satisfactory academic performance, that student is placed on academic suspension from the College of Engineering and Applied Science. The conditions of academic suspension are as follows:

The period of the suspension is indefinite, but must be for at least one academic year.

This academic suspension applies to the College of Engineering and Applied Science on all campuses of the University of Colorado.

Suspended students may not enroll in courses of the college, except those offered during summer session and those offered by correspondence through the Division of

Continuing Education.

If students, while on academic probation or suspension, elect to transfer to another college or school of the University of Colorado, the College of Engineering and Applied Science considers that they have changed their choice of academic major to one offered by that college or school. Therefore, the students are not permitted to enroll in any courses taught by this college which may apply toward engineering degree requirements. If a student attempts to transfer back into the college via an intrauniversity transfer (IUT), the college policy governing IUT admissions will apply, and the student must petition the Committee on Academic Progress and Discipline for removal of a scholastic stop.

Suspended students 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. However, these students return to their prior CU GPA, and grades earned at the other institution do not transfer.

Readmission of suspended students must be approved by the college and the CU-Boulder Office of Admissions; such readmission is not assured. All students seeking readmission must have a cumulative CU GPA of at least 2.00. In addition, the students must present convincing evidence of their ability to successfully complete an engineering degree program.

Petition Policy

A student desiring a waiver of college or departmental policies must request and secure approval for this waiver 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.

ADMISSION AND ENROLLMENT POLICIES

Freshman Applicants

Prospective engineering students must have mathematical aptitude and 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 applicants who have a high probability of completing their designated degree 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, academic ability, and accomplishment. These factors are indicated by academic records, test scores, letters of recommendation, and personal accomplishments.

Engineering students are expected to begin their study of mathematics with calculus. The college also requires that students have prior credit in chemistry and physics. Specific admission requirements are detailed in the Undergraduate Admission section of this catalog.

Transfer Students

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.

Intercampus Transfer Students

The transfer of a student from one campus of the University to another is considered on an individual basis if the following conditions are fulfilled:

1. Enrollment levels permit.
2. The applicant has completed approximately 30 semester credit hours on a separate University of Colorado campus.
3. The applicant's academic record must meet transfer admission requirements of the college.
4. The applicant must have at least 45 semester credit hours remaining to complete a degree from this college.

It is recommended that a student anticipating an intercampus transfer meet with the transfer credit evaluator in the appropriate engineering academic department to coordinate the transfer of credit and remaining degree requirements.

Intrauniversity Transfer Students

Intrauniversity transfers (IUTs) on the Boulder 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 semester he or she is enrolled in the second semester of calculus and the appropriate science course.
2. The applicant's academic record fulfills the IUT admissions requirements of the College of Engineering and Applied Science.
3. The applicant applies prior to the college IUT deadline of April 1 (for fall) or November 1 (for spring).

Specific application details are available in the Office of the Dean (AD 1-1).

Former Students

Former students must meet the requirements outlined in the Undergraduate Admissions section of this catalog and must reapply to the University. Courses taken at other collegiate institutions 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 may have a dean's administrative stop placed in their records and must obtain permission of the dean to re-enroll in the College of Engineering and Applied Science.*

Students who interrupt their course of study may be required to complete current degree requirements, which may require them to repeat course work or complete new degree requirements.

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. If students stop attending a course in which they are enrolled, they will receive a failing grade (*F*). 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 final examination is given. Failure to do so may result in an *F* in the course.

Changing Majors

The form necessary for transferring from one engineering major to another is available in the dean's office (AD 1-1).

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 a student in a degree program.

Credit Policies

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 the required score in the CEEB's Advanced Placement examination, advanced placement and college credit will be granted. All advanced placement credit must be validated by satisfactory achievement in subsequent courses, in accordance with the transfer policies of the college.

College-Level Examination Program (CLEP) Credit

Prospective students may earn college credit through the College-Level Examination Program (CLEP) examinations, provided that they score at the 67th percentile or above. A list of subjects in which CLEP examinations will be accepted may be obtained in the Office of the Dean of the College of Engineering and Applied Science. Departments will advise their students on the application of CLEP credit toward degree requirements.

Credit for ROTC

Some departments may allow their students 3 to 6 semester credit hours for ROTC courses toward technical or elective requirements if the ROTC courses are deemed to have suitable educational content.

Incompletes

By University policy, use of the *IF* grade is at the option of the academic dean's office. The grade of *IF* (incomplete, failing) may be given by an engineering faculty member when circumstances beyond a student's control warrant. This grade may be given only after the instructor has determined sufficient reason for doing so. If an incomplete grade is given, the instructor is required to document clearly both the conditions precedent to the removal of the incomplete and the time limit for the fulfillment of these conditions. The specified time shall not exceed a one-year period. A copy of this documentation will be filed with the Office of the Dean, the instructor's department office, and the student involved.

Course work to complete a grade of *IF* must be taken on the same campus on which the grade of *IF* was awarded. Credit for a course similar to the course in which the grade of *IF* was awarded may not be used to substitute for the incomplete course or be used to remove the grade of *IF*.

The grade of *IW* (incomplete, withdrawn) may not be awarded to undergraduate students in courses taught by the college.

No Credit Restrictions

In the College of Engineering and Applied Science, courses required for fulfillment of graduation requirements *cannot be taken for 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 Option

The primary purpose for offering courses on a pass/fail grading option is to encourage students to broaden their educational experience by electing challenging courses without serious risk to their academic record. In general, the pass/fail option is limited to 3000- or 4000-level courses. Individual departments may have additional rules that should be checked before registering for the pass/fail option. The college pass/fail policy is:

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. It is recommended that a student obtain advance approval from the major department prior to selecting the pass/fail option. Course work taken pass/fail without appropriate approval may be reverted to the letter grade earned.
3. All students who wish to register for the pass/fail option must do so during the registration or schedule adjustment periods. After the schedule adjustment period, it will not be possible for students to change their pass/fail registration unless approved by the dean.
4. A transfer student may count toward graduation 1 hour of pass/fail credit for each 9 hours of credit completed in this college.
5. Students on academic probation may not elect the pass/fail grade option.

Transfer Credit

After a prospective transfer student has applied and submitted transcripts to the University of Colorado, the Office of Admissions issues a transfer credit evaluation form listing those courses acceptable for transfer by University of Colorado at Boulder standards. A copy of this evaluation is received by the dean's office after the student is admitted and is made a part of the student's permanent record. The appropriate faculty transfer credit evaluator then uses this form to indicate which of those courses are tentatively acceptable in meeting engineering degree requirements. 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 final acceptance of this credit toward engineering 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 in the student's college file.*

If at any time a student wishes to have a course not previously accepted reconsidered 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 are not as rigorous mathematically or are otherwise divergent.

In order to assist engineering technology students with transfer problems, the following guidelines have been established:

1. Courses on basic subjects such as mathematics, physics, foreign languages, literature, or history may be acceptable for transfer 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. They may petition for permission to waive the course requirement. The course requirement 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.

Work Experience

It is the policy of the College of Engineering and Applied Science that any credits accrued in the official records of a student that were awarded for work or co-op experience will not apply toward degree requirements.

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 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 Colorado Springs

Bachelor's degree programs are offered in electrical engineering, computer science, and applied mathematics. The master of science degree is awarded in computer science, applied mathematics, and electrical engineering. The master of science option in systems engineering is offered, as is the master of engineering with the space operations option. Students may also complete work for master of engineering and Ph.D. degrees through the systemwide Graduate School.

University of Colorado at Denver

Bachelor's and master's degree programs are offered by the Departments of Civil Engineering, Electrical Engineering and Computer Science, and Mechanical Engineering on the campus of the University of Colorado at Denver. The bachelor of science degree is offered in computer science, civil engineering, electrical engineering, mechanical engineering, and applied mathematics. A master of science degree is offered in civil engineering, electrical engineering, and mechanical engineering. The master of science in computer science, the master of engineering, and the Ph.D. degree are offered in civil engineering and electrical engineering through the systemwide Graduate School.

Registration

All students must register for at least 12 credit hours per semester in course work applicable toward degree requirements. Variations from this policy must be approved by the appropriate faculty advisor, department, and dean's office on a college petition. Part-time enrollment will be approved for one semester only. 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.

A student who receives a grade of *D+* or lower in a course that is prerequisite to another may not enroll in the succeeding course without the a petition approved by the student's major academic department, the instructor of the succeeding course, and the dean's office.

All courses are not necessarily offered each semester. According to college policy, undergraduate courses having an enrollment of fewer than 20 students may be cancelled. Students can minimize scheduling problems by closely following the curricular sequence recommended by their major department. If a course is unavailable, a junior or senior may petition to enroll for equivalent study in an independent study course.

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 option information and drop/add procedures. Also see the current *Schedule of Courses* and current *Student Survival Guide.*

Only under circumstances clearly beyond the student's control will petitions for dropping courses be approved after the drop deadline.

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 that they have previously completed for no credit.*

Summer Courses

A limited selection of summer session courses is offered for continuing 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.

Withdrawal

Students may withdraw only during the first six weeks of the semester. After this time, withdrawals are permitted by this college only upon presentation of documented evidence to verify that the withdrawal is necessary because of conditions clearly beyond the student's control.

If a student withdraws, permission must be secured from the dean of the college to re-enroll. Students who interrupt their course of study may be required to complete all current degree requirements and to repeat courses previously completed. A student wishing to return after a withdrawal must reapply for admission and is therefore subject to enrollment limits and academic performance evaluation.

UNDERGRADUATE DEGREE REQUIREMENTS

Fundamentals taught in the freshman year are of prime importance in the more advanced classes, and every effort is made to place all freshman students in appropriate courses.

It is strongly recommended that students avoid the likelihood of later scheduling problems by carefully following the curriculum in their major or in the recommended open option program.

Each freshman is exposed to a broad university background, completing course work outside the College of Engineering and Applied Science in science, mathematics, social science, and the humanities.

Advising

All students are advised by faculty members from their respective major academic department or open option program. The college also provides professional advising staff.

Advising information is available at the administrative offices of the College of Engineering, EC AD 1-1, telephone (303) 492-5071, or directly through the major departments.

Aerospace Engineering Sciences, EC OT 6-16, 492-6417
Applied Mathematics Program, EC OT 2-6, 492-4668
Chemical Engineering, EC ChE wing, 492-7471
Civil, Environmental, and Architectural Engineering, EC OT 4-21, 492-7315
Computer Science, EC OT 7-5, 492-6362
Electrical Engineering, EC EE 0-2, 492-7327
Engineering Physics, Gamow E-032, 492-6952
Mechanical Engineering, EC OT 6-35, 492-7151
Open Option, EC AD 1-1, 492-5071

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 and Applied Science *Student Survival Guide* for the current year. A copy of this publication may be obtained in the dean's office.

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 major department.

The last 45 hours must be earned after admission and matriculation as an undergraduate engineering degree student at the University of Colorado at Boulder campus. Some students will need to present more than the minimum number of credit hours because of departmental requirements or because they may have enrolled in courses that do not carry credit toward a degree—for example, math modules, some ROTC courses, 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 degree requirements have been successfully completed.

The diploma indicates the University of Colorado campus from which the department recommending the student for the degree is located. Consideration will generally be given to designating the campus where the majority of the course work was completed. However, the final decision on the campus designation is made by the designated faculty representative from 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. A cumulative grade point average (GPA) of 2.00 is required in all courses used to fulfill degree requirements. In addition, a separately computed GPA of 2.00 must be attained in all courses taken in the student's major department (for students in the applied mathematics program, the major department is the mathematics department and includes both applied mathematics and mathematics courses; for students in the engineering physics program, the major department is the physics department).

The grade of *P* is excluded from GPA calculations; the grade of *F* is included.

3. Each degree program requires a minimum of 18 semester credit hours in humanities, social science, and language subjects. Humanities and social science electives must not be limited to a selection of unrelated introductory courses. At least two courses must be at an advanced level (3000 or above) and one of these courses must be from the University Writing Program. All electives should be selected with the approval of a faculty advisor.

Qualified students may take appropriate honors courses for humanities and social sciences credit.

Courses such as accounting, finance, 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 3000 level or above before the end of their junior year. This writing course should focus on argumentative writing and critical thinking.

5. Students who graduated from high school in the spring of 1988 and thereafter must complete any minimum academic preparation standards (MAPS) deficiencies. Students should consult with a faculty advisor or the dean's office (AD 1-1) to determine any MAPS deficiencies and how to satisfy these deficiencies.

6. Students should also see 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 are equivalent.

Graduation

It is the student's responsibility to be certain that all degree requirements are fulfilled, to notify the major department upon completion of 100 semester hours applicable to B.S. degree requirements, to fill out a diploma card at the beginning of the next-to-last semester before graduation, and to keep the departmental advisor and the dean's office informed of any change in graduation plans.

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.

Commencement exercises are held in December, May, and August.

Double Degrees

A student in the College of Engineering and Applied Science may be able to obtain bachelor's degrees in two engineering disciplines or one degree in engineering and one in another field, such as business, music, or one of the arts and sciences disciplines. Interested students should come to the dean's office (AD 1-1) for additional information and application materials for these double-degree programs.

Double Degrees from Engineering and Another College

Arrangements to obtain 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.

Double Degrees within the College of Engineering and Applied Science

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. Transfer students desiring two bachelor's degrees must present a minimum of 75 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 offered by the secondary academic department or in courses approved in advance by the department as substitutes.

Students desiring to pursue a double-degree program must formally designate themselves double-degree candidates by filing a petition signed by the chairs of both departments concerned and the dean before enrolling for the last 30 hours of work to be completed for the double degree.

The decision to earn a double 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).

Premedical Option

Several engineering departments have an option by which a student may meet all requirements for entry into medical school while 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 usually prescribed by medical schools and must be completed with superior grades.

	Semester Hours
Expository or creative writing	3
General chemistry	8-10
Organic chemistry	8-10
General biology or zoology	8
Literature	6
English composition	3
Physics	9
Calculus (recommended)	4

Students can meet these requirements by carefully substituting electives in their engineering curriculum. In some cases where additional hours may be required, interested students should consult with the department chair and the preprofessional 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.

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 Graduate School information for the College of Business and Administration for additional details.)

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 their senior year rather than from their first year of graduate study. Students can then plan their courses better, make fuller use of courses offered in alternate years, and reach proficiency sooner.

Application is made to the Graduate School through the appropriate major department. 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 those for two degrees taken separately: 128 credit hours for the B.S. degree and 24-30 hours including thesis (plan I) or 30 credit hours (plan II) for the M.S. or for the M.E. 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 a faculty advisor to help them develop a program best suited to their 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 students qualify for the B.S. degree and maintain a grade point average of at least 3.00. If the grade point average falls below 3.00, all hours completed with a passing grade while in the program will count toward fulfillment of 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 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
chemical engineering
civil, environmental, and architectural engineering
computer science
electrical engineering
engineering management
mechanical engineering
telecommunications

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 80 for more information.

The master of science in telecommunications is offered cooperatively by various departments. A description of the telecommunications program is found on pages 304 and 305.

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, space-station design, and neurobiosystems 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.

Engineering management combines technical courses with unique management courses, including productivity and quality, statistical process control, and manufacturing. These courses are designed for the engineer interested in acquiring effective management skills.

Mechanical engineering areas of concentration include combustion science, convective heat transfer, materials 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 and 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.

The Center for Advanced Training in Engineering and Computer Science (CATECS) provides 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 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 and managerial short courses in cooperation with the departments and interdisciplinary research centers.

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, CO, 80309-0435, or call (303) 492-6331.

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. Information may be obtained from the appropriate academic department office.

Master of Engineering, Master of Science, and Doctor of Philosophy

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 and the interdisciplinary Telecommunications Program, 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. 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 that some engineering departments have foreign language requirements.

Course Work. 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 M.E. combined degree.
2. Courses that are offered as minors for candidates who have chosen their major in some other department.

Graduate students majoring in any department receive no credit in the Graduate School for courses listed as required 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 received their 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.

Qualifying Examinations. Graduate students who plan to become candidates for the 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.

AEROSPACE ENGINEERING SCIENCES

The following areas of knowledge are central to the undergraduate degree in aerospace engineering sciences:

- knowledge of the basic subfields of aerospace engineering (fluid mechanics; astrodynamics; design, dynamics, and control of aerospace structures; guidance, navigation, and control of aerospace vehicles; aerospace structural materials and assembly; propulsion and fluid management systems; life support systems; and systems engineering);
- knowledge of mathematics sufficient to facilitate the understanding and application of physical principles to the solution of aerospace engineering problems;
- knowledge of the major principles and theories of the natural sciences, including physics, chemistry, the biological sciences, and the earth sciences; and
- knowledge of the interrelations between theory and observation, the nature of systematic and random error, and the methods used to analyze experimental uncertainty and to compare experiment with theory.

In addition, students completing the degree in aerospace engineering sciences acquire:

- the ability to apply the knowledge and design skills of aerospace engineering to solve the problems of society and help attain society's goals;
- the ability to address socially related technical problems which confront the aerospace profession;
- the ability to attain design standards of reliability, environmental quality, and protection of both occupational and public health and safety in the execution of projects;
- the ability to maintain professional competency through lifelong learning in aerospace engineering, humanities, and social science fields;
- the skill to design aerospace vehicles to meet technical and societal goals;
- the skill to design space experiments to meet scientific and commercial goals;
- the skill to design transportation, environmental, and energy systems to serve society's needs;
- the skills to manage an aerospace engineering design project or to cooperate with an aerospace engineering project management team effort;
- the ability to conduct experimental investigations in wind tunnels, structural and materials laboratories, life support system laboratories, etc., necessary to validate aerospace system analyses and designs;
- the skill to conduct all experimental work in a safe manner;
- the ability to use digital computation techniques to solve specific aerospace engineering problems;
- skill in the use of at least one modern high-level programming languages; and
- the ability to communicate effectively both orally and in writing, including presenting and writing technical aerospace project proposals and results.

Bachelor's Degree Requirements

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. From a list of capstone design courses, B.S. students must complete three. 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 for 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

The Department of Aerospace Engineering Sciences offers a bioengineering/premedical option that 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 choosing the bioengineering/premedical option 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.

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 this catalog was printed.

Semester Hours

Freshman Year

Fall Semester

ASEN 1011 Introduction to Science of Flight 3
APPM 1350 Calculus 1 for Engineers 4
CHEM 1211 Engineering General Chemistry 3
CHEN 1221 General Chemistry Lab for Engineers 2
Humanities or social science elective 3

Spring Semester

ASEN 1020 Introduction to Space Science 2
APPM 1360 Calculus 2 for Engineers 4
PHYS 1110 General Physics 1 4
CSCI 1700 Introduction to Scientific Programming 3
Humanities or social science elective 3

Sophomore Year

Fall Semester

APPM 2350 Calculus 3 for Engineers 4
PHYS 1120 General Physics 2 4
PHYS 1140 Experimental Physics 1 1
ASEN 2010 Mechanics 1 3
ASEN 2013 Thermodynamics 3
Engineering science or laboratory elective 1

Spring Semester

APPM 2360 Introduction to Linear Algebra and Differential Equations 4
PHYS 2130 General Physics 3 3
PHYS 2150 Experimental Physics 1
ASEN 2020 Mechanics 2 3
ASEN 2022 Materials Science and Engineering 3
Humanities or social science elective 3

Junior Year

Fall Semester

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/Circuits Laboratory for Nonmajors 1

Spring Semester

ASEN 3028 Flight Mechanics 3
ASEN 3021 Fluid Dynamics 2 3
ASEN 3022 Structures 2 3
ASEN 3024 Sysrems Analysis 2 3
Humanities or social science elective 3

Senior Year

Fall Semester

ASEN 4013 Foundations of Propulsion 3
ASEN 4018 Senior Design Lab 1 3
ASEN 4317 Computational Fluid Mechanics 3
Design course No. 1 3

Technical elective.....3
Design course No. 2 3

Spring Semester
ASEN 4028 Senior Design Lab 2.....3
Design course No. 3.....3
Technical elective 3

Humanities and Social Science Electives
For details on these requirements, a separate booklet titled *Guide to Humanities and Social Science Requirements* is published by Sigma Gamma Tau, the aerospace engineering honor society. It is available in the department office.

1. A minimum of 18 semester credit hours in the humanities and social sciences is required.
2. The 18 hours of humanities and social science elective credit should not be composed of a selection of unrelated introductory courses. At least 6 semester credit hours must be successfully completed at an advanced level, which is the upper division (3000-4000) or graduate (5000 and above) level.
3. ROTC course sequences (AIRR and NAVR 4010-4020 and MILR 4072-4082) are acceptable for 3 semester credit hours of humanities and social science elective credit. They are considered equivalent to PSCI 4191 and COMM 4240, respectively.
4. Students are permitted to take appropriate honors courses for humanities and social science credit.
5. Courses in business are not acceptable as humanities and social science electives.
6. Foreign language courses (including first-year courses) are acceptable for meeting humanities and social science requirements.
7. Participation in the Presidents Leadership Class is accepted for up to 6 credit hours.
8. The Herbst Program in Humanities for engineering students, a two-year program, is available to juniors. It provides up to 12 hours of honors humanities credit (3 hours per semester) and includes a waiver of the junior writing program requirement (UWRP 3030). See the dean's office for application deadlines and materials.

Technical Electives
1. Any ASEN course at the 3000 level ot above that is not a required course can be used as a technical elective.
2. A technical elective is generally a course in engineering or science (such as mathematics, applied mathematics, physics, chemistry, MCD biology, APAS, or computer science) at the 3000 level or higher. Elective ASEN courses most likely to help an aerospace engineer's career development are ASEN, math, and physics courses. It is suggested that students secure advance approval for technical elective courses from their advisors.
3. Independent study or undergraduate research is acceptable for technical elective credit. Upper-division ROTC course work is acceptable for 3 semester hours of technical elective credit. Any ROTC course numbered 3000 and above may be used for this credit. This does not affect the use of ROTC hours as humanities and social science elective credit discussed earlier.
4. Any course from the list of approved design courses is acceptable as a technical elective.

Engineering Design Requirement
In addition to ASEN 4018 and 4028 (Senior Design Lab 1 and 2) and the design work included in other aerospace required courses, a minimum of 9 credit hours of engineering design must be taken from the following list of capstone design courses:

ASEN 4098 System Engineering and Design
ASEN 4138 Aircraft Design
ASEN 4148 Spacecraft Design
ASEN 4158 Space Habitation
ASEN 4178 Remote Sensing Systems Design
ASEN 4238 Computer-Aided Control System Design
ASEN 4338 Structures Computer Laboratory
ASEN 4418 Design of Aerospace Structural Components
ASEN 5168 Experimental Space Science
ASEN 5218 Design of Large Space Structures
CVEN 3515 Structural Design I
CVEN 4545 Steel Design
MCEN 4025 Component Design
MCEN 4045 Mechanical Engineering Design Project

Note: Independent study may be used for design elective credit. An independent study agreement form must be picked up in the department office and completed by the student and instructor. Also, see the department office for a current list of available design elective courses.

Graduate Degree Programs

The Department of Aerospace Engineering Sciences offers graduate programs in the following areas: 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, satellite geodesy, satellite oceanography, ocean modeling, and application of the global positioning system); control, systems engineering, structures, 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, and biomanufacturing in space).

Aerospace-related research centers recently established in the college include the Colorado Center for Astrodynamics Research, the Center for Space Structures and Controls, Bioserve Space Technologies (a NASA Center for the Commercial Development of Space), the Center for Space Construction (a NASA Engineering Research Center), and the Center for Space Environmental Health. 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 Center for Astrophysics and Space Astronomy, the Center for Space and Geosciences Policy, 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 the Graduate Record Examination and are 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.

Advanced degrees are available with specialization in the four broad areas of astrodynamics and remote sensing; fluid dynamics; space structures, systems, and controls; and bioengineering. Courses below the 5000-level in aerospace engineering cannot count toward graduate degree requirements; relevant courses below the 5000 level outside the department may be accepted for master's degree credit if they fit with the student's degree plan. Such courses must have academic content consistent with graduate study in aerospace engineering sciences.

Advising. Students are assigned an academic advisor to review their course selection and 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 area for the thesis, academic advising is done by their thesis advisor.

Master of Science Degree

All master's degree students are required to take 6 hours of advanced math, 3 hours of applied computation, and 6 hours of basic specialty courses. All students are expected

to follow the nonthesis (plan II) program unless sponsored by a faculty member who has agreed to supervise the M.S. thesis.

Plan I (Thesis Plan). Twenty-four hours of graduate work are required, including 4-6 thesis hours. Course requirements are 6 hours of advanced math, 3 hours of applied computation, and 6 hours of basic specialty courses.

Plan II (Nonthesis Plan). Thirty hours of graduate work are required, including up to 6 hours of independent study. Students must follow the guidelines provided for their area of specialization. M.S. students are also permitted to select a general program and follow a broad-based curriculum leading to the degree. In this case students may choose the 6 hours of advanced math and 3 hours of applied computation from the recommendations of any of the areas of specialization. In addition to the 6 hours of basic specialty courses required of all M.S. students, nonthesis M.S. students are expected to take 6 additional hours of basic specialty courses.

The M.S. comprehensive examination contains a written part covering the basic specialty courses for the student's area, advanced math, and computational techniques. The written exam may cover additional subjects at the request of the student's advisor. The examination will be given every semester on demand, in approximately the tenth week of the semester.

Master of engineering students are not required to take the master of science comprehensive examination. See the department for a description of the master of engineering degree.

Ph.D. Degree

Course Requirements. A minimum of 30 semester credit hours of courses numbered 5000 or above and 30 credit hours of thesis credit are required for the degree. A maximum of 21 credit hours may be transferred from another accredited institution and applied toward a Ph.D. degree if approved by the graduate committee of the department and the Graduate School. All courses taken for the master's degree at the 5000 level or above at the University of Colorado may be applied toward the doctoral degree at the University. The formal course work must include a minimum of 21 hours of courses or their equivalent in aerospace engineering sciences.

Preliminary Examination. Students must pass a preliminary examination, administered by the graduate committee, which consists of two sections; a written, open book examination and an oral examination. The written examination is identical to the M.S. comprehensive examination. The oral examination shall be in the student's area of concentration.

Comprehensive Examination. The degree program culminates in an oral examination before the student's committee of five or more graduate faculty members appointed by the department and approved by the Graduate School. This should be preceded by individual examinations or interviews, either written or oral or both, by every committee member. The oral examination before the committee is based primarily on a detailed, written proposal for the thesis research provided by the student to committee members in advance.

Ph.D. Thesis. Students must write a thesis based on original research conducted under the supervision of a graduate faculty member. The thesis must fulfill all Graduate School requirements. After the thesis is 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 are available from the department graduate secretary.

APPLIED MATHEMATICS

The Program in Applied Mathematics in the College of Arts and Sciences offers courses and degree programs for undergraduate and graduate students. These courses range from calculus to seminars in computation, discrete mathematics, nonlinear phenomena, and physical applied mathematics. Students pursuing a major in applied mathematics within the College of Engineering and Applied Science complete their degree within this program.

Course offerings at the undergraduate level focus on providing students with the mathematical tools, problem solving strategies, and expertise that are useful in science and engineering.

Bachelor's Degree Requirements

The B.S. degree in applied mathematics requires the completion of a minimum of 128 credit hours of acceptable course work with cumulative and major grade point averages of *C* or better. Students must complete the following minimum requirements:

1. Three semesters of calculus (APPM 1350, 1360, and 2350).
2. Computing experience (CSCI 1200 or CSCI 1700 or GEEN 1300).
3. Completion of the following required chemistry and physics courses: CHEM 1211 and CHEN 1221, or CHEM 1151; PHYS 1110; PHYS 1120; and PHYS 1140.
4. Completion of the following required applied mathematics courses: APPM 2380 Differential Equations; APPM 3310 or MATH 3130 Linear Algebra; APPM 4350 and 4360 Methods in Applied Mathematics 1 and 2; APPM 4650 Intermediate Numerical Analysis 1; and MATH 4310 Advanced Calculus 1.
5. A two-semester course sequence of applied mathematics or mathematics courses numbered 4000 or above in addition to APPM 4350 (for example, APPM 4650 and APPM 4660, or MATH 4310 and 4320).
6. A minimum of 24 credits in applied mathematics or mathematics courses numbered 3000 or above (including the required courses).
7. A minimum of 24 credits in engineering courses (or approved chemistry/physics courses) with at least 15 credits in courses numbered 2000 or above and at least 6 credit hours in courses numbered 3000 or above. GEEN 3100, 3200, 4100, and 4200 may not be used to fulfill this requirement, although they may be used as social and humanistic electives. Several possible options are listed below.
8. The general bachelor degree requirements of the College of Engineering and Applied Science (including a 3000-level writing course offered through the University Writing Program and 18 credit hours of social and humanistic electives).

Recommended Options for Applied Math Majors

Aerospace Engineering Sciences Option
Recommended courses (total of 21 credits):

In sophomore year:
PHYS 2130 General Physics 3 3
ASEN 2010 Mechanics 1 3

In junior year:
ASEN 3011 Fluid Dynamics 1 3
ASEN 3012 Structures 1 3
ASEN 3014 Systems Analysis 1 3
At least one of the following three courses:
ASEN 3021 Fluid Dynamics 2 3
ASEN 3022 Structures 2 3
ASEN 3024 Systems Analysis 2 3

In senior year:
ASEN 4317 Computational Fluid Mechanics 3
Also recommended:
PHYS 2150 Experimental Modern Physics 1

Chemical Engineering Option
CHEM 1211 and CHEN 1221 5
Recommended courses (total of 22 credits):

In sophomore year:
CHEN 2120 Material and Energy Balance 3
CHEN 3200 Fluids 3

In junior year:
CHEN 3210 Heat Transfer 3
CHEN 3220 Mass Transfer 4
CHEN 3320 Thermodynamics 3
CHEM 4511 Physical Chemistry 3

In senior year:
CHEN 4330 Reaction Kinetics 3
Also recommended:
APPM 3570 Applied Probability and Statistics 3

Computer Science Option
Recommended courses (total of 20 credits)
CSCI 1210 Introduction to Programming 2 4
CSCI 2010 C/Unix Workshop 1
CSCI 2204 Disctete Structures 3
CSCI 2250 Data Structures 3
CSCI 3245 Programming Languages 3
ECEN 2100 Logic Circuits 3
ECEN 2220 Microcomputer Architecture and Programming 3
Note: An additional 3000-level course is required.

Electrical and Computer Engineering Option
Recommended courses (total of 21 credits)
ECEN 2100 Logic Circuits 3
ECEN 2220 Microcomputer Architecture and Programming 3
ECEN 2150 Circuits/Electronics 1 4
ECEN 2550 Circuits/Electronics Lab 1 1
ECEN 2160 Circuits/Electronics 2 4
ECEN 2560 Circuits/Electronics Lab 2 1
ECEN 3230 Circuits/Electronics 3 4
ECEN 3530 Circuits/Electronics Lab 3 1

Engineering Physics Option
Recommended courses after first-year physics (18 or 19 credits)

In sophomore year:
PHYS 2130 General Physics 3 3
PHYS 2150 Experimental Modern Physics 1

In junior/senior year:
PHYS 3210 Analytical Mechanics 3
PHYS 3220 Quantum Mechanics 3
PHYS 3310 Principles of Electricity and Magnetism 1 3
PHYS 3320 Principles of Electricity and Magnetism 2 3

Plus either of the following:
PHYS 3330 Junior Laboratory 2
PHYS 4230 Thermodynamics and Statistical Mechanics 3
Also recommended:
APPM 3570 Probability and Statistics 3
MATH 3140 Introduction to Modern Algebra 3

Mechanical Engineering Option
Recommended courses (total of 22 credits):
In sophomore year:
PHYS 2130 General Physics 3 3
MCEN 2023 Mechanics of Particles 3
MCEN 2043 Mechanics of Rigid Bodies 3
MCEN 2022 Thermodynamics 3

In junior/senior year:
MCEN 3021 Fluids 3
MCEN 3022 Heat Transfer 3
MCEN 3023 Mechanics of Deformable Bodies 4
Also recommended:
APPM 3570 Applied Probability and Statistics 3
PHYS 2150 Experimental Modern Physics 1

Civil, Environmental, and Architectural Engineering Option
Recommended basic courses (total of 15 credits):
CVEN 2121 Analytical Mechanics 1 3
AREN 2020 Energy Fundamentals 3
CVEN 3121 Mechanics of Materials 3
CVEN 3313 Theoretical Fluid Mechanics 3
CVEN 3217 Civil Engineering Systems 3

Students also take two courses from any one of the following groups:
a) CVEN 3414 Introduction to Environmental Engineering 3
CVEN 4333 Applied Hydraulics 3
b) CVEN 3505 Structures 3
CVEN 3708 Soil Mechanics 3
c) ARCH 2010 Solar Utilization 3
ARCH 3010 Building Energy Analysis and Design 3
ARCH 3540 Illumination 1 3

ARCHITECTURAL ENGINEERING

The overall goal of the Department of Civil, Environmental, and Architectural Engineering is to prepare students for careers as professional engineers. The curricula have been designed to qualify students for entry-level positions in professional practice in the areas of civil, environmental, or architectural engineering. These broad area designations may be separated into the sub-disciplines of building systems and energy management; construction engineering and management; environmental engineering; geotechnical engineering; mechanical systems and illumination; structural engineering and structural mechanics; and water resources engineering and management. Alternatively, undergraduates are prepared to begin graduate study in any of the subdisciplines listed above, improving their qualifications and permitting them to enter professional practice at a higher level or to progress to higher levels more rapidly after entry at the beginning level.

The following areas of knowledge are central to the undergraduate degree in architectural engineering:

experience with or exposure to architectural appreciation and design; basic science elective; building electrical systems; capstone experience in illumination, mechanical systems, solar energy, or structural design; construction; engineering materials, energy, or illumination laboratory; engineering science elective; heating, ventilating, and air conditioning; history and philosophy of architecture; illumination engineering; manual and computer-aided engineering drawing; mechanics; personal computers and engineering workstation usage; seminar in professional practice and ethics; solar utilization; structural analysis and design; surveying; and technical electives in the area of emphasis.

Architectural engineering has many elements in common with civil engineering, but is specifically directed toward the building industry. It focuses on building systems, which include structural systems; design of the building envelope; design of heating, ventilating, and air conditioning (HVAC) systems; illumination and electrical systems 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.

Bachelor's Degree Requirements

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 help students select a coherent academic program that enhances one of these areas.

Curriculum for B.S. (Arch. E.)

Semester Hours

Freshman Year
Fall Semester
AREN 1306 Introduction to Architectural Engineering 1
APPM 1350 Calculus 1 for Engineers 4
GEEN 1300 Introduction to Engineering Computing 3
CHEM 1211 General Chemistry for Engineers 3
CHEN 1221 Engineering Chemistry Lab 2
Humanities or social science elective 3

Spring Semester
APPM 1360 Calculus 2 for Engineers 4
GEEN 1017 Engineering Drawing 2
PHYS 1110 General Physics 1 4
CVEN 2012 Plane Surveying 3
AREN 2010 Introduction to Solar Utilization 3

Sophomore Year

Fall Semester

CVEN 2121 Analytical Mechanics 1 3
AREN 1027 Descriptive Geometry 2
AREN 3050 Environmental Systems for Buildings 1 3
APPM 2350 Calculus 3 for Engineers 4
PHYS 1120 General Physics 2 4
PHYS 1140 Experimental Physics 1

Spring Semester

AREN 2020 Energy Fundamentals 3
CVEN 3121 Mechanics of Materials 3
APPM 2360 Introduction to Linear Algebra and Differential Equations 4
AREN 2406 Introduction to Building Construction 3
AREN 3060 Environmental Systems for Buildings 2 3

Junior Year

Fall Semester

CVEN 3505 Structural Analysis 3
AREN 3010 Mechanical Systems for Buildings 3
AREN 3540 Illumination 1 3
CVEN 3246 Introduction to Building Construction 3
Basic science elective 3
UWRP 3030 Writing for Science and Society 3

Spring Semester

CVEN 3515 Structural Design 1 3
AREN 3030 Energy Laboratory (Note 1) 3 (2)
AREN 4110 Heating, Ventilating, and Air Conditioning 1 (Note 2) 3
AREN 4550 Illumination 2 (Note 2) 3
Humanities or social science elective 3

Senior Year

Fall Semester

ARCH 3114 History and Theories of Architecture 1 3
ARCH 4010 Architectural Appreciation and Design 6
Technical elective (Note 1) 3 (4)
ECEN 3030 Electronics and Electric Circuits 3

Spring Semester

CVEN 4039 Senior Seminar 1
AREN 4570 Building Electrical Systems Design 1 3
Technical elective 3
Capstone selection 3
Humanities or social science elective 3
ARCH 3214 History and Theories of Architecture 2 3

Minimum hours for degree 129

Curriculum Notes

1. Either CVEN 3141, AREN 3030, or AREN 3040 will fulfill the laboratory requirement. However, if CVEN 3141 is taken, then an additional 1-credit technical elective must be taken.
2. AREN 4010 Solar Design for Buildings may be substituted for either AREN 4110 or AREN 4550.

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 4010 Solar Design
AREN 4110 HVAC Design 1
AREN 4315 Design of Masonry Structures
AREN 4466 Construction Planning and Scheduling
AREN 4560 Luminous Radiative Transfer
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 5010 HVAC System Controls 1
CVEN 5111 Introduction to Structural Dynamics*
CVEN 5121 Mechanics of Materials 2*
CVEN 4511 or 5511 Introduction to Finite Element Analysis*
ACCT 2000 Introduction to Financial Accounting
ACCT 2310 Managerial Cost Accounting 1
ECEN 5767 Power Distribution Systems
MCEN 3022 Heat Transfer

* For well-qualified undergraduates.

Double Degree with Business

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.

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 5110 HVAC Design
CVEN 5111 Introduction to Structural Dynamics
CVEN 5121 Mechanics of Materials 2
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
CVEN 5511 Introduction to Finite Element Analysis
CVEN 5525 Matrix Structural Analysis
CVEN 5575 Advanced Topics in Steel Design
CVEN 5585 Advanced Topics in Reinforced Concrete Design
CVEN 5830 Special Topics in Energy
CVEN 6525 Finite Element Analysis of Structures
CVEN 6595 Earthquake Engineering
CVEN 7111 Dynamics of Structures
CVEN 7131 Theory of Elasticity
CVEN 7141 Plates and Shells
CVEN 7161 Buckling in Structures
CVEN 7511 Computational Mechanics of Solids and Structures
CVEN 7545 Structural Optimization
CVEN 7555 Structural Reliability
CVEN 7565 Inelastic Theory of Structures

CHEMICAL ENGINEERING

The following areas of knowledge are central to the undergraduate degree in chemical engineering:

- mathematics beyond trigonometry, emphasizing mathematical concepts and principles;
- general chemistry, organic chemistry, physical chemistry, and general physics;
- the engineering sciences that have their origins in mathematics and the basic sciences and that provide a bridge to engineering practice;
- the extension of mathematics and basic sciences toward creative applications;
- the iterative decision-making process in which basic sciences, mathematics, and engineering sciences are applied to covert resources optimally to meet a stated objective;
- elements ancillary to the engineering design process;
- humanity and culture; and
- individual relationships in and to society.

In addition, students completing the degree in chemical engineering acquire the ability and skills to:

- delineate and solve in a practical way the

problems of society involving molecular change that are susceptible to engineering treatment;
- address socially-related technical problems that confront the profession;
- implement the engineer's responsibility to protect both occupational and public health and safety;
- maintain professional competency through lifelong learning;
- conduct experimental investigations that combine elements of theory and practice;
- carry out experimentation in a safe manner;
- use digital computation techniques to solve specific engineering problems;
- use at least one modern high-level programming language; and
- communicate both orally and in writing.

Bachelor's Degree Requirements

Chemical engineers are responsible for producing products based on chemical and biochemical processing. They carry out basic research; design, build, operate, and manage chemical processes and plants; and supply petroleum products, plastics, detergents, agricultural chemicals, pharmaceuticals, biological compounds, photographic materials, electronic memory devices, and various food and other products. Today's processes must be energy efficient, nonpolluting, and profitable. Thus, students must master inorganic, organic, and physical chemistry; mathematics, statistics, and computers; physics; and often, biology and biochemistry. Students must learn to use these fundamentals as they are applied in the process industries. Paralleling the technical courses are studies in literature, social sciences, and humanities.

There is a natural affinity between chemical engineering and medicine, and the department emphasizes its premedical and biotechnology program.

At the B.S., M.S., and Ph.D. levels, there are opportunities to specialize via electives, independent study, and research. If a student has an interest that is not included in the following copy, special arrangements can usually be made.

Students may carry out a part of their studies in another country (see the Office of International Education in this catalog), and are encouraged to consider this opportunity 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 particular interest. To follow one of these requires careful planning and course selection by student and advisor.

Biotechnology-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 biotechnology research. The department has a strong undergraduate program tailored toward meeting the needs of 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 in molecular biology and 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 comprising the central core of the biotechnology program are: CHEN 3700, Bioenergetics: Srructure and Function; CHEN 4710 or 5710, Molecular Basis of Biological Behavior; CHEN 4800 or 5800, Recent Advances in Biotechnology; and CHEN 4820 or 5820, Biochemical Separations (optional in place of CHEN 4710 or 5710). In addition, biotechnology students are required to complete two semesters of general biology.

The department also offers graduate biotechnology research programs at both the M.S. and Ph.D. levels. These programs are oriented toward specializarion 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 improvement. The environmental engineering option is designed to emphasize biological and environmental sciences, the effects of chemicals on the environment, and chemical engineering applications in environmental problems.

Computer Option. Applications of computers in chemical engineering are widespread, and the chemical engineer who has solid preparation in computer science and engineering is in demand. Areas include software systems, simulation, and on-line real-time computing. Students in this option complete the core of the computer engineering degree program in the Department of Electrical and Computer Engineering.

Materials Science Option. The need to develop new materials for a rapidly broadening spectrum of applications is one of the major technological challenges confronting applied science. Chemical engineers have the required background in chemistry and transport theory to contribute significantly in this area. This option focuses on materials processing by complementing the chemical engineering curriculum with elective courses stressing the interrelationship between materials fabrication, structure, properties, and performance.

Curriculum for B.S. (Ch.E.)

	Semester Hours
Freshman Year	
Fall Semester	
APPM 1350 Calculus 1 for Engineers	4
CHEM 1211 General Chemistry for Engineers	3
CHEN 1221 General Chemistry Laboratory for Engineers	2
GEEN 1300 Introduction to Engineering Computing (Note 1)	3
Humanities or social science elective (Note 2)	3
Spring Semester	
APPM 1360 Calculus 2 for Engineers	4
CHEM 3311 Organic Chemistry 1	3
CHEM 3321 Laboratory in Organic Chemistry	1
CHEN 1300 Introduction to Chemical Engineering (Note 1)	1
Humanities or social science elective (Note 2)	3
PHYS 1110 General Physics 1	4
Sophomore Year	
Fall Semester	
APPM 2350 Calculus 3 for Engineers	4
CHEM 3331 Organic Chemistry 2	3
CHEM 3341 Laboratory in Organic Chemistry 2	1
CHEN 2120 Chemical Engineering Material and Energy Balances (Note 1)	3
PHYS 1120 General Physics 2	4
PHYS 1140 Experimental Physics	1
Spring Semester	
APPM 2360 Introduction to Linear Algebra and Differential Equations	4
Chemistry elective (Note 3)	3/4
CHEN 3200 Chemical Engineering Principles 1 (Note 1)	3
CHEN 2010 Probability and Statistics for Chemical Engineers (Note 1)	3
Humanities or social science elective (Note 2)	3

Junior Year

Fall Semester

CHEM 4511 Physical Chemistry 1 3
CHEN 3210 Chemical Engineering Principles 2 (Note 1) 3
ECEN 3030 Electronics and Electric Circuits 3
ECEN 3430 Electronics/Circuits Laboratory for Nonmajors 1
UWRP 3030 Writing on Science and Society .. 3
Technical elective (Note 4) 3

Spring Semester

CHEM 4541 Physical Chemistry Lab 2
Chemistry elective (Note 3) 3/4
CHEN 3220 Chemical Engineering Principles 3 (Note 1) 4
CHEN 3320 Chemical Engineering Thermodynamics (Note 1) 3
Elective 4/3

Senior Year

Fall Semester

CHEN 4030 Chemical Engineering Laboratory 4
CHEN 4330 Chemical Engineering Reaction Kinetics (Note 1) 3
CHEN 4440 Chemical Engineering Materials (Notes 1 and 5) 3
CHEN 4580 Numerical Methods for Process Simulation (Note 1) 3
Humanities or social science elective (Note 2) 3

Spring Semester

CHEN 4520 Chemical Process Synthesis (Note 1) 4
CHEN 4570 Instrumentation and Process Control (Note 1) 3
Humanities or social science elective (Note 2) 3
Technical electives (Note 4) 3/4
Elective 3

Minimum total hours for degree 128

Curriculum Notes

1. Course offered only in semester indicated.
2. Courses selected must meet humanities and social science requirements. Students should consult with their advisor.
3. Students should consult with their advisor about chemistry electives.
4. Technical elective must meet engineering science requirements. See advisor.
5. Recommended technical elective.

Graduate Degree Programs

Major areas of current research interest in the chemical engineering department are bioengineering and biotechnology, heterogeneous catalysis and kinetics, cryogenics, fluid dynamics, low gravity science, 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 Requirements

Admission. General criteria for regular admission to the master's program include a bachelor's degree with a 3.00 or better overall grade point average 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 degree at this University); promise of ability to pursue advanced study and research, as judged by previous scholastic record or otherwise; and 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:

1. 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.
2. A final examination as required by the Graduate School on the thesis and/or course work.

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.

The following courses must be taken for the M.S. and Ph.D. degrees:

CHEN 5210 Transport Phenomena
CHEN 5220 Mass Transport
CHEN 5390 Chemical Reactor 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 graduate faculty members from the Department of Chemical Engineering.

Master of Engineering 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.

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 orally defend their written reports as specified in the M.E. degree description, and a comprehensive examination is 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 Admission Requirements

1. 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.
2. The applicant must show the ability to perform independent research.
3. The applicant must indicate a field of specialization and obtain an advisor in the chemical engineering graduate faculty.
4. The applicant must pass the Ph.D. preliminary examination administered by the Department of Chemical Engineering.

Admission to the doctoral program is 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.

All Ph.D. students in chemical engineering must satisfy a communication skills requirement. This includes performing an advanced teaching assistantship and demonstrating satisfactory communication skills on the Ph.D. comprehensive examination. Students whose primary language is English may choose to demonstrate foreign language proficiency instead of being judged on their communications skills on the comprehensive exam.

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 ourside

the department. A graduate faculty member of the department must serve 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 AND ENVIRONMENTAL ENGINEERING

The overall goal of the Department of Civil, Environmental, and Architectural Engineering is to prepare students for careers as professional engineers. The curricula have been designed to qualify students for entry-level positions in professional practice in the areas of civil, environmental, or architectural engineering. These broad area designations may be separated into the subdisciplines of building systems and energy management; construction engineering and management; environmental engineering; geotechnical engineering; mechanical systems and illumination; structural engineering and structural mechanics; and water resource engineering and management. Alternatively, undergraduates are prepared to begin graduate study in any of the subdisciplines listed above, improving their qualifications and permitting them to enter professional practice at a higher level or to progress to higher levels more rapidly after entry at the beginning level.

Students in civil and environmental engineering gain experience with or exposure to a capstone experience in environmental engineering or structural design; civil engineering systems; construction; engineering geology; engineering materials, geotechnical, or water quality laboratory; environmental engineering; fluid mechanics; geotechnical engineering; manual and computer-aided engineering drawing; mechanics; personal computers and engineering workstation usage; a seminar in professional practice and ethics; structural analysis and design; surveying; transportation systems; and technical electives in their area of emphasis.

Bachelor's Degree Requirements

This curriculum requires students 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 communication courses, with not more than 12 hours from any one of the three areas.

Advanced technical courses are selected 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 advisor.

Curriculum for B.S. (C.E.)

Semester Hours

Freshman Year
Fall Semester
APPM 1350 Calculus 1 for Engineers 4
CHEM 1211 General Chemistry for Engineers 3
CHEN 1221 General Chemistry Laboratory of Engineers 2
CVEN 1306 Introduction to Civil Engineering 3
GEEN 1300 Introduction to Engineering Computing 3

Spring Semester
APPM 1360 Calculus 2 for Engineers 4
PHYS 1110 General Physics 1 4
GEEN 1017 Engineering Drawing 2
CVEN 2012 Plane Surveying 3
Humanities or social science elective 3

Sophomore Year
Fall Semester
APPM 2350 Calculus 3 for Engineers 4
CVEN 2121 Analytical Mechanics 1 3
PHYS 1120 General Physics 2 4
PHYS 1140 Experimental Physics 1
Humanities or social science elective 3

Spring Semester
APPM 2360 Introduction to Linear Algebra and Differential Equations 4
CVEN 3121 Mechanics of Materials 3
CVEN 3313 Theoretical Fluid Mechanics 3
CVEN 3698 Engineering Geology 3
AREN 2020 Energy Fundamentals 3

Junior Year
Fall Semester
CVEN 3141 Engineering Materials Laboratory *or* CVEN 3454 Engineering Laboratory—Water Quality (Notes 1, 2) 2
CVEN 3323 Applied Fluid Mechanics 3
CVEN 3414 Introduction to Environmental Engineering 3
CVEN 3505 Structural Analysis 3
CVEN 3708 Geotechnical Engineering 1 3
Humanities or social science elective 3

Spring Semester
CVEN 3728 Engineering Materials Laboratory—Geotechnical Engineering (Note 2) 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
UWRP 3030 Writing on Science and Society 3

Senior Year
Fall Semester
CVEN 3217 Civil Engineering Systems 3
CVEN 3602 Transportation Engineering 3
CVEN 4XXX Capstone course (Note 3) or technical elective 3
Technical elective (Note 4) 4
Humanities or social science elective 3

Spring Semester
CVEN 3111 Analytical Mechanics 2 3
CVEN 4039 Senior Seminar 1
CVEN 4XXX Capstone course (Note 3) or technical elective 3
Technical elective (Note 4) 3
ECEN 3030 Electronics and Electric Circuits 3
Humanities or social science elective (3000-level or above) 3

Minimum hours for degree 128

Curriculum Notes
1. Either CVEN 3141, 3454, or 3728 will fulfill lab requirement.
2. Students must schedule a 2-hour technical elective if an engineering laboratory is not scheduled.
3. 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.
4. Not more than 6 hours of technical electives may be taken outside the department, and then only for defensible reasons.

Double Degree with Business

Students interested in pursuing a B.S. degree in business in addition to the B.S. degree in civil 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.

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.

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 the College of Engineering and Applied Science.

Doctor of Philosophy Degree

This degree requires a minimum of 30 semester hours of graduate-level work (5000 level or above), 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 a 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 15g-ton centrifuge for geotechnical and structural model studies and a large 440g-ton geotechnical centrifuge for use in model testing. Also available is an instructional computing facility, the Bechtel Laboratory, equipped with 25 Sun workstations. In addition, extensive structural engineering, engineering mechanics, and geotechnical capabilities exist such as a one-million-pound universal testing machine and several cubical cells for multiaxial testing of materials. A 40 ft. by 80 ft. structural strong floor with associated equipment permits the testing of a wide variety of structural configurations under controlled conditions, both static and quasi-static. The hydraulics and water resources research laboratories include excellent facilities in water quality and environmental engineering. A unique workstation laboratory for advanced decision support systems is available. Programs in construction management and building energy are well supported. A state-of-the-art HVAC laboratory is capable of testing full-scale, commercial building HVAC systems and their controls using a one-of-a-kind data acquisition and experimental control system.

Current research covers such topics as water and wastewater treatment, surface and subsurface contaminant transport, decision support systems, hydraulic research, land treatment, rapid infiltration, and activated sludge processes. Cost prediction in construction, construction management, energy conservation in buildings, solar applications, and lighting systems are included. Also, offshore structures, centrifugal modeling, excavations, and rock and soil mechanics are being studied. In structures, research focuses include stability and fracture, finite element techniques, reinforced concrete, earthquake behavior, reinforced 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 department 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 computer science applications 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 computer engineering, business, and mathematics; students interested in these programs should contact the appropriate department.

The Department of Computer Science also offers M.S. and Ph.D. degrees.

The following areas of knowledge are central to the undergraduate degree in computer science:

- an understanding of computing at all levels of abstraction, including circuits, computer architecture, operating systems, programming languages, algorithms, and large application systems;
- an understanding of the interdependence of hardware and software, illustrated by instances including cost-performance trade-off in storage technology, leading to multilevel storage systems;
- an appreciation of the challenge of large-scale software production and of engineering principles used to meet that challenge;
- an understanding of the technology-independent aspects of computation; and
- an awareness of the major advances in the history of computer science and technology and of current areas of research.

In addition, students completing the degree in computer science acquire:

- the ability to communicate effectively and competently with users as well as fellow computer professionals about computing issues;
- the ability to adapt algorithms and data structures drawn from a large standard repertoire to new problems;
- fluency in several programming languages and acquaintance with several more;
- experience in being a sophisticated user of one programming environment or operating system, and acquaintance with several more; and
- the ability to assess new developments in computer science and add to the skills and knowledge described here.

Bachelor's Degree Requirements

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 background by selecting from a wide variety of electives in such areas as artificial intelligence, graphics, and database systems. Students should consult their academic advisor 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-one hours of courses in the humanities and social sciences are required, including literature. 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.

The following curriculum is only a sample. It can be adjusted to the needs of individual students (e.g., transfer students and open option students). The curriculum can also be augmented by two semesters of co-op work in industry. Contact the Department of Computer Science for more detailed and up-to-date information for advising.

Curriculum for B.S. (Comp. Sci.)

Semester Hours

Freshman Year
Fall Semester
CSCI 1300 Introduction to Computing for Majors (Note 1) 4
APPM 1350 Calculus 1 for Engineers 4
Science 1 (Note 2) 4
Literature 3

Spring Semester
CSCI 2030 C/UNIX Workshop for Majors 1
CSCI 2224 Discrete Structures for Majors 3
APPM 1360 Calculus 2 for Engineers 4
Science 2 (Note 2) 5
Humanities or social science elective (Note 3) 3

Sophomore Year
Fall Semester
CSCI 2270 Data Structures and Algorithms for Majors 3
APPM 2350 Calculus 3 for Engineers 4
Humanities or social science elective (Note 3) 3
Free electives 6

Spring Semester
CSCI 2300 Fundamentals of Computer Science 4
ECEN 2100 Logic Circuits 3
ECEN 2110 Logic Laboratory 1
MATH 3130 Linear Algebra 3
Literature 3
Free elective 3

Junior Year
Fall Semester
CSCI 3155 Principles of Programming Languages 3
CSCI 3656 Numerical Computation 1 3
ECEN 2220 Microcomputer Architecture and Programming 3
ECEN 2230 Microprocessor Laboratory 1
Science elective (Note 2) 3
Humanities or social science elective (Note 3) 3

Spring Semester
CSCI 3434 Computer Science Theory 1 3
CSCI 3753 Systems 3
ECEN 4593 Computer Organization 3
UWRP 3030 Writing on Science and Society (Note 4) 3
Science elective 4

Senior Year
Fall Semester
CSCI 4308 Software Engineering Project 1 4
Computer sciences elective (Note 5) 3
Statistics (Note 6) 3
Science elective 3
Humanities or social science elective (Note 3) 3

Spring Semester
CSCI 4318 Software Engineering Project 2 4
Computer science elective (Note 5) 3
Upper-division humanities or social science elective (Note 3) 3
Free electives 6

Total credit hours 128

Curriculum Notes
1. A grade of *B* or better in CSCI 1200 may replace CSCI 1300, but CSCI 1300 is preferable. MATH 3150 or APPM 2360 may replace MATH 3130.
2. The courses listed as Science 1 and Science 2 must be a two-semester introductory sequence in a laboratory science.
3. Specific requirements for humanities and social science electives are available from the computer science department. These requirements include at least one upper-division humanities or social science course.
4. This course must be taken in the junior year.
5. This course may be any upper-division undergraduate CSCI course, with the exception of CSCI 3263, 4208, and 4218. Graduate CSCI courses approved by an advisor, as well as computing courses taught in other departments, may also satisfy the elective. Students who intend to pursue a graduate degree are strongly encouraged to take CSCI 3444 Computer Science Theory 2 and MATH 4710 Introduction to Mathematical Logic.
6. MCEN 4120 Engineering Statistics or MATH 4570 are equally acceptable.

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 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, sufficient mathematical maturity to understand pure mathematics courses, and a number of academic computer science courses.

Applicants should satisfy the following requirements for mathematics courses: at least three semesters of university-level mathematics courses such as calculus, differential equations, linear algebra, probability, statistics, discrete mathematics, and abstract algebra. 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, applicants should offer the equivalent of the following University of Colorado courses: CSCI 1200, 1210, 2204, 2250, 3245, and one course in assembly language programming or machine architecture. Courses in areas such as artificial intelligence, databases, numerical computation, operating systems, software engineering, theory, and others can be substituted for courses on the above list. However, courses on the list are prerequisites to many of the graduate-level offerings and students who are admitted lacking their equivalent will usually be required to make them up, without graduate credit. 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 to both programs is very 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. These scores are required if the applicant wishes to be considered for financial support, has a marginal grade point average or has previous work at an institution lacking a strong national reputation.

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 February 28 for fall admission and by October 15 for spring admission. Ph.D. applications should be received by January 2 for fall admission.

Master's Degree

Admission requirements for this program are given above under General Admission Requirements. Plan I (thesis) or plan II (no thesis) may be followed. In either plan, students must complete 30 credit hours of course or thesis work. The requirements for plan I are as stated under the general requirements of the Graduate School in this catalog. Students in plan I receive 6 credit hours for thesis work and are examined orally on their thesis. Under either plan a student may take 6 hours in a minor field. Students are expected to work out an acceptable program of course work with their advisor. Specific courses depend on the student's background and field of specialization, but four of the courses must satisfy a distribution requirement.

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 foreign language requirement is the equivalent of four college semesters; a detailed statement is available in the computer science department. 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 Department of Computer Science has a number of different types of computers on the computer science research network as detailed in the table below. These computers are interconnected by a 10 Mbit/sec Ethernet-based local area internet with 1.5 Mbit/sec links to the Westnet regional network and the NSFNet national backbone. In addition, departmental instruction is based on a network of HP workstations, a Sequent Balance 8000, a VAX DEC station 3100, and timesharing access to the computing center's VAX VMS cluster. These machines, together with associated peripherals, sophisticated output devices including laser printers and x-y plotters, and terminals provide ready access for graduate students and faculty.

Computers	*Use*
SUN workstations (approximately 70)	faculty and graduate students
10 DEC workstations	faculty and graduate students
16 Symbolics workstations	AI research
5 IBM RS/6000 workstations	undergraduate students
7 IBM X-stations	undergraduate students
17 HP workstations	undergraduate students
5 DEC station 5000/200	undergraduate students
16 NCD X terminals	undergraduate supercomputing
30 HP workstations	AI instruction and research
4 NeXT workstations	faculty and graduate students
MIPS M/1000	general timesharing (graduate students)
Ardent Titan	graphics, numerical computation
CM2 Connection Machine (8K processors)	parallel computation research
Sequent Balance 8000	instruction (Computing Center)
VAX/VMS cluster	instruction (Computing Center)
Numerous PCs, Macs, and terminals	instruction

ELECTRICAL AND COMPUTER ENGINEERING

Since the electrical engineering curriculum is almost continually under revision, the information herein may be superseded by the time this catalog is printed and distributed. Up-to-date policies are contained in the department's "HELP! Guide," available through the Electrical and Computer Engineering office.

Bachelor's Degree Requirements

The department 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, optical computing, optical systems 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, students desiring to specialize in computer engineering may elect the electrical and 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 nontechnical 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 ECE.

Qualified transfer students can usually join the program without appreciable loss of time or credit. For example, students who have completed the required mathematics and physics courses of the freshman and sophomore years and who have a total of about 68 credit hours acceptable to the department can usually complete the program in about four semesters.

The following areas of knowledge are central to the degrees in electrical engineering and electrical and computer engineering:

- knowledge of the basic subfields of electrical and computer engineering, including logic circuits, fundamentals of computer programming, electric circuits and electronics, microcomputer architecture and assembly language programming, and electric and magnetic field phenomena;
- knowledge in several of the following intermediate subfields of electrical and computer engineering—thermodynamics, semiconductor devices, energy conversion, electromagnetics and transmission, linear systems, switching and finite automata, and mechanics; and
- knowledge in any of the following advanced subfields of electrical and computer engineering—bioengineering, communications, computer systems, electromagnetics, materials, optics, power, systems, electronics, and VLSI CAD methods.

In addition, students completing the degree in electrical and computer engineering acquire:

- skills in laboratory techniques in the application areas of logic circuits, microprocessors, and circuits and electronics;
- skills in laboratory techniques in the application areas of power systems, digital and analog systems, and communications;
- skill in the use of at least one modern high-level programming language and familiarity with others; and
- the capability to assess new developments in the various fields of electrical and computer engineering.

Standard Curriculum for B.S. in Electrical Engineering (EE)

The regular EE 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.

Standard Curriculum for B.S. in Electrical and Computer Engineering (ECE)

This program, leading to the degree B.S. in ECE, 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 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 EE program and includes courses in scientific application of computers, logic structure of computers, and assembly language programming. Operating systems experience on departmental computers is an important adjunct to this program.

For other computer-related programs, see the computer science listings.

Biomedical Engineering Option and Premedical Studies in ECE

The biomedical engineering option focuses on the application of ECE concepts to the improvement and protection of health. Course work in the ECE curriculum is coupled with specialized courses linking electrical engineering to such biomedical applications as neural signals and systems, bioeffects of electromagnetic fields, and therapeutic and diagnostic uses of bioelectric phenomena. Undergraduates may also participate in research activities in these areas.

Students interested in biomedical engineering may receive elective credit for two semesters of biology if they also complete two bioengineering courses from the ECE offerings. One of these ECE courses can also be used to satisfy course distribution requirements. The basic biomedical engineering option is thus composed of two semesters of biology and two ECE bioengineering courses taken in lieu of electives.

ECE students who wish to complete course requirements for medical (or dental, veterinary, etc.) school should add two semesters of organic chemistry to the ECE biomedical engineering option. Premedical ECE students may petition to have these courses substituted for other electives.

Interested students are urged to contact the departmental biomedical engineering advisor for additional information.

Double-Degree Program with Business

A five-year double-degree program in electrical engineering and business leading to the degrees B.S. (EE) or B.S. (ECE) 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 and Administration about the necessary business courses early in their programs.

Double-Degree Program with Music

A five-year double-degree program in electrical engineering and music leading to the degrees B.S. (EE) or B.S. (ECE) 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)

Semester Hours

Freshman Year

Fall Semester

APPM 1350 Calculus 1 for Engineers	4
CHEM 1211 General Chemistry for Engineers	3
CHEN 1221 General Chemistry Lab for Engineers	2
CSCI 1200 Introduction to Programming 1 (Note 1)	3
Humanities or social science elective (Note 2)	3

Spring Semester

APPM 1360 Calculus 2 for Engineers	4
PHYS 1110 General Physics	4
Freshman elective (Note 3)	3-4
Humanities or social science elective	3

Sophomore Year

Fall Semester

APPM 2360 Introduction to Linear Algebra and Differential Equations (Note 4)	4
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Physics Lab	1
ECEN 2150 Circuits/Electronics 1	4
ECEN 2550 Circuits/Electronics Lab 1	1
Humanities or social science elective	3

Spring Semester
APPM 2350 Calculus 3 for Engineers (Note 4) 4
PHYS 2130 Modern Physics 3
ECEN 2100 Logic Circuits 3
ECEN 2110 Logic Circuits Lab 1
ECEN 2160 Circuits/Electronics 2 4
ECEN 2560 Circuits/Electronics Lab 2 1

Junior Year
Fall Semester
ECEN 3130 Electromagnetic Fields and Waves 3
ECEN 3230 Circuits/Electronics 3 4
ECEN 3530 Circuits/Electronics Lab 3 1
ECEN 3810 Introduction to Probability Theory 3
UWRP 3030 Writing on Science and Society 3
ECEN elective (Note 5) 3

Spring Semester
ECEN 2220 Microcomputer Architecture and Programming 3
ECCN 2230 Microprocessor Lab 1
Engineering science (Note 6) 3-4
ECEN electives 6
Humanities or social science elective 3

Senior Year
Fall Semester
ECEN elective 3
Humanities or social science elective 3
Two senior-level theory courses 6
Senior-level laboratory course 2
Technical elective (Note 7) 3

Spring Semester
Senior-level theory course 3
Two senior-level laboratory courses 4
Humanities or social science electives 3
Technical electives 4-6

Curriculum for B.S. (ECE)

Junior Year
Fall Semester
ECEN 2220 Microcomputer Architecture and Programming 3
ECEN 2230 Microprocessor Lab 1
ECEN 3130 Electromagnetic Fields and Waves 3
ECEN 3810 Introduction to Probability Theory 3
ECEN elective (Note 8) 3
UWRP 3030 Writing on Science and Society 3

Spring Semester
ECEN 3230 Circuits/Electronics 3 4
ECEN 3530 Circuits/Electronics Lab 3 1
CSCI 2250 Data Structures and Algorithms 3
ECEN 4593 Computer Organization 3
ECEN elective 3
Humanities or social science elective 3

Senior Year
Fall Semester
ECEN 4573 Microprocessor Lab *or* ECEN 4603 Computer Lab 2
ECEN 4703 Switching and Finite Automata 3
Technical elective 3
ECEN elective 3
Humanities or social science elective 3
Software elective (Note 9) 3

Spring Semester
CSCI 3245 Survey of Programming Languages 3
Senior-level theory course 3
Senior-level laboratory 2
Humanities or social science elective 3
Technical electives (Note 6) 4-5

Minimum total hours for degree 128

Election of this program will be made during the first semester of the junior year.

Curricula Notes
1. CSCI 1200 (Introduction to Programming 1) is taught in Pascal and may repeat material covered in other courses. If this seems to be the case, students should request a waiver of the course in question from their advisor before or during the first week of the semester in which they are registered for the course.
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 six hours will be accepted for skill courses such as composition, communication skills, or ROTC, with only one course in each area.
3. The freshman elective is chosen from CSCI 1210 (Introduction to Programming 2), ECEN 1400 (Methods and Problems in ECE), or EPOB 1210 and 1220 (General Biology with Laboratory 1).
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. ECEN electives for the EE degree include a minimum of four of the following five courses: ECEN 3140 (Electromagnetic Waves and Transmission), ECEN 3170 (Energy Conversion 1), ECEN 3310 (Linear Systems), ECEN 3320 (Semiconductor Devices), ECEN 4703 (Switching and Finite Automata).
6. The engineering science course should be selected from ECEN 3020 (Statistical Thermodynamics), PHYS 3210 (Analytical Mechanics), ASEN 2013 (Thermodynamics and Heat Transfer), or MCEN 2022 (Engineering Thermodynamics 1).
7. The senior year technical electives provide 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.
8. ECEN electives for the ECE program include a minimum of three of the following four courses: ECEN 3140 (Electromagnetic Waves and Transmission), ECEN 3170 (Energy Conversion 1), ECEN 3310 (Linear Systems), ECEN 3320 (Semiconductor Devices).
9. One of the following four courses must be taken to satisfy the software elective requirement: ECEN 4553 (Introduction to Compiler Construction), ECEN 4583 (Software Systems Development), ECEN 5513 (Real-Time Hardware-Software System Design), or ECEN 5573 (Operating Systems).

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; and 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; commu-nication theory and signal processing; electrical machinery; solid-state, integrated-circuit, and electron devices; energy and power; electronics; control systems, and others.

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 Institute of Standards and Technology 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

A minimum undergraduate grade point average of 3.00 is required for application

to the master's program. Minimum requirements for admission to the Ph.D. program include a 3.40 undergraduate GPA, good GRE scores, and demonstration of research ability. Exceptional students with a B.S. degree can be directly admitted into the Ph.D. 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, CO 80309-0425. Qualified students in their senior year at the University of Colorado 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 may choose either an M.S. thesis option 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 first 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.

Research and Instructional Equipment

The department's 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; a special microscope for laser manipulation of microorganisms, *in vivo;* and a bio-microwave laboratory.

The Department of Electrical and Computer Engineering has a large variety of computing equipment to support its research and instructional activities. This equipment includes several dozen SUN 3 and 4 computers, and 25 HP 9000/300 and 9000/400 series machines. These machines are connected to the campuswide Ethernet network. There are numerous Apple Macintoshes and IBM-compatible PCs.

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 students 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, students 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 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.

In order to earn a bachelor's degree in engineering physics, students 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. Students must also achieve an overall physics course grade point average of at least 2.00.

Curriculum for B.S. (E. Phys.)

Semester Hours

Freshman Year

Fall Semester

APPM 1350 Calculus 1 for Engineers 4
CSCI 1200 Introduction to Programming (Note 1) 3
Humanities or social science electives (Note 2) 6
PHYS 1110 General Physics 1 4

Spring Semester

APPM 1360 Calculus 2 for Engineers 4
Humanities or social science elective (Note 2) 3
PHYS 1120 General Physics 2 4
PHYS 1140 Experimental Physics 1
CSCI 1700 Scientific Programming (Note 1) 3

Sophomore Year

Fall Semester

APPM 2350 Calculus 3 for Engineers 4
Elective (Note 3) 3
PHYS 2140 Methods of Theoretical Physics 3
CHEM 1211 and CHEM 1221 General Chemistry for Engineers and Lab (Note 4) 5

Spring Semester

APPM 2360 Introduction to Linear Algebra and Differential Equations (Note 5) 4
Humanities or social science elective (Note 2) 3
PHYS 2150 Experimental Physics 1
PHYS 2170 Modern Physics 3
Elective (Note 3) 4

Junior Year

Fall Semester

Upper-division mathematics elective (Note 5) 3
PHYS 3210 Analytical Mechanics 3
PHYS 3310 Principles of Electricity and Magnetism 1 3
PHYS 3330 Junior Laboratory 2
CHEM 4511 Physical Chemistry 1 3
Elective (Note 3) 3

Spring Semester

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
CHEM 4541 Physical Chemistry Lab 2
Elective (Note 3) 3

Senior Year

Fall Semester

PHYS 4410 Atomic and Nuclear Physics 1 3
PHYS 4430 Senior Laboratory 2
Electives (Note 3) 8
Humanities or social science elective (Note 2) 3

Spring Semester

PHYS 4420 Atomic and Nuclear Physics 2 3
PHYS 4340 Introduction to Solid State (Note 6) 3
Humanities or social science elective (Note 2) 3
Electives (Note 3) 6

The minimum total hours for the degree is 128. Approved ROTC courses may be substituted for a maximum of 6 hours of electives.

Curriculum Notes

1. MCEN 1025 Computer-Aided Drawing and Fabrication or GEEN 1017 Engineering Drawing or another computer science course may be substituted for either one of CSCI 1200 or 1700.

2. A total of 18 semester hours of humanities or social science courses is required from the following three areas. At least 6 of these semester hours must be at or above the 3000 level. (These requirements apply to students first entering CU in the fall of 1989 and thereafter. Students who attended CU while other requirements for the engineering physics degree were in effect may elect to satisfy those requirements instead.)
   a. **Humanities.** Courses in literature, philosophy, fine arts (critical or historical courses only), music (critical or historical courses only), and all courses listed in the humanities section of the arts and sciences college list, except those under communication disorders and speech science.
   b. **Social Science.** Courses in anthropology, economics, history, political science, psychology, sociology, and all courses listed in the social science section of the 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 also acceptable.
   c. **Language and Communication.** Any reading or conversation course in a language other than the student's native tongue, and any course in expository writing, including those listed under the University Writing Program.
3. Elective engineering courses including at least one upper-division laboratory, but excluding math, physics, computer science, and drafting, must total 19 hours. This total assumes that 6 hours are taken to fulfill the computer science/drafting requirement.
4. CHEM 1111-1131 may replace CHEM 1211-1221-4511-4541.
5. 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 4510, 4530, 4610, 4620, 5010, 5030, 5040, 5150, 5210, 5220, 5250, or 5770.

MECHANICAL ENGINEERING

Bachelor's Degree Requirements

The undergraduate curriculum in mechanical engineering incorporates mathematics, physical science, engineering science, design and manufacturing, systems engineering, and the humanities. Courses in these areas are interwoven throughout the curriculum to provide a balanced education in the fundamentals of the profession and 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
fluid mechanics
industrial engineering
materials science
pre-medicine
solid mechanics
systems engineering
thermal science

Curriculum for B.S. (M.E.)

The following constituted a representative course schedule for freshmen entering the program in the fall of 1991.

Semester Hours

Freshman Year
Fall Semester
Literature elective 3
CHEM 1211 General Chemistry for Engineers 3
CHEN 1221 General Chemistry Laboratory for Engineers 2
APPM 1350 Calculus 1 for Engineers 4
MCEN 1020 Analytical and Computational Tools 3

Spring Semester
Literature elective 3
Humanities or social science elective 3
PHYS 1110 General Physics 1 4
APPM 1360 Calculus 2 for Engineers 4
MCEN 1025 Computer-Aided Drawing and Fabrication 3

Sophomore Year
Fall Semester
Humanities or social science elective 3
PHYS 1120 General Physics 2 4
PHYS 1140 Experimental Physics 1
APPM 2350 Calculus 3 for Engineers 4
MCEN 2023 Mechanics of Particles 3

Spring Semester
Humanities or social science elective 3
PHYS 2130 General Physics 3 3
PHYS 2150 Experimental Physics 1
APPM 2360 Introduction to Linear Algebra and Differential Equations 4
MCEN 2022 Engineering Thermodynamics 1 3
MCEN 2043 Mechanics of Rigid Bodies 3

Junior Year
Fall Semester
Humanities or social science elective 3
UWRP 3030 Writing on Science and Society 3
ECEN 3030 Electronics and Electric Circuits 3
MCEN 3024 Introduction to Materials Science 3
MCEN 3020 Mathematical Methods 3
MCEN 3021 Fluid Mechanics 3

Spring Semester
MCEN 3027 Measurements Laboratory 3
MCEN 3022 Heat Transfer 3
MCEN 3023 Mechanics of Deformable Bodies 3
MCEN 3030 Computational Methods 3
MCEN 3026 Control Systems 3

Senior Year
Fall Semester
MCEN 4025 Component Design 3
MCEN 4026 Manufacturing Processes and Systems 4
MCEN 4027 Mechanical Engineering Laboratory 3
Technical electives 6

Spring Semester
MCEN 4045 Mechanical Design Project 3
MCEN 4065 Design Estimating 3
Technical electives 9

Minimum total hours for degree 128

Graduate Degree Programs

The department offers master of science (M.S.) and doctor of philosophy (Ph.D.) degree programs to students whose career plans include advanced practice, research and development, and/or teaching at the college or university level.

Research activities focus on the three major disciplinary areas of the department: fluid mechanics/thermal sciences, solid mechanics/material sciences, and design and manufacturing. There are three interdisciplinary research centers hosted by the department involving faculty from mechanical engineering and other departments, post-doctoral researchers, and graduate students.

The Center for Combustion Research carries out studies of combustion-related problems. Current research includes projects in the areas of solid and liquid rocket combustion, flame structure, air pollution chemistry, hazardous waste treatment, and flame-synthesized materials processing.

The Center for Acoustics, Mechanics, and Materials focuses its studies on problems relating to the mechanical and dynamic behavior of materials and material processing. Current research includes a variety of studies relating to non-destructive evaluation of composite materials,

development of air-coupled ultrasonic acoustic microscopy methods, seismic wave propagation, fluid-structure interactions, and ceramic, polymeric, and biological materials.

The Center for Electronics Manufacturing is concerned with the development of manufacturing science and technology. Projects include electronic fabrication, electronic packaging, economy of scale for manufacturing systems, economic models for manufacturing, and computer-aided design of mechanisms.

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 must complete a minimum of 21 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 must complete 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 decide what course of study best meets their academic objectives.

A student pursuing the Ph.D. in mechanical engineering must complete 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 21 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:

computational mechanics
design
engineering analysis
fluid mechanics
manufacturing
materials science
solid mechanics
thermal 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 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.

TELECOMMUNICATIONS

This interdisciplinary graduate program offers a master of engineering or master of science degree to students from a wide variety of undergraduate backgrounds. Both degree programs ensure that students obtain an understanding of the latest aspects of technology as well as social, political, and business applications in the expanding field of telecommunications. This understanding is gained through course work, research, and laboratory studies.

For information about this program and its offerings, please see the Interdisciplinary Programs listing under the Graduate School section of this catalog.

COURSE DESCRIPTIONS

The following courses are offered in the College of Engineering and Applied Science 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 current information on times, days, and instructors of courses, 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.

Courses are organized by subject matter within each department, and are listed numerically *by last digit* (courses ending in the number "0" are listed before courses ending in "1," and so on). The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:

Prereq.—Prerequisite
Coreq.—Corequisite
Lab—Laboratory
Rec.—Recitation
Lect.—Lecture

Aerospace Engineering Sciences

Space Sciences and Mechanics

ASEN 1020-2. 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 the exploration of space. For freshmen in engineering.

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 3060-3. Introduction to Space Experimentation. Provides a systems perspective of space exploration for students in all disciplines. Surveys scientific and technical research that can be accomplished from space and the engineering principles and tools needed to make that research possible. Prereq., one semester of calculus (MATH 1080, 1090, and 1100; MATH 1300; or APPM 1350) and one year of physics (PHYS 2010-2020 or PHYS 1110-1120). Same as APAS 3060.

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 5010-3. Spacecraft Attitude Dynamics.1 Studies the rotational motion of spacecrafts, including attitude parameters and spacecraft torques. Euler equations are applied to the attitude motions of simple spacecrafts and their stability. Prereq., ASEN 3010 or equivalent.

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 instructor consent.

ASEN 5060-3. Satellite Geodesy. Earth-based and space-based tracking of artificial satellites provides a unique and valuable approach to the study of the Earth's gravitational field and rotational characteristics. Develops and applies the basic techniques for studying the physical earth in this evolving field. Prereq., ASEN 3010.

ASEN 5070-3, 5080-3. Introduction to Statistical Orbit Determination 1 and 2. Develops the theory of batch and sequential (Kalman) filtering, including a review of necessary concepts of probability and statistics. Course work includes a term project that allows students to apply classroom theory to an actual satellite orbit determination problem.

ASEN 5100-3. Atmospheric Entry. Covers 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 or ASEN 5050, or instructor consent.

ASEN 6210-1. Remote Sensing Seminar. Faculty, students, and invited speakers cover subjects pertinent to remote sensing of the Earth. Covers oceanography, meteorology, vegetation monitoring, and geology. Emphasizes techniques for extracting geophysical information from satellite data. Prereq., graduate standing.

ASEN 6220-3. Topics in Remote Sensing. Covers infrared and microwave techniques for remote sensing, emphasizing oceanographic applications, fundamentals of electromagnetic radiation, remote sensing instrumentation (radars and radiometers), and conversion of sensory data to geophysical parameters, including sea surface topography, temperature, and atmospheric moisture. Prereq., graduate standing and instructor consent.

ASEN 6060-3. Advanced Space Flight Dynamics. Topics include perturbations of orbital motion; 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. Prereq., ASEN 5050 or instructor consent.

ASEN 6950-variable credit. Master's Thesis.

ASEN 8990 (16 to 24 maximum). Doctoral Thesis

Fluid Mechanics

ASEN 1011-3. 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 3011-3. Fluid Dynamics 1. Elementary theoretical approach to problems of fluid mechanics. Includes statics theorem, stream function, velocity potential, and the Laplace equation. Prereqs., 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 instructor consent.

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 instructor consent.

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., instructor consent.

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 instructor consent.

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., gtaduate standing or instructor consent.

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 instructor consent.

ASEN 5091-3. Quantum Fluid Dynamics. Two-fluid model, macroscopic quantum phenomena, analogies with superconductivity and electromagnetism, phenomenological theory, microscopic theory, and remaining puzzles. Prereq., instructor consent.

ASEN 6031-3. Advanced Compressible Flow. Advanced topics in dynamics and thermodynamics of compressible fluid flow. Prereq., ASEN 5031.

Materials and Structures

ASEN 2022-3. Materials Science and Engineering. Applications of the principles of physics, chemistry, and thermodynamics to the understanding of relationships between atomic structures engineering processes, and engineering properties of materials and to 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.

ASEN 5122-3. Control of Aerospace Structures 1. Introduces the basic problems in dynamic modeling and active control of large spacecraft and satellites. Includes system descriptions, model reduction, controller design, and closed-loop stability analysis. Prereq., ASEN 3014, graduate standing, or instructor consent.

ASEN 5212-3. Composite Structures and Materials. Develops the macromechanical and micromechanical theory of the elastic behavior and failure of composite laminates. Applies basic theory to a broad range of practical problems including the buckling and vibration of composite plates, columns, and shells. Prereq., senior standing in aerospace or mechanical engineering, or instructor consent.

Thermodynamics and Propulsion

ASEN 2013-3. Thermodynamics. Introduces 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. 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 4403-3. Space Power Thermohydraulics. The design of space power systems requires in-depth knowledge of low-gravity fluid mechanics and heat transport phenomena. Course gives an introduction to thermal-hydraulic aspects, related low-graviry fluid dynamics, and current scien-

tific issues. Prereq., ASEN 2013 and ASEN 3021. Same as ASEN 5403.

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 instructor consent.

ASEN 5053-3. Rocket Propulsion. Presents in depth the theory, analysis, and design of rocket propulsion systems. Emphasizes liquid and solid propellant systems with an introduction to advanced propulsion concepts. Reviews nozzle and fluid flow relationships. Prereq., senior standing in aerospace or mechanical engineering or instructor consent.

ASEN 5403-3. Space Power Thermo-hydraulics. Same as ASEN 4403.

Systems and 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 4034-3. Stochastic Methods for Systems Engineering. Covers development of stochastic models used in aerospace and other systems engineering and optimization problems. Reviews probability theory, stochastic models used in decision theory, random processes, queueing theory, information theory, reliability, and quality control. Computer solutions required. Prereq., APPM 3570. Same as ASEN 5034.

ASEN 4054-3. Operations Research Models for Systems Engineering. Covers the mathematical methods of operations research applicable to systems engineering. Topics include classical optimization methods, linear, dynamic, and non-linear programming, game theory, network models, production and inventory control, forecasting and time series, and simulation models. Computer solutions required. Prereq., APPM 2360. Same as ASEN 5054.

ASEN 5014-3. Linear Control Design—Systems Analysis 3. Continuation of ASEN 3024. 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. Introduces nonlinear systems; generalized Lagrangian mechanics; Liapunov methods, calculus of variations; Pontryagin methods, and general optimal control; Hamilton-Jacobi optimization, Kalman equation. Prereq., ASEN 5014.

ASEN 5034-3. Stochastic Methods for Systems Engineering. Same as ASEN 4034.

ASEN 5054-3. Operations Research Models for Systems Engineering. Same as ASEN 4054.

Geophysical and Environmental

ASEN 4215-3. Oceanography. Fundamentals of biological, physical, and dynamic oceanography. Influence of the sea on worldwide weather and ecology. Prereq., ASEN 3021. Same as ASEN 5215.

ASEN 4255-3. Environmental Aerodynamics. Reviews the properties and causes of hazards posed by the environment, ranging from atmospheric wind shear to tornadic flows. Involves a multi-disciplinary approach; combining analytical, numerical, and scale modeling studies with extensive field measurements, wind energy, and biophysical aerodynamics. Prereq., senior standing in aerospace engineering. Same as ASEN 5255.

ASEN 5215-3. Oceanography. Same as ASEN 4215.

ASEN 5255-3. Environmental Aerodynamics. Same as ASEN 4255.

Bioengineering

ASEN 3116-3. Bioengineering. Human response to environment and physical stimuli. Use of engineering and physical principles in the study of human dynamics. Prereqs., MCDB 1050, PHYS 2130, and ASEN 2013, or instructor consent.

ASEN 4216-3. Neural Signals. Analyzes information processing in the brain and peripheral nervous system in terms of fundamental signaling processes that occur at the neuronal level. Examines biophysical bases for these processes, neural impulse generation, synaptic communication, and sensory reception of molecular and membrane mechanisms. Prereq., instructor consent. Same as ASEN 5216, ECEN 4811, ECEN 5811.

ASEN 4426-3. Neural Systems. Surveys behavioral, neurophysiological, and biochemical controls manifested by the central nervous system. Provides biological background material for application of formal control theory. Prereq., ASEN 3116 or instructor consent. Same as ASEN 5426, ECEN 4821, and ECEN 5821.

ASEN 4436-3. Brains, Minds, and Computers. Introductory, integrative survey of brain science, cognitive science, artificial intelligence, and their interrelations. Considers central concepts and principles from each of these areas and the similarities and differences of brains, minds, computers, and robots. Prereq., ECEN 2160, 3030, or instructor consent. Same as ASEN 5436, ECEN 4831, and ECEN 5831.

ASEN 4446-3. Engineering Mechanics of the Nervous System. Points towards a Newtonian foundation for the electrical activities of the nervous system. Studies engineering principles of its operations with computer simulation, including neurons, neural networks, and neural systems. Students do engineering modeling and computer simulation. Prereq., CSCI 1700 and instructor consent. Same as ASEN 5446.

ASEN 5116-3. Lunar Closed Life Support Systems. Develops the design of a closed ecological life support system for a lunar base. Evaluates biological and physicochemical systems in order to develop a cost-efficient system design. Emphasizes technical trades and integration challenges. Prereq., ASEN 3116 and ASEN 4158 or ASEN 5158.

ASEN 5216-3. Neural Signals. Same as ASEN 4216, ECEN 4811, and ECEN 5811.

ASEN 5426-3. Neural Systems. Same as ASEN 4426, ECEN 4821, and ECEN 5821.

ASEN 5436-3. Brains, Minds, and Computers. Same as ASEN 4436, ECEN 4831, and ECEN 5831.

ASEN 5446-3. Engineering Mechanics of the Nervous System. Same as ASEN 4446.

ASEN 5466-3. Membrane Transport: Biological and Artificial. 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 3116 or instructor consent.

ASEN 5506-3. Bioengineering Seminar. Focuses on active research areas in medical and space endeavors. Topics range from systematic to molecular concerns. In-depth analysis of ongoing research is expected. Emphasizes biophysical mechanisms, comprehensive empirical models, and unresolved research problems. Prereqs., ASEN 3116; ASEN 4216 or 5216 or ECEN 4811 or 5811; and ASEN 4426 or 5426 or ECEN 4831 or 5831.

Computational and Analytic Methods

ASEN 4307-3. Engineering Data Analysis Methods. Gives students broad exposure to a variety of traditional and modern statistical methods for filtering and analyzing data. Introduces these methods and provides practical experience with their use. Students carry out problem assignments. Prereq., APPM 2360. Same as ASEN 5307.

ASEN 4317-3. 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 4417-3. Numerical Computation. Provides computational skills for advanced courses in scientific computation. Includes an introduction to UNIX and shell programming, interpolation, spectral methods, least squares, linear systems, and ordinary and partial differential equations. Prereq., APPM 2360 and instructor consent. Same as ASEN 5417.

ASEN 5007-3. Introduction to Linear Finite Elements. Introduces finite element methods used for solving linear problems in structural and continuum mechanics. Covers modeling, mathematical formulation, and computer implementation. Prereq., matrix algebra.

ASEN 5017-3. Advanced Numerical Analysis for Computational Mechanics. Offers within reasonable limits a complete description and analysis of the state-of-the-art numerical sparse methods used in computational mechanics. Covers implementation of these methods on currently available supercomputers. Prereq., MATH 3130 or instructor consent.

ASEN 5037-3. Turbulent Flow Computation. Studies turbulent closure methods and computational procedures used to solve practical turbulent flows. Emphasizes multi-equation models used with time-averaged equations to calculate free-turbulent shear-flows and turbulent boundary layers. Spectral methods are employed in direct and large-eddy simulation of turbulence. Prereq., ASEN 5051 or equivalent.

ASEN 5107-3. Nonlinear Finite Element Methods. A continuation of ASEN 5007. Covers the formulation and numerical solution of nonlinear static structural problems by finite element methods. Emphasizes the treatment of geometric nonlinearities and structural srability. Prereq., ASEN 5007.

ASEN 5307-3. Engineering Data Analysis Methods. Same as ASEN 4307.

ASEN 5317-3. Computational Fluid Mechanics. Similar to ASEN 4317 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 instructor consent.

ASEN 5327-3. Advanced Computational Fluid Mechanics. Continuation of ASEN 4317 and 5317. Introduces advanced computational methods for solving fluid mechanics problems on the computer, emphasizing nonlinear flow phenomena. Prereqs., ASEN 4317 or ASEN 5317 or instructor consent.

ASEN 5347-3. Mathematical Methods in Dynamics. Two-part graduate-level course on dynamics. Covers both flexible and rigid multibody analytical dynamics and finite element method for dynamics. Emphasizes formulations that naturally lead to easy computer implementation and stability, linearization, and modern rotational kinematics. Prereq., graduate standing and instructor consent.

ASEN 5367-3. Advanced Finite Element Methods. Continuation of ASEN 5007. Covers more advanced applications to linear static problems in structural mechanics, including three-dimensional finite elements, advanced variational principles, beams, plates, and shells. Prereqs., ASEN 5007 or equivalent, MCEN 5120 and 5130, or equivalent.

ASEN 5417-3. Numerical Computation. Same as ASEN 4417.

ASEN 5517-3. Computational Methods in Dynamics. Continuation of ASEN 5347. Covers numerical algorithms, computer implementation aspects, and treatment of constraints and nonlinear rotational computational techniques. Emphasizes the combined numerical and physics characterization for the solution of dynamical systems. Prereq., ASEN 5347.

Design

ASEN 3028-3. Flight Mechanics. Airfoil design, performance of propeller-driven and jet-driven aircraft, static stability and control, design tradeoffs of stability and control, and maneuvering flight. Prereq., ASEN 3011; coreq., ASEN 3021.

ASEN 4018-3. Senior Design Laboratory 1. One lab and one rec. per week. Fundamental measurements in experimental study of aeronautics and astronautics. Prereq., senior standing.

ASEN 4028-3. Senior Design Laboratory 2. One lab and one rec. per week. Fundamental measurements in experimental study of aeronautics and astronautics, including technical report writing. Prereq., ASEN 4018.

ASEN 4098-3. System Engineering and Design. Discusses the design, analysis, and technical management aspects of system engineering, and focuses on applying the design techniques taught in student design projects. Designed to prepare students for the leadership of multidisciplinary engineering projects. Prereq., senior or graduate standing in aerospace engineering, or instructor consent. Same as ASEN 5098.

ASEN 4138-3. Aircraft Design. One rec. and two labs per week. Principles of aircraft layout to meet a given specification, taking accounr of both aerodynamic and structural considerations. Design of major elements of an aircraft. Prereq., ASEN 3028.

ASEN 4148-3. Spacecraft Design. Systems approach to the design of an unmanned spacecraft, including guest lectures from specialists in each of the disciplines that make up a spacecraft design team. Topics include mission design, payload, launch systems, tracking and data systems, communications, structures, guidance, and control. Prereq., instructor consent. Same as ASEN 5148.

ASEN 4158 (3-6). Space Habitation. Advanced design course conducted by the department in conjunction with the NASA-University Advanced Space Mission Design program. Centered on design of a geosynchronous space station. The NASA-Ames Research Center sponsors the University of Colorado. Prereq., instructor consent. Same as ASEN 5158.

ASEN 4178-3. Remote Sensing System Design. Involves the use of both instrument systems and software systems for data collection and analysis. Systems are studied and students carry out projects to assess, evaluate, and utilize design concepts and facilities. Prereqs., CSCI 1700, ASEN 3014, and ASEN 3024. Same as ASEN 5178.

ASEN 4238-3. Computer-Aided Control Systems Design. Covers software and multivariable control system synthesis and analysis techniques for typical aircraft and spacecraft control problems. Control problems are formulated and control functions are synthesized using pole placement and linear quadratic techniques. Prereq., ASEN 3024.

ASEN 4338-3. Structures Computer Laboratory. Covers basic structural design concepts and finite element modeling techniques. Emphasizes use of finite element static and dynamic analysis to validate and refine an initial design. Introduces basic design optimization and tailoring. Prereq., ASEN 3022.

ASEN 4418-3. Design of Aerospace Structural Components. Covers the basic fundamentals for designing built-up aerospace structural components such as wing boxes and cylinders. Presents analytical tools and assumptions as well as the methodology for conducting trade studies to arrive at an acceptable design. Prereq., senior standing.

ASEN 5098-3. System Engineering and Design. Same as ASEN 4098.

ASEN 5148-3. Spacecraft Design. Same as ASEN 4148.

ASEN 5158 (3-6). Space Habitation. Same as ASEN 4158.**ASEN 5168-3. 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.

ASEN 5178-3. Remote Sensing System Design. Same as ASEN 4178.

ASEN 5218-3. Design of Large Space Structures. Develops the necessary structural analysis for conducting conceptual and preliminary designs of large space structures. Analyses are applied to a broad range of space missions requiring large space structures with an emphasis on achieving low-cost, practical designs. Prereq., senior standing in aerospace or mechanical engineering, or instructor consent.

Specialized Topics

ASEN 2519-3. 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 3519-3. Special Topics. Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter ar the upper-division level. Course conrent is indicated in the *Schedule of Courses.* Prereq. varies.

ASEN 4519-3. 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 4849 (1-6). Independent Study.ASEN 4859 (1-6). Undergraduate Research. Assignment of a research problem on an individual basis.

ASEN 4869 (1-3). Independent Study—Center for Space Construction. Examines the various design concepts of a base on the moon and designs the construction process and techniques for the base. Same as ASEN 5869.

ASEN 5519-3. Selected Topics. Treatment of specialized aspects of aerospace engineering sciences by staff or visiting lecturers. Course content indicated in the *Schedule of Courses.* Prereq. varies.

ASEN 5849 (1-6). Independent Study. Study of special projects.

ASEN 6519-3. Special Topics. Treatment of specialized aspects of aerospace engineering sciences by staff or visiting lecturers. Course content indicated in the *Schedule of Courses.* Prereq. varies.

ASEN 6849 (1-6). Independent Study. Study of special projects agreed upon by student and instructor.

ASEN 5869 (1-3). Independent Study—Center for Space Construction. Same as ASEN 4869.

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 modules (MATH 1000-1040).

APPM 1360-4. Calculus 2 for Engineers. Continuation of APPM 1350. Applications of the definite integral, methods of integration, improper integrals, Taylor's theorem, and infinite series. Prereq., APPM 1350 or MATH 1300.

APPM 2350-4. Calculus 3 for Engineers. Covers multivariable calculus, vector analysis, and theorems of Gauss, Green, and Stokes. Prereqs., APPM 1360, 1380, or MATH 2300.

APPM 2360-4. Introduction to Linear Algebra and Differential Equations. Introduces ordinary differential equations, systems of linear equations, matrices, determinants, vector spaces, linear transformations, and systems of linear differential equations. No credit is awarded to students already having credit in both MATH 3130 and 4430 or APPM 2380. Prereq., APPM 2350.

APPM 2380-4. Introduction to Ordinary Differential Equations. Basic concepts of ordinary differential equations. Solutions of first order, linear, and systems of differential equations. Advanced topics including series solutions and boundary value problems. Studies numerical techniques with some laboratory experience. Prereq., APPM 2350 or MATH 2400. No credit for students having credit for APPM 2360.

APPM 3170-3. Discrete Applied Mathematics. Introduces discrete structures, their representations, and applications. Emphasizes applications of graph theory to fields such as computer science, engineering, operations research, social sciences, and biology. Prereq. or coreq., APPM 3310. Same as MATH 3170.

APPM 3310-3. Matrix Methods and Applications. Introduces linear algebra and matrices, emphasizing applications. Includes methods of solving systems of linear algebra and linear ordinary differential equations. Discusses computational algorithms to implement these methods. Some applications in operations research may be included as time permits. Students may not receive credit for both MATH 3130 and APPM 3310. Prereqs., APPM 2350 or MATH 2400, and APPM 2360 or 2380.

APPM 3570-3. Applied Probability and Statistics. Introduces concepts in probability, including combinatorics and some common probability distributions (binomial, Poisson, normal, etc.). Introduces statistical inference, organization of statistical data, sampling, testing hypotheses, linear regression, and analysis of variance. Students may not receive credit for both APPM 3570 and MATH 2510 or MATH 4570. Prereq., APPM 2350 or MATH 2400.

APPM 4350-3. Methods in Applied Mathematics 1. Reviews ordinary differential equations, including solutions by series. Physical derivation of the classical linear partial differential equations (heat, wave, and Laplace equations). Solution of these equations via separation of variables, with Fourier series, Fourier integrals, and more general eigenfunction expansions. Prereqs., APPM 1350, 1360, 2350, and 2360 or 2380.

APPM 4360-3. Methods in Applied Mathematics 2. Introduces methods of complex variables. Contour integration and theory of residues. Application to solving partial differential equations by transform methods; Fourier and Laplace transforms; Reimann-Hilbert boundary-value problems. Conformal mapping with application to ideal fluid flow and/or electrostatics. Prereq., APPM 4350 or instructor consent.

APPM 4380-3. Modeling in Applied Mathematics. Exposition of a variety of mathematical models arising in the physical and biological sciences. Models may be taken from applications in classical and celestial mechanics, fluid dynamics, traffic flow, population dynamics, economics, and elsewhere. Prereqs., APPM 4350 and PHYS 1120.

APPM 4520-3. Introduction to Mathematical Statistics. Point and confidence interval estimation. Principles of maximum likelihood, sufficiency, and completeness; test of simple and composite hypothesis, linear models, and multiple regression analysis. Analysis of variance distribution-free methods. Prereq., MATH 4510. Same as MATH 5520.

APPM 4560-3. Introduction to Stochastic Population Models. Study of mathematical models used in demography, epidemic theory, statistical genetics, and mathematical ecology, and their strengths and limitations. Surveys mathematical techniques used in these applications. Prereqs., one year of calculus and a course in probability and/or statistics.

APPM 4570-3. Statistical Methods. Covers discrete and continuous probability laws, random variables; expectation; laws of large numbers and central limit theorem; estimation, testing hypotheses, analysis of variance, regression analysis, and nonparametric methods. Emphasizes applications with an introduction to packaged computer programs. Credit cannot be received in both MATH 2510 and 4570/5570. Prereq., Calculus 2.

APPM 4650-3. Intermediate Numerical Analysis 1. Numerical solution of nonlinear equations; interpolation; methods in numerical integration; numerical solution of linear systems and matrix eigenvalue problems. Stresses significant computer applications and software. Prereq., APPM 2350 or MATH 2400; APPM 3100 or MATH 3130; and a background in computing. Same as MATH 4650.

APPM 4660-3. Intermediate Numerical Analysis 2. Continuation of APPM 4650. Numerical solution of initial-value problems, and two-point boundary-value methods for ordinary differential equations. Numerical methods for solving partial differential equations. Prereq., APPM 4650. Same as MATH 4660.

APPM 4840 (1-3). Independent Study. Introduces undergraduate students to the research focuses of the program in applied mathematics. Prereqs., APPM 1350, 1360, 2350, 2360, and either APPM 3310 or MATH 3130. Recommended prereqs., a course in ordinary or partial differential equations and APPM 4650.

APPM 4955-3. Undergraduate Seminar in Applied Mathematics. Introduces undergraduates to applied mathematical topics and strategies for research. A maximum of 6 hours of seminar work is allowed toward the degree in applied mathematics. Prereqs., three semesters of calculus, APPM 2360 or an upper-division applied mathematics course, and instructor consent.

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, photovoltaics, and storage systems. Material is applied to the long-term performance analysis of space and water heating and solar electric systems. Prereq., PHYS 1110.

AREN 2020-3. Energy Fundamentals. Lect. Presents basic principles of heat transfer and thermodynamics, emphasizing building energy applications. Prereq., PHYS 1110. Coreq. (or prereq.), APPM 2360.

AREN 3010-3. Building Energy Analysis and Design. Lect. Psychrometrics, thermal comfort, building heating and cooling loads, fluid flow basics, HVAC components and systems. Prereq., AREN 2020.

AREN 3030-3. Building Energy Laboratory. Two lect., one 3-hour lab per week. Laboratory course on mechanical systems in buildings, with focus on building applications of thermodynamics, fluid dynamics, and heat transfer. Applications include solar collectors, pumps, fans, heat exchangers, and air conditioning and refrigeration systems. Prereq., AREN 3010.

AREN 3040-3. Illumination Laboratory. Two lect., one 3-hour lab per week. Introduces the measurement of photometric and psychophysical quantities used in lighting. Experience is acquired in using light measurement instruments to evaluate lighting equipment and luminous environments.

AREN 3050-3. Environmental Systems for Buildings 1. Introduces 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.

AREN 3060-3. Environmental Systems for Buildings 2. Introduces 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.

AREN 3540-3. Illumination 1. Lect. Studies the fundamentals of architectural illumination. Introduces and applied basic principles and

vocabulary to elementary problems in the lighting of environments for the performance of visual work and the proper interaction with architecture.

AREN 3630-3. Introduction to Acoustics and Noise. 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. Prereqs., PHYS 1120 and junior standing, or instructor consent. Same as ASEN 3016.

AREN 4010-3. Solar Design for Buildings. Lect. 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. Prereq., AREN 2010.

AREN 4110-3. HVAC Design 1. Lect. Design of heating, ventilating, and air conditioning (HVAC) systems for buildings. Covers HVAC systems description, load estimating, code compliance, duct design, fan systems, applied psychrometrics, cooling and heating coils, filters, hydronic systems, piping, and pumps. Prereq., AREN 3010. Same as CVEN 5110.

AREN 4550-3. Illumination 2. Lect. Application of the principles studied in Illumination 1. Provides further study in architectural lighting design methods. Uses lighting studio work to develop a broad knowledge of lighting equipment, design methods, and their application in a series of practical design problems in modern buildings. This is one of several "capstone" courses available to architectural engineering students.

AREN 4560-3. Luminous Radiative Transfer. Lect. Fundamentals of radiative exchange as applied to illumination engineering. Describes and uses principal numerical techniques for radiative transfer analysis. Applies techniques to lighting design and analysis.

AREN 4570-3. Building Electrical Systems Design 1. Lect. Introduces the generation and control of electrical power. Focuses on understanding the loads, control, and protection of secondary electrical distribution systems in building. Applies the national electric code.

AREN 4580-3. Daylighting. Lect. Studies design process and lighting calculation techniques for the synthesis and analysis of daylighting in modern buildings. Covers integration with electric lighting and other building subsystems. Prereq., AREN 4560.

AREN 4590-3. Computer Applications in Lighting. Lect. Study of the numerical methods required for advance calculations in architectural lighting design and analysis. Practice in their implementation in computer programs and use in the lighting design process.

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. For non-engineering students; does not apply toward an engineering degree. Prereq., senior standing or instructor consent.

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. For non-engineering students; does not apply toward an engineering degree. Prereq., AREN 4035.

AREN 4315-2. Design of Masonry Structures. Lect. Covers modern masonry construction; properties and behavior of the reinforced masonry component materials, clay and concrete masonry units, mortar, grout, and steel reinforcement; vertical and lateral load types and intensities; design of reinforced masonry walls, beams, and columns by working stress and strength design methods.

Construction

AREN 1306-3. Introduction to Architectural Engineering. Lect. Surveys the broad subject of civil and architectural engineering and professional practice, emphasizing study of construction methods including foundations, structural systems, building materials, and systems applications in building construction. Same as CVEN 1306.

AREN 2406-3. Introduction to Building Construction. Lect. Surveys 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. May not be taken by upper-division students.

AREN 4416-3. Construction Costs, Estimating, and Prices. Lect. Introduces building construction costs accounting and controls, analysis of direct and indirect cost fundamentals and collecting systems, methods engineering and value engineering. Includes a study of types of estimates, quantity take-off techniques and pricing applications, and preparation of a detailed estimate for a building project including all cost analyses, a complete quantity survey, development of unit prices, and final assembly of the bid proposal. Prereq., senior standing or instructor consent.

AREN 4466-3. Construction Planning and Scheduling. Lect. 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. Prereqs., AREN 4416 or equivalent and senior standing, or instructor consent.

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). Inde-pendent Study. Students may also consult the Department of Civil, Environmental, and Architectural Engineering for courses applicable to the architectural engineering program.

Chemical Engineering

CHEN 1000-3. Creative Technology. Lect. Introduces undergraduate arts and sciences students to the most recent concepts in technology and how these concepts impact all aspects of life, such as health, the health of the planet, and social structures. Approved for arts and sciences core curriculum: natural science. Engineering students should consult an advisor before registering for this course.

CHEN 1300-1.Introduction to Chemical Engineering. Introduces facets of chemical engineering including history of the profession, chemical engineering curriculum, industries in which chemical engineers practice, and industrial chemistry. Students participate in design experiences, visit industry, meet faculty and practicing professionals, and develop a goals statement.

CHEN 2010-3. Probability and Statistics for Chemical Engineers. Use of probability models and statistical methods for analyzing data is common in chemical engineering. Course provides a comprehensive introduction to those models and methods by applying them to typical problems. Prereq., GEEN 1300 or equivalent.

CHEN 2120-3. Chemical Engineering Material and Energy Balances. Lect. Introduces quantitative aspects of chemical engineering. Concepts of material and energy balances with and without chemical reactions. Prereqs., CHEM 1211, 1131, or 1171 or equivalent, and GEEN 1300.

CHEN 2800-3. Biophysics of High-Altitude Physiology. Examines the many physiological problems encountered by humans living or traveling in high altitudes, such as problems caused by the body's inability to cope with low oxygen concentration, including respiration, blood circulation, oxygen uptake, and other physiological effects.

CHEN 2840 through 2850 (1-3). Independent Study. Available to sophomores with approval of the Department of Chemical Engineering. Subject arranged to fit needs of the student.

CHEN 3200-3. Chemical Engineering Principles 1. Lect. Introduces fluid mechanics and momentum transfer, emphasizing 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 theory and application of 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 mechanisms of mass transfer, including molecular diffusion, eddy diffusion, and convective mass transfer. Application of mass transfer theory to the design

of chemical equipment. Prereqs., CHEN 3200 and 3210.

CHEN 3320-3. Chemical Engineering Thermodynamics. Lect. Thermodynamic principles applied to nonideal systems, phase equilibrium, chemical equilibrium, power generation, refrigeration, and chemical processes. Prereq., CHEM 4511.

CHEN 3700-3. Bioenergetics: Structure and Function. Rec. Introduces molecular biophysics dealing principally with questions related to energy conversion as related to the structure and function of biological macromolecules and organisms. Concludes by considering a variety of biological systems that interface between the physical and engineering sciences. Prereqs., one year of college chemistry and one year of college biology (MCDB or EPOB).

CHEN 3840 through 3850 (1-3). Independent Study. Available to juniors with approval of the Department of Chemical Engineering. Subject arranged to fit needs of the student.

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 technical reports. Prereqs., CHEN 3210 and 3220.

CHEN 4330-3. Chemical Engineering Reaction Kinetics. Lect. Introduces chemical kinetics and chemical reactor design. Mass and energy balances for steady-state and transient reactor systems. Examination of design considerations involved in heterogeneous catalysis and with mass transfer in catalytic reactors. Prereqs., CHEN 2010, 3210, and 3320.

CHEN 4390-3. Chemical Reactor Engineering. Same as CHEN 5390. Prereqs., CHEN 4330 and instructor consent.

CHEN 4440-3. Chemical Engineering Materials. Lect. Introduces materials engineering, including properties of polymers, metals, ceramics, and semiconductors, especially as related to chemical engineering processes. Emphasizes chemical stability and corrosion resistance. Prereqs., CHEM 3311, 4511, 5331, and CHEN 3320.

CHEN 4520-4. Chemical Process Synthesis. Three lect., one rec. or calculation session 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. Same as CHEN 5950.

CHEN 4570-3. Instrumentation and Process Control. Lect. Principles of operation and applications of industrial instruments. Process control sysrem synthesis, design, and implementation. Prereq., ECEN 3030.

CHEN 4580-3. Numerical Methods for Process Simulation. Develops skills necessary to efficiently perform process modeling and computer simulations of chemical, physical, and biological processes. Develops numerical methods needed to perform high speed machine computation. Prereqs., CHEN 3220 or equivalent. Same as CHEN 5750.

CHEN 4660-3. Cryogenic Engineering. Lect. Investigation of modern cryogenic systems and processes involving mechanical, thermodynamic, heat, and mass transfer considerations. Provides design aspects of refrigeration, liquefaction, separation, and purification processes. Covers equipment, instrumentation and storage systems. Emphasizes safety aspects in cryogenic processing. Prereq., undergraduate thermodynamics, fluid mechanics, and heat transfer. Same as CHEN 5660.

CHEN 4710-3. Molecular Basis of Biological Behavior. Lect. Problems approach to neurobiology. Covers molecular biology, genetics, biochemistry, and physiology of model behavioral systems from chemotaxis in bacteria to vision in vertebrates to the brain. Prereqs., CHEN 3700 and CHEN 4800 or 5800, or instructor consent. Same as CHEN 5710.

CHEN 4800-3. Recent Advances in Biotechnology. Lect. and lab. Reviews the recent developments in the fields of microbiology, molecular genetics, and genetic engineering which are of commercial value and benefit to mankind. Covers engineering implementation of such biological processes. Prereq., senior or graduate standing in engineering or science, or instructor consent. Same as CHEN 5800.

CHEN 4820-3. Biochemical Separations. Lect. and lab. Purification methods, mass transfer, coefficients, problems specific to biologicals, and scale-up processes. Discusses chromatography, phase extraction, supercritical fluids, sedimentation, precipitation, electrophoresis, dialysis, affinity techniques, cell separation, application of separations to bioreactors, and comparison of continuous and batch processes. Prereqs., unit operations and elementary transport phenomena. Same as CHEN 5820.

CHEN 4840 through 4850 (1-3). Independent Study. Available to seniors with approval of Chemical Engineering Department. Subject arranged to fit needs of the student.

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 fluid mechanics and heat transfer, 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 instructor consent.

CHEN 5280-3. Statistical Thermodynamics. Same as MCEN 5142.

CHEN 5360-3. Catalysis and Kinetics. Study of principles of chemical kinetics and catalytic reactions, emphasizing heterogeneous catalysis. Coreq., CHEN 4330, or prereqs., CHEM 4551 and instructor consent, or graduate standing in CHEN or CHEM.

CHEN 5370-3. Intermediate Chemical Engineering Thermodynamics. Review of 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 3320 or equivalent).

CHEN 5380-3. Macroscopic Thermodynamics. Same as MCEN 5122.

CHEN 5390-3. Chemical Reactor Engineering. Advanced study of ideal and nonideal chemical reactors, including unsteady state behavior, mixing effects, reactor stability, residence time distribution, and modeling of nonideal reactors. Additional topics include fluidized beds and diffusion in porous catalysts. Same as CHEN 4390.

CHEN 5420-3. Physical Chemistry and Fluid Mechanics of Interfaces. Covers rhermodynamics 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. 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 3570 or ECEN 4138.

CHEN 5580-3. Optimal Control and Identification for Industrial Processes. Develops optimal control and identification theory using the calculus of variations and Pontryagin's minimum principle. Stresses applications in process situations including chemical, biochemical energy, and micro-electronic industries. Prereq., senior or graduate standing.

CHEN 5660-3. Cryogenic Engineering. Same as CHEN 4660, except that special term report is required.

CHEN 5690-3. Industrial Pollution Control. 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 instructor consent.

CHEN 5710-3. Molecular Basis of Biological Behavior. Same as CHEN 4710, except that students are expected to participate in an independent research project.

CHEN 5740-3. Analytical Methods in Chemical Engineering. Presents applied analytical mathematical methods 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 instructor consent.

CHEN 5750-3. Numerical Methods for Process Simulation. Prereqs., graduate standing or instructor consent. Same as CHEN 4580, except that major report is required.

CHEN 5760-3. Engineering Aspects of Animal Locomotion. 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 instructor consent.

CHEN 5800-3. Recent Advances in Biotechnology. Same as CHEN 4800, except that a major term report is required.

CHEN 5820-3. Biochemical Separations. Same as CHEN 4820, except that reports and extra reading are required.

CHEN 5840 through 5850 (1-3). Independent Study. Available to M.S. students.

CHEN 5910 through 5919 (0-3). Selected Topics. Credit and subject matter to be arranged.

CHEN 5950-3. Chemical Process Synthesis. Same as CHEN 4520.

CHEN 5970-0. Low-Gravity Seminar. Covers a wide variety of topics 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, former astronauts, and payload specialists. Same as ASEN 5906.

CHEN 6210-3. Microhydrodynamics of Suspensions and Colloids. Focuses on fluid mechanics and colloid science of suspensions of particles, cells, and drops. Covers fundamentals, applications, and research frontiers. Prereq., CHEN 5210 or equivalent.

CHEN 6270-3. Heat Transfer 1. Same as MCEN 5162.

CHEN 6280-3. Heat Transfer 2. Same as MCEN 5172.

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 6820-3. 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 instructor consent.

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 7850 (1-6). Independent Study. Available to Ph.D. students.

CHEN 8990 (1-10). Doctoral Thesis

Special Topics

CHEN 4830 through 4839 (1-4). Special Topics in Chemical Engineering. Senior topics courses offered upon demand. Prereq., senior standing or instructor consent.

CHEN 5830-5839 (1-4). Special Topics in Chemical Engineering. Graduate-selected topics courses offered upon demand. Prereq., graduate standing or instructor consent.

Laboratories

CHEN 1221-2. General Chemistry Laboratory for Engineers. In a one-hour recitation, concepts and problems from CHEM 1211 are reemphasized, homework collected, and quizzes given. During the three-hour laboratory, students perform experiments illustrating chemical concepts discussed in CHEM 1211. Students are introduced to basic techniques in chemical measurement and synthesis. Prereqs., enrollment in the College of Engineering and Applied Science; one year of high school algebra; and one year of high school chemistry or satisfactory performance (grade of *B-* or better) in CHEM 1001 or 1021. Coreq., CHEM 1211.

Civil and Environmental Engineering

Building Systems

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. Discusses computer energy management system design. 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. Emphasizes existing buildings. Prereq., AREN 3010 or equivalent.

CVEN 5050-3. Advanced Solar Design. Lect. Performance prediction and economic analysis of high temperature, photovoltaic, and other innovative solar systems; performance prediction methods for solar processes. Prereq., AREN 2010 or equivalent.

CVEN 5060-3. Advanced Passive Solar Design. Lect. Emphasizes design-oriented treatment of passive solar systems. Treats generic types of systems and their performance and cost. Covers passive system construction and daylighting. Prereq., AREN 2010 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., AREN 3010 or equivalent.

CVEN 5080-3. Computer Simulation of Building Energy Systems. Lect. Introduces major simulation programs for analysis of building energy loads and system performance. Uses one or more programs to develop capability for analysis of multizone structure. Prereq., AREN 4110 or CVEN 5110.

CVEN 5090-1. Building System Seminar.

CVEN 5110-3. HVAC Design 1. Lect. Design of heating, ventilating, and air conditioning (HVAC) systems for buildings. Covers HVAC systems description, load estimating, code compliance, duct design, fan systems, applied psychometrics, cooling and heating coils, filters, hydronic systems, piping, and pumps. Prereq., AREN 3010 or equivalent. Same as AREN 4110.

CVEN 5830 through 5839 (0-3). Special 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 (1-10). Doctoral Thesis. A minimum of 30 hours is required.

Mechanics

CVEN 2121-3. Analytical Mechanics 1. Lect. 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 3111-3. Analytical Mechanics 2. Lect. 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, 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 mechanics of materials, or incorporate requirements of ASTM Standards. Prereq., CVEN 3121.

CVEN 4511-3. 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, and viscous flow. Prereq., instructor consent. Same as CVEN 5511.

CVEN 5111-3. Introduction to Structural Dynamics. Lect. Introduces dynamic response of structural systems, both linear and nonlinear. Prereq., instructor consent.

CVEN 5121-3. Mechanics of Materials 2. Lect. Second-level course in the mechanics of deformable bodies. Stress and strain transformation, stress-strain relations, emphasizing 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 5511-3. Introduction to Finite Element Analysis. Same as CVEN 4511. Prereq., graduate standing.

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 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. Construction and highway surveying, horizontal and vertical curves, earthwork, 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., instructor consent.

CVEN 3602-3. Transportation Engineering. Lect. Introduces technology, operating characteristics, and relative merits of highway, airway, waterway, railroad, pipeline, and conveyor transportation systems. Focuses on evaluation of urban transportation systems and recent transportation innovations. Prereq., instructor consent.

Note: The following surveying and transportation courses are usually offered only at the Denver campus.

CVEN 4602-3. Highway Engineering. 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. Lect. Analysis of traffic engineering problems commonly found in urbanized areas and design of alternative solutions. Prereq., CVEN 3602 or instructor consent.

CVEN 5602-3. Advanced Highway Design. Lect. Design and location of various classes of rural and urban highways. Stresses development of theory as a rational basis of design for highway alignment, cross-section, intersections, and interchanges. Prereq., CVEN 3602.

CVEN 5612-3. Quantitative Techniques in Urban Transportation Engineering. 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 instructor consent.

CVEN 5622-3. Urban Transportation Planning. 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. 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., instructor consent.

CVEN 5642-3. Urban Traffic—Characteristics. 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 instructor consent.

CVEN 5652-3. Urban Traffic—Operations. 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. Lect. Discusses safety aspects of highway, railroad, and airway transportation systems. Includes accident analysis, accident prevention, and economic consequences of accidents. Prereq., CVEN 3602.

CVEN 5682-3. Pavement Design. 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. 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. Reviews basic fluid mechanics, incompressible flow in conduits, pipe system analysis and design, and dimensional analysis and similitude including design aspects, open channel flow, flow measurement, analysis and design of hydraulic machinery, and water resource engineering. Prereq., CVEN 3313.

CVEN 4333-3. 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., instructor consent. Same as CVEN 5333.

CVEN 4343-3. Open Channel Hydraulics. Lect. Study of flow in open channels both natural and constructed. Topics include application of energy equation and momentum relation-

ships, tractive force on erodible boundaries, water surface profiles theory and calculations, and design of transitions. Prereq., CVEN 3313. Same as CVEN 5343.

CVEN 5333-3. Applied Hydrology. Same as CVEN 4333. Prereq., instructor consent.

CVEN 5343-3. Open Channel Hydraulics. 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. Introduces and use of basic 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. Prereqs., CVEN 4333 and CVEN 4537.

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. Lect. Multidisciplinary exploration of the principles governing water resources planning and development. Emphasizes the sciences of water—physical, engineering, chemical, biological, and social—and their interrelationships. Prereq., senior or graduate standing. Same as ECON 8555.

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. Introduces environmental protection legislation and various water, air, and hazardous waste problems. Stresses basic geochemical, ecological, mass conservation, and environmental chemistry concepts in relation to solving environmental engineering problems. Prereqs., CHEM 1211, CHEN 1221, and APPM 2350.

CVEN 3424-3. Water and Wastewater Treatment. Lect. Inrroduces 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 instructor consent.

CVEN 4404-3. Environmental Engineering Application of Chemistry. Lect. Quantitative treatment of 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 4424-3. Municipal and Sanitary Design. Two lect. and one 3-hour lab per week. Design of a municipal subdivision, including street and lot layout, stormwater system, water and wastewater systems, transportation system, and wastewater pumping plant. One of three capstone courses available to civil engineering majors. Prereqs., CVEN 3313, 3424, and 3602.

CVEN 4444-3. Environmental Engineering Chemistry. Lect. 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, dy-namics 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 consent. Same as CVEN 5444.

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. Seminar in environmental engineering research methods with emphasis on conducting studies and preparing presentations and publications. Prereq., graduate status in environmental engineering.

CVEN 5414-3. Pilot Plant Laboratory. One 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 instructor consent.

CVEN 5444-3. Environmental Engineering Chemistry. Same as CVEN 4444.

CVEN 5454-3. Simulation Methods in Environmental Engineering. Lect. Introduces 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., instructor consent and computer background.

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 instructor consent.

CVEN 5494-3. Fate and Effects of Pollutants in the Environment. Lect. Water quality management course in which the relationships among air, water, and land pollution, water quality, and beneficial uses are examined. 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., instructor consent.

CVEN 5524-3. Advanced Water Treatment. Lect. Advanced studies on theory of treatment; design and operation of domestic and industrial water supplies. Prereq., graduate standing or instructor consent.

CVEN 5534-3. 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 instructor consent.

Structures

CVEN 3505-3. Structural Analysis. Three lect. and one 2-hour computational lab per week. Principles of structural analysis applied to statically determinate and indeterminate structures. Emphasizes 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 2-hour computational lab per week. Introduces 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 4525-3. 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. Same as CVEN 5525.

CVEN 4545-3. Steel Design. Two lect. and one 3-hour computational lab per week. Application of basic principles to design of steel structures;

design of tension members, columns, beams, beam-columns, and connections; continuous beams and frames; elastic and plastic design methods. One of three capstone courses available to civil engineering majors. Prereq., CVEN 3515.

CVEN 4555-3. Reinforced Concrete Design. Two lect. and one 3-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. One of three capstone courses available to civil engineering majors. 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 5525-3. Matrix Structural Analysis. Same as CVEN 4525.

CVEN 5575-3. Advanced Topics in Steel Design. 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 Design. 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. Introduces nonlinear problems. Application to buckling and vibration of structures. Prereqs., CVEN 4525 and instructor consent, or CVEN 5511.

CVEN 6595-3. Earthquake Engineering. Lect. 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.

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 principles and methods of structural reliability, and formulate bases for design to insure adequate safety and performance of elements and structural systems. Prereq., CVEN 3515, 4525, or instructor consent.

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.

Construction

CVEN 1306-3. Introduction to Civil Engineering. Lect. Surveys the broad subject of civil and architectural engineering and professional practice, emphasizing study of construction methods including foundations, structural systems, building materials, and systems applications in building construction. Same as AREN 1306.

CVEN 3246-3. Introduction to Construction. Lect. Broad view of concerns, activities, and objectives of 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 instructor consent.

CVEN 5236-3. Construction Planning and Scheduling. 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. Same as AREN 4466.

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 instructor consent. Same as CVEN 4087.

CVEN 5256-3. Construction Management. Lect. 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. Stresses investigations to improve construction management efficiency and to lower construction costs. Prereqs., senior standing with AREN 4416, 4466, CVEN 4087, or instructor consent.

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. 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 instructor consent.

CVEN 5286-3. Construction Engineering 1. Lect. Introduces the economics, utilization and limitations of large-scale horizontal construction methods. Advanced study of planning, analysis, and methods improvement techniques as applied to public works and energy facilities construction. Emphasizes computer simulation of construction operations and time lapse analysis. Prereqs., graduate standing with CVEN 4147, CVEN 3708, or instructor consent.

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. 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. Introduces systems analysis concepts and applications in civil engineering emphasizing 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 standing.

CVEN 4087-3. Engineering Contracts. 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 instructor consent. Same as CVEN 5246.

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. Same as MCEN 4147.

CVEN 4537-3. Numerical Methods in Civil Engineering. Lect. Introduces 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 standing. Same as CVEN 5537.

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.

CVEN 5537-3. Numerical Methods in Civil Engineering. Prereq., graduate standing. Same as CVEN 4537.

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. Discusses shear strength, bearing capacity, lateral earth pressures, slope stability, and underground construction. Analysis and design of shallow and deep foundations, retaining walls, tunnels, and other 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 instructor consent.

CVEN 4728-3. Foundation Engineering. Lect. Geotechnical design of shallow and deep foundations, including spread footings, 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 instructor consent. Same as CVEN 5728.

CVEN 5708-3. Soil Mechanics. Lect. Advanced course in 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. Prereq., CVEN 3708 and 3718, and graduate standing. Same as CVEN 4728.

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 instructor consent.

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 instructor consent.

CVEN 5758-3. 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 instructor consent.

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 instructor consent.

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 instructor consent.

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 laboratoty. Prereq., CVEN 5708 or instructor consent.

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 physicochemical principles. Applications to stabilization and improvement of soils, and disposal of waste materials. Prereqs., CVEN 3708 and 3718, or instructor consent.

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 instructor consent.

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 instructor consent.

Special Topics

CVEN 4039-1. 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. The EIT examination is required for successful completion of this course. Prereq., senior standing.

CVEN 4839 (1-6). Special Topics for Seniors. Supervised study of special topics of interest to students, under instructor guidance. Prereq., instructor consent.

CVEN 4849 through 4879 (1-6). Independent Study.

CVEN 4889 through 4899-3. Senior Projects. Entire semester 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 project idea can be generated by the student or suggested by a faculty member. A list of projects is available in the departmental office at registration. Students are not permitted to register for this course during their last semester in residence and must obtain registration approval for a particular project from the faculty director. Prereq., senior standing.

CVEN 5849 through 5909 (1-6). Independent Study. Available only through approval of graduate advisor. Subject arranged to fit needs of the student.

CVEN 6849 through 6909 (1-6). Independent Study. Available only through the approval of the graduate advisor. Subject arranged to fit needs of the student.

CVEN 8920 through 8929-3. Selected Topics. Credit and subject matter to be arranged. Prereq., instructor consent.

Computer Science

General Computer Science

CSCI 1200-3. Introduction to Programming 1. Presents good engineering practices for constructing, documenting, testing, and debugging computer programs. Provides an introduction to common algorithms and data structures and major characteristics of modern computers. Programming projects use Pascal. Prereq., three years of high school mathematics, including trigonometry, or MATH 1020 and 1030, or concurrent enrollment in a calculus class, or instructor consent.

CSCI 1210-4. Introduction to Programming 2. Emphasizes problems encountered in building larger, more complex programs. Students gain experience in using existing software modules as building blocks for larger programs. Prereq., CSCI 1200.

CSCI 1300-4. Introduction to Computing for Majors. 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 use C. Open only to majors and others by instructor consent.

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. Introduces some common algorithms and data structures. Coreq., a calculus course or instructor consent.

CSCI 2010-1. C/UNIX Workshop. A brief introduction to C and to UNIX and its software development tools. Prereq., CSCI 1200 or 1300, or a similar background. Credit not granted for both CSCI 2010 and 2030.

CSCI 2030-1. C/UNIX Workshop for Majors. Similar to CSCI 2010, but for computer science majors. Prereq., CSCI 1200 or 1300, or a similar background. Coreq., CSCI 2224. Credit not granted for both CSCI 2010 and 2030. Open only to majors.

CSCI 2250-3. Data Structures and Algorithms. 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 or 1300; CSCI 2010 or 2030; and CSCI 2204 or 2224. Credit not granted for both CSCI 2250 and 2270.

CSCI 2270-3. Data Structures and Algorithms for Majors. Similar to CSCI 2250, for computer science majors. Prereqs., CSCI 1210 or 1300; CSCI 2010 or 2030; and CSCI 2204 or 2224. Credit not granted for both CSCI 2250 and 2270. Open only to majors.

CSCI 2300-4. Fundamentals of Computer Science. Application of computer science principles to 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 and current or prior enrollment in CSCI 2204 or 2224. Open only to majors.

CSCI 2900 (1-3). Independent Study. Selected topics at the elementary level for students with little or no previous computing experience.

CSCI 4900 (1-6). Independent Study. Provides opportunities for independent study at the upper-division undergraduate level. Students work on a small research problem or tutor lower-division computer science students. Prereq., CSCI 1200, 1300, or 1700.

CSCI 5000-2. Foundation Module in Data Structures. Accelerated review of fundamental data structures and of algorithms processing such structures. Primarily intended for incoming Ph.D. students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., department permission.

CSCI 5900 (1-6). Independent Study. Provides opportunities for independent study at the master's level.

CSCI 6800-3. Master of Engineering Project. Students seeking the Master of Engineering degree must complete a creative investigation project, including a written report, supervised by a member of the graduate faculty. Prereq., completion of 21 hours towards the M.E. degree.

CSCI 6940-3. Master's Degree 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., instructor consent.

CSCI 7900 (1-6). Independent Study. For doctoral students.

CSCI 8990 (1-10). Doctoral Dissertation. Investigation in some specialized field of computer science. Approved and supervised by faculty members.

Parallel Processing

CSCI 5551-3. Parallel Processing. Same as ECEN 5553.

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., instructor consent.

Artificial Intelligence

CSCI 3202-3. Introduction to Artificial Intelligence. Surveys artificial intelligence techniques of knowledge representation, search, learning, and natural language processing. Introduces artificial intelligence programming in Lisp. Prereq., CSCI 3155 or 3245, or instructor consent.

CSCI 5582-3. Artificial Intelligence. Overview of artificial intelligence methods, theories, and applications. Relationship between artificial intelligence and psychology, linguistics, and philosophy. Introduces artificial intelligence programming. Prereq., CSCI 3245 or equivalent. Same as ECEN 5583.

CSCI 5592-3. Advanced Artificial Intelligence Programming. Discusses the role of programs in artificial intelligence and cognitive science as well as social implications. Further topics are 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 5622-3. The Connectionist Approach to Artificial Intelligence. The connectionist (or "neural network") approach to artificial intelligence explores computation in massively interconnected networks of simple autonomous processing elements. Introduces the principles underlying the connectionist approach, as well as its limitations and weaknesses. Prereq., graduate standing or instructor consent.

CSCI 5782-1. Survey of Cognitive Science. Class led by a different faculty member of the Institute of Cognitive Science each week. Introduces graduate students to research in cognitive science currently underway within the institute. Prereq., graduate standing or instructor consent.

CSCI 5832-3. Natural Language Processing. The field of natural language processing is concerned with the theoretical and practical issues that arise in getting computers to perform useful and interesting tasks with natural language. Covers the problems of understanding complex language phenomena and building practical programs. Prereq., graduate standing or instructor consent.

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 6622-3. Advanced Connectionist Modeling. Participants read and evaluate papers from the current research literature, experiment with simulations of connectionist networks, and engage in semester-long research projects applying the connectionist approach to selected problems in machine learning, artificial intelligence, psychology, neurobiology, or linguistics. Prereq., CSCI 5622.

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 instructor consent. Highly recommended prereq., CSCI 5592.

CSCI 7222-3. Topics in Nonsymbolic Artificial Intelligence. Topics vary from year to year. Possible topics include human and machine vision, signal and speech processing, artificial life, mathematical foundations of connectionism, and computational learning theory. Prereq., CSCI 5622 or instructor consent.

CSCI 7782-3. Topics in Cognitive Science. Addresses different set of one to three topics each year. For each topic one or two faculty members of the Institute of Cognitive Science present background material and present current research. Prereq., graduate standing or instructor consent.

Operating Systems and Hardware

CSCI 3263-3. Computer Systems. Applications-oriented introduction to 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 or 2270. Credit not granted to students who have taken CSCI 3753.

CSCI 3753-3. Systems. For computer science majors. Examines software comprising computing systems as it builds upon hardware to provide a programming environment. Structure and function of editors, compilers/assemblers, linkers, etc. Basic operating systems concepts and systems programming in high-level languages. Prereqs., CSCI 2270 and ECEN 2220. Credit not granted to students who have taken CSCI 3263.

CSCI 4593-3. Computer Organization. Same as ECEN 4593.

CSCI 4753-3. Computer Performance Modeling. Presents a broad range of system measurement and modeling techniques, emphasizing applications to computer systems. Topics include system measurement, work load chatacterization, and analysis of data; design of experiments; simulation; queueing theory and queueing network models. Prereqs., CSCI 3753 or equivalent, and second-semester calculus. Recom-mended prereq., a course in statistics. Same as CSCI 5753 and ECEN 4753 and 5753.

CSCI 5003-2. Foundation Module in Operating Systems. Accelerated review of fundamental operating systems concepts. Primarily intended for incoming Ph.D. students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., department permission.

CSCI 5513-3. Real-Time Hardware-Software System Design. Same as ECEN 5513.

CSCI 5573-3. Operating Systems. Study of supervisory programs within a computer system that interact most closely with hardware, and that allow efficient and shared access to the computer. Topics include processes (communication implementation, synchronization), memory management (storage allocation, virtual memory), and processor management (multiprogramming, timesharing, scheduling). Same as ECEN 5573.

CSCI 5593-3. Advanced Computer Architecture. Same as ECEN 5593.

CSCI 5673-3. Distributed Systems. Examines systems that span multiple autonomous computers. Topics include system structuring techniques, scalability, heterogeneity, fault tolerance, load sharing, distributed file and information sysrems, naming, directory services, resource discovery, resource and network management, security, privacy, ethics, and social issues. Recommended prereq., CSCI 5573 or a course in computer networks. Same as ECEN 5675.

CSCI 5753-3. Computer Performance Modeling. Same as CSCI 4753.

CSCI 7123-3. Topics in Operating Systems. Topics 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 selected by instructor. Possible topics are on-line systems, multiprocessing, microprogramming, architecture, data communications, and computing networks.

Theory of Computation

CSCI 2204-3. Discrete Structures. Prepares students for a fundamental understanding of computing. Studies set theory, Boolean algebra, relations, functions, graph theory, and techniques for formal reasoning including propositional and predicate calculus, proof techniques, induction, and program logics. Prereqs., college algebra or calculus, and CSCI 1210. Credit not granted for both CSCI 2204 and 2224.

CSCI 2224-3. Discrete Structures for Majors. Similar to CSCI 2204, but for computer science majors. Prereqs., CSCI 1210 or 1300. Coreq., CSCI 2270. Credit not granted for both CSCI 2204 and 2224. Open only to majors.

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 2250 or 2270, and 2300.

CSCI 3444-3. Computer Science Theory 2. 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 instructor consent.

CSCI 5004-2. Foundation Module in Discrete Structures. Accelerated review of material in discrete mathematics and its applications in computer science. Primarily intended for incoming Ph.D. students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., department permission.

CSCI 5444-3. Introduction to Theory of Computation. Reviews 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 2224 or 3434, or equivalent.

CSCI 5454-3. Design and Analysis of Algorithms. Techniques for algorithm design, analysis of correctness and efficiency; divide and conquer, dynamic programming, greedy method, balancing, amortization, and scaling. Advanced data structures, algorithms in graph theory, computational geometry, parallel computation, VLSI, linear algebra, etc. Prereqs., CSCI 2224 and 2270, or equivalent.

CSCI 5654-3. Linear Programming. Algorithms—simplex and modifications. Theory—duality, complementary slackness. Network flow algorithms. Introduces 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 instructor consent.

CSCI 6454-3. Advanced Algorithms. Topics include matching and network flows, matroids, computational geometry, parallel computation (PRAM, hypercube, mesh). Also includes VLSI, database theory, distributed computation, 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., instructor consent.

Programming Languages

CSCI 3155-3. Principles of Programming Languages. Studies the fundamental principles of programming language design and implementation. Examples drawn from common programming languages such as Fortran, Algol, Pascal, C, Ada, Modula 2, Lisp; and Prolog. Provides practical experience with a small number of new languages. Prereq., CSCI 2300. Credit not granted for both CSCI 3155 and 3245. Open only to majors.

CSCI 3245-3. Survey of Programming Languages. Systematic study of the fundamental principles of programming language design and implementation. Examples drawn from common programming languages such as Fortran, Algol, Pascal, C, Ada, Modula II, Lisp, and Prolog. Provides practical experience with a small number of new languages. Prereq., CSCI 2250 or 2270. Credit not granted for both CSCI 3155 and 3245.

CSCI 4555-3. Introduction to Compiler Construction. Same as ECEN 4553.

CSCI 5005-2. Foundation Module in Programming Languages. Accelerated review of fundamental principles of programming language design and implementation. Primarily intended for incoming Ph.D. students with

strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., department permission.

CSCI 5525-3. Compiler Construction Tools. Same as ECEN 5523.

CSCI 5535-3. Fundamental Concepts of Programming Languages. Same as ECEN 5533.

CSCI 5565-3. Translation of Programming Languages. Same as ECEN 5563.

CSCI 7135-3. Topics in Programming Languages. Topics selected by instructor. Possible topics are syntax, semantics, metacompilers, compiler design, and translator writing systems. Prereq., instructor consent.

Numerical Computation

CSCI 3656-3. Numerical Computation 1. Covers development, computer implementation, and analysis of numerical methods for applied mathematical problems. 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 4676-3. High Performance Scientific Computing 1. Introduces computing systems, software, and methods used to solve large-scale problems in science and engineering. Students use high-performance workstations and a supercomputer. First course in a two-semester sequence. Prereqs., CSCI 2270 and 3656, or equivalent.

CSCI 4686-3. High Performance Scientific Computing 2. Introduces computing systems, software, and methods to solve large-scale problems in science and engineering. Students use high-performance workstations and a supercomputer. Second course in a two-semester sequence. Prereq., CSCI 4676.

CSCI 5006-2. Foundation Module in Numerical Computation. Accelerated review of mathematical and computational foundations of numerical computation. Primarily intended for incoming Ph.D. students with strong academic backgrounds in areas other than computer science. Credit does not count toward degree requirements. Prereq., department permission.

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 5606.

CSCI 6676-3. Numerical Methods for Unconstrained Optimization. Modern computational methods for 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 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., instructor consent.

Database Systems

CSCI 3287-3. Database and Information Systems. 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 2270.

CSCI 5817-3. Database Systems. Advanced treatment of basic database concepts. Prereqs., CSCI 2250 or 2270, and admission as a graduate student in computer science or electrical engineering. Recommended prereqs., CSCI 3287 and 3753.

CSCI 5917-3. Database Practicum. Addresses practical issues in implementation, modeling, and measurement of database systems. Centers around a significant software project. Prereqs., CSCI 5817 and significant software experience, or instructor consent.

CSCI 6817-3. Readings in Database Systems. Complements CSCI 5817; introduces graduate students to classic research results and current trends in the database systems area. Prereq., CSCI 5817.

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 instructor consent.

Software Engineering

CSCI 4208-3, 4218-3. Senior Project 1 and 2. Advanced practicum in computer science for computer applications majors. Students design, implement, document, and test software systems for use their department. Students must take CSCI 4208 and 4218 consecutively, as the project spans the entire year. Prereq., CSCI 3245. Coreq., CSCI 3263. Open only to computer science applications majors.

CSCI 4308-4, 4318-4. Software Engineering Project 1 and 2. Advanced practicum in computer science for computer science majors. Students design, implement, document, and test software systems for use in local industry, in university departments, or government laboratories. They gain practical experience by working closely with project sponsors from these organizations and review ongoing projects. Students also gain extensive experience in oral and written communication through presentations throughout the software life cycle. Students must take CSCI 4308-4318 continuously, as the project spans entire academic year. Prereqs., CSCI 3155 and 3753, and UWRP 3030. Open only to computer science seniors.

CSCI 5828-3. Software Engineering. Firsthand study of some of the problems connected with the development of large programs. Students, either individually or in small groups, are involved in 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 a relatively complex software system.

CSCI 6838-3. User Interface Design. Covers techniques for creating and evaluating effective user interfaces for computing systems. Introduces relevant findings and theory from psychology and human factors, as well as implementation methods. Prereq., graduate status or instructor consent.

CSCI 7818-3. Topics in Software Engineering. Selected topics of current interest in software engineering. Prereq., instructor consent.

Graphics

CSCI 4229-3. Computer Graphics. Design, analysis, and implementation of computer graphics techniques. Interactive techniques, 2D and 3D viewing, clipping, segmentation, translation, rotation, and projection. Removal of hidden edges, shading, and color. Prereqs., knowledge of basic linear algebra and CSCI 2250 or 2270. Same as CSCI 5229.

CSCI 5229-3. Computer Graphics. Same as CSCI 4229.

Electrical and Computer Engineering

General

ECEN 1400-3. Methods and Problems in ECE. Introduces students to the types of problems that electrical and computer engineers are expected to solve; develops the theory of complex numbers, phasors, and linear algebra; introduces advanced topics such as vector graphics and computer arithmetic; develops facility with computing tools such as MATLAB and mathematics. Prereqs., APPM 1350 and CSCI 1200.

ECEN 1840 through 1849 (1-3). Independent Study. Opportunity for freshmen to do independent, creative work. Prereq., instructor consent.

ECEN 2100-3. Logic Circuits. Studies Boolean algebra and its application to the synthesis of

digital logic circuits from logic elements such as AND, OR, NAND, and NOR gates. Such circuits are found not only in electrical engineering but also in many related fields. Also covers the design of memory elements, synchronous, and asynchronous sequential machines. Coreq., ECEN 2110.

ECEN 2110-1. Logic Circuits Laboratory. Provides laboratory experience in the design and construction of digital logic circuits. Experiments are performed in combinational circuits and sequential machines. Instrumentation introduced in the laboratory includes a Logic Source and Display station and breadboarding system. Coreq., ECEN 2100.

ECEN 2150-4. Circuits/Electronics 1. DC network analysis by mesh, mode, and source transformation methods. Time-domain analysis of switched RL, RC, RLC, and operational amplifier networks. Sinusoidal steady state phasor analysis of networks, including magnetically coupled circuits. Power and energy. Introduction of frequency domain. Coreqs., ECEN 2550 and APPM 2360.

ECEN 2160-4. Circuits/Electronics 2. This course continues the basic circuit analysis of ECEN 2150 by introducing nonlinear circuit elements: pn diode, BJT, JFET, MOSFET. Emphasizes biasing, large and small signal (low frequency) operation and basic application such as amplification and switching. Develops concepts as they apply to the ideal transformer and to self-inductance. Three-phase circuits and Fourier series expansions are introduced. Prereqs., ECEN 2150 and 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 2100 and CSCI 1200. Coreq., ECEN 2230.

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. Programming is performed in Pascal, C, and assembly language. Prereqs., ECEN 2100 and 2110; coreq., ECEN 2220.

ECEN 2550-1. Circuits/Electronics Laboratory 1. Concentrates on basic principles of electrical measurements using oscilloscopes, multi-meters, and frequency generators. Coreq., ECEN 2150.

ECEN 2560-1. Circuits/Electronics Laboratory 2. Covers basic electrical instruments, including oscilloscopes, electrical circuits, power measurements, transformers, integrated circuit operational amplifiers and transistors. Prereqs., ECEN 2150 and 2550. Coreq., ECEN 2160.

ECEN 2840 through 2849 (1-6). Independent Study. Opportunity for sophomores to do independent, creative work. Prereq., instructor consent.

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., APPM 2360. Prereq. or coreq., PHYS 2130.

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. Preteq., APPM 2350.

ECEN 3130-3. Electromagnetic Fields and Waves. Maxwell's equations postulated for free space and developed for material regions; boundary conditions as developed. Vector algebra and calculus in three common coordinate systems are 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 ate considered in detail, emphasizing the field aspects 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. 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. Applies basic magnetism theory to inductors, transformers, relays, stepper motors, AC and DC motors and generators. Prereqs., ECEN 2160 and ECEN 3130.

ECEN 3230-4. Circuits/Electronics 3. Analyzes circuits containing two and three terminal nonlinear devices, emphasizing their amplifying and switching properties. Makes extensive use of computer simulations for analyzing and designing circuits. Prereqs., ECEN 2150 and 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 transfotm. 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, 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. Coreq., ECEN 3030. Available to non-engineering majors only.

ECEN 3530-1. Circuits/Electronics Laboratory 3. Extends student experience in the operating characteristics of components and integrated circuits, including the silicon controlled rectifier, the solar cell, and photodevices. 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 random variables. Provides a foundation for study of communication theory, control theory and reliability theory. Prereq., APPM 2350, 2360, or equivalent.

ECEN 3840 through 3849 (1-6). Independent Study. Opportunity for juniors to do independent, creative work. Prereq., instructor consent.

ECEN 4001 through 4009 (0-3). Selected Topics. Credit and subject matter to be arranged. Prereqs. vary.

ECEN 4200-1. Effective Presentation. Prepares students to make polished and professional oral and written presentations. Stresses effective use of visual aids. Student presentations are critiqued by the class and videotaped.

ECEN 4400-3. Reliability and Quality Control. Concerned with 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 MATH 4510.

ECEN 4410-2. Careers in Electrical and Computer Engineering. Prepares students for the workplace. Includes how to perform key EE/ECE industrial assignments; engineering management tools and techniques; the job search (tuned to EE/ECE graduates); and lectures by industry practicing engineers.

ECEN 4840 through 4849 (1-6). Independent Study. Opportunity for seniors to do independent, creative work. Prereq., instructor consent.

ECEN 5000 through 5839 (0-3). Selected Topics. Intermediate graduate-level courses of variable titles and variable ctedit, usually offered once by guest lecturers. See current departmental notices for details.

ECEN 5840 through 5849 (1-6). Independent Study. Opportunity for students to do independent, creative work at the master's level. Prereq., advisor consent.

ECEN 6940 through 6949-3. Master's Degree Candidate.

ECEN 6950-variable credit. Master's Thesis.

ECEN 6800 (0-8). Master of Engineering Report.

ECEN 7000 through 7839 (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 7840 through 7849 (1-6). Independent Study. Opportunity for students to do independent, creative work at the doctoral level. Prereq., advisor consent.

ECEN 8990 (0-10). Doctoral Thesis.

Bioengineering

ECEN 4811-3. Neural Signals. Analyzes information processing in the brain and peripheral nervous system in terms of fundamental signaling processes that occur at the neuronal level. Explores biophysical bases for these processes, including neural impulse generation, synaptic communication, and sensory reception in terms of molecular and membrane mechanisms. Approaches abstraction of biological neurons into computational neural elements, mainly from the viewpoint of neural networks and other forms of synthetic intelligence. Prereq., ECEN 2160 or 3030, or instructor consent. Same as ECEN 5811, ASEN 4216, and ASEN 5216.

ECEN 4821-3. Neural Systems. 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., ECEN 2160 or 3030, or instructor consent. Same as ECEN 5821, ASEN 4426, and ASEN 5426.

ECEN 4831-3. Brains, Minds, and Computers. Introductory, integrative survey of brain science, cognitive science, artificial intelligence, and their interrelations. Considers central concepts and principles from each of these areas and the similarities and differences of brains, minds, computers, and robots. Prereq., ECEN 2160 or 3030, or instructor consent. Same as ECEN 5831, ASEN 4436, and ASEN 5436.

ECEN 5811-3. Neural Signals. Same as ECEN 4811.

ECEN 5821-3. Neural Systems. Same as ECEN 4821, ASEN 4426, and ASEN 5426.

ECEN 5831-3. Brains, Minds, and Computers. Same as ECEN 4831, ASEN 4436, and ASEN 5436.

Communications

ECEN 4242-3. Communication Theory. Modern digital and analog communication systems; Fourier analysis of signals and systems; signal transmission; amplitude modulation; angle modulation; digital communication systems; and behavior of communication systems in the presence of noise, including both analog and digital systems. Prereqs., ECEN 3310 and ECEN 3810 or MATH 4510.

ECEN 4632-3. Introduction to Digital Filtering. Covers both the analysis and design of FIR and IIR digital filters. Discusses implementations in both software and hardware. Emphasizes use of the FFT as an analysis tool. Examples in speech processing, noise canceling, and communications. Prereqs., ECEN 2160 and 2560.

ECEN 4652-2. 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. Noise and Random Processes. Review of probability theory; convergence and probability bounds; multivariable normal theory; sequences of random variables and stochastic processes; Bernoulli and Poisson processes; wide-sense stationary processes; correlation functions and power spectra. Linear systems with random inputs and Gauss-Markov processes; first- and second-order properties of ARMA processes; Markov chains. Prereq., ECEN 3310, 3810, or MATH 4510.

ECEN 5622-3. 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 or MATH 4510, or instructor consent.

ECEN 5632-3. 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 characterization of linear discrete-time circuits by unit-pulse response, transfer functions, and difference equations, use of z-transforms and Fourier analysis, discrete Fourier transform and fast algorithms (FFT), design of finite and infinite impulse response filters, frequency transformations, study of least squares filters for deterministic and stochastic inputs. Prereq., ECEN 3310, ECEN 3810, or MATH 4510.

ECEN 5642-3. 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. Detection and Extraction of Signals from Noise. Introduces 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, prediction in stationary time series, and modal analysis. Applications include studies in communications, control, and experimental modeling. Prereq., ECEN 5612 or equivalent.

ECEN 5662-3. 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. Prereq., ECEN 3310 or 3810, MATH 4510, or equivalent.

ECEN 5672-3. 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. Theory and Practice of Error Control Codes. 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 a digital signal processing point of view. Decoding algorithms for block codes and convolutional codes. Prereq., ECEN 3310.

ECEN 5692-3. Principles of Digital Communication. Fundamental principles underlying 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, or instructor consent. Coreq., ECEN 5612.

ECEN 7632-3. 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. Introduction to Compiler Construction. Introduces 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, or electrical and computer engineering. Same as CSCI 4555.

ECEN 4573-2. Microprocessor Systems Laboratory. Use of microprocessor systems in measurement and control applications. Development of medium-sized systems based upon microprocessors. Students work in teams to develop hardware and software. Design reviews and extensive documentation are required. Prereq., ECEN 2230.

ECEN 4583-3. Software Systems Development. Techniques for product requirements definition, project planning, coding, verification, validation, performance evaluation, and maintenance of medium-scale software 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, UNIX, and CSCI 2250 recommended but not required. Prereq., ECEN 2220 and CSCI 1200.

ECEN 4593-3. Computer Organization. Computer design at the gate level. Discusses microprogrammed and hardwired control units, memory design, arithmetic and logic units, I/O, and peripheral devices. Also briefly covers aspects of modern computer architecture such as parallel processing and reduced instruction set computers. Prereqs., ECEN 2100 and 2220. Same as CSCI 4593.

ECEN 4603-2. Computer Laboratory. Student teams design, build, and document a digital computer based upon low-level components. Design includes the architecture and instruction set at the computer, as well as software. Design reviews and documentation are required.

ECEN 4703-3. 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., CSCI 1200 and APPM 2360.

ECEN 4753-3. Computer Performance Modeling. Presents a broad range of system modeling techniques with emphasis on applications to computer systems. Covers stochastic processes, queueing network models, stochastic Petri nets, and simulation (including parallel processing techniques). Prereqs., CSCI 3753 or equivalent and second-semester calculus. Recommended: a course in statistics. Same as CSCI 4753 and 5753, and ECEN 5753.

ECEN 5513-3. Real-Time Hardware-Software System Design. Centers on the design and use of real-time computer systems. Gives special attention 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 C or PASCAL. Same as CSCI 5513.

ECEN 5523-3. Compiler Construction Tools. Practical experience using state-of-the-art CAD tools on high-performance workstations. Intended to provide skills needed to rapidly create "little languages" for specific problem domains, and familiarize students with automated software development. Prereq., ECEN 4553 or 5563, or instructor consent. Same as CSCI 5525.

ECEN 5533-3. Fundamental Concepts of Programming Languages. 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. Preteq., ECEN 2220, CSCI 3245, or instructor consent. Same as CSCI 5535.

ECEN 5543-3. Software System Engineering. Application of engineering principles to phases of software product development; project planning, requirements definition, design, implementation, validation, maintenance. Emphasizes practical methods for communicating and verifying definitions and designs: prototyping, inspections, and modeling. Includes relation to RTS and object-oriented programming. Prereqs., ECEN 4583 and CSCI 4318, or equivalent industrial experience.

ECEN 5553-3. Parallel Processing. 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 coveted include vector computers, multiprocessors, network computers, and data flow machines. Prereqs., background in computer organization, introduction to programming languages, elementary numerical analysis, ECEN 4593 and CSCI 3656, or instructor consent. Same as CSCI 5551.

ECEN 5563-3. Translation of Programming Languages. Study of practical techniques for transferring algorithms understood by humans into programs understood by machines. Concentrates on semantic analysis, code generation, and optimization methods supported by tools. Prereq., ECEN 4553, ECEN 5533, or instructor consent. Same as CSCI 5565.

ECEN 5573-3. Operating Systems. Same as CSCI 5573.

ECEN 5583-3. Artificial Intelligence. Same as CSCI 5582.

ECEN 5593-3. Advanced Computer Architecture. Broad-scope treatment of important concepts in the design and implementation of high-performance computer systems. Discusses important issues in the pipelining of a machine and the design of cache memory systems. Also studies current and historically important computer architectures. Prereq., ECEN 4593 or instructor consent. Same as CSCI 5593.

ECEN 5603-3. Software Project Management. Presents topics and techniques critical to the management of software product development, including estimating, planning, quality, tracking, reporting, team organization, people management, and legal issues. Special attention given to problems unique to software projects. Prereqs., ECEN 4583, 5543, and CSCI 4318, or equivalent industrial experience.

ECEN 5673-3. Distributed Systems. Examines systems that span multiple autonomous computers. Topics include system structuring techniques, scalability, heterogeneity, fault tolerance, load sharing, distributed file and information systems, naming, directory services, resource discovery, resource and network management, security, privacy, ethics, and social issues. Recommended prereq., CSCI 5573 or a course in computer networks. Same as CSCI 5673.

ECEN 5753-3. Computer Performance Modeling. Same as ECEN 4753, and CSCI 4753 and 5753.

Electromagnetics

ECEN 4614-3. Microwaves and Millimeter Waves. Aimed at providing senior students with an overview of devices, circuits, and systems operating in microwave and millimeter wave frequency ranges. Discusses semiconductor devices and vacuum tube sources available at these frequencies, transmission structures and circuit concepts, and system applications. Prereq., ECEN 3140.

ECEN 4634-2. 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; s-parameter measurements; microwave superheterodyne receiver characteristics; and antenna pattern measurements. Prereq., ECEN 3140 or equivalent.

ECEN 5104-3. Computer-Aided Microwave Circuit Design. Emphasizes the design of stripline and microstrip circuits, using a CAD package. Discusses design of impedance transformers, amplifiers, switches, phase shifters, etc. Assignments include design of typical circuits and their analysis using a microwave circuit analysis program. Laboratory includes measurements using a network analyzer facility on a typical circuit designed and fabricated by students. Prereq., ECEN 3140.

ECEN 5114-3. Waveguides and Transmission Lines. 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, and pulse propagation in waveguides. Prereq., ECEN 3140.

ECEN 5134-3. 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. Electromagnetic Boundary Problems. Provides mathematical and physical fundamentals necessary for the systematic analysis of electromagnetic fields problems. Requires some maturity in electromagnetics. Prereq., ECEN 5114 or 5134, or instructor consent.

ECEN 5254-3. Radar and Remote Sensing. Active techniques of remote sensing. Wave propagation in the earth's atmosphere. Signal-to-noise ratio in radio and radar. Pulse-doppler, FW-CW, chirp, and synthetic aperture radars. Scattering processes. Applications of radar to remote sensing of the atmosphere, sea, and land. Prereqs., ECEN 3130 and 3310, or instructor consent.

ECEN 5264-3. Propagation Effects on Satellite and Deep-Space Telecommunica-tions. Role of propagation effects in 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. Treatment of CCIR models. Prereq., ECEN 3140.

ECEN 5274-3. Radar Science and Techniques. Atmospheric 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 instructor consent.

Materials and Devices

ECEN 4045-3. Introduction to Optical Electronics. Introduces lasers, Gaussian optics, modulators, nonlinear optics, optical detectors, and other related devices. Prereq., ECEN 3140. Same as ECEN 5045.

ECEN 4345-3. Introduction to Solid State. Covers basic crystallography; lattice vibrations; free electron theory; energy band theory; semiconducting, dielectric, optical and superconducting materials and devices, emphasizing properties relevant to solid state electronics and optoelectronics. Prereqs., ECEN 3020 and 3130. Same as ECEN 5345.

ECEN 4375-3. 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.

ECEN 5025-3. Optical Properties of Materials. Surveys optical properties of materials important in optoelectronic and optical devices. Covers the relationships between optical constants, optical properties of semiconductors, dielectrics, ferroelectrics, liquid crystals, and metals. Prereq., ECEN 4345 or 5345, or PHYS 4340, or equivalent.

ECEN 5045-3. Introduction to Optical Electronics. Same as ECEN 4045.

ECEN 5055-3. Principles of Electronic Devices. Relates performance and limitations of solid state devices to their structures and technology. Semiconductor physics and technology. Includes PN-junction, MOS, and optoelectronic devices. For both advanced circuit and device engineers. Prereq., senior standing.

ECEN 5065-3. 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, AlGaAs, etc., band structure engineering, and the electrical and optical properties of compound semiconductors. Prereqs., ECEN 3020, and ECEN 4345 or 5345.

ECEN 5075-3. 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 instructor consent.

ECEN 5085-3. 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 3320 and instructor consent. Offered alternate semesters.

ECEN 5345-3. Introduction to Solid State. Same as ECEN 4345.

Optics

ECEN 4106-3. Applied Optics/Optical Instrumentation. Introduces applied optics and optical instruments, emphasizing optical engineering. Topics include ray optics, wave phenomena, polarization, holography, electro- and magneto-optics, and introduction to nonlinear optics. Prereqs., ECEN 3140 and 3310.

ECEN 4616-3. Optoelectronic System Design. Treats optics, optical systems, and electro-optical devices with the goal of integrating optical and electro-optical devices into optoelectronic systems. Covers system design and emphasizes resolution, field of view, signal-to-noise ratio, speed of operation, and other system constraints. Prereqs., ECEN 3140 and 4242. Same as ECEN 5616.

ECEN 5156-3. Physical Optics. 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. Guided Wave Optics. Builds up the concepts necessary to understand guided wave optical systems. Topics include slab waveguides, semiconductor lasers, fiber optics, and integrated optics. Prereqs., ECEN 4045 or 5045, and ECEN 5156.

ECEN 5606-3. Optics Laboratory. Consists of 13 optics experiments that introduce the techniques and devices essential to modern optics, including characterization of sources, photodetectors, modulators, use of interferometers, spectrometers, and holograms, and experimentation of fiber optics and Fourier optics. Prereq., undergraduate optics course such as PHYS 4510.

ECEN 5616-3. Optoelectronic System Design. Same as ECEN 4616.

ECEN 5686-3. 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 3310 and 4242, or instructor consent.

ECEN 5696-3. Fourier Optics and Optical Computing. Topics include holography, Fourier transform properties of lenses, two-dimensional convolution and correlation functions, spatial filtering, and optical computing techniques. Also covers coherent and incoherent imaging techniques, tomography and synthetic aperture radar. Prereqs., ECEN 3140, 3310, and 4106, or instructor consent.

Power

ECEN 4167-3. 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. Discusses conditions under which an electromagnetic torque can be produced. Applies theory to the most important modes of steady-state and transient operation of electrical energy converters. Prereq., ECEN 3170 or equivalent.

ECEN 4517-2. Power Laboratory 1. Basic concepts concerning electromagnetic energy conversion principles as related to practical devices. Overview of magnetics, transformers, and rotating machinery. Measurement techniques in power circuits are emphasized. Prereq., ECEN 3170.

ECEN 4527-2. Power Laboratory 2. Experimental investigations of 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. Power Systems Laboratory. Emphasizes 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 5717-3. 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, traveling-wave phenomena, and stability. Prereqs., ECEN 3130 or equivalent, and ECEN 3170 or equivalent.

ECEN 5727-3. Energy Systems Analysis 2. Topics include 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 or equivalent.

ECEN 5737-3. Adjustable-Speed AC Drives. Presents unified treatment of complete electrical drive systems: mechanical load, electrical machine, power converter, and control equipment. Emphasizes induction, synchronous, and permanent-magnet drives. Simulation programs (e.g., SPICE, Finite Element/Difference Program) available on VAX computers are extensively used to simulate drive system components (e.g., gating, inverter, electric machine). Prereq., ECEN 3170.

ECEN 5747-3. 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. Energy Systems Stability 1. Topics include transient, dynamic, and steady-state stability limits of energy transmission systems; dynamic models of synchronous machines; excitation systems; and motor loads. Prereq., ECEN 4167, 5717, or instructor consent.

ECEN 5777-3. 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 instructor consent.

ECEN 5787-3. Power Quality Phenomena in Power Systems. Covers single-time and periodic disturbances of power systems and their causes and effects on sensitive (electronic) end-use devices. Studies and models power system components. Addresses measurement techniques of the impact of such disturbances (power quality phenomena) on devices, as well as prevention and mitigating techniques.

ECEN 5797-3. Power Electronics 1. Introduces use of repetitively-switched electronic circuits for conversion and regulation of electrical power. Basic converters and steady-state analysis. Dynamic modeling and analysis using state-space averaging method. Fundamentals of inductor, transformer, and semiconductor switch design. Prereqs., ECEN 3170 and 3230, or instructor consent.

ECEN 5807-3. Power Electronics 2. Advanced topics of current interest in the power electronics field: control of power converters, current-programmed mode, series and parallel resonant converters, and resonant switch converters. Prereq., ECEN 5797.

Systems and Electronics

ECEN 4138-3. 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 3310.

ECEN 4228-3. Electronics 4. Includes D/A and A/D converters. Filter theory and design: analog, ladders, synthesized ladders, switched capacitors, and introduction to digital filters. Prereqs., ECEN 3230 and 3310.

ECEN 4458-2. Process Control Laboratory. On-line control scheme in real time for a DC generator is designed, built, and tested, first using analog controls, then an HP9845 computer. Investigates effects of noise, derivative control, aliasing, logging, and A/D and D/A conversions. Prereq., senior standing.

ECEN 4618-2. Advanced Electronics Laboratory. Lab. Includes experimental work with logic gates, oscillarors, operational amplifiers, phase-locked loops, A/D and D/A converters, and radio-frequency circuits. Includes several design projects. Prereqs., ECEN 3230 and 3530.

ECEN 5418-3. Automatic Control Systems 1. Studies multivariable feedback systems using frequency-domain techniques. Covers transfer functions matrices, poles and zeros, stability analysis, performance and robustness, LQG design theory, Nyquist-array methods, and Youla parametrization. Prereqs., ECEN 3310 and 4138.

ECEN 5438-3. Robot Control. Provides a comprehensive treatment of the mathematical modeling of robot mechanisms and the analysis methods used to design control laws for these mechanisms. Prereqs., ECEN 5029, 5039, and CSCI 5454.

ECEN 5448-3. 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. 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 and D/A). Dead-beat design, digital controller design. Prereqs., ECEN 3310 and 4138.

ECEN 7438-3. Theory of Nonlinear Systems. 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.

VLSI CAD Methods

ECEN 4019-3. Physical Design Automation for VLSI. Discusses 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. Prereq., instructor consent.

ECEN 4029-3. Modeling and Simulation of VLSI Systems. Topics include basic theory and use of simulation tools at circuit, switch, timing (relaxation based), logic and functional levels. Presents the basic ideas behind test generation (including the D algorithm), and fault simulation (including concurrent fault simulation). Prereq., instructor consent.

ECEN 5019-3. VLSI Theory and Parallel Computation. Topics include theory of VLSI computation, including VLSI models, synthesis layout techniques, and fundamental tradeoffs and layout techniques; parallel computation on fixed connection VLSI networks such as arrays, trees, hypercubes, etc.; and related topics, such as design automation, design for testability, and three-dimensional models. Prereq., CSCI 2250 or instructor consent. Offered every few years.

ECEN 5029-3. Simulation Tools for VLSI Systems. Develops foundations of VLSI simulation—numerical analysis, linear algebra, data structures, language theory, and digital and analog circuits. Students, in teams, write simulation packages. Covers simulation from the switch level to the behavioral level, including fault simulation. Prereqs., ECEN 4029 and instructor consent.

ECEN 5039-3. 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.

ECEN 6039-3. Synthesis of VLSI Systems 2. Synthesis and optimization of sequential circuits, including retiming transformations and "don't care" sequences. Hardware description languages and their application to finite state systems. Synthesis for testability and performance. Algorithms for test generation. Formal verification of sequential systems. Synthesis of asynchronous circuits. Prereqs., ECEN 5029, 5039, and CSCI 5454.

Engineering Management

EMEN 5010-3. Introduction to Engineering Management. The first course in the engineering management degree program. Provides a base for assisting engineers in becoming more effective managers. Topics include the company as a business; management as a profession; Deming's philosophy; strategic planning and marketing; research, development, and design; product life cycle; manufacturing as a strategic tool; organization and personnel management; and leadership functions of the engineering manager.

EMEN 5020-3. Financial Accounting and Finance for Engineers. Familiarizes the engineer with 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 develop-

ment, 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 required EMEN course. 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; process variability; statistical quality control; information systems; and human and organizational aspects.

EMEN 5050-3. Leadership and Management. The fifth core EMEN course. Specially designed to give working engineers background in leadership and management theory and enables them to develop their practical skills in leading and managing. Topics include managerial styles, organizational factors, ethics, management of change, and conflict resolution.

EMEN 6800-3. Master of Engineering Project. Students seeking the M.E. degree must complete an individual capstone project including a written creative investigation that may be related to the student's professional work. A member of the graduate faculty supervises the student.

Engineering Physics

See physics in the College of Arts and Sciences for a listing of courses.

General Engineering

GEEN 1017-2. Engineering Drawing. Beginning engineering drawing; covers the use of instruments, orthographic projection, pictorial drawing, sections, dimensioning, and working drawings.

GEEN 1300-3. Introduction to Engineering Computing. Introduces the use of computers in engineering problem solving, processing of data, and presentation of information. Emphasizes use of personal computers. Students use BASIC, FORTRAN, and packaged software such as word processors, spreadsheets, and networking to host computers.

GEEN 1510-2. Self Management and Leadership Principles 1. Develops group cohesiveness, mutual support, multicultural awareness, and leadership skills. Topics include self esteem, motivation, time management and study skills, personal assertiveness, and career awareness. Open only to new freshmen. Controlled enrollment through the MEP office.

GEEN 1520-2. Self Management and Leadership Principles 2. Continuation of GEEN 1510. Prereq., GEEN 1510 and approval of the MEP office.

GEEN 3100-3. Humanities for Engineers 1. The first course in the four-semester sequence of the Herbst Humanities Program for engineering students. Culturally and historically significant readings are discussed in small group seminars. A lecture series accompanies the seminars to provide context for the readings and to widen perspectives. Prereqs., junior standing and program approval.

GEEN 3200-3. Humanities for Engineers 2. Continuation of GEEN 3100. Culturally and historically significant readings are discussed in small-group seminars. A lecture series accompanies the seminar meetings to provide context for the readings and to widen perspectives. Prereq., GEEN 3100.

GEEN 3500-0. Cooperative Education. Assists students in maintaining enrollment at the University when participating in a previously arranged college-sponsored cooperative education program.

GEEN 4100-3. Humanities for Engineers 3. Continuation of GEEN 3100 and 3200. Focuses on humanities themes or texts of increased complexity, often in comparative perspective, including non-literary works. Prereqs., GEEN 3100 and 3200.

GEEN 4200-3. Humanities for Engineers 4. Continuation of GEEN 4100. Provides the opportunity to pursue a variety of humanistic themes related to the Herbst Humanities Program. Students prepare and present a senior paper. Prereq., GEEN 4100.

GEEN 4800-1. Leadership Seminar. Offers a series of invited lectures by leaders from engineering practice; allows for group and individual discussion. Prereq., senior standing in the College of Engineering and Applied Science.

Mechanical Engineering

Math

MCEN 1020-3. Analytical and Computational Tools. Introduces 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 3020-3. Mathematical Methods. Covers selected mathematical methods widely used in engineering. Cartesian tensors; Fourier series; Fourier and Laplace transforms; complex variables and contour integration; eigenvalue problems. Addresses both theory and applications. Prereq., APPM 2360.

MCEN 3030-3. 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 1020, 3020, or equivalent.

MCEN 4120-3. Engineering Statistics. Probability and statistics with emphasis on engineering applications. Frequency distributions; statistical hypotheses and estimation; nonparametric, linear regression, and correlation; nonlinear and multiple regression; analysis of variance; quality control. Prereq., APPM 2360.

MCEN 5020-3. 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 5040-3. 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 5020 or equivalent.

MCEN 5120-3. 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. Emphasizes formulation of mathematical models in fluid mechanics, combustion, heat transfer, solid mechanics, dynamics, and wave propagation. Prereqs., MCEN 5020 and 5040, 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. Prereqs., APPM 2360 and MCEN 2022.

MCEN 5021-3. Introduction to Fluid Dynamics. 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 5020 or equivalent.

MCEN 5041-3. Viscous Flow. 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 5021 or equivalent.

MCEN 5121-3. 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 5021 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.

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 3022.

MCEN 4142-3. Refrigeration. Principles of mechanical refrigeration. Absorption cycles; liquefaction of gases; properties of refrigerants. Thermodynamic analysis of refrigeration systems. Prereqs., MCEN 2022 and 3022.

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 5022-3. Thermodynamics. A comprehensive presentation of macroscopic and statistical thermodynamics and representative applications, from an axiomatic formulation designed to develop and clarify thermodynamic property relationships. Statistical thermodynamics deals with the evaluation of the properties of atoms and molecules and the subsequent calculation of thermodynamic properties. Includes thermodynamic functions and derivatives, quantum mechanics, kinetic theory of gases, black body radiation, chemical equilibrium, and molecular spectroscopy.

MCEN 5042-3. Heat Transfer. Development of the equations governing the transport of heat by conduction, convection, and radiation, and their solution. Analytical and numerical solution of initial and boundary value problems representative of heat conduction in solids. Description of heat transfer in free and forced convection, including laminar and turbulent flow. Radiation properties of solids, liquids, and gases and the transport of heat by radiation.

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. Prereq., APPM 1360.

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.

MCEN 3023-3. 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.

MCEN 4123-3. Vibration Analysis. Free and forced vibration of discrete and continuous systems. Lagrange's equation, Fourier series, 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, nonconservative systems; Lagrange and Euler equations. Prereq., MCEN 2043.

MCEN 4163-3. Introduction to Continuum Mechanics. Kinematics of deformable media. Mass, momentum, and energy conservation principles; constitutive equations for linear elastic solids and Newtonian viscous fluids; elements of tensor notation. Prereqs., MCEN 2043 and APPM 2360.

MCEN 5023-3. Solid Mechanics 1. Introduces stress, strain, and motion of a continuous system. Material derivative; fundamental laws of mass, momentum, energy, and entropy; constitutive equations and applications to elastic and plastic materials. Prereq., MCEN 3023 or equivalent; coreq., MCEN 5020 or equivalent.

MCEN 5043-3. Solid Mechanics 2. Solution of problems of linear elasticity, both static and dynamic. Potentials; integral representations; source problems; variational principles; thermoelasticity; viscoelasticity; finite deformation. Prereq., MCEN 5023 or equivalent.

MCEN 5123-3. 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 5020, or equivalents; coreq., MCEN 5040 or equivalent.

MCEN 5143-3. Dynamics. Elements of vector analysis; particle motion; kinematics of a rigid body; rotating axes; rigid body motion; Euler's equations. Introduces analytical mechanics; Hamilton's principle, Lagrange's equations for holonomic and nonholonomic systems. Prereq., MCEN 2043 or equivalent; coreq., MCEN 5020 or equivalent.

MCEN 7123-3. Dynamics of Continuous Media. 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 5020, 5040, and 5043, or equivalents. Same as PHYS 6680 and GEOL 6680.

MCEN 7143-3. 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 5043 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. Prereqs., MCEN 5020, 5040, and 5143, or equivalents.

Materials

MCEN 3024-3. 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 2043, CHEM 1211, CHEN 1221, 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 3023 and 3024.

MCEN 5024-3. Materials Science 1: Principles. Unified presentation of scientific principles applicable to all materials systems. Concepts of material structure from localized interatomic bonding to short- and long-range order in crystalline and noncrystalline solids; the nature and

consequences of imperfections in solids; phase equilibria; transformation kinetics. Considers metallic, polymeric, and ceramic materials. Prereq., MCEN 3024 or equivalent.

MCEN 5044-3. Materials Science 2: Behavior. Application of principles of materials science developed in MCEN 5024 to the study of physical and mechanical behavior of metals, poly-mers, 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 5024 or equivalent.

MCEN 5124-3. Plasticity and Creep. Inelastic deformation of materials such as metals, alloys, glasses, composites, polymers, etc., from the phenomenological and structural point of view. 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 5044, or equivalent.

MCEN 5144-3. 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 5023 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, 5044, or equivalent.

MCEN 5184-3. Structure and Properties of Polymers. Introduces 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, 5044, 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.

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. Emphasizes application and open-ended design problems. Computers are used extensively. Prereq., MCEN 3023.

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 orally present the final design and prepare a written report. Prereqs., MCEN 4025 and 4026; coreq., MCEN 4065.

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 4045.

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 3022.

MCEN 4165-3. Mechanism 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.

MCEN 5025-3. Computer-Aided Design of Mechanical Systems. Displacement, velocity, and accelerations matrix formulation of mechanisms. Numerical methods to solve simultaneous nonlinear algebraic and differential equations modeling mechanical devices. Analysis and synthesis of mechanical components and systems, including planar and spatial linkages, cams, springs, shafts, and gear trains. Prereqs., MCEN 3030 or equivalent, and MCEN 4025.

MCEN 5045-3. Design for Manufacturability. Topics include general design guidelines for manufacturability; aspects of manufacturing processes that affect design decisions; design rules to maximize manufacturability; statistical considerations; value engineering and design for assembly (manual, robotic, and automatic). Case studies of successful products exhibiting DFM are presented. Prereq., MCEN 4026 or equivalent.

MCEN 5125-3. Optimal Design of Mechanical Components. Linear and nonlinear optimization methods applied to the design of mechanical components and systems. Unconstrained and constrained optimization. Formulation of objective functions, including cost, weight, response time, and deflection. Application to gears, springs, cams, and linkages. Prereqs., MCEN 3030 or equivalent, and MCEN 4025.

Manufacturing and Systems

MCEN 3026-3. Control Systems. 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 3024.

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 versus manual operations; process variability; cost analysis; risk assessment. Prereq., MCEN 1020 or CSCI 1200 or CSCI 1700.

MCEN 5026-3. Design and Manufacturing to Cost. Evaluates the effects of material, labor, logistic costs, automated vs. manual operations, economics of design, scale, and learning upon production and product cost. Additionally, process yield, quality, and life-cycle analysis are studied using computer models. Prereq., MCEN 4045. Graduate standing required.

MCEN 5046-3. Integrated Manufacturing Systems. Two lect., 3 hours of lab. per week. Small groups of students participate in laboratory experiments, carrying out theory presented in lectures. Theory details elements of manufacturing systems from design through marketing and application of common data within the system. Prereq., undergraduate degree in engineering or closely related technical science.

MCEN 5126-3. Applied Statistics for the Manufacturing and Process Industries. Discusses the concepts and techniques of applied statistics essential to quality control and product/process improvement. Includes computer control (SQC/SPC), sampling methods and time series analysis, and methods of experimental design. Prereq., MCEN 4120.

Miscellaneous

MCEN 3027-3. Measurements Laboratory. One lect. and 6 hours of lab. 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 1120.

MCEN 4027-3. Mechanical Engineering Laboratory. One lect. and 6 hours of lab. 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. Emphasizes planning an experiment, applying sound experimental procedures, keeping proper records, and communicating results orally and in lab reports. Includes a library research project that is presented orally to the class. Prereqs., MCEN 3021, 3023, 3024, and 3027.

MCEN 4147-3. Engineering Economy. Application, by engineers, of economic and financial principles to capital investment. Emphasizes 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. Same as CVEN 4147.

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. Emphasizes case studies and individual development. Seminar format. 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., instructor consent.

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., instructor consent.

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., instructor consent.

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., instructor consent.

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.) Doctoral Thesis.

Telecommunications

TLEN 5110-3. Contemporary Issues in Telecommunications Policy. Lectures, selected readings, and class discussions of major issues in telecommunications policy. Stresses multidisciplinary approach and explores basic values and goals for telecommunications policy making. 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 5130-3. Strategic Planning in Telecommunications. Provides a clear understanding of basic trends, dynamic forces of change, and key planning and management techniques for coping with the field of telecommunications. Considers technological innovations, market and regulatory shifts, especially those related to privatization, competition, and liberalization. Also focuses on tools and methodologies for strategic planning and management, forecasting and modelling, and heuristic and analytic techniques that can be used in strategic planning for telecommunications products and services. Case studies emphasize the practical aspects of planning and management while case projects allow practice in the use of these techniques.

TLEN 5300-3. Telecommunications Theory and Applications. 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 physical units, trigonometric functions, sine waves, attenuation, logarithms, indices, decibels, complex numbers, elementary calculus, elementary probability, power, and circuit analysis.

TLEN 5310-3. Telecommunications Systems. The telecommunications systems currently in use and some of the basic technical concepts of their operation are analyzed. Surveys the system resources available to the telecommunications manager. Includes 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 ttoposcatter and meteor scatter, instrumentation and navigation; and radar.

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. Emphasizes 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. Presents switching and transmission system technologies 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 include traffic concepts, blocking theory, Erlang formulas, delay theory, computational procedures, and computer simulation of traffic problems.

TLEN 5430-3. Data Communications 2: LANs, MANs, WANs, and FDDI. Topics include local area networks (e.g., LANs, MANs, WANs, and FDDI) and additional topics of importance such as cryptography and communi-

cations protection. For more technically inclined students. Normally follows TLEN 5330. Prereqs., TLEN 5300 and 5310 or equivalents; one year of calculus, statistics, and programming experience are strongly recommended.

TLEN 5460-3. Telecommunications Systems Laboratory. Studies switching functions and measure transmission and traffic chatacteristics on models of the major business communications systems and carrier transmission facilities. Utilizes current commercial equipment in a laboratory setting including an AT&T Definity, a Northern Telecom SL-1, a Rolm CBX-II, as well as an NTI DMS 250 central office. Gives hands-on experience through individual experiments and demonstrations, including use of the oscilloscope, modulation methods, and time and frequency awareness multiplexing. Demonstrates relevance of such concepts as band width, noise interference, channel capacity, signal power, etc.

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 5500-3. 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. Offered only on demand; not offered every academic year.

TLEN 5510-3. Wireless and Cellular Communications. Presents in detail the technologies and architectures employed in cellular and other modern wireless systems; discusses regulatory and other industry issues. Major topics include radio technology review, multiple access techniques, analog and digital cellular telephony, mobile and fixed (wireless LAN) packet ratio systems, and personal communications networks (PCNs).

TLEN 5520-3. Telecommunications Standards. Familiarizes students with domestic and international standards involved in telecommunications and information processing studies. Presents the development, implementation, and importance of U.S. standards in general, as well as the differences between standards and regulations in the United States. Considers the impact of the information age and related technology on the development of international standards. Special stress 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. Optical Communications. 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 given to certain matters affecting trade and commerce. Covers limitations and capabilities of certain components. Analyzes typical loss budgets and dispersion budgets, discusses cost-benefit analysis, and makes some comparison to other communication systems.

TLEN 5920-3. Independent Study—Advanced Telecommunications Laboratory. Gives students an opportunity to complete a major telecommunications research project related to telephones, videos or computers, or data communications, with approval of the laboratory director. Students provide written and oral presentations of project results.

TLEN 6940. Candidate for Degree.

TLEN 6950. Master's Thesis.

TLEN 6960. Telecommunications Project.

Special Topics

TLEN 5830-3. Special Topics: Network Management. Provides a foundation in the issues and principles of telecommunications network management. Explores network planning, network initialization and configuration management, fault management, usage accounting, and security.

TLEN 5831-3. Special Topics: The Future of Telecommunications. Explores the development of telecommunications in the past, present, and especially the future. Examines advanced applications such as HDTV, 3DTV, holovision, supercomputer data relays, tele-work, tele-health, tele-education, the tele-city, tele-robotics, and mobile communications. Also explores advanced technologies such as repeaterless fiber optic cables, optoelectronic switching and computing, and infrared transmission and advanced satellite concepts. Discusses information overload time compression, the 168-hour work week, human-machine interface, tele-war, and electronic immigration and tele-colonies. Creates an analytical framework for understanding how political changes and regulatory processes shape and even stimulate technological changes.

TLEN 5832-3. Special Topics: Engineering Economy. 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 5833-3. Special Topics: UNIX/C/C++. Develops knowledge of the UNIX environment, including file editing, shell programming, document preparation, data manipulation, system calls, and C++/C programming. Studies techniques for source control and modification of large problems written by others, as is often encountered in telecommunications environments. Teaches paradigms are applicable in other environments.

TLEN 5834-3. Special Topics: Integrated Services Digital Networks (ISDN). ISDN is a significant communications event, and this course reviews the telecommunications and digital concepts, provides an overview of standards, CCITT recommendations, basic user-network interface, multiplexing and rate adaption, and planning and future development.

TLEN 5836-3. Special Topics: Law and Regulation. While technology is a necessary antecendent to mass communication, a society's laws ultimately determine how the technology will be developed and how wide its reach will be. Examines past and current experiments by state and federal legislators, regulators and the judiciary in directing the development and rage of communications technology.

TLEN 5837-3. Special Topics: Management and Information Technology. Discusses trends in organizational management and information technology as they relate to new business tactics and emerging/converging communications, computing, and knowledge technologies. Focuses on business issues and how technology influences markets, economics, and business development worldwide.

TLEN 5838-3. Special Topics: Telecommunications Economics. Covers the foundation of economics as applied to the telecommunications industry. In particular, alternative regulatory practices and cost and pricing methodologies and their impact on specific telecommunications policies are examined.

TLEN 5839-3. Advanced Topics in Telecommunications Economics. Covers advanced issues in telecommunications pricing, alternative forms of regulation, and privatization of telecommunications entities. Pricing theory includes nonlinear pricing and peak load pricing. Alternative regulation includes, in addition to rate of return regulation, the variety of incentive regulation, both theoretical and applied. Privatization examines the cases of the UK and Japan in detail and some of the Latin American cases. A background in microeconomics is required, and completion of TLEN 5838 is desired.

Cross-Listed

TLEN 5106-3. The Political System and Telecommunications. See PSCI 5106.

FACULTY

Aerospace Engineering Sciences

ROBERT D. CULP, Department Chair; Professor. B.S., University of Oklahoma; M.S., Ph.D., University of Colorado.

MARK J. BALAS, Professor. B.S., University of Akron; M.A., University of Matyland; 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., University of Oklahoma; M.S., Southern Methodist University.

CHUEN-YEN CHOW, Professor. B.S., National Taiwan University; M.S., Purdue University; M.S., Massachusetts Institute of Technology; Ph.D., University of Michigan.

WILLIAM EMERY, Professor. B.S., Brigham Young University; Ph.D., University of Hawaii.

CHARBEL FARHAT, Associate Professor. D.E., Ecole Centrale, Paris, France; M.S., Ph.D., University of California, Berkeley.

CARLOS A. FELIPPA, Professor. B.S., Universidad Nacional de Cordoba, Argentina; M.S., Ph.D., University of California, Berkeley.

PETER FREYMUTH, Professor. M.S., Ph.D., Technische Universitat (Berlin).

ELAINE HANSEN, Lecturer. B.A., Knox College; M.S., University of Wyoming.

DONALD HEARTH, Professor. B.S., M.S., Northeastern University.

LAKSHMI KANTHA, Professor. B.S., Bangalore University (India); M.S., Indian Institute of Science; Ph.D., Massachussetts Institute of Technology.

DONALD A. KENNEDY, Associate Professor. B.S., Ph.D., Johns Hopkins University.

JEAN N. KOSTER, Assistant Professor. Dip-Ing., Dok-Ing., University of Karlsruhe (Germany).

CULBERT B. LANEY, Assistant Professor. B.S., University of Maryland; M.S., Ph.D., Cornell University.

MARK T. LANGHENRY, Lecturer. B.S., Purdue University; M.S., Ph.D., Auburn University.

KRISTINE LARSON, Assistant Professor. Ph.D., University of California, San Diego.

DALE A. LAWRENCE, Assistant Professor. B.S., Colorado State University; M.S., Ph.D., Cornell University.

ROBERT R. LEBEN, Research Assistant Professor. B.S., M.S., Ph.D., University of Colorado.

MARVIN W. LUTTGES, Professor. B.S., University of Oregon; Ph.D., University of California, Irvine.

PETER F. MacDORAN, Professor Attendant Rank. B.S., California State University; M.S., University of California, Santa Barbara.

RONALD J. MacGREGOR, Associate Professor. B.S., M.S., Ph.D., Purdue University.

WILLIAM E. McCLINTOCK, Lecturer. B.A., M.A., Ph.D., Johns Hopkins University.

MARTIN M. MIKULAS, JR., Professor. B.S., M.S., Ph.D., Virginia Polytechic Institute.

ALAN J. MORD, Associate Professor Adjoint. B.S., University of California, Berkeley; M.S., Ph.D., University of Oregon.

GEORGE W. MORGENTHALER, Professor. B.S., De Paul University, Concordia; M.S., University of Chicago; M.S., University of Colorado (Denver); M.S., Massachusetts Institute of Technology; Ph.D., University of Chicago.

KWANG-CHUN PARK, Professor. B.S., Inha Institute of Technology (Korea); M.S., Stanford University; Ph.D., Clarkson College.

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A. RICHARD SEEBASS, III, Dean of Engineering and Applied Science, Professor. B.S.E., M.S.E., Princeton University; Ph.D., Cornell University.

HOWARD A. SNYDER, Professor. B.S., Rensselaer Polytechnic Institute; S.M., Ph.D., University of Chicago.

KARL D. WOOD, Professor Emeritus.

NGUYEN X. XINH, Associate Professor. Licence és science, Doctor in Theoretical Physics, D.Sc., University of Paris.

HAROLD F. ZIMBELMAN, Professor Adjunct. B.S., M.S., University of Colorado. P.E., state of Colorado.

Chemical Engineering

PAUL L. BARRICK, Professot Emeritus.

CARL F. BORGMANN, Professor Emeritus.

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DAVID E. CLOUGH, Associate Dean; Professor. B.S., Case Institute of Technology; M.S., Ph.D. (Ch.E.), University of Colorado.

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JOHN L. FALCONER, Professor. B.E.S., Johns Hopkins University; M.S., Ph.D. (Ch.E.), Stanford University.

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College of Environmental Design

Raymond G. Studer, Dean

The College of Environmental Design offers the only undergraduate preprofessional education in the fields of architecture and planning in the state of Colorado.

The college takes a broad and integrated view of the design professions. In recent years the problems and opportunities facing the design professions have changed dramatically. These changing conditions demand a broader educational experience than the individual professions traditionally have supplied.

To prepare students for these conditions, the college expects students to take a wide range of courses in the humanities, the arts, and the sciences, in order to examine the world and contemporary society from a variety of viewpoints.

Unlike undergraduate education in many fields, environmental design students receive practical experience under the direct supervision of the college's professors and outside professional designers. From the first day of the freshman year, students integrate and synthesize knowledge gained in studio and related lecture courses.

The College of Environmental Design also provides required core courses throughout the curriculum in which students from all design disciplines study shared problems together. Architects, interior designers, landscape architects, urban and regional planners, building technologists, and engineers need to understand each other's perspectives and increasingly work together on the complex issues facing the design of the built environment.

Facilities

Facilities for academic programs at CU-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, photographic laboratory, slide library, and drawing studios supplement design studios, which are available throughout the building. Studio space is provided for all students for academic use during the entire semester and is available throughout the day and evening.

Beginning and advanced computer facilities, including graphic capabilities, are also 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.

Career Opportunities

Architecture

Most students entering the profession of architecture aim to become licensed architects. The requirements for licensure vary from state to state. CU-Boulder students may work toward licensure in Colorado by earning a bachelor of environmental design degree, working six years in an internship, and passing the state license exam. Alternatively, students may earn a National Architecture Accrediting Board (NAAB)-accredited architecture degree, work approximately three years in an internship, and pass the state license exam.

In Colorado, the only NAAB-accredited degree available is the master of architecture (M.Arch.) in the School of Architecture and Planning at CU-Denver. Although the master of architecture program at CU-Denver normally requires three and one-half years of study for completion, students who have completed the architecture option in the environmental design program at CU-Boulder may be considered for advanced standing and complete the degree in about two years.

The route of a B.Envd. plus an M.Arch. opens up more options for students, should they decide to practice in another state. Since preprofessional degree programs are not accredited by the NAAB, the B.Envd. alone is not accepted as sufficient education to become a licensed architect in many states. Nor is a B.Envd. accepted as sufficient education to become certified as an architect by the National Council of Architectural Registration Boards. NCARB certification makes it easier to become licensed in additional states.

Advanced Standing at CU-Denver. The following courses, completed with a *B* or better in the environmental design architecture option at CU-Boulder, substitute for the first-year requirements in the M.Arch. program at CU-Denver:

AREN 4035 and 4045 (Architectural Structures 1 and 2)
AREN 4050 and 4060 (Environmental Systems 1 and 2)
ARCH 3114 and 3214 (History of Architecture)
ENVD 4112 and 4212 (Architectural Graphics 1 and 2)
ENVD 4310 and 4410 (Architectural Studio 3 and 4)

In addition, graduates from the environmental design program must have completed the prerequisites of college physics (PHYS 2010) and college mathematics through introductory calculus (MATH 1300) before entering the CU-Denver program. Studio work is accepted for credit only after the faculty of the architecture program at the School of Architecture and Planning have reviewed the portfolio submitted as a part of the application for admission.

Graduate Programs outside Colorado. Students may also choose to study for an M.Arch. in an accredited program elsewhere. Two to three years are required to complete this degree, depending on the course work completed at the undergraduate level and on the requirements of the graduate program. Students who have taken the architecture option in the environmental design program should receive at least a year of advanced standing in most reputable graduate architectural programs. A critical factor in placement, however, is the quality of the student's design portfolio. A student with a weak portfolio may be asked to take extra design studios, requiring more time to complete the graduate degree.

Internships. In all routes to licensure, students must spend a number of years after graduation in a paid internship. In most states, including Colorado, a certain amount of experience under the direct supervision of a licensed architect must be documented in each of 14 phases of practice in order to become eligible for the Architectural Registration Examination.

Planning

While the practice of planning is not currently licensed in most states, in areas of high growth like New York, California, and Florida, the need for licensing to regulate practice is becoming more apparent. Professional regulation and certification is currently overseen by the American Planning Association (APA) and the

American Institute of Certified Planners (AICP). Degrees in the field are accredited by the Planning Accreditation Board (PAB) of the Association of Collegiate Schools of Planning.

Although students interested in entry-level positions in planning may find the B.Envd. degree adequate, an advanced degree (master's or Ph.D.) is highly desirable and advisable. Students primarily interested in professional practice are advised to obtain a master's degree in city planning, in city and regional planning, or in city planning and community development. Students interested in teaching or research in planning should complete a Ph.D.

Advanced Standing at CU-Denver. Graduates of the college's planning option with a GPA of at least 3.00 will be admitted into the master's program in urban and regional planning (M.U.R.P.) at CU-Denver with advanced standing. Planning graduates of the college with a GPA of 3.20 or better in the three required planning studios will have the initial graduate-level planning studio waived, and can anticipate completion of M.U.R.P. requirements in three semesters of full-time study instead of the usual four. Students may not take advantage of this agreement if their date of graduation with the B.Envd is more than five years past at the time of application. Students may seek additional information and advice for appropriate selection of undergraduate courses from the planning option coordinator in the College of Environmental Design.

Study Abroad

The College of Environmental Design and the University's Office of International Education urge design students to participate in one of the various study abroad programs offered for University credit. Every other summer, including 1992 and 1994, the college offers a traveling seminar in Europe that investigates some aspects of European design in detail. The University of Colorado at Boulder is also a coordinating institution for DIS, Denmark's international study program at the University of Copenhagen. DIS offers semester and year-long programs in architecture and design. Taught in English, the DIS program offers advanced design studio and related courses in addition to guided travel-study opportunities in other European nations, including the Soviet Union. For more information about these programs, contact the Office of International Education.

College of Environmental Design Lecture Series

The college's lecture series enables students and faculty to meet people whose work significantly contributes to the field of environmental design. All students registered in the College of Environmental Design may be required to attend convocations and special lectures throughout the year. In addition, the graduate programs in Denver sponsor a year-long series of lectures, and the Colorado Society of Architects presents a lecture series in Denver that is open to the public. The college also cosponsors the annual National Natural Hazards Information and Applications Conference held in July, the National Pedestrian Conference held in September, and the annual World Affairs Conference held in April.

ACADEMIC EXCELLENCE

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 CU-Boulder.

Scholarships, Loans, Awards, and Prizes

Several scholarships for environmental design students are awarded upon recommendation of the faculty of the college. 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, the Centennial 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 Hunter Douglas Scholarship. Through the generosity and support of Hunter Douglas, Inc., an award is given to an outstanding third- or fourth-year student in the undergraduate design program with a demonstrated interest in interior design or space planning.

The Charles Haertling Architecture Scholarship. In honor and living tribute to one of Boulder's most distinguished architects, an award is given in alternating years to an undergraduate student intending to pursue the profession of architecture. Environmental design students may apply for the 1992 and 1994 awards. The award is given to music students in the alternating years.

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 they may continue professional education.

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.

Design certificates are also presented to the outstanding design students at each year level.

Dean's scholar awards are available to Colorado residents on a funds-available basis. A limited number of these merit scholarships are available to nonresidents.

In addition, interested students may participate in faculty-student research projects funded by the Undergraduate Research

Opportunities Program (UROP) for a maximum of $750 per award.

ACADEMIC STANDARDS

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 someone else's work as one's own, 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 may be referred to the faculty executive committee for study and disciplinary decision.

Grade Point Average Requirements and Scholastic Suspension

A student must achieve a grade of *C-* or better in all courses applied towards graduation requirements, excluding general electives. General electives that 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 cumulative 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 college academic advisor. It is the responsibility of the academic advisor to monitor the student's progress.

Students on suspension will not be allowed to register on any campus of the University of Colorado while on suspension, except continuing education or regular campus summer sessions.

Suspended students will be readmitted on a case-by-case basis by review of the director of undergraduate studies. When necessary, a case may be taken to the executive committee by the director for policy review.

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 executive 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.

ADMISSION AND ENROLLMENT POLICIES

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.

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 generally 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 must be listed on the official transcript sent for admission consideration. Transfer students should apply 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 admission standards for transfer students.

Normally, students should transfer by the beginning of the second year of college-level work; all transfer students will be required to take a minimum of 30 credits in the College of Environmental Design. Transfer students are admitted for both the fall and spring semesters of each year.

If a student chooses to provide letters of intent and recommendation, they must accompany the application. It is the responsibility of the student to be sure transcripts and other application materials are complete. 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. In general, credits in vocational-technical courses will not be accepted for transfer by the college.

Intrauniversity Transfer

University of Colorado students in good standing who are interested in pursuing a design education may apply for transfer into the college. Applications are accepted and reviewed on a continuous basis throughout the academic year. Students applying for intrauniversity transfer (IUT) admission must, at minimum, have completed or be enrolled for the introductory studio class, ENVD 1000. Completion of additional introductory ENVD courses and general education requirements is encouraged. Though a factor in admission, grade-point average is not in itself a determinant, and interested students are encouraged to apply. Students may anticipate a response to their application within approximately one week of the college's receipt of a complete application packet (available in ENVD 168). Students meeting criteria for automatic admission are so notified. Students not meeting automatic admission criteria may be offered conditional admission, with specified conditions to be met at the end of the application semester.

Attendance

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 inform students of policies governing grading policies and attendance in each class.

Students who miss a final examination for illness or other good reason must notify the instructor or the director of undergraduate studies no later than the end of the day on which the examination is given.

Credit Policies

Advanced Placement

Advanced placement and college credit may be granted on the basis of the College Board's Advanced Placement tests. For students who have taken advanced placement course work in high school and who make scores meeting University standards in the advanced placement examination, advanced placement as well as college credit is granted. College credit granted is treated as transfer credit without a grade, but will count toward graduation and the meeting of other specific requirements for which it is appropriate.

Denver Campus Credits

Students in residence on the Boulder campus in the College of Environmental Design may take work on the Denver campus on a space-available basis with the approval of the dean of the college.

Incomplete Grades

The College of Environmental Design does not give incomplete grades except in cases of extreme emergency. By petition, a grade of *IF* may be granted.

Independent Study

Ordinarily, only environmental design students at the 3000- or 4000-level of studio are permitted to obtain independent study credit. Independent study credit may not be used to substitute for any required design studio or laboratory course.

A complete prospectus of what work 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 permission is granted for enrollment in the course. Students should make arrangements for the independent study course details during registration or well before the semester begins.

Only students who have at least a 3.00 GPA are permitted to register for independent study. Additional requirements could be established depending on the proposed topic. 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.

Other Credits

Credits for teaching assistantships, research assistantships, and internships are all guided by the same standards as those for independent study. Independent study credit limits are independent of credit earned as a teaching assistant, research assistant, or intern.

Pass/Fail Credits

A student may choose to take up to 15 credits toward the degree in environmental design on a pass/fail basis, but these credits must fall in the category of general electives. No courses meeting requirements and no elective environmental design courses may be taken on a pass/fail basis.

Repeated Courses

Students should confer with the college's academic advisor regarding specific academic standards for repeating laboratory, studio, and other environmental design courses. Credits for repeated courses are not counted toward the 128 credits needed for graduation.

ROTC Credit

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 academic advisor for 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.

Transfer Credit

Credits transferred from other institutions are limited to the number of credit hours given for similar work in 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 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.

Residence Requirement

A student must complete 30 credits of required preprofessional 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.

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 contribute to possible educational exhibits requested by the University community and the general public.

UNDERGRADUATE DEGREE REQUIREMENTS

General Education in Environmental Design

The following areas of knowledge are central to the programs in environmental design:

- an understanding of the role of the built environment in human affairs and knowledge of people-environment relations;
- an understanding of the major theoretical perspectives of environmental design and planning, including those of the related professional fields such as architecture, landscape architecture, and urban and community planning;
- a working knowledge of information gathering, analysis, design, and decision-making methods utilized in the planning, design, and management of built environments;
- an understanding of the physical properties of built environments and the natural and man-made physical factors that condition their realization;
- an understanding of historical environmental design and planning processes and products in their related social, cultural, and geographic contexts; and
- an understanding of professional norms, roles, and institutions related to the analysis, planning, design, and management of the built environment in the broader context of social, political, and economic processes.

In addition, students completing a degree in environmental design are expected to acquire:

- the ability to effectively and creatively organize built environments, integrating and utilizing appropriate substantive and procedural knowledge;
- the ability to define built environmental requirements for various human populations;

- the ability to effectively and creatively utilize appropriate physical technologies in the planning, design, and/or management of built environments; and
- effective verbal, graphic, and written communication skills required to function as environmental design professionals.

Advising

All students receive their academic counseling from the academic advisor in the Office of the Dean of the College of Environmental Design. For graduation, a student must see the academic advisor and complete an application for graduation the semester before the desired commencement. 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.

Orientation

In order to receive an overview of the philosophy and educational opportunities in the college and meet other new students and the faculty of the college, incoming freshman and transfer students are required to attend an orientation approximately one week prior to the beginning of the fall semester. New freshmen are also invited to attend a two-day retreat, held in the mountains near Boulder, as a part of their orientation.

Curriculum

By the end of their first year, students in the College of Environmental Design must choose to emphasize either architecture or planning. Each is designed to prepare students for graduate studies in that particular design profession.

All students in the college must take certain core courses common to both the options. These include an introductory survey course, several design studios, graphics courses, and introductions to social and physical factors in design. The various design professions are increasingly collaborating on complex design and planning issues related to the built environment, and the college core courses reflect this interdisciplinary, interprofessional focus.

General Education Requirements

Students must complete one course from each subject area.

Writing
UWRP 1150 (Students are assigned a course level according to their assessed writing ability; courses below 1150 will not meet this requirement).....3

Social Science
ANTH 1030, 1040, 2100, 2200; BLST 2030, 2040; ECON 2010, 2020; GEOG 1982, 1992; HIST 1010, 1015, 1018, 1020, 1025, 1028, 1030, 1035, 1040, 1045, 1051, 1061, 1113, 1123, 2117, 2170, 2180, 2417, 2427, 2517, 2527, 2616, 2717, 2718; PSCI 1101, 2012, 2101; PSYC 1001; SOCY 1001, 1002, 1021, 1031, 2011, 2041; WMST 2000.....3

Humanities
CHST 1031; ENGL 1200, 1260, 1300, 1400, 1500, 1600, 1700, 2260, 2530, 2600, 2610; FINE 1109, 1209, 2009, 2109, 2209, 2309, 2409; HUMN 1010, 1020; PHIL 1000, 1100, 1200, 1300, 1400, 1440, 1600, 1700, 1750.....3

Math
Architecture option: MATH 1300.....5
Planning option: MATH 2510; OPMG 2010; PSYC 2101; SOCY 3061; ECON 3818.....3-4

Natural Science
Architecture option: PHYS 2010 (includes lab).....5
Planning option: EPOB 1210 plus 1230; CHEM 1111; NASC 1230 or 1250; PHYS 2010.....4-6

Architecture Option

The architecture option is intended for those students who wish to pursue a professional career in architecture. Students may enter the work force directly after graduation or use their studies as a foundation for graduate work. Many of the requirements of this option are designed to help students achieve advanced standing in M.Arch. programs around the country.

General Education Requirements.....19

Studios
ENVD 1000 Environmental Design Studio (Note 1).....6
ENVD 2110 Architectural Studio 1.....6
ENVD 3210 Architectural Studio 2.....6
ENVD 4310 Architectural Studio 3.....6
ENVD 4410 Architectural Studio 4.....6
ENVD 4550 Urban Design Studio (Note 1).....6

Methods
ENVD 2002 Media (Note 1).....4
ENVD 3002 Design Theory and Methods....4
ENVD 3112 Programming.....3

History and Theory
ENVD 1014 Introduction to Environmental Design (Note 1).....3
ARCH 3114 Architectural History 1.....3
ARCH 3214 Architectural History 2.....3

Social Factors
ENVD 2001 Social Factors in Design (Note 1).....3
ENVD 3091 Environment and Behavior (Note 1).....3

Physical Factors
ENVD 2003 Ecology and Design (Note 1)....3

Technology and Practice
ENVD 3115 Building Materials and Assembly.....3
AREN 4035 Structures 1.....3
AREN 4045 Structures 2.....3
AREN 4050 Environmental Systems 1.....3
AREN 4060 Environmental Systems 2.....3

Electives.....29

At least 12 credits must be taken within the College of Environmental Design, and at least 9 credits must be taken from other University offerings. The remaining credits may be taken from either category. Three of the environmental design courses must be chosen from separate categories (i.e., design, methods, history, social factors, physical factors, and technology).

Curriculum Note
1. Curriculum core course. Must be taken by all environmental design students regardless of option area.

Planning Option

The planning option is intended for those students who wish to pursue careers in community, urban, and/or regional planning. Although a student may enter the work force after finishing this option, it is expected that many students will continue on for a master's degree in planning, urban design, geography, law, or public administration.

General Education Requirements.....16-19

Studios
ENVD 1000 Environmental Design Studio (Note 1).....6
ENVD 2120 Planning Studio 1.....6
ENVD 3220 Planning Studio 2.....6
ENVD 3320 Planning Practicum.....2
ENVD 4320 Planning Studio 3.....6
ENVD 4550 Urban Design Studio (Note 1) .6

Methods
ENVD 2002 Media (Note 1).....4
ENVD 3122 Planning Methods.....3

History and Theory
ENVD 1014 Introduction to Environmental Design (Note 1).....3
ENVD 4794 History of Planning.....3
ENVD 4824 Senior Seminar.....3

Social Factors
ENVD 2001 Social Factors in Design (Note 1).....3
ENVD 3091 Environment and Behavior (Note 1).....3
ENVD 4311 International Housing Policies....3
plus three upper-division courses from any of the following arts and sciences areas: economics, human and cultural geography, sociology, and political science.....9

Physical Factors
ENVD 2003 Ecology and Design (Note 1)....3
ENVD 4023 Environmental Impact Assessment.....3

plus two upper-division courses in civil engineering, physical geography, or geographic technique.....6
Electives 31-34

At least 9 credits must be taken from within the College of Environmental Design, and at least 15 credits must be taken from other University offerings. The remaining elective credits may be taken in either category. Three of the other University courses must be chosen from civil engineering, geography, political science, sociology, anthropology, or public administration.

Curriculum Note
1. Curriculum core course. Must be taken by all environmental design students regardless of option area.

Double-Degree Programs

In addition to the bachelor of environmental design degree, students may pursue a degree in another college at CU-Boulder. Past students have received the B.Envd. degree concurrently with undergraduate degrees in business, engineering, and in various programs offered by the College of Arts and Sciences. Typically, specific course requirements do not change in either program of a double degree; however, additional hours (varying by college) may be required. All environmental design students must complete the general education requirements and the requirements for their specific option area within the College of Environmental Design in addition to the other college's requirements. Students considering a double-degree program are encouraged to speak with advisors in both colleges to determine requirements and procedures for application.

COURSE DESCRIPTIONS

The following courses are offered in the College of Environmental Design 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 current information on times, days, and instructors of courses, students should consult the *Schedule of Courses* issued at the beginning of each semester.

Some courses may be open to nonmajors. Students should check for current policies.

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 are organized by subject matter and are generally listed numerically *by last digit* (courses ending in the number "0" are listed before courses ending in "1," and so on). The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:
Prereq.—Prerequisite
Coreq.—Corequisite
Lab—Laboratory
Rec.—Recitation
Lect.—Lecture

Architecture

ARCH 3114-3. History and Theories of Architecture 1. Survey of architecture, landscape architecture, and urban design from ca. 3000 B.C. to ca. 1400 A.D., emphasizing developments in the western world. Open to nonmajors.

ARCH 3214-3. History and Theories of Architecture 2. Survey of architecture, landscape architecture, and urban design from ca. 1400 A.D. to the present, emphasizing developments in the western world. Open to nonmajors.

ARCH 4010-3. Architectural Appreciation and Design. Introduces basic processes and principles of architectural design to provide students with a basis for understanding and evaluating architecture. Open to AREN seniors only.

Environmental Design

Studios

ENVD 1000-6. Environmental Design Studio. Required introductory studio course. Examines a range of architectural and planning problems; presents basic material about structure, construction, space planning, and site layouts. Shows how concepts of architectural meaning and human behavior help shape the built environment. Open to nonmajors.

ENVD 2110-6. Architecture Studio 1. Preprofessional studio in architectural design. Addresses a wide variety of architectural problems, from residential and commercial to urban design, and integrates the many factors that shape buildings, including construction, structures, climate, human behavior and values, and cultural meaning. Prereq., ENVD 1000.

ENVD 2120-6. Planning Studio 1. Applies knowledge from other courses in the curriculum; introduces the various physical systems (natural and built) affected by planning interventions; and progressively addresses more complex issues in planning for neighborhoods, central districts, citywide and regional planning scales. Prereqs., ENVD 1014, 2002, 2003, and general education requirements.

ENVD 3210-6. Architecture Studio 2. See ENVD 2110.

ENVD 3220-6, Planning Studio 2. See ENVD 2120. Prereqs., ENVD 2120 and 4794.

ENVD 3320-2. Planning Practicum. Supervised practicum in some aspect of urban or regional planning. Prereq., ENVD 3220.

ENVD 4300-3. Special Topics: Design. Advanced studio or seminar course. Explores new and emerging themes in design. Prereq., instructor consent.

ENVD 4310-6. Architecture Studio 3. See ENVD 2110.

ENVD 4320-6. Planning Studio 3. See ENVD 2120. Prereqs., ENVD 3220 and 4311.

ENVD 4340-6. Landscape Architecture Studio. Preprofessional studio in landscape architecture. Prereq., ENVD 3210 or 3220.

ENVD 4360-6. Historic Preservation Studio. Preprofessional studio in historic preservation design. Prereq., ENVD 3210 or 3220.

ENVD 4410-6. Architecture Studio 4. See ENVD 2110.

ENVD 4550-6. Urban Design Studio. Preprofessional studio in urban design for architecture and planning. Prereq., three architecture or planning studios.

Social Factors

ENVD 2001-3. Introduction to Social Factors in Environmental Design. Critical evaluation of built environments. Considers how social and individual behavior is reflected in and influenced by the built environment. Open to nonmajors.

ENVD 3091-3. Environment and Behavior. Examines the social and behavioral aspects of relationships between people and the built environment. Gives special attention to antecedent factors (why we have the environments we do), implications of given arrangements for special population groups, and responses to incongruent environments. Open to nonmajors.

ENVD 4311-3. International Housing Policies and Practices. Provides students with descriptive knowledge and analytical understanding of the use and development of residential settings in different political economies, globally divided into advanced capitalistic nations, collectivist economies, and the third world. Prereqs., ENVD 2001 and 3091.

ENVD 4361-3. Special Topics: Social Factors in Design. Variable topics in the relationship of human experience and behavior to the built environment, e.g., social research methods in environmental design.

Methods and Techniques

ENVD 2002-4. Environmental Design Media. Develops graphics skills, emphasizing drawing as a means to design. Includes investigation of drawing types and methods; diagramming of ideas and systems; and informative, exploratory, and developmental sketching. Prereq., ENVD 1000.

ENVD 2052-3. Computers in Architecture and Planning. Introduces the use of computers in design fields, including applications for word-processing, desktop publishing, graphic creation, and CAD-style design. Aims to provide basic general skills in computer use that are transferrable to other computer applications.

ENVD 3002-4. Design Theory and Methods. Explores the nature of design and systematic methods for improving design. Topics include nature of design problems, structure of design

process, theory of form, problem definition, generation of solutions, evaluation, and roles of form and functions. Students use computers without having to learn to program.

ENVD 3022-2. Photography for Visual Communications. Introduces students to the technical and practical aspects of making photographic images: the workings of the camera and lens, principles of depth of field, black and white film processing, printing, and basic darkroom procedures. Open to nonmajors.

ENVD 3052-3. Introduction to Computer Methods in Environmental Design. Surveys existing and emerging computer methods used in the environmental design professions, with an introduction to computer programming. Open to nonmajors. Prereqs., MATH 1300 and PHYS 2010, or instructor consent.

ENVD 3112-3. Research Issues and Programming for Architecture. Further develops critical capacity to evaluate environments. Introduces selected methods from the social sciences used in programming and evaluating designs. Prereq., ENVD 2002.

ENVD 3122-3. Research Issues and Methods for Planning. Explores topics of current interest in planning. Looks at the development and social consequences of the neighborhood movement, forms of municipal and regional governments, regional settlement patterns, and new communities. Introduces selected methods from the social sciences used by planners and urban designers. Prereqs., ENVD 2002, 2003, 3091, general education requirements.

ENVD 3152-3. Introduction to Computer Graphics Applications. Principles and uses 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 techniques for the preparation, composition, and presentation of landscape and built environment drawings. Prereq., ENVD 2002.

ENVD 3252-3. Computer Graphic Programming. Introductory computer programming course designed to teach the capabilities of a computer in providing graphic representations of environments, including buildings. Open to nonmajors.

ENVD 4012-3. Imagination and Creativity. Seminar on imagination and creativity in environmental design. Students research and prepare a class presentation and paper on a topic of interest. Open to nonmajors at all levels.

ENVD 4092-3. Improving Imaging Ability. Advanced course dealing with theories of imaging and methods of improving imaging in the design process. Open to nonmajors.

ENVD 4112-3. Architectural Graphics 1. Techniques of graphics communication and presentation for architectural design. Includes advanced delineation and use of color. Prereq., ENVD 2002.

ENVD 4122-2. Advanced Technical Photography. Focuses on working with high-contrast graphic arts film to create special effect photographs. Processes include cyanotype (blue print), Van Dyke Brown, and hand-applied color to black and white images. Intended to give students a full array of photographic techniques to incorporate into studio course presentations and portfolio work. Students must provide their own 35mm SLR camera. Prereq., ENVD 3022 or FINE 2191 or instructor consent.

ENVD 4152-3. Computer Graphic Applications. Introduces the mechanics of entering 2-D images and 3-D objects into the computer. Once entered, graphics are interactively rotated in space, walked through, and displayed in perspective from any position. Also covers the mechanics of other computer programs allowing additional manipulation of the images and objects.

ENVD 4192-3. Improving Imaging Ability 2. Advanced course dealing with theories of imaging and methods of improving imaging in the design process. Open to nonmajors.

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 and architectural disciplines. Prereq., ENVD 2002.

ENVD 4252-3. Advanced Computer Graphics Programming. Covers 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 databases.

ENVD 4322-3. Special Topics: Graphics. Advanced seminar on special issues in design communications. Open to nonmajors. Prereq., upper-division standing.

ENVD 4352-3. Special Topics: Computer Methods. Topics include animation and environmental simulation; computational methods of technical evaluation and optimization; and computational mapping and analysis.

Physical Factors

ENVD 2003-3. Ecology and Design. Introduces basic principles and techniques of ecology as they relate to the design and understanding of the built environment. Includes a study of hazards and the impact of modern technology on the natural and built environments. Open to nonmajors.

ENVD 4023-3. Environmental Impact Assessment. Field-oriented seminar in current environmental impact controversies. Gives attention to history, theory, and application of impact analysis at state levels for designers, land-use planners, and others involved in resource decision making. Open to nonmajors. Prereq., instructor consent.

ENVD 4363-3. Special Topics: Physical Factors in Environmental Design. Includes such topics as appropriate technology, public policy and natural hazards, organization of the designing and building process, and physical elements of urban development. Prereq., upper-division standing.

History and Theory

ENVD 1014-3. Introduction to Environmental Design. Survey of factors shaping the built environment. Discusses various theories of design architects and planners have employed and offers an historical review of these two fields. Discusses potential career opportunities in the design professions. Open to nonmajors.

ENVD 4024-4. Comparative European Environments. Summer semester field seminar in Europe, offered in alternate years. Explores new towns, satellite cities, other forms of human settlement, and cities of antiquity. Includes England, Switzerland, Italy, and Greece. Preference given to students with a planning emphasis. Open to nonmajors. Prereq., instructor consent.

ENVD 4114-3. History of American Architecture and Urbanism. Survey of architecture, landscape architecture, urban design, and planning in the U.S. from ca. 1600 to the present. Open to nonmajors. Prereq., ARCH 3214 or equivalent, or instructor consent.

ENVD 4364-3. Special Topics: History and Historiography of Environmental Design. Advanced seminar on history and historiography of environmental design, e.g., American dwellings. May be repeated for credit by petition. Prereq., ARCH 3214 or equivalent, or instructor consent.

ENVD 4764-3. Special Topics: Theory and Criticism in Environmental Design. Advanced seminar on theory and criticism in environmental design, e.g., architecture now and introduction to design theory and criticism. May be repeated for credit by petition. Prereq., ARCH 3214 or equivalent, or instructor consent.

ENVD 4794-3. History of Urban Design and Planning. History of European and American planning and urban design in the late 19th and 20th centuries.

ENVD 4824-3. Senior Planning Seminar. Advanced seminar focusing on theoretical concerns and practical issues inherent in environmental design planning. Views concerns and issues in terms of settings, processes, and planning outcomes. Provides a critical synthesis of the inherently interdisciplinary nature of planning education. Open to planning seniors only, or by instructor consent.

Technology and Practice

ENVD 3015-3. Historic Preservation Technology. Introduces methods for identifying historic structures and evaluating their materials. Considers techniques for preserving and restoring and legal options for promoting preservation efforts.

ENVD 3115-3. Introduction to Building Materials Systems. Surveys building methods, materials, and assemblies from the designer's perspective.

ENVD 4005-3. Design and Planning Law. Students learn how to research the various codes and to draft and pass laws. Covers environmental, water quality, property, zoning, and building codes and laws. Open to nonmajors.

ENVD 4035-3. Solar Technology. Introduces aspects of solar technology relevant to the environmental design professions. Includes readings and lectures on the nature of energy limitations, energy needs, and the potential role of solar energy in meeting these needs. Open to nonmajors. Prereq., PHYS 2010 or equivalent.

Miscellaneous

ENVD 3909 (1-6). Independent Study. By special arrangement with instructor. Prereqs., junior standing and 3.00 GPA.

ENVD 4909 (1-6). Independent Study. By special arrangement with instructor. Prereqs., junior standing and 3.00 GPA.

ENVD 3919 (1-6). Teaching Assistant. By special arrangement with instructor. Prereqs., junior standing and 3.00 GPA.

ENVD 4919 (1-6). Teaching Assistant. By special arrangement with instructor. Prereqs., junior standing and 3.00 GPA.

ENVD 4929 (1-6). Research Assistant. By special arrangement with instructor. Prereqs., junior standing and 3.00 GPA.

ENVD 4939 (1-6). Internship. By special arrangement with instructor and outside sponsor. Prereqs., junior standing and 3.00 GPA.

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.

BARBARA AMBACH, Lecturer. B.F.A., B.Arch., Rhode Island School of Design.

ERNESTO G. ARIAS, Associate Professor. B.Arch., University of Florida; M.Arch., M.C.P., Ph.D. (Urban Planning), 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 Emeritus.

MARK GELERNTER, Associate Professor. B.Arch., Montana State University; Ph.D. (Architecture), Bartlett School of Architecture and Planning, University College, London.

MARK GROSS, Assistant Professor. B.S., Ph.D. (Architecture), Massachusetts Institute of Technology.

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.

JOSEPH JUHASZ, Associate Professor. A.B., Brown University; Ph.D. (Psych.), University of California, Berkeley.

JAMES LEESE, Lecturer. B.Arch., Arizona State University. Licensed Architect: Colorado, New Mexico, and California.

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 Emeritus.

JEFFREY SHEPPARD, Lecturer. B.S., M.Arch., Georgia Institute of Technology. Licensed Architect: Colorado.

LUIS SUMMERS, Professor, Environmental Design and Civil, Environmental, and Architectural Engineering. B.Arch., M.S., Ph.D., Notre Dame.

WILLEM K. T. VAN VLIET, Associate Professor. Doctorandus, Free University of Amsterdam; Ph.D. (Urban Sociology/Planning), University of Toronto.

Graduate School

David R. Kassoy, Interim Dean

Graduate work at the University of Colorado began on a small scale in 1892. Following 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, and a dean is in residence on each campus. The Universitywide Graduate School is administered by 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.

Degrees

The Graduate School of the University of Colorado at Boulder offers instruction leading to the following advanced degrees:

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. degree programs include:

Anthropology
Art Education
Chinese
Classics
Communication
Communication Disorders and Speech Science
Comparative Literature
Economics
Education
English
Environmental, Population, and Organismic Biology
Fine Arts
French
Geography
History
Journalism
Linguistics
Mathematics
Molecular, Cellular, and Developmental Biology
Philosophy
Political Science
Psychology
Religious Studies
Sociology
Spanish
Theatre

M.S. degree programs include:

Aerospace Engineering Sciences
Applied Mathematics
Astrophysical, Planetary, and Atmospheric Sciences
Business Administration
Chemical Engineering
Chemistry
Civil Engineering
Computer Science
Electrical Engineering
Geology
Kinesiology
Mechanical Engineering
Pharmacy
Physics
Telecommunications

Ph.D. degree programs include:

Aerospace Engineering Sciences
Anthropology
Applied Mathematics
Astrophysical, Planetary, and Atmospheric Sciences
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
Environmental, Population, and Organismic Biology
French
Geography
Geology
Geophysics
History
Linguistics
Mathematical Physics
Mathematics
Mechanical Engineering
Molecular, Cellular, and Developmental Biology
Music
Pharmacy
Philosophy
Physics
Political Science
Psychology
Sociology
Spanish
Theatre

Inquiries regarding admission to graduate programs should be addressed to the graduate department in which the applicant wishes to study (see the directory for campus addresses).

RESEARCH SUPPORT

The University of Colorado at Boulder takes an active part in research in a wide variety of fields.

More than $100 million in sponsored research and programs was generated in 1991. The principal sources of these funds are research and training grants and contracts awarded by 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

The Business Research Division is responsible for the organized research activities of the College of Business and Administra-tion, which are conducted through seven organizations. **The Center for Recreation and Tourism Development** supports research in recreation and tourism and conducts tourism and recreation programs in Colorado and adjoining states. **The Center for Applied Artificial Intelligence** focuses on the state-of-the-art artificial intelligence tools and methodologies applied to practical business and economic problems. **The Technology and Innovation Management Research Center** conducts research on issues related to managing high technology organizations and collaborates on projects with high tech firms. **The International Center for Energy and Economic Development** conducts international conferences on energy resource issues and publishes books, monographs, and a journal on these topics.

The Bureau of Business Research performs contract research and provides the Colorado business community with information and special studies on the state's economy and business problems. This unit

supervises the activities of the CU Business Advancement Center and the Rocky Mountain Trade Adjustment Assistance Center. These centers provide management assistance, business information, and consulting services to small- and medium-sized businesses in the region.

The Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) applies artificial intelligence techniques to water and environmental decision making and produces state-of-the-art systems. CADSWES is the U.S. Bureau of Reclamation's National Center for Research and Development of Advanced Decision Support Systems.

The Center for Astrophysics and Space Astronomy (CASA) is a research center within the Department of Astrophysical, Planetary, and Atmospheric Sciences. CASA provides a focus for campuswide 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, staff members carry out research involving X-ray, far-UV, optical, infrared and radio satellite and ground-based facilities with national and international collaboration. Additional CASA staff are involved in one of the astrophysical theory centers funded by NASA in 1985.

CASA's experimental effort includes design studies of the LYMAN (far-ultraviolet spectroscope explorer) satellite and two sounding rockets for ultraviolet and high-energy astrophysics. The ultraviolet rocket successfully observed Supernova 1987A in 1988, and future UV and X-ray flights are planned to observe hot stars, interstellar matter, quasars, and cosmic X-ray sources. CASA plans to expand in three areas: development of a comprehensive "panchromatic" astronomical data analysis center, creation of a new, large optical telescope facility, and enhancement of space and ground-based astronomy instrumentation in several spectral regions.

The Center for British Studies, the only unit of its kind in the country, promotes research in all aspects of British culture, history, and contemporary life. Its resources include the outstanding research collections of the University of Colorado Libraries, including a wide range of microfilmed copies of original materials from Britain. Some of these materials were copied exclusively for CU-Boulder. The center is the leading research facility in British studies in the Rocky Mountain/high plains area.

The center sponsors visiting lecturers, colloquium series, and conferences, and serves as a gathering point for scholars and students in the region. It welcomes outside users of the research collections and works to continue developing the research base. It also cooperates with community groups in sponsoring activities dealing with British politics, business, and the arts.

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. Other focuses 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 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 Labor Education and Research (CLEAR) conducts labor education programs and research in various aspects of labor relations. Noncredit courses are offered for members of organized labor as the University's service to the labor community of Colorado. Graduate students may attend conferences with staff members and use available library facilities. CLEAR staff members also teach credit courses in other schools and colleges.

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 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 from the understanding of the Earth as a closely integrated system, and from learning how people and their activities can change that system. For example, the global climatic changes that occur as a result of increased atmospheric carbon dioxide may have socioeconomic implications requiring further study.

These policy areas are 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 Center for the Study of American Politics provides institutional support for research on political behavior, institutions, processes, and policymaking in the United States. The center is particularly concerned with the analysis of political change in the United States. The center also coordinates an undergraduate internship program on state politics and promotes the training of graduate students as research scholars in the area of U.S. politics.

The Center of Atmospheric Theory and Analysis (CATA) involves collaboration among researchers in the Department of Astrophysical, Planetary, and Atmospheric Sciences (APAS); the National Center for Atmospheric Research (NCAR); and the National Oceanic and Atmospheric Administration (NOAA). Research activi-

ties 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 waves, cyclogenesis, photochemistry and transport in the upper atmosphere, climate dynamics, equatorial waves, and satellite remote sensing.

CATA, which is headquartered in the APAS department atmospheric sciences laboratory, operates a Pyramid 90X super minicomputer, an IRIS three-dimensional graphics workstation, and a SUN-based image analysis system, all linked to the University computing network and to NCAR's network. Numerical calculations are carried out locally and at the NCAR supercomputing facility at which NCAR's extensive atmospheric data base is available. The center also operates a Unidata satellite receiver, 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 Engineering Research Center coordinates the research activities of the College of Engineering and Applied Science. The center has formed a number of interdisciplinary research centers that augment discipline-based research in traditional academic fields. These centers conduct research in collaboration with industry and national laboratories.

Areas in which centers have been or are being formed include: optoelectronic computing systems, parallel processing, geotechnical engineering, astrodynamics and remote sensing, space structures and control, low-gravity fluid mechanics 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, space construction, and the study of Earth from space.

In addition to the interdisciplinary centers, the Engineering Research Center helps coordinate nearly 200 other projects, most conducted by individual faculty members or groups of faculty and funded by governmental agencies or industry. Graduate students and some undergraduate 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 construction, 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, parallel and distributed processing, 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 Joint Center for Energy Management (JCEM) is dedicated to excellence in energy-related education, research, and technical assistance. Established in cooperation with Colorado State University, JCEM programs focus on the design and technology of cost-effective, energy-efficient buildings and industrial processes. Included is a major, state-of-the-art HVAC laboratory designed to test system performance under various climatic and load situations, to develop diagnostic expert systems, and to perform research on control technologies.

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 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 and trade relations in the Pacific region are 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, and international business.

Research Institutes

The Cooperative Institute for Research in Environmental Sciences (CIRES) is jointly sponsored by the University of Colorado and the National Oceanic and Atmospheric Administration (NOAA). CIRES employs more than 350 faculty, students, and staff from a variety of scientific disciplines. Academic departments currently represented in CIRES are chemistry and biochemistry; environmental, population, and organismic biology; geography; geological sciences; electrical and computer engineering; mechanical engineering; and physics. The institute serves as a center for multidisciplinary collaboration of environmental scientists from Boulder and throughout the world. A visiting fellowship program enables scientists from other institutions working in these fields to spend time at CIRES.

CIRES research programs involve 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, the Arctic and Antarctic regions, Hawaii and various Pacific atolls, and elsewhere. Results of this research bear on such practical societal problems as destruction of the Earth's ozone shield by pollutants, acid deposition in rain and snow, degradation of air and water quality, toxic waste treatment, and earthquake prediction.

Current CIRES research programs, in which approximately 90 graduate students are involved, can be loosely grouped into four areas. In environmental chemistry and biology, ongoing research involves measurements of constituents and reactions in the atmosphere, kinetics of reactions in the stratosphere and troposphere, gas and liquid chromatography, mass spectrometry, microcomputer interfaced instrumenta-

tion, metal complex chemistry, aerosol chemistry, and leaching of toxic wastes from mining. Scientists and students in atmospheric and climate dynamics presently study air-sea interactions, dynamics of the atmospheric boundary layer, ocean dynamics, ice nucleation physics, cryosphere-climate interactions, ice sheet dynamics, and contemporary and paleoclimatology.

Current research in solid earth geophysics includes earthquake prediction and earthquake physics, plate tectonics, seismic wave propagation, nuclear test discrimination, rock deformation and fracture, strains and tilts associated with Earth tides and secular deformation, and normal modes of vibrations of the Earth.

In a major step to expand the research capabilities in remote sensing of the environment, CIRES established the Center for the Study of Earth from Space to provide a focus for the development and application of modern remote sensing techniques to research in all aspects of the environmental sciences. CIRES also administers the Center for the Study of Global Change. Scientists affiliated with this center conduct collaborative studies aimed at understanding anthropogenically induced global changes.

The Institute of Arctic and Alpine Research (INSTAAR) is an interdisciplinary research institute with ongoing programs in the Rockies, Arctic Canada, Alaska, Spitsbergen, 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 30 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 Alaskan North Slope, quaternary studies, especially in regard to the mode of glaciation and deglaciation, and a center for geochronological research, which is involved in amino acid, 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 25 miles west of the Boulder campus, is operated for the University by INSTAAR. The station, a national center for field studies in the biological and physical sciences, 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 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 is offered in summer and winter in areas such as plant and animal ecology, climatology, geomorphology, and hydrology. 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 (IBG) 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 upon behavioral research the perspectives of biochemical genetics, cytogenetics, developmental genetics, evolutionary genetics, molecular genetics, pharmacogenetics, and quantitative genetics. Facilities are available for research on a variety of organisms, including humans, laboratory mice, and nematodes. Institute faculty currently are applying the concepts and tools of behavioral genetics to such diverse areas as aging, alcoholism, cognitive development, drug addiction, learning disabilities, neurological diseases, personality, and psychopathology.

The Institute of Behavioral Science (IBS) 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's principal administrative units conduct research in the areas of problem behavior, population processes, environment and behavior, and 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, computer science, linguistics, philosophy, and other cognitive sciences. Its major research programs fall into five areas: natural language processing; human-computer interaction and knowledge-based systems; connectionist modeling; human information processing and skilled performance; and judgment and decision making. These programs include the use of artificial intelligence techniques and cognitive simulations in gaining an understanding of basic cognitive processes as well as educational and industrial applications.

The Joint Institute for Laboratory Astrophysics (JILA) was established in 1962 by an agreement between the University and the National Bureau of Standards (now the National Institute of Standards and Technology, or NIST). 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 NIST, and with the University's physics, chemistry, and astrophysical, planetary, and atmospheric sciences departments. A brochure giving more detailed information is available on request from the institute.

The Laboratory for Atmospheric and Space Physics (LASP) is an established center for basic theoretical and experimental research in planetary, atmospheric, and solar physics. LASP also conducts research

to explore the potential uses and development of space operations and information systems; as well as a program to develop scientific instrumentation. Students and faculty from the Departments of Astrophysical, Planetary, and Atmospheric Sciences; Physics; Geological Sciences; the College of Engineering and Applied Sciences; and the Space Grant College can pursue their research interests under the auspices of the laboratory. LASP has experiments on two current NASA spacecraft: on the Voyager mission a photopolarimeter is studying the atmospheres of Jupiter, Saturn, Uranus, and Neptune; and the Pioneer Venus mission carries a programmable ultraviolet spectrometer that is examining the Venusian atmosphere. LASP scientists are preparing for extensive use of the Hubble Space Telescope, which was launched in 1990. 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.

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, neurochemistry, closed ecological life support systems, and microgravity bioprocessing. Computer laboratories are equipped for use in upper-division and graduate courses and for graduate research, with special capabilities for computer-aided design, neural network modeling, satellite image processing, and space structures dynamics and controls. A NOAA satellite receiving station is available to the department for use in teaching and research.

The Department of Astrophysical, Planetary, and Atmospheric Sciences 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 conducted 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, a scanning tunneling microscope, and associated surface analysis tools. Three 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.

The suspension fluid dynamics laboratories include hollow-tube and plate-and-frame crossflow microfilters, two sedimentation/light extinction devices, two continuous inclined settlers, an Elzone 180XY particle size analyzer, a flocculation reactor, a disk centrifuge, and a microphotography system. Most of the experiments are interfaced with microcomputers.

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 Institute of Standards and Technology in Boulder.

The biotechnology research laboratories are equipped with ten highly instrumented and controlled fermenters in sizes ranging from 1 to 20 liters, two high-performance liquid chromatographs, a gas chromatograph, a UV-vis scanning spectrophotometer, two laminar flow hoods, two autoclaves, an automatic glucose and lactate analyzer, a biofreezer, three shaking incubators, a CO2 incubator, a sonicator, centrifuges, and other standard equipment for conducting fermentation research on bacterial yeast, mycelial, and mammalian cell cultures.

The bioengineering laboratory is also equipped for biophysical measurements. This 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 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.

Civil, environmental, and architectural engineering research interests and facilities include extensive research laboratories for use 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 in 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, groundwater hydrology, hydraulic and hydrologic modeling, 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 Department of Computer Science has built a network (10 Mbit/s 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 and Applied Science. It is managed and operated by Computing and Network Services using computer science students. These students gain valuable real-world experience and find themselves well prepared for the job market.

The network is configured as follows:

Aerospace engineering	Pyramid 90x 3 SUN 3 workstations 2 microVAX IIs
Applied mathematics	Pyramid 90x 6 SUN 3 workstations
Astrophysical, planetary, and atmospheric sciences	Pyramid 90x Silicon Graphics Iris SUN 3 workstation
Civil engineering	6 Apollo workstations 6 SUN workstations
Computer science	mips M/1000 30 HP-9000 workstations 32-node Intel Hypercube 20-node Encore Multimax Pyramid 90x Silicon Graphics Iris SUN 4/260 36 SUN 3 workstations 8 Symbolics AI workstations VAX 11/785 VAX 11/780
Electrical engineering	2 Apollo workstations 2 Graftek workstations Harris H800 10 HP-9000 workstations IBM RT workstation 2 Metheus workstations Pyramid 90x 8 SUN 3 workstations
MCD biology	Pyramid 90x Silicon Graphics Iris microVAX II/GPX
Mechanical engineering	Pyramid 90x 8 SUN 3 workstations
Supercomputing lab	12 SUN 3 workstations VAX 11/750

A wide variety of terminals, graphics terminals, line printers, plotters, and letter quality laser is readily accessible to students.

In addition, instructional support for computer science students is excellent. Laboratories of small two-user UNIX machines (AT&T 3B2s) support undergraduate courses; Pyramid 90x 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.

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;* and a biomicrowave laboratory.

The department has a large variety of computing equipment to support its research and instructional activities. Most machines are connected via Ethernet, which also provides access to a large number of shared computing resources on campus. Department facilities include over 75 minicomputers and workstations, including SUN and Hewlett-Packard 9000 series systems.

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 450oC 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 Research Center 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 Computing and Network 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. 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 land 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., at the Indiana University Cyclotron Facility and elsewhere. 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 (HAO) 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 used by graduate students pursuing advanced studies in astrophysical, planetary, and atmospheric sciences and physics.

ACADEMIC EXCELLENCE

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.

Assistance offered by the Graduate School includes University of Colorado fellowships, protected class fellowships, chancellor's graduate fellowships, nonresidential tuition differential scholarships, Patricia Roberts Harris fellowships, and Colorado graduate grants.

University of Colorado fellowships are awarded to entering and continuing regular degree graduate students. These are awarded to entering students on the basis of academic promise and to continuing students on criteria of academic success. The fellowships consist of a stipend or a full fellowship, including a tuition waiver. Students holding these fellowships must reapply each year to their departments for renewal. Entering students intending to apply are required to take the Graduate Record Examination, with the exception of D.Mus.A., M.F.A., theatre, and protected-class students.

Protected-class fellowships are awarded in the same manner as University fellowships; however, eligibility is limited to minority students and women in fields in which they have been traditionally underrepresented. GRE scores are not required for applicants.

The Chancellor's Graduate Fellowship Program was instituted in 1984-85 to recruit the most outstanding students for graduate study at the University of Colorado. Selected students receive a stipend of $15,000 for two years and a full waiver of all tuition and fees. To be considered for this award, students must be entering a master's or doctoral program and be nominated by their department.

Nonresident tuition differential fellowships are awarded to entering out-of-state and foreign students to encourage enrollment in graduate programs at the University. More than 60 of these fellowships, equal to the difference between Colorado resident and nonresident tuition, are awarded by the Graduate School to students nominated by their major department.

Patricia Roberts Harris fellowships are presently awarded to minority and protected class students in selected departments. Students should indicate their interest in being nominated for this award when applying for admission. Students receive a stipend and a waiver of all tuition and fees for a period of three years. These fellowships are awarded to specific departments by the U.S. Department of Education.

The Colorado Graduate Grant Program is open to graduate students who are Colorado residents. The competition for these funds is based on need. Applications are available from the Office of Financial Aid.

Additional fellowships are available from private sources or supplemental funds. Fellowships, traineeships, and scholarships are also offered by certain departments. Applications for financial support are due in the departments before the announced deadlines.

For further details, contact the fellowship coordinator in the Graduate School.

ACADEMIC STANDARDS

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 because a student completes a specified period of residence and passes 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* (3.00) 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. For a master's degree, a course mark below *C* 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 upon consultation with the major department. The final decision on suspension will be made by the dean of the Graduate School.

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.

ADMISSION AND ENROLLMENT POLICIES

Admission 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. A student may be admitted to the Graduate School as either a regular degree student or a provisional degree student.

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 chosen field.
4. Have at least a 2.75 (2.00 = *C*) undergraduate grade point average (for engineering, 3.00).
5. Meet additional requirements for admission established by major departments.

Pass/Fail Grades. To permit a meaningful evaluation of an applicant's scholastic record, no more than 10 percent of the credit hours relevant to the intended field of graduate study shall have been earned with pass/fail grades, or 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 may 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 their 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 the 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.

According to the terms of their provisional admission, provisional degree students are required to maintain a 3.00 grade

point average or higher during 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.

To be changed to regular degree status from provisional status, a student must maintain a 3.25 grade point average in 12 hours of graduate course work.

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 no 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.

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 an 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 be working toward an advanced degree from this University.

Graduate Record Examinations

Graduate Record Examination (GRE) scores are normally 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 should take the GRE no later than the previous December testing date so that their scores will be available to the graduate awards selection committee. Students should allow three months after taking the test for scores to reach applicable departments at the University.

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, students should consult the specific department before taking any graduate test.

Packets containing application/registration materials, instructions, test dates and deadlines, and fee information may be obtained on the second-floor landing of Willard Administrative Center. Special problems or requests must be handled by Educational Testing Service, Box 995, Princeton, NJ 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 and registration materials for law school (LSAT), business school (GMAT), medical school (MCAT), dental school (DAT), National Teacher Examinations (NTE), and Miller Analogies Test (MAT) on the second-floor landing of Willard Administrative Center.

Application Procedures

An applicant for admission must present complete application materials that include:

1. Part I and part II of the graduate application, available from academic departments.
2. Two official transcripts of *all* academic work completed to date.
3. A $40 nonrefundable application fee (check or money order). No application will be processed unless this fee is paid. Foreign application fee is $60.
4. Four letters of reference.
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 that 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 titled 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 required by the major department. (Exceptions may be made by individual departments.)

Foreign students coming from abroad should have complete applications on file in the Office of Admissions before March 1 for the fall semester and October 1 for the spring semester; foreign students currently studying in the United States should follow deadlines set for United States citizens.

Qualified applicants may find that their application cannot be processed for a specific term if enrollment levels have 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 and confirmation form, which must be returned with the designated nonrefundable enrollment deposit before enrollment levels are reached or the

deadline passed. If the confirmation is accepted, the student will be sent information regarding registration. Should enrollment levels be reached, the deposit will be returned. Applicants not accepted for admission will be notified by the appropriate graduate department.

Registration

Specific registration procedures are sent to new graduate students when they have confirmed their intent to enroll. Please refer to the Policies, Programs, and Services section of this catalog for further information.

Late Registration

Late registration will be held only if enrollment levels have not been reached. Therefore, there is no guarantee that late registration will take place. Graduate students who fail to complete registration and pay fees during the regular registration period may be charged a late registration fee if a late registration is held. Students registering as candidates 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 the Registration section of this catalog).

Limitations on Registration

A graduate student will be considered to be carrying a full load if the student is registered for not fewer than 5 semester hours in course work numbered 5000 or above, at least 8 semester hours in a combination of undergraduate, graduate, and professional course work acceptable for graduate credit, or any number of thesis hours in a regular semester.

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.

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 take more than 6 credit hours per semester. Part-time employees, including assistants, may take such work as is approved by the major department.

Credit Policies

Change of Department or Major

A graduate student wishing to change department or major must submit a complete graduate application to the new department or school and request the former department to forward recommendations and credentials.

Continuing Education Course Work

Students may use the resources of the Division of Continuing Education for graduate studies only if they obtain proper academic approval in advance from the major department and the graduate dean. Continuing education credits are considered transfer hours. All transfer of credit limitations apply.

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 graduate degree, nor may it be accepted for the removal of deficiencies. Marks below *B-* are not accepted for the Ph.D.
2. Graduate students have a maximum of one academic year to complete a course for which a grade of *IW* or *IF* has been given.
3. 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.
4. An in-progress *(IP)* grade given for thesis or dissertation hours will be valid until the thesis or dissertation has been completed. Once a grade has been received, it will be calculated into the student's cumulative grade point average.

No Credit

Course work to be applied toward an advanced degree may not be taken for no credit.

Courses taken for no credit cannot be used toward the minimum credit load requirement for full-time or half-time status.

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.

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.

Transfer Credit—Master's Program

Work already applied toward a 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 courses accepted for transfer must be at the graduate level and come within the five-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.

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 five-year time limit;
3. Has not been applied toward another degree; and
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. This form is to be completed by the student, endorsed by his or her 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 verification that the course work was at the graduate level.) In order to have courses considered for transfer, a student must have an overall *B* average in all courses taken at the University of Colorado in the Graduate School. Grades of courses accepted for transfer, however, are not calculated in the GPA.

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 a student takes at another recognized graduate school, as a nondegree student at this University, or as 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. A grade of *B-* or better must be obtained in any course work transferred in this manner.

Transfer Credit—Doctoral Program

Resident graduate work of high quality earned in another institution of approved standing will not be accepted for transfer for a doctoral degree until the student has established a satisfactory record of residence in this Graduate School. Such credit must be transferred before the student applies 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 formal course work required.

The maximum amount of work that may be transferred and applied toward the Ph.D. is 21 semester hours that must be graduate level and have a course mark of *B-* or above. All requests for transfer of credit must have the approval of the student's graduate program director.

Dropping and Adding Courses

A student who wishes to add or drop a course must follow the standard procedures and adhere to the drop/add deadlines found in that term's *Schedule of Courses* (the student should pay particular attention to refund policies). Note that after the sixth week of classes a graduate student may not drop, add, or change a course to noncredit status without presenting a letter to the dean of the Graduate School, 308 Regent Administrative Center. The letter must state the exceptional circumstances justifying the change. This letter, endorsed by the instructor of the course, must accompany the properly signed and completed special action form or a change-of-record form for a past semester.

Reciprocal Exchange Agreement Program

Reciprocal registration enables University of Colorado graduate students to attend classes at other northern Colorado institutions, 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 for 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 must not be offered on the student's home campus at a time the student can take advantage of it.
5. The request is presented prior to the home campus drop/add deadline.
6. The request is presented for 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 the Registrar, Regent 125, 492-6581.

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. Satisfaction of this requirement depends not so much upon the ability to pass formal tests, although these may be required, as 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.

Withdrawal

A graduate student who desires to withdraw from the University should go to Regent Administrative Center 125 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.

Animal and Human Research

Research involving the observation of human subjects or the use of animals must have the approval of the Human Research Committee or the Animal Care and Use Committee.

FINANCIAL AID FOR GRADUATE STUDY

The University of Colorado receives funds earmarked to provide financial assistance to graduate students who demonstrate financial need. Students may apply for financial assistance by submitting a financial aid application as soon as possible after January 1.

Graduate students may apply for long-term loans through the Stafford Loan (formerly GSL) program or the Perkins Loan program (formerly the National Direct Student Loan) and for part-time jobs through the College Work-Study program by submitting this application.

Graduate Part-Time Instructors and Teaching Assistants

Many departments employ graduate students as graduate part-time instructors (GPTIs) or as teaching assistants (TAs). GPTIs are full-time, regular degree graduate students who have a master's degree or the equivalent and who have demonstrated competence in classroom teaching. Teaching assistants are also full-time regular degree graduate students, but it is not necessary for them to have any previous experience. GPTIs and TAs must have a cumulative GPA of at least 3.00. Students

are compensated on the basis of the percentage of time worked. Tuition credits are also based on the student's percentage of time worked. Nonresident students employed as assistants are eligible for the nonresident tuition differential waiver for their first-year appointment only, with the exception of foreign students. Exceptions extending beyond the first year must be approved in advance by the dean.

Research Assistants

Research activities provide opportunities for graduate students to secure part-time work as research assistants in many departments. All research assistants must maintain a cumulative GPA of at least 3.00. 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.

GRADUATE TEACHER PROGRAM

The Graduate Teacher Program (GTP), directed by Graduate School staff, offers teacher training to all graduate students who teach courses, labs, and recitations, or who assist with office hours and grading. The GTP conducts intensives before the beginning of fall and spring semesters and follow-up workshops throughout the year. Topics covered include effective teaching and grading strategies, communication skills, and professional ethics. The GTP also offers a graduate teacher training certificate for students who complete workshop requirements, videotape consultation, and individual and departmental consultations.

REQUIREMENTS FOR ADVANCED DEGREES

Master of Arts and Master of Science

A student regularly admitted to the Graduate School and later accepted as a candidate for the master of arts or master of science degree 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 field 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 will have graduate rank only if they are taught by members of the graduate school faculty *and* are within the major department at the 5000 level or above, or are outside the major department at the 3000 level or 4000 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). Additional work required to make up deficiencies or prerequisites may consist partly or entirely of 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 (e.g., changing of IW grades, submission of diploma cards, and notification of final examinations).*

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 Requirements

The minimum requirements for the master of arts or master of science degree 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 thesis, which may be a research, expository, critical, or creative work, 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. If using human subjects for research, students must have approval from the human research committee before research can be undertaken.
2. Be based upon independent study and investigation.
3. Represent the equivalent of 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 typed copies of the thesis, including abstract and signatures, must be filed in the Graduate School by the posted due date for that semester.

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.

Graduate students who write a thesis under plan I must register for 4, 5, or 6 semester thesis hours during one semester or over a number of semesters. Students 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 grade *(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 a master's candidate for degree. Students receive 3 credit hours when taking this course. However, this course does not apply toward the Graduate School's minimum credit-hour requirements for a master's degree. The student will receive a grade of pass or fail for this course, not a letter grade.

Language Requirement

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 from the date course work is started in the program. Students who attend exclusively during summer sessions must complete all degree requirements within 72 months. Students who fail to complete all requirements within this time period must submit a petition 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 five 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.

Residence

In general, the residence requirement 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 Limitations on Registration 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 no later than 10 weeks prior to the completion of the comprehensive-final examination.

Applications must be made on forms available in the dean's office and appropriate departments and must be signed by the major department, certifying that a student's work is satisfactory and that the program outlined in the application meets the requirements set for the student.

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 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 on the Boulder campus as a regular degree-seeking student when the examination is taken.
2. Notice of the examination must be filed by the major department in the dean's office at least two weeks 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. The chair of the committee must have a regular or tenured graduate faculty appointment.
4. The examination, which may be oral, 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 for at least three months and until any work prescribed by the examining committee has been completed. The student may retake the examination only once.

Supplemental Examination

A supplemental examination 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 (Ph.D.) 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. 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, significant contribution 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 are found in the announcements of separate departments. Any department may make additional regulations consistent with these general rules.

Studies leading to the Ph.D. degree must be chosen 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 of 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 (e.g., changing of *IW* grades, submission of diploma cards, and notification of final examinations).

Departments or program committees may have additional deadlines that must be met by graduate students. Students are responsible for ascertaining such requirements and for meeting 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 courses at the 5000 level or above taken for the master's degree at the University of Colorado may be applied toward the Ph.D. 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.

Dissertation Credit-Hour Requirement

To satisfy the requirements for the Ph.D. degree, a student must complete a total of at least 30 hours of doctoral dissertation credit, with not more than 10 of these credit hours in any one semester. Not more than 10 dissertation hours may be applied to the degree from semesters preceding the semester in which the comprehensive examinations are taken. In addition, up to 10 hours may be taken in the semester in which the student passes comprehensives. Dissertation 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 dissertation 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 of the advisoty committee and the executive officer of the department and with the approval of the dean of the Graduate School, 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 additional members to serve on the committee, so that several fields related to the student's special interest will be represented. A purpose of the advisoty committee (beyond guiding the student throughout 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 must 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 used here. 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 that does not contribute directly to their degree program 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.) If 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 course work and/or dissertation work taken at this Universiry.

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 admission to candidacy form filed by the student at least two weeks before the comprehensive examination is attempted.

Language Requirement

Foreign language requirements for the Ph.D. degree are specified by individual departments. The campuswide foreign language requirement of the Graduate School is no longer in effect.

Communication Requirement. Students whose native language is not English and who are not United States citizens will, by passing their courses and completing their graduate work at the University, demonstrate sufficient ability in English to meet the communication requirement.

Comprehensive Examination

Before admission to candidacy for the Ph.D. degree, students must pass a comprehensive examination in the field of concentration and related fields. This examination may be oral, written, or both, and tests mastery of a broad field of knowledge, not merely the formal course work completed. The oral part is open to members of the faculty. Students must be registered on the Boulder campus as regular degree-seeking students 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. The chair and outside member must have regular or tenured graduate faculty appointments. Successful candidates must receive the affirmative votes of a majority of the members of their 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 at least two weeks before the comprehensive examination is attempted.

A student shall have earned at least four semesters of residence, shall have passed the language requirements specified by the department, and shall have passed the comprehensive examination before admission to candidacy for the degree.

Continuous Registration Requirement. Following successful completion of the comprehensive examination, students must register continuously as regular degree-seeking students on the Boulder campus.

Students will register for and be charged for 7 or 10 dissertation hours of credit for each full-time term of doctoral work. To be excepted from this requirement, students not making use of campus facilities may petition the Graduate School for 3 credit hours of off-campus status; off-campus status is considered part-time enrollment. Continuous registration for dissertation hours during the academic year will be required until completion of the dissertation defense. The student and advisor are expected to consult each semester as to the number of hours for which the student will register.

Dissertation Requirements

A dissertation 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.

The student is responsible for notifying 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 copy of the dissertation, including abstract, plus one additional copy of the title page and abstract, must be filed in the Graduate School office by the posted deadline for the semester in 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 dissertations must be signed by no fewer than two members of the major department staff who are regularly engaged in graduate instruction.

All approved dissertations are kept on file in the library.

When the dissertation is deposited in the Graduate School, the candidate must pay the dissertation 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 dissertation has been accepted by the student's major department, a final examination on the dissertation 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. Three of the members must be Boulder campus resident faculty. The chair and outside member of the committee must have regular or tenured graduate faculty appointments. The other committee members must have either regular or special graduate faculty status. More than one dissenting vote will disqualify the candidate in the final examination.

Students must notify the Graduate School of their final oral examination at least two weeks before their scheduled examination date. Students should obtain a leaflet announcement form from the Graduate School office for this purpose. The examination must be scheduled not later than the posted deadline for the semester in which the degree is to be conferred. A student must be registered for 7 or 10 dissertation hours as a regular degree-seeking student on the Boulder campus at the time of the final examination.

In case of failure, the examination may be attempted once more after a period of time determined by the examining committee.

Time Limit

Doctoral students are expected to complete all degree requirements within six years from the date they start course work in the program. A student who fails to complete the degree within the six-year time limit must file a petition for an extension with the dean. The petition must give evidence of adequate progress and request that the student be allowed to continue in the program, and it must be endorsed by three members of the student's advisory committee. If the petition is approved, the student may continue in the program for one additional year. If the dean does not approve the petition, 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 applied 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 interdisciplinary programs are offered at CU-Boulder.

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 field 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 the first level 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: Behavioral Genetics). The second level includes the following additional requirements: competence in general genetics (e.g., EPOB 3200), 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. Trainees aspiring to second-level 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 be formally associated with, either the Department of Chemistry and Biochemistry or the Department of Physics, in accordance with their undergraduate backgrounds.

Entering students 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 requirements 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 specific departments.

	Semester Hours
CHEM 5011 and 5061 Advanced Inorganic Chemistry	6
CHEM 5311 and 5321 Advanced Organic Chemistry	6
CHEM 5531 Statistical Mechanics	3
CHEM 5541 Chemical Dynamics	3
CHEM 5561 Physical Chemistry of Macromolecules	3
CHEM 5581 Introductory Quantum Chemistry	3
CHEM 5591 Advanced Molecular Spectroscopy	3
CHEM 6411 Advanced Topics in Physical Chemistry	3
CHEM 8991 or PHYS 8990 Doctoral Dissertation	30
PHYS 5210 Theoretical Mechanics	3
PHYS 5250 and 5260 Introduction to Quantum Mechanics	6
PHYS 7230 Statistical Mechanics	3
PHYS 7310 and 7320 Electromagnetic Theory	6
PHYS 7530 Topics in 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 and Biochemistry, or the secretary, Department of Physics.

Environmental Policy

The graduate certificate program in environmental policy is designed to provide an interdisciplinary specialization for students in regular master's and doctoral programs. Environmental issues—such as water policy, wilderness preservation, air quality, energy development, and global change—transcend ordinary academic boundaries. Policy analyses that deal with these problems must integrate insights and information from many disciplines.

The program draws on courses in economics, geography, philosophy, political science, psychology, sociology, law, engineering, and environmental design. Two team-taught capstone seminars are offered each year—Environmental and Natural Resources Policy, and Policy Responses to Global Change. Each focuses on a policy research problem, emphasizing the contribution of different disciplines to the understanding of that problem and the integration of disciplinary perspectives in the analysis of alternative policy recommendations.

Admission to the certificate program is open to students in any regular degree program. A limited number of students already holding master's or doctoral degrees from other institutions may be admitted, provided they are admitted as nondegree students by one of the participating departments and meet the normal admission requirements of that department. To qualify for the certificate, students must complete at least 18 hours of approved course work, including the two required capstone seminars. At least 12 of the 18 hours must be in courses outside the department in which the student is currently enrolled. The certificate is awarded to recognize the additional course work beyond that required for the student's regular degree program.

Questions about the certificate program in environmental policy should be directed to the Center for Public Policy Research, Campus Box 330, University of Colorado at Boulder, Boulder, CO 80309-0330; (303) 492-2954.

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 subfields 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, which includes representatives from each of the participating departments. The comprehensive examination and the dissertation defense are directed by 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 subjects. The required course work is as follows. (For course numbers and course descriptions see the listings under the specific departments.)

Earth and Planetary Physics 1, 2, 3
Intermediate-level mathematical physics or engineering analysis (one year)
Seminar in geophysics (students may register 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 CIRES, Campus Box 449, University of Colorado at Boulder, Boulder, CO 80309-0449.

Master of Basic Science Program

This interdisciplinary program leads to the master of basic science (M.B.S.) degree. It provides an opportunity for present and prospective mathematics and science teachers, museum 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. Program participants include private and public school teachers, industrial scientists, engineers, and business persons.

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 and biochemistry; 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. The administrative committee decides policy, procedures, and rules for the operation of the program. An executive committee is responsible for the administration of the program.

The student may elect an emphasis in mathematics, museology, or science 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.

Requirements for Admission

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 yeats after admission by completing one year of calculus (or other courses in mathematical subjects approved by the executive committee) with a grade of *C* or better. Such remedial work does not count toward the hours required for the degree.

General regulations for admission to the Graduate School apply (see Admission Requirements). Verbal and quantitative portions of the Graduate Record Examination (GRE) are required.

Application should be made to the Master of Basic Science Program, Campus Box 249, University of Colorado at Boulder, Boulder, CO 80309-0249.

Requirements for the Master of Basic Science Degree

Courses fulfilling program requirements may be selected only from among the areas 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

Plan I (with thesis). This option is available only to students electing the science emphasis, as described below. Requirements include 24 hours of basic science courses numbered 3000 and above, selected from two or more departments, which must include a minimum of 12 hours at the 5000 level and above. Included in these 24 hours are 4 to 6 hours of thesis credit, which are not counted toward the 12 hours required at the 5000 level. The thesis must meet the general requirements of the Graduate School and must be approved by the executive committee.

Plan II (without thesis). Thirty hours of basic science courses numbered 3000 and above are required. At least 12 semester hours must be at the 5000 level and above. In the science and mathematics emphases, a student may include 3 semester hours of courses or seminars in secondary school science or mathematics teaching, history of mathematics or science, or philosophy of mathematics or science. Students following plan II must submit a project paper, the topic of which must be approved by the executive committee. Approval is given on the basis of a written explanation or précis 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.

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 listed above is required. 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 are required to complete an approved 30-hour degree plan. Of these 30 hours, 12 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

Requirements include:

1. At least 8 but not more than 12 semester hours of courses offered by the museum. Alternatives are the sequence MUSM 4011-4021, 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 hours, 12 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 listed 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, the student must complete an approved 30-semester-hour degree plan with upper-division electives in science, mathematics, or computer science. For the thesis option, upper-division electives in science, mathematics, or computer science can be used 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. 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. The thesis advisor may be the same person who serves as the major advisor.

Time Limit and Transfer of Credit

All students are subject to the Graduate School's four-year time limit and transfer of credit limits for master of arts and master of science degrees.

Grades and Quality of Work

Courses at the 3000 or 4000 level will be accepted toward the degree only with grades of *B* or better; 5000 and above level courses will be accepted with grades of *C* or better. The student must have a *B* average in all course work taken subsequent to admission to the program, including courses not actually used to fulfill program requirements.

Master of Engineering Program

The master of engineering (M.E.) degree program is administered by the Graduate School through the engineering departments and the interdisciplinary Telecommunications Program. The requirements for admission and for quality and quantity of academic work are the same as for the master of science degree 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 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 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. Each year, CATECS offers over 40 graduate courses to approximately 500 students at 50 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 M.E. 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 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 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 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 acceptance into the graduate program. At that time, a plan of study shall be completed and a copy placed on record with the department office. Changes in the plan must have the concurrence of the committee and must be reported to the departmental graduate office.

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 also see 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 between the ideas of mathematics and those of physics. At the same time, increasing specialization in both fields has reduced the possibility of communication between the two disciplines, so that students of mathematics have less time to study physics and vice versa. This relationship contrasts strongly with that during the early part of this century, when the two fields were in close contact, 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.

Against this background, the Departments of Mathematics and Physics offer an interdisciplinary doctoral program in mathematical physics. The program has the following general objectives: to attract students to and prepare them for research in modern mathematical physics and the relevant mathematics; to promote collaboration and cooperation between the Departments of Mathematics and Physics; to institute courses pertinent to mathematical physics not already offered in either department; and to develop a strong center of mathematical physics at this University.

Initially the number of students involved in the program will be small, so that the steering committee may follow their progress closely. Because of this close individual attention a rigid set of requirements and regulations is not necessary. The design of the program is outlined below.

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.

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. The steering committee accepts students into the program on the basis of the foregoing requirements and academic promise. Satisfaction of the second requirement is evaluated 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 mathematics department, that examination is the physics GRE test. For a student enrolled in the physics department, it is a preliminary examination based 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.

Advisory Committee

All students in the program, as soon as their field of specialization has been chosen, request that the staff member with whom they wish to work acts as chair of their 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 advisory committee. A purpose of the advisory committee (beyond guiding the student throughout graduate study) is to ensure against too narrow a specialization.

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 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 6130 Algebra
MATH 6210, 6220 Topology
MATH 6230, 6240 Differential Geometry
MATH 6310, 6320 Real Analysis
MATH 8330, 8340 Functional Analysis

Physics Courses for Mathematics Students
PHYS 5210 Theoretical Mechanics
PHYS 5250, 5260, 7270, 7280 Quantum Mechanics and Theory
PHYS 7230, 7240 Statistical Mechanics
PHYS 7310, 7320 Electromagnetic Theory
PHYS 7770 Theory of Relativity

These are in addition to such subjects as ordinary and partial differential equations, linear algebra, and complex variables required of all physics students and covered, for example, in mathematical physics.

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-final examination required by the Graduate School.

Transferring Into and Out of the Program

A student may transfer into the program at any time, subject to the entrance requirements mentioned above; a student may also transfer out of it, because a student in the program retains status as a regular degree student in the department of the 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.

Master's Degree

Master's degrees in mathematical physics are not awarded. Students who, for any reason, become master's degree candidates, will be transferred out of the mathematical physics program into a regular department major.

Research Requirements

Each successful participant in the program is required to submit and to defend a thesis of original research. The student may carry out research under the direction of any graduate faculty member in the Department of Mathematics or the Department of Physics.

Language Requirement

Each student in the program must fulfill the language requirement of the department in which the student has matriculated.

Population Studies

The graduate certificate program in population studies, offered through the population program of the Institute of Behavioral Science, provides master's and doctoral degree students with recognition for interdisciplinary work in demography. The population program, which is international in scope and has an applied and policy-oriented focus, fosters research on population trends and patterns and provides training in population analysis. Students who are earning graduate degrees through the departments of anthropology, economics, geography, or sociology and are majoring in demography are eligible to petition for admission to the program.

The population program emphasizes research training through direct faculty-student interaction and involvement in research projects. In addition, students develop competence in a field of specialization such as family, gerontological, or spatial demography. Students work under the close supervision of a faculty member and devel-

op both substantive knowledge and research skills relevant to their specialization. They are also required to take three core courses: Economic Demography, Formal Population Geography, and Population Issues, Problems, and Policies. Students are granted a certificate on the basis of the three core courses, their applied research, and their thesis or dissertation.

Questions about the certificate program in population studies should be directed to the Population Program, Institute of Behavioral Science, Campus Box 484, University of Colorado at Boulder, Boulder, CO 80309-0484; (303) 492-7986.

Telecommunications

The graduate interdisciplinary program in telecommunications is unique in the breadth it gives those concerned with the technology, planning, and management of telecommunications systems. The master of science (M.S.) is offered in telecommunications; students may also receive an M.E. with an emphasis in telecommunications. The program involves a number of traditional University schools and departments, including journalism and mass communication, computer science, electrical and computer engineering, finance, management, information systems, and political science. Specifically, the program offers courses concerned with the technology of existing and future telecommunications systems, their cost effectiveness, their capacity for expansion, and the trends in telecommunications traffic. The curriculum also includes detailed study of the political aspects of telecommunications, such as government usage of telecommunications, regulation, and law, with procedures and trends at the local, national, and international levels. Also included is a study of the financing of the telecommunications industry and a consideration of the sociocultural impact of modern telecommunications.

Participants in the program include both mid-career professionals and entry-level students. Students are expected to have career interests in telecommunications even though their undergraduate study may have been in such other fields as political science, business, economics, journalism, or engineering. The program of study is geared to the needs of individual students and their special areas of interest. The selection of courses is arranged with the student's faculty advisor to cover both technical and nontechnical areas.

Students entering the M.S. program are expected to be adept in mathematics through trigonometry. Students without a year of calculus and a semester of computer science will be expected to attain such proficiencies as part of their curriculum.

Students selecting to receive an M.E. with an emphasis in telecommunications must have a 3.00 undergraduate GPA in electrical engineering, computer science, or engineering physics with proficiency in linear systems, probability, linear algebra, computer systems, and communications theory. In addition to course work in telecommunications technology, policy, management, and business, M.E. students must take at least 9 credit hours of graduate-level electrical engineering courses. As with all M.E. degrees, there is no residency requirement; thus, course work can be completed via CATECS or the National Technological University satellite delivery system. Students must complete 30 credit hours of course work, complete a report on a creative investigation, and make an oral defense.

The minimum duration for either the M.S. or M.E. program is 12 months. Most students, however, are expected to pursue a 16-month curriculum to enhance their background as well as gain a strong grasp of the various issues in telecommunications. For the M.S., a minimum of 32 hours, including 6 hours of thesis, is needed to graduate, but students are encouraged to take at least 40 hours. For the M.E. degree, a minimum of 30 hours and a project are required.

A suitable academic program is planned for each individual. Some of the offerings are listed below.

First Year

Fall Semester
FNCE 5050 Fundamentals of Finance (offered every semester)
INFS 6450 Information Systems for Management (offered every semester)
JOUR 5644 Radio/TV Station Organization and Operation
JOUR 6211 New Media and Development
MKTG 5030 Fundamentals of Marketing (offered every semester)
ORMG 5040 Fundamentals of Management and Organization (offered every semester)
PSCI 5106 The Political System and Telecommunications
TLEN 5134 Strategic Planning for Telecommunications
TLEN 5300 Introduction to Telecommunications System Theory
TLEN 5310 Telecommunications Systems
TLEN 5330 Data Communications 1
TLEN 5600 Telecommunications Seminar
TLEN 6950 Master's Thesis

Spring Semester
CSCI 7143 Topics in Computer Systems
JOUR 5821 Telecommunications Policy
JOUR 6781 Economic and Political Aspects of Mass Communication
TLEN 5310 Telecommunications Systems (offered both fall and spring semester)
TLEN 5350 Trends in Satellite Communication Systems
TLEN 5360 Telephone Systems
TLEN 5430 Data Communications 2
TLEN 5600 Telecommunications Seminar
TLEN 5830 Telecommunications Pricing and Economics
TLEN 5831 Future of Telecommunications
TLEN 5832 Engineering Economy for Telecommunications
TLEN 5833 Introduction to UNIX, C, and CTT
TLEN 5835 LANS, WANS, and FDDI
TLEN 5836 Law and Regulation for Telecommunications
TLEN 5837 Management and Information Technology
TLEN 6950 Master's Thesis

Summer Session
TLEN 5110 Contemporary Issues in Telecommunications Policy
TLEN 5300 Introduction to Telecommunications System Theory
TLEN 5510 Radio, Mobile, and Secure Communications Systems
TLEN 5520 Telecommunications Standards
TLEN 6950 Master's Thesis

Second Year

Fall Semester
TLEN 5340 ISDN (Integrated Systems Digital Network)
TLEN 5370 Optical Communications and Transmission
TLEN 5400 Traffic and Queuing Theory
TLEN 5920 Independent Study/Advanced Telecommunications Laboratory
TLEN 5834 Network Management
TLEN 5838 Strategic Planning for Telecommunications
TLEN 5839 The Economics of Telecommunications Policy
TLEN 6950 Master's Thesis

M.E. degree students work with their advisor to integrate three electrical and computer engineering graduate courses into their course work.

School of Journalism and Mass Communication

Willard D. Rowland, Jr., Dean

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 in 1962. In 1985, the name of the program was changed to the School of Journalism and Mass Communication to reflect its broad range of instructional and research activities.

The school offers its undergraduate majors superior professional and media studies 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 makes courses available to nonjournalism majors within the limits of space and equipment, upon which majors properly have first claim.

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 journalism and mass communication students at CU-Boulder take approximately three-fourths of their college work outside the school and approximately one-fourth in the school.

Accredited programs, as described by the ACEJMC, 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 and Research Activities

Laboratories. Students work in laboratories designed for reporting, editing, advertising, graphics, radio, television, and photojournalism. They have opportunities to use video cameras and recorders, video display terminals, personal computers, 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, scholarly and trade publications, and other professional 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's student radio station).

Center for Mass Media Research. The center is responsible for encouraging and focusing interdisciplinary research in a wide array of areas involving mass communication. Students and faculty participate in its programs and projects, which focus on research in the social, cultural, economic, and policy aspects of the mass media and telecommunications.

Career Opportunities

The school offers undergraduate programs in advertising, news-editorial, broadcast news, and broadcast production management. Graduates find careers with newspapers, magazines, broadcast, cable and audio/video production companies, 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.

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, Spain, and Taiwan. 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, CO 80309-0123.

Student Organizations

Through an elected student government, students conduct a wide range of activities and assist in forming policies of the school.

The school has chapters of the Society of Professional Journalists, Sigma Delta Chi; Women in Communication; and the American Advertising Federation.

ACADEMIC EXCELLENCE

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 December 1 of each year.

Boulder Press Club Scholarship Burns Memorial Scholarship, awarded to an advertising major
Gene Cervi Memorial Scholarship
Colorado Press Women Scholarship, awarded to a woman student
Denver Woman's Press Club, awarded to a woman student
Alvin G. Flanagan Scholarship
Lisa Gorman Memorial Scholarship
Marcella Gibbons Hertzog Scholarship, endowed by Georgene Carlson
Brian Hostetler Memorial Scholarship, awarded to a broadcast major
Raymond B. Johnson Award
Nonie Lann Endowed Scholarship
Winton Lemen Scholarship
Dominic Manzanares Memorial Scholarship, awarded to a minority and/or Colorado resident
Mile High Kennel Club Scholarship, awarded to a senior from the Denver metropolitan area
L. C. Paddock Memorial Scholarship
Gladys Van Vranken Parce Memorial Scholarship, awarded to a print journalism major
J. Ember and Agnes P. Sterling Scholarship
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

ACADEMIC STANDARDS

Scholastic Suspension

Journalism students 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 Commun-ication 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.

Academic Dishonesty

The School of Journalism and Mass Communication has adopted a statement on academic dishonesty to maintain the highest standards of intellectual honesty. Copies of the statement are available from all advisors and in the school office.

ADMISSION AND ENROLLMENT POLICIES

Requirements for Admission

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.

Pre-Journalism and Mass Communication

Pre-journalism and mass communication students are enrolled in the College of Arts and Sciences until they are eligible to transfer into the School of Journalism and Mass Communication, which normally occurs at the end of the sophomore year. They must have completed or be working towards completing 60 semester hours with a grade point average of at least 2.50. These students must consult with advisors in the school.

Before they can apply for admission to the school, pre-journalism and mass communication majors must make satisfactory progress in 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. Two journalism classes (JOUR 1001 and 2001) must also be taken with a GPA of at least 2.50 before application.

Students wishing to apply to the School of Journalism and Mass Communication must fill out an intrauniversity transfer (IUT) form and a letter of application by October 1 for spring admission or March 1 for fall admission. Students must indicate the major sequence in which they wish to enroll.

Meeting these minimum requirements does not guarantee a student admission to the school.

Transfer Students

Students applying to transfer into the School of Journalism and Mass Communication from another institution should have 60 semester hours of college credit and should have completed two introductory courses in journalism with a GPA of at least 2.50 before they apply. Students without 60 hours of credit should apply to the College of Arts and Sciences, pre-journalism major.

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.

Credit Policies

Pass/Fail

In addition to the University's general policies, majors in the School of Journalism and Mass Communication 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.

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.

Residence Requirement

A candidate for a degree from the School of Journalism and Mass Communication must earn the last 30 hours in residence at the University of Colorado. This may include courses taken on the Boulder, Denver, or Colorado Springs campus.

Senior Requirement

Seniors should file a diploma card with the school by October 1 for December graduation, January 15 for May graduation, and June 1 for August graduation. Diploma cards are available at the office of the School of Journalism and Mass Communication.

Withdrawal

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.

UNDERGRADUATE DEGREE REQUIREMENTS

General Education in Journalism

The following areas of knowledge are central to the undergraduate degrees in journalism and mass communication:

- knowledge of the nature and functions of contemporary mass media;
- knowledge of the history of national and international mass communication;
- appreciation of the unique role and responsibility of mass communication in a democracy;
- knowledge of the Constitutional provisions relating to freedom of the press and expression;
- knowledge of the laws controlling and supporting freedom of the press and expression;
- knowledge of the formation and influence of public opinion; and
- an understanding of social responsibility and media ethics.

In addition, students completing a degree in journalism and mass communication acquire:

- the ability to gather information from records and by asking questions;
- the ability to write correctly, concisely, and interestingly; and
- the ability to perform in a professional setting.

The following areas of knowledge are central to the degree in advertising:

- understanding of the relationship of advertising to the presentation of news and entertainment;
- knowledge of the organization of the advertising industry;
- understanding of research techniques applicable to the industry;
- knowledge of how advertising programs are planned and evaluated;
- understanding of the principles of advertising writing and design;
- knowledge of the principles of advertising campaign planning; and
- knowledge of issues and controversies surrounding the effects of the industry in society at large.

In addition, students completing the degree in advertising acquire:

- the ability to analyze a communication problem to determine if it's amenable to solution through advertising;
- the ability to analyze alternative solutions to a communication problem and to present succinct arguments for recommendations;
- the ability to develop a comprehensive written plan for the solution of a communication problem; and
- the ability to present complex material persuasively using oral, visual, and written forms.

The following areas of knowledge are central to the broadcast degrees:

- knowledge of the economics of broadcast production;
- knowledge of electronic media organization;
- understanding of the principles of radio and television production; and
- knowledge sufficient to evaluate broadcast media performance.

In addition, students completing either of the degrees in broadcast acquire:

- the ability to write general news pieces as well as specialized report packages; and
- the ability to use equipment to shoot and edit broadcast materials.

The following areas of knowledge are central to the news-editorial degree:

- knowledge of the structure and organization of print media in the United States;
- knowledge of the economics of print media organizations; and
- knowledge sufficient to evaluate print media performance.

In addition, students completing the news-editorial degree acquire:

- the ability to report with accuracy, fairness, and balance;
- the ability to write general news pieces as well as specialized reports;
- the ability to correct and perfect story manuscripts for publication; and
- the ability to execute appropriate publication design.

Advising

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, students are ultimately responsible for fulfilling all degree requirements.

Requirements for Graduation

The undergraduate degree offered is the bachelor of science degree.

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 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 to 34 must be in journalism. In addition, 65 of the 124 hours must be in arts and sciences.

No student may take more than 34 hours of journalism in the 124 hours required for graduation. The upper limit is imposed to ensure 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

Students may complete requirements in two fields and receive two degrees from the University. Such double-degree programs are available combining journalism and mass communication with business, music, 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 combined program must be arranged by consulting both schools or colleges.

SEQUENCES

Four areas of professional study(sequences) 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.

Required Courses	*Semester Hours*
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 3473 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.

Required Courses	*Semester Hours*
JOUR 1001 Contemporary Mass Media	3
JOUR 2001 Mass Media Writing	3
JOUR 3001 Reporting of Public Affairs	3
JOUR 3473 Advertising Research *or* JOUR 4791 Mass Communication and Public Opinion	3

JOUR 3604 Radio and Television 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.

Required Courses	*Semester Hours*
JOUR 1001 Contemporary Mass Media	3
JOUR 2001 Mass Media Writing	3
JOUR 3403 Principles of Advertising	3
JOUR 3473 Advertising Research *or* JOUR 4791 Mass Communication and Public Opinion	3
JOUR 3604 Radio and Television News	3
JOUR 3644 Principles of Broadcast Production	3
JOUR 3674 Television 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.

Required Courses	*Semester Hours*
JOUR 1001 Contemporary Mass Media	3
JOUR 2001 Mass Media Writing	3
JOUR 3001 Reporting of Public Affairs	3
JOUR 3473 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 4651 Mass Communication Law	3
Journalism electives	1-7

GRADUATE DEGREE PROGRAMS

Master's Degree

A master of arts degree in journalism and mass communication is awarded after a 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 master's 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.

The School of Journalism and Mass Communication is currently redesigning its master of arts programs. It will retain its plan I (thesis) option, but is reworking its plan II emphases to offer a new option in integrated marketing communication and a revised option in news (both print and broadcasting). Please check with the Journalism and Mass Communication office for additional information.

Graduate students should read carefully requirements for advanced degrees in the Graduate School section of the catalog.

Journalism and mass communication is available as a minor in other fields of advanced study to which it is logically related. The school is also an active participant in the interdisciplinary telecommunications program (see the Graduate School Interdisciplinary Programs section of this catalog).

Requirements

Master's students without adequate educational or practical experiences in the profession are required to take basic prerequisite courses. Such requirements are determined individually.

Candidates for the master's degree in journalism and mass communication pursue either of two plans, depending upon background at the time of admission. In either case, students 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 the field, to each candidate's interests and goals. For details about the program write to the Coordinator of the Master's Program, School of Journalism and Mass Communication, Campus Box 287, University of Colorado at Boulder, Boulder, CO 80309-0287.

Ph.D. Degree

The School of Journalism and Mass Communication offers a media studies track in the Ph.D. program in communication. The program examines interactions among the major components of mass communication—media institutions, their contents and messages, and their audiences or publics—as a process by which cultural meaning is generated. It examines that process through communication and through social, economic, political, historical, and legal theories from both national and international perspectives.

Requirements

The Ph.D. curriculum includes requirements in foundation theory and perspective, methods, and elective options in the School of Journalism and Mass Communication and other appropriate academic units. Comprehensive examinations and a dissertation also are required.

Students may enter the program without a professional or academic background in the media, but will be required to augment their studies through selected course work. Under certain circumstances, the school will consider granting admission to applicants without master's degrees. For current admission requirements and curriculum information, contact the Director of the Doctoral Program, School of Journalism and Mass Communication, Campus Box 287, University of Colorado at Boulder, Boulder, CO 80309-0287.

COURSE DESCRIPTIONS

The following courses are offered in the School of Journalism and Mass Communication 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 current information on times, days, and instructors of courses, students should consult the *Schedule of Courses* issued at the beginning of each semester.

Some courses may be open to nonmajors. Students should check for current policies.

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.

Courses are organized by subject matter and are listed numerically *by last digit* (courses ending in the number "0" are listed before courses ending in "1," and so on). The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:

Prereq.—Prerequisite
Coreq.—Corequisite
Lab—Laboratory
Rec.—Recitation
Lect.—Lecture

Core Curriculum and General Electives

JOUR 1001-3. Contemporary Mass Media. Examines the mass media's interaction with society; looks at journalism and the mass media in

historical, intellectual, economic, political, and social contexts.

JOUR 2001-3. Mass Media Writing. Introduces 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. Covers problems and practice in reporting news of government, politics, the courts, industry, business, science, and other areas involving public issues. Prereq., JOUR 2001.

JOUR 3511-3. Reporting of Public Affairs—Graduate Level. Covers 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. Discusses 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. Covers 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. Studies 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. Studies 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 4661-3. 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. Same as JOUR 5661.

JOUR 4791-3. 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. Same as JOUR 5791.

JOUR 4831-3. Publication Design and Production. Covers editorial and production aspects of magazines, both general and specialized, including company publications, industrial journals, and other types of limited-audience publications. Same as JOUR 5831.

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 5331-3. Scholastic Publications. Emphasizes teaching, sponsoring, organizing, and financing student newspapers, yearbooks, and literary magazines at all grade levels.

JOUR 5661-3. Newspaper Management. Same as JOUR 4661.

JOUR 5791-3. Mass Communication and Public Opinion. Same as JOUR 4791.

JOUR 5831-3. Publication Design and Production. Same as JOUR 4831.

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. Introduces new graduate students to the University, the school's graduate program, journalism graduate faculty, and opportunities for graduate study.

JOUR 6051-3. Theories of Mass Communication. Studies 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. Covers 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. Studies and analyzes communications technologies and techniques used in addressing social problems in developing countries.

JOUR 6651-3. Press and the Constitution. Graduate seminar in communications law. Studies changing law and applied legal research techniques.

JOUR 6661-3. Media Ethics and Responsibility. Develops a theoretical framework with which to recognize and analyze ethical issues as they arise in the mass media.

JOUR 6711-3. Mass Communication 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. Examines 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 6941-3. Master's Degree Candidate.

JOUR 6951 (1-6). Master's Thesis.

JOUR 7011-3. Proseminar in Commu-nication Theory 1. Introduces the principal concepts, literature, and theoretical and paradigmatic perspectives of media studies and mass communication and their ties and contributions to parallel domains in the social sciences and humanities.

JOUR 7021-3. Proseminar in Communication Theory 2. Continuation of JOUR 7011. Prereq., JOUR 7011.

JOUR 7871-3. Special Topics.

JOUR 7951 (1-10). Doctoral Thesis.

News Editorial/Public Relations

JOUR 3102-3. Press Photography. Covers the camera as a reporting tool; training in the use of cameras; composition; darkroom procedures.

JOUR 3552-3. News Editing. Discusses principles and practice in copy editing and writing headlines for local and wire stories. Practice in page makeup, picture editing, and electronic editing. Prereq., JOUR 3001.

JOUR 3902 (1-3). Newspaper Practicum. News work on *Campus Press.* May be repeated for a total of six hours.

JOUR 4002-3. Reporting 2. In-depth reporting and writing resulting from investigation, analysis, and critical thought. Prereq., JOUR 3001.

JOUR 4102-3. Advanced Photography. Advanced camera and darkroom techniques, the picture story, picture editing, trends in pictorial journalism, and individual projects. Same as JOUR 5102. Prereq., JOUR 3102.

JOUR 4272-3. Public Relations. Surveys public relations in America. Case studies and individual projects. Same as JOUR 5272.

JOUR 4282-3. Public Relations Programs. Develops and applies public relations programs, from identification of the problem through execution of the public relations techniques. Same as JOUR 5282. Prereq., JOUR 4272.

JOUR 4502-3. Advanced Reporting. Writing news and features about actual events for publication under deadline pressure. Same as JOUR 5502. Prereq., JOUR 4002.

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 4602-3. Editorial and Opinion Writing. Concentrates on several of the subjective areas of journalism. Emphasizes editorial writing, editorial pages, critics, and criticism of the performing arts. Same as JOUR 5602.

JOUR 4702-3. Critical Writing for the Journalist. Analyzes the entertainment area, especially as it pertains to the print media; emphasizes the composition of criticism and the attitudes and writing techniques of individual critics. Same as JOUR 5702. Prereq., JOUR 3001.

JOUR 4802-3. Magazine Article Writing. Provides practice in writing freelance articles; considers types, sources, methods, titles, illustrations, and marketing. Same as JOUR 5802. Prereq., JOUR 3001.

JOUR 5102-3. Advanced Photography. Same as JOUR 4102.

JOUR 5272-3. Public Relations. Same as JOUR 4272.

JOUR 5282-3. Public Relations Programs. Same as JOUR 4282.

JOUR 5292-3. Public Relations Practices. Same as JOUR 4292.

JOUR 5502-3. Advanced Reporting. Same as JOUR 4502.

JOUR 5602-3. Editorial and Opinion Writing. Same as JOUR 4602.

JOUR 5702-3. Critical Writing for the Journalist. Same as JOUR 4702.

JOUR 5802-3. Magazine Article Writing. Same as JOUR 4802.

JOUR 5812-3. Science Writing. Explores ways to improve the public understanding of science and technology. Studies and analyzes communications problems in several technical disciplines.

Advertising

JOUR 3403-3. Principles of Advertising. Covers basic principles of publication, radio, and television advertising; analysis of consumers, markets, and media; organization of advertising departments and agencies.

JOUR 3453-3. Advertising Copy and Layout. Provides experience in creating advertising copy and layout and analyzing consumer and product appeals. Students prepare copy for various media: newspapers, magazines, radio, and television. Prereq., JOUR 3403.

JOUR 3463-3. Advertising Media. Studies media, markets, and audiences, and their relationships to advertising messages. Prereq., JOUR 3403.

JOUR 3473-3. Advertising Research. Introduces students to applied research methods and provides practice in using research in marketing and advertising decision making.

JOUR 3913 (1-3). Advertising Practicum. Advertising work on *Campus Press*. May be repeated for a total of six houts.

JOUR 4403-4. Advertising Campaigns. Discusses advanced copy and layout. Emphasizes planning integrated advertising campaigns for national and regional audiences. Same as JOUR 5403. Prereq., JOUR 3453, 3463, 3473.

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 4453-3. Advertising and Society. Examines criticisms and contributions of advertising in society and the economy. Same as JOUR 5453.

JOUR 5403-4. Advertising Campaigns. Same as JOUR 4403.

JOUR 5453-3. Advertising and Society. Same as JOUR 4453.

Broadcast

JOUR 3604-3. Radio and Television News. Covers principles and techniques involved in the preparation of news for broadcasting. Prereq., JOUR 2001.

JOUR 3614-3. Radio Programming and Production. Introduces audio console, microphones, turntables, tape recorders, tape editing, timing, and combo operation. Emphasizes applying the basic principles to professional production of radio programs.

JOUR 3644-3. Principles of Broadcast Production. Introduces the use of television equipment. Emphasizes applying the basic principles to professional program production. Prereq., JOUR 2001.

JOUR 3674-3. Television Production 2. Covers 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. Prereq., JOUR 3644.

JOUR 4614 (1-3). Advanced Radio Practices. Applies the theory of radio programming and production. Assignments include producing radio programming for radio stations in Colorado and weekly discussion-critique sessions. Prereq., JOUR 3614.

JOUR 4624-3. Advanced Radio-TV News. Emphasizes visualization. Covers 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. Same as JOUR 5624. Prereq., JOUR 3001, 3604, 3644.

JOUR 4634-3. Broadcast News Projects. Covers interpretation, preparation, and reporting of public affairs for broadcast media; preparation of radio and film documentaries. Same as JOUR 5634.

JOUR 4644-3. Radio-TV Station Organization and Operation. Analyzes station operations, public relations, personnel, financing, labor relations, and laws and regulations as well as the manager's ethical and social responsibilities. Same as JOUR 5644.

JOUR 4674 (1-4). Television Production 3. Provides in-depth experience in one facet of a complex television production; e.g., directing, producing, writing, sports, commercials.

JOUR 5624-3. Advanced Radio-TV News. Same as JOUR 4624.

JOUR 5634-3. Broadcast News Projects. Same as JOUR 4634.

JOUR 5644-3. Radio-TV Station Organization and Operation. Same as JOUR 4644.

FACULTY

WILLARD D. ROWLAND, JR., Dean; Professor. B.A., Stanford Univ.; M.A., Univ. of Pennsylvania; Ph.D., Univ. of Illinois.

LEN ACKLAND, Associate Professor. B.A., Univ. of Colorado; M.A., Johns Hopkins School of Advanced International Studies.

SAMUEL J. ARCHIBALD, Associate Professor. B.A., Univ. of Colorado; M.A., American Univ..

JOANNE EASLEY ARNOLD, Associate Dean, Associate Professor. B.A., M.A., Ph.D., Univ. of Colorado.

JAMES E. BRINTON, Professor Emeritus.

RAMON CHAVEZ, Associate Professor. B.A., Texas Tech Univ.; M.A., Univ. of Washington.

MALCOLM A. DEANS, Senior Instructor Emeritus.

THOMAS R. DUNCAN, Associate Professor. B.S., Northwestern Univ.; M.A., Northwestern Univ.; Ph.D., Univ. of Iowa.

SHU-LING C. EVERETT, Assistant Professor. B.A., Fu-Zen Univ.; M.S., Southern Illinois Univ.; Ph.D., Univ. of Tennessee.

STEPHEN E. EVERETT, Assistant Professor. B.S., Ph.D., Univ. of Tennessee.

DON HEIDER, Instructor. B.A., Colorado State Univ.; M.A., American Univ..

HAROLD E. HILL, Professor Emeritus.

STEWART HOOVER, Associate Professor. B.A., McPherson College; M.A., Ph.D., Annenberg School of Communications, Univ. of Pennsylvania.

STEPHEN B. JONES, Assistant Dean, Instructor. B.A., M.A., West Virginia Univ.; Ph.D., Univ. of Utah.

FRANK L. KAPLAN, Associate Professor. B.A., M.A., Univ. of Southern California; Ph.D., Univ. of Wisconsin.

SAM KUCZUN, Professor. B.S., M.S., Boston Univ.; Ph.D., Univ. of Minnesota.

POLLY E. McLEAN, Assistant Professor. B.A., Richmond College, City Univ. of New York; M.S., Columbia Univ.; Ph.D., Univ. of Texas.

WILLIAM I. McREYNOLDS, Associate Professor. B.J., M.J., Univ. of Texas; Ph.D., Univ. of Minnesota.

SANDRA E. MORIARTY, Professor. B.J., Univ. of Missouri; M.S., Ph.D., Kansas State Univ..

MARGUERITE J. MORITZ, Associate Professor. B.S., M.S., Northwestern Univ..

SUE O'BRIEN, Associate Ptofessor. B.A., Grinnell College; M.P.A., Harvard Univ..

PATRICIA RAYBON, Associate Professor. B.A., Ohio State Univ.; M.A., Univ. of Colorado.

DONALD RIDGWAY, Instructor. B.J., Univ. of Missouri; B.A., Washburn Univ..

ROBERT B. RHODE, Professor Emeritus.

LINDA M. SCOTT, Assistant Professor. B.A., M.A., Univ. of Texas; M.B.A., Southern Methodist Univ.; Ph.D., Univ. of Texas.

ARDYTH SOHN, Associate Professor. B.A., Univ. of Illinois; M.S., Ph.D., Southern Illinois Univ..

DON S. SOMERVILLE, Professor Emeritus.

MICHAEL TRACEY, Professor. B.A., Univ. of Exeter; Ph.D., Univ. of Leicester.

ROBERT TRAGER, Professor. B.A., San Francisco State College; M.A., Ph.D., Univ. of Minnesota; J.D., Stanford Univ..

A. GAYLE WALDROP, Professor Emeritus.

JAN WHITT, Assistant Professor. B.A., M.A., Baylor Univ.; Ph.D., Univ. of Denver.

School of Law

Gene R. Nichol, Jr., Dean

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 480 and a favorable faculty-student ratio produce classes of a size that encourages discussion. Classes normally consist of no more than about 75 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 emphases are available in areas of particular curricular strength at the School of Law such as commercial law, natural resources, and criminal law and procedure. 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 on the southwestern corner 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 Program, Natural Resources Law Center, Natural Resources Litigation Clinic, offices for various student organizations, the *University of Colorado Law Review,* the *Colorado Journal of International Environmental Law and Policy,* faculty and administrative offices, and a student lounge. The building has ample space to accommodate the student body of 480 now enrolled.

The law library contains one of the better legal reference collections in the western United States. The collection consists of over 255,000 volumes and microform equivalents. Students and faculty have ready access to a comprehensive collection of American case law from all jurisdictions, statutes of all states (in annotated form when available), and the major digests, encyclopedias, periodicals, and texts dealing with American law. English, Canadian, and other Commonwealth materials are almost as complete. A collection of books in German, French, and international law provides a basis for comparative law studies.

Career Services

The school's Office of Career Services offers a broad range of services to students and alumni. Assistance is provided to students as they begin to define their career goals, and in their efforts to obtain part-time and summer employment during law school and full-time employment following graduation. Several services, including a monthly employment newsletter, are also provided for alumni who wish to redefine career goals and/or change employment.

The career services resource library, open to students and alumni, contains information about legal and law-related careers, as well as materials which describe the practice of law in many large and small private firms, corporations, public and community legal agencies, and government agencies at all levels.

The Office of Career Services sponsors a major on-campus interview program, providing students with the opportunity to interview with more than one hundred legal employers who recruit at the School of Law each year. In addition, the Office of Career Services sponsors numerous seminars throughout the academic year at which private and public sector employers discuss the recruitment process, different types of law practice, and career opportunities available to law graduates. The office also conducts a number of clinics in resume writing and interviewing skills each semester. Staff members provide individual assistance to students and alumni in the preparation of resumes and cover letters and in interview techniques and job search strategies.

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 Victor G. Rosenblum, professor of law at Northwestern University, former president of Reed College, and former president of the Association of American Law Schools; Father Robert Drinan, professor of law at Georgetown University Law Center, former dean of Boston College, and former congressman; Homer H. Clark, Jr., professor emeritus at the University of Colorado School of Law; and Richard Delgado, professor of law at the University of Wisconsin.

In 1955, a trust fund was established in memory of John R. Coen to bring to the school each year a prominent jurist, scholar, or other public figure to deliver a lecture to the students and faculty of the School of Law. Recent lecturers in the series have included Marvin E. Frankel, former judge, United States District Court for the Southern District of New York; R. Kent Greenawalt, Cardozo Professor of Law, Columbia University; Geoffrey C. Hazard, Jr., Sterling Professor of Law, Yale Law School; Vincent A. Blasi, the Corliss Lamont Professor of Civil Liberties at Columbia Law School; and Susan Rose-Ackerman, the Ely Professor of Law and Political Economy at Yale Law School. The 1991 Coen Lecturer was Professor Martha Minow, Harvard Law School.

Special Programs

Under the supervision of full-time clinical faculty who are experienced trial attorneys, the Legal Aid and Defender Program allows students to represent low-income clients in civil and criminal cases in Colorado courts and before administrative agencies.

The Natural Resources Litigation Clinic's docket consists exclusively of environmental litigation that concentrates on water resources development and public lands protection. Clinic cases often require

expert testimony and witness preparation; analysis and presentation of detailed scientific and environmental data; and submission of complex and precedential legal briefs. Students work as "associates" in a small environmental law practice that represents public interest clients before administrative agencies, state and federal courts, Congress, and state legislatures. In this practice, students forge and clarify the law in controversial environmental arenas. In the process, they learn not only from the clinic's staff, but also from matching the best and brightest attorneys and experts the opposition can muster.

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 these competitions, students thoroughly prepare and brief hypothetical cases and then argue before panels of distinguished judges and lawyers.

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 *Colorado Journal of International Environmental Law and Policy,* a scholarly journal dedicated to examining international environmental issues, was formed by students in the spring of 1989.

The Student Bar Association represents the interests of law students generally. Other student organizations include the American Bar Association/Law Student Division, American Civil Liberties Union, Asian American Law Students Association, Association of Law Students and their Partners, Black Law Students' Association, Business Law Association, Colorado Trial Lawyers' Association, Environmental Law Society, Federalist Society for Law and Public Policy Studies, Health Care Law Society, Hispanic Law Students' Association, Native American Law Students Association, Nicholas R. Doman Society of International Law, Women's Law Caucus, and Delta Theta Phi, Phi Alpha Delta, and Phi Delta Phi legal fraternities.

Lectures by leading jurists, lawyers, and scholars broaden exposure to legal issues.

ACADEMIC EXCELLENCE

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 71 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.

ACADEMIC STANDARDS

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

The School of Law also grades on the following 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 72. If the instructor judges the work not the equivalent of a 72, the work is assigned that letter and numerical grade between the 50 *(F)* and 71 *(C-)* 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.

ADMISSION AND ENROLLMENT POLICIES

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 acquiring 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 that requires rigorous application of one's abilities.

Admission Requirements and Standards

The School of Law grants admission to qualified applicants who have received a baccalaureate degree from a properly accredited institution.

The applicant must also show substantial intellectual promise and give evidence of high moral and ethical standards. The entering class in 1991 had a median GPA of 3.30 and a median Law School Admission Test (LSAT) score in the 93rd percentile.

Admission decisions are based heavily on undergraduate grade point averages and LSAT scores. Also, other factors are weighed because they may indicate ability and motivation, and because diversity in the student body contributes to the educational process. 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 distinc-

tive communities. In its efforts to offer equal opportunity for obtaining a legal education, the School of Law 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. Applicants are required to submit a personal statement and one or two letters of recommendation in support of their application.

Beginning students are admitted for 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 admitted persons 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.

How and When to Apply

1. Request a catalog and application from the School of Law, Fleming Law Building, Campus Box 403, University of Colorado at Boulder, Boulder, CO 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 14. Applicants are responsible for arranging for submission of all supporting documents, including materials from the Law School Data Assembly Service, and for ensuring that materials are received by the School of Law in a timely fashion. Late applications will be considered but those that are timely will be reviewed first. Only the strongest late applicants have any chance of admission.

Some forms of financial aid will be jeopardized by late application. All applicants who seek financial aid should ensure compliance with the SingleFile instructions described in this catalog.

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 the end of April. 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 to the School of Law no later than the time stated in the acceptance letter.

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) an official transcript showing all law school work as yet undertaken, and (2) upon completion of all law school work undertaken, a letter from the law school dean stating that the applicant is in good standing and eligible to continue without condition. Class rank must be indicated on one of these official documents.

Usually fewer than 5 second-year transfer students are accepted each year. Decisions are based heavily on law school performance.

Admitted students, having 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.

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 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.

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.

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.

Normal Course Load

The normal course load is 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 Office of the Dean before dropping any course.

Dropping Courses

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 Office of the Dean upon a petition showing good cause. Second- and third-year students may not be permitted to drop without discredit any seminar or course with enrollment limited below the maximum which did not reach capacity 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 Office of the Dean of a petition showing good cause.

Summer Session

Any student who has completed at least one year in an accredited law school may register for courses offered during 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 summer session will be determined by the Office of the Dean.

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, CO 80309-0403.

Transcripts of Credit

Official transcripts of credit should be ordered from the Office of the Registrar transcript section, Regent Administrative Center 105, either in person or in writing. Official transcripts are prepared only at the student's request. 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.

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 Office of the Dean. Readmission will be at the discretion of the faculty. Tuition and fee refunds are based on withdrawal date. Consult the Law School Registrar and/or the Bursar's Office for refund deadlines.

EXPENSES AND FINANCIAL AID

Colorado residents enrolled in the School of Law paid about $3,560 in tuition and fees for the 1991-92 academic year; nonresidents paid about $10,560. The School of Law's Office of Admissions will tentatively classify applicants as resident or nonresident students, but the final decision will be made by the tuition classification officer. For more information concerning resident and nonresident classification, consult the University Policies, Programs, and Services section of this catalog.

Living expenses, books, and incidental costs in the amount of approximately $7,800 per year should be added to tuition figures in estimating yearly expenditures.

Grants are available on a limited basis to eligible resident students and are awarded on the basis of need and timeliness of filing the financial aid application. Nonresident 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 Stafford Loans (formerly GSL) must file the SingleFile Form of the United Student Aid Funds, the Family Financial Statement (FFS) of the American College Testing (ACT) Need Analysis Service, the Graduate and Professional Schools Financial Aid Service (GAPSFAS) application, or the Financial Aid Form (FAF) of the College Scholarship Service. Any of these forms may be obtained from local high schools or colleges. For the 1992-93 academic year, applications must have been properly completed and submitted as soon as possible after January 1.

Financial aid applications cannot be processed until students have been officially admitted to the School of Law. Students missing the admission deadline are considered late, even if they meet the financial aid application filing deadline.

The Stafford Loan, PLUS Loan, and Supplemental Loan for 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 Access Loan Program, a program that includes the Stafford Loan and SLS as well as the Law Access Loan.

All students who receive financial aid are required to understand and comply with minimum standards of reasonable academic progress. The *Reasonable 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 Director of Admissions and Financial Aid, School of Law, Campus Box 403, University of Colorado at Boulder, Boulder, CO 80309-0403, (303) 492-7203, or the Office of Financial Aid, Campus Box 106, University of Colorado at Boulder, Boulder, CO 80309-0106, (303) 492-5091.

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 that will interfere with class attendance.

The School of Law's Office of Career Services assists students who wish to secure law-related employment. The University's Office of Career Services aids those who wish to find conventional employment or work-study placement.

DEGREE REQUIREMENTS

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.

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 listed under the 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 60 hours in residence is required at the school.

Half a semester's time and residence credit may be earned in a summer term, if at least 5 credit hours are earned. By enrolling in two summer terms and earning

a minimum of 5 credit hours 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.

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, civil procedure, property, one semester of torts, criminal law, 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 1 and 2, evidence, professional responsibility, a seminar, and either trial advocacy or comparable trial experience in a clinical course. 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.

First-Year Required Courses

(in alphabetical order)

LAWS 5223-1	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

Second- and Third-Year Courses

(in alphabetical order)

Business

LAWS 6201-3	Agency-Partnership
LAWS 7201-3	Antitrust
LAWS 7041-3	Banking Law
LAWS 7021-3	Bankruptcy
LAWS 7211-3	Business Planning
LAWS 7051-2	Commercial Drafting
LAWS 6001-4	Commercial Transactions
LAWS 7301-3	Copyright and Unfair Competition
LAWS 6251-4	Corporations
LAWS 7011-3	Creditors' Remedies and Debtors' Protection
LAWS 7541-2	Employment Discrimination
LAWS 7455-3	Insurance Law
LAWS 7611-2	International Business Transactions
LAWS 6501-3	Labor Law
LAWS 6281-3	Legal Accounting
LAWS 7311-2	Patent and Trademark Law
LAWS 7024-3	Real Estate Planning
LAWS 7401-3	Securities Regulation
LAWS 8031-2	Seminar: Construction Law
LAWS 8501-2	Seminar: Labor Arbitration
LAWS 8411-2	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 6510-3	International Environmental Law
LAWS 7406-1	International Moot Court Competition
LAWS 7617-3	International Taxation
LAWS 6400-3	Public International Law
LAWS 8420-3	Seminar: International Economic Development Policy and Law

Jurisprudence and Perspective Courses

LAWS 6200-2	Comparative Law
LAWS 7058-3	Conflict of Laws
LAWS 7228-2	Intellectual Origins of the Constitution
LAWS 7128-3	Jurisprudence
LAWS 7218-2	Legal History
LAWS 6128-3	Legislation
LAWS 8538-2	Seminar: Modern Legal Theory
LAWS 8318-2	Seminar: Problems in Law and Economics
LAWS 8548-2	Seminar: Theories of Criminal Punishment
LAWS 8428-2	Seminar: Women in Law and Literature

Natural Resources

LAWS 7735-2	Advanced Indian Law
LAWS 7725-3	American Indian Law
LAWS 7702-2	Conservation Philosophy and the Law
LAWS 7202-3	Environmental Law
LAWS 6102-3	Natural Resources Law
LAWS 7102-3	Oil and Gas
LAWS 6002-3	Public Land Law
LAWS 8112-3	Seminar: Advanced Natural Resources
LAWS 8302-2	Seminar: Advanced Problems in Water Resource Management
LAWS 8202-2	Seminar: Environmental Policy
LAWS 7307-3	Taxation of Natural Resources
LAWS 7402-2	Toxic and Hazardous Wastes
LAWS 6302-3	Water Resources

Practice and Procedure

LAWS 7205-3	Administrative Law
LAWS 7303-3	Complex Civil Litigation
LAWS 6045-3	Criminal Procedure
LAWS 7045-3	Criminal Procedure: Adjudicative Process
LAWS 6197-2/ LAWS 6353-3	Evidence (required course)
LAWS 7003-3	Federal Courts
LAWS 7409-3	Legal Negotiation and Dispute Resolution
LAWS 7255-3	Local Government
LAWS 6103-2	Professional Responsibility (required course)
LAWS 7433-3	Remedies

Practice—Clinical

LAWS 7159-2	Advanced Trial Advocacy
LAWS 7009-2	Appellate Advocacy Clinic
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 6079-4	Legal Aid: Criminal Practice
LAWS 6029-4	Legal Aid: Criminal Practice 1
LAWS 6039-3	Legal Aid: Criminal Practice 2
LAWS 7169-2	Motions Advocacy
LAWS 7209-3	Natural Resources Litigation Clinic
LAWS 7109-2	Trial Advocacy
LAWS 7509-1	Trial Competition
LAWS 6179-2	Trial Practice

Property

LAWS 7154-3	Land Use Planning
LAWS 7024-3	Real Estate Planning
LAWS 6024-3	Real Property Security
LAWS 6104-3	Wills and Trusts

Public

LAWS 7205-3	Administrative Law
LAWS 7735-2	Advanced Indian Law
LAWS 7725-3	American Indian Law
LAWS 7025-3	Civil Rights Legislation
LAWS 6015-3	Constitutional Law I (required course)
LAWS 6025-3	Constitutional Law II (required course)
LAWS 6045-3	Criminal Procedure
LAWS 7045-3	Criminal Procedure: Adjudicative Process
LAWS 7035-2	Death Penalty in America
LAWS 7105-3	Domestic Relations
LAWS 7003-3	Federal Courts
LAWS 7015-3	First Amendment
LAWS 7065-3	Immigration Law
LAWS 7455-3	Insurance Law
LAWS 7415-3	Law and Medicine
LAWS 7085-3	Law and Religion
LAWS 7255-3	Local Government

LAWS 8445-2	Seminar: Alternative Dispute Resolution
LAWS 8055-2	Seminar: Church and State Relations
LAWS 8613-2	Seminar: Civil Liberties Litigation
LAWS 8345-2	Seminar: Comparative Criminal Procedure
LAWS 8015-3	Seminar: Constitutional Theory
LAWS 8075-2	Seminar: Race, Racism, and American Law
LAWS 8525-2	Seminar: Social Legislation
LAWS 8435-2	Seminar: Tort and Insurance Law Reform
LAWS 8065-2	Seminar: White Collar Crime
LAWS 7775-3	Women and the Law
Research and Writing	
LAWS 6846-1	Advanced Legal Research
LAWS 6856-2	Advanced Legal Research
LAWS 7846-1	Independent Legal Research
LAWS 7856-2	Independent Legal Research
LAWS 7916-1	Independent Legal Research: *Environmental Law Journal*
LAWS 7926-2	Independent Legal Research: *Environmental Law Journal*
LAWS 7896-1	Independent Legal Research: *Law Review*
LAWS 7906-2	Independent Legal Research: *Law Review*
LAWS 7406-1	International Moot Court Competition
LAWS 7106-1	Rothgerber Moot Court Competition
LAWS 7509-1	Trial Competition
Taxation	
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 7617-3	International Taxation
LAWS 7024-3	Real Estate Planning
LAWS 8407-2	Seminar: Tax Policy
LAWS 7307-3	Taxation of Natural Resources

Double-Degree Program

The School of Law participates with the Graduate School of Business Administration in a double-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, a specified number of courses will apply as requirements for both degrees. School of Law credit for work in the Graduate School of Business Administration 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 double-degree program. School of Law credit for work in the Graduate School of Business Administration 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 double 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 double-degree program at the time of initial application to both schools.

A student enrolled in the double-degree program may commence studies under the program in either the School of Law or the Graduate School of Business Administration. However, a student in the double-degree 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. The Graduate School of Business Administration also requires that the first year of the M.B.A. program be taken as a unit. Thereafter, the student may take courses in the Graduate School of Business Administration or in the School of Law, or both, as the student desires and as may be necessary to meet the requirements of the degree programs of the two schools.

No student in the double-degree program shall be allowed to take fewer than 10 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 12 semester hours of acceptable performance in graduate-level courses taken by a double-degree student at the Graduate School of Business Administration. 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 Graduate School of Business Administration currently grants up to 15 semester hours of credit for acceptable law courses toward the master of business administration degree. However, that degree program is being restructured, and applicants should contact the school to determine how law courses will relate to the M.B.A. degree.

Termination of Double-Degree Enrollment or of Good Standing

Students in the double-degree program who do not maintain the academic or ethical standards of either school may be terminated from the double-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 double-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 Program

The School of Law offers a program of law study that leads to the juris doctor degree with a certificate evidencing an emphasis in the area of taxation.

This program is designed to provide a student with a credential that the School of Law believes will be attractive to many potential employers. The certificate signifies taxation law experience beyond the experience normally obtained by law graduates, and intermediate between the normal law school experience and that obtained in a master 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 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 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 College of Arts and Sciences Department of Economics.

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 courses taken for School of Law credit under the tax emphasis 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 that cover the same subject matter as courses taught at the School of Law will not normally be approved fot 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 non-overlapping 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 program. However, in order to ensure that the student's law program is sufficiently broad, the faculty requires that not less than 73 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 interested in this program are encouraged to complete the forms during the spring of their first year.

COURSE DESCRIPTIONS

The following courses are offered in the School of Law 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 current information on times, days, and instructors of courses, students should consult the *Schedule of Courses* issued at the beginning of each semester.

Courses are organized by subject matter and are listed numerically *by last digit* (courses ending in the number "0" are listed before courses ending in "1," and so on). The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:

Prereq.—Prerequisite
Coreq.—Corequisite
Lab—Laboratory
Rec.—Recitation
Lect.—Lecture

International

LAWS 6200-2. Comparative Law. Considers foreign solutions to certain key legal problems. Focuses on general problems of legal process, rather than on substantive rules. Sample topics include the role of lawyers, civil dispute resolution, criminal procedure, and employment discrimination. Covers different legal systems in different years.

LAWS 6400-3. Public International Law. Examines the principles of public international law as developed and applied by all participants in international legal process, including national and international tribunals, governmental bodies, international organizations, and others. Particular attention given to the role of international law in recent events, human rights, and developing countries.

LAWS 6510-3. International Environmental Law. Examines theory and rules of international environmental law, including transboundary environmental harm generally and specific activities leading to international environmental effects such as global warming or atmospheric ozone depletion. Issues include the existence and content of norms of inter-generational equities; principles of compensation; and whether international environmental norms should give special consideration to developing countries. A course in public international law is not a prerequisite, but students who have not taken such a course will probably find it useful to do some additional background reading.

LAWS 8420-3. Seminar: International Economic Development Policy and Law. Focuses on the relation between economic development and law. Areas of policy formulation, foreign assistance, and the role of law and lawyers in development are examined, as are issues of population, effect of poverty on women, rural development, agriculture, and natural resources. Given over two semesters to allow more time for writing papers. The spring semester is devoted to writing and discussing papers.

Business

LAWS 5101-3, 5111-3. Contracts 1 and 2. Covers basic principles of contract liability, offer, acceptance and consideration, statute of frauds, contract remedies, and the parole evidence rule. Performance of contracts, conditions, effect of changed circumstances, third-party beneficiaries, assignment, and specific performance.

LAWS 6001-4. Commercial Transactions. Examines 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.

LAWS 6201-3. Agency-Partnership. Covers the partnership form of doing business. Also covers the substantial legal issues raised when people (agents) act on behalf of and subject to the control of other people (principals). Covers the concepts of vicarious tort liability, apparent authority, ratification, imputation of knowledge, and the undisclosed principal, among other matters.

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. Studies 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 concerning the employment relationship, focusing in significant part on the rights of employers, unions, and employees under the National Labor Relations Act and related legislation (including legal aspects of strikes, picketing, representation proceedings, and collective bargaining).

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. Includes prejudgment remedies, statutory and equitable remedies, fraudulent conveyance principles, and exemptions and other judicial protections afforded debtors.

LAWS 7021-3. Bankruptcy. Examines briefly nonbankruptcy business rehabilitation devices and then basic principles of federal bankruptcy law and the bankruptcy court system. Concludes with attention to business reorganizations under Chapter 11 of the Bankruptcy Code. Recommended prereqs., LAWS 6001 and 7011.

LAWS 7041-3. Banking Law. Covers the law regulating banking activities. Includes the study of bank formation and expansion, bank holding companies, financially troubled banks, and other aspects of banking law.

LAWS 7051-2. Commercial Drafting. Exposes the third-year law student to legal drafting techniques that will be useful in the private practice of law. 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. Recommended prereq., LAWS 6251.

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. Considers formation of business entities, sale of a business, recapitalization, division, reorganization, and dissolution.

LAWS 7301-3. Copyright and Unfair Competition. Examines state and federal laws relating to protection of literary, artistic, and musical works. The 1976 Copyright Act is stud-

ied in detail. Considers state laws, 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. Introduces 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 7401-3. Securities Regulation. Concerned with various federal statutes regulating the issue of corporate securities and the cases and regulations that have arisen out of those statutes; stresses statutory interpretation.

LAWS 7541-2. Employment Discrimination. Examines statutory and constitutional prohibitions of discrimination in employment on the basis of race, gender, age, religion, natural origin, and disability.

LAWS 7611-2. International Business Transactions. Problem-oriented study of 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 8031-3. Seminar: Construction Law. Addresses the legal aspects of the construction process. Emphasizes the provisions of standard form contracts, and the liability issues that arise out of the relationships between design professionals, contractors, and owners. Within this framework, course covers bidding, types of contracts, pricing variations, the rights and obligations of parties involved in the process, delays, unforeseen circumstances, risk allocation of defective work, payments, and remedies for breach.

LAWS 8411-2. Seminar: Mergers and Acquisitions. Covers state and federal law concerning acquisition by tender offer, ptoxy contest and friendly acquisition by conventional mergers, and purchase of assets. Considers all aspects of these transactions.

LAWS 8501-2. Seminar: Labor Arbitration. Studies 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. Explores federal law, policy, and agency practice affecting the use of mineral, timber, range, water, wildlife, and wilderness resources on public lands.

LAWS 6102-3. Natural Resources Law. Survey course for students who want an overview of the natural resources area, but do not intend to take additional courses in the area. Topics may include water law, public lands, land use planning, and environmental law.

LAWS 6302-3. Water Resources. Analysis of regional and national water problems, including legal methods by which water supplies are allocated, and an examination of 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 7402-2. Toxic and Hazardous Wastes. Explores the growing problem of handling and disposing of toxic substances in a way that protects public health and the environment. Focuses primarily on several federal statutes that regulate hazardous waste disposal, clean-up of contaminated sites, uranium mill tailings and nuclear wastes, toxic chemicals, and pesticides. Examines a sampling of state laws, as well as common law liability for toxic torts.

LAWS 7702-2. Conservation Philosophy and the Law. Studies the writings of leading conservation philosophers and examines the extent to which their ideas have influenced federal and state policy and law. Includes the works of people such as Henry David Thoreau, Chief Seattle, John Muir, Gifford Pinchot, Robert Marshall, Aldo Leopold, Rachel Carson, Wallace Stegner, Joseph Sax, Edward Abbey, Terry Tempest Williams, Randal O'Toole, Wendell Berry, Barry Lopez, and Jack Ward Thomas. Covers biocentrism, homocentrism, utilitarianism, preservation of wild areas, economic analysis, natural resource planning, and integrated resource management.

LAWS 8112-3. 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. Studies 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. Includes a field trip and additional expenses for students.

LAWS 8202-2. Seminar: Environmental Policy. Focuses on how law responds to evidence of threats to health and welfare. Examines particular case studies of political and legal responses to problems such as air and water pollution, toxic chemicals, radiation, and land use. Studies the roles of common law, crises, political leadership, and economics.

LAWS 8302-2. Seminar: Advanced Problems in Water Resource Management. Deals with selected water law problems, including a consideration in greater depth of some issues covered in the basic water law course. New topics are also examined. During the second half of the semester the class discusses student papers.

Practice and Procedure

LAWS 5223-1. Appellate Court Advocacy. Students prepare appellate briefs and related documents and deliver oral arguments before a three-judge court composed of faculty, upperclass students, and practicing attorneys. Practice arguments are videotaped and critiqued.

LAWS 5303-3, 5313-3. Civil Procedure 1 and 2. Studies modern practice in civil suits, including rules governing pleading, joinder of parties, discovery, jurisdiction of courts over the subject matter and parties, right to jury trial, appeals, and res judicata and collateral estoppel, with emphasis on the Federal Rules of Civil Procedure and their Colorado counterpart.

LAWS 5503-4. Criminal Law. Statutory and common law of crimes and defenses, procedures by which the law makes judgments as to criminality of conduct, purposes of criminal law, and 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 lawyer's professional responsibilities. The Code of Professional Responsibilities and the Model Rules of Professional Conduct are discussed in some detail.

LAWS 6353-3. Evidence. Studies the methods and forms of proof in litigation, including detailed consideration of hearsay, impeachment of witnesses, relevancy and certain restrictions on relevant evidence, expert opinion testimony, the authentication and best evidence doctrines, and privileges.

LAWS 6353-3 and 6179-2. Evidence and Trial Practice. A 5-hour course that covers the theoretical material of Evidence (LAWS 6353) and the skills performance of Trial Practice (LAWS 6179) in which students apply the rules and doctrine of evidence in simulated trial settings, but seeks to develop them together rather than separately.

LAWS 7003-3. Federal Courts. Structure and jurisdiction of 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. An advanced course in civil procedure in modern complex multiparty suits, including extended examination of class actions in such settings as employment discrimination and mass torts. Also studies problems in discovery, joinder, res judicata, collateral estoppel, and judicial management in such suits.

LAWS 7433-3. Remedies. Problem-solving course examining types of relief available to vindicate various rights. Covers damages, specific performance, injunctions, and restitution. Emphasizes planning aspect of enforcement, in view of limitations and problems of proof associated with specific remedies.

LAWS 8613-2. Seminar: Civil Liberties Litigation. Studies issues unique to the prosecution and defense of civil liberties lawsuits. Students discuss litigation strategies with reference to several lawsuits currently pending in the federal courts.

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 6024-3. Real Property Security. Basic mortgage law, including use of mortgage substitutes, deeds of trust, and installment land contracts. Covers foreclosure, redemption, and related problems; special priority problems in land acquisitions and construction financing; special financing devices including variable interest and wrap-around mortgages; and problems relating to the transfer of the mortgagor's and mortgagee's respective interests.

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 various contemporary legal problems involved in 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 local environments and private land uses through planning, zoning, and regulation of land development, including consideration of the constitutional and statutory limitations on such legislatively created techniques.

Public

LAWS 5425-4. Torts. Studies nonconsensual allocation of losses for civil wrongs, focusing primarily on concepts of negligence and strict liability.

LAWS 6015-3. Constitutional Law I. Studies constitutional structure: judicial review, federalism, and separation of powers.

LAWS 6025-3. Constitutional Law II. Studies constitutional rights of due process, equal protection, and free speech and press.

LAWS 6045-3. Criminal Procedure. Focuses primarily on 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 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 7025-3. Civil Rights Legislation. Presents a comprehensive study of federal civil rights statutes briefly touched on in other courses. Studies federal civil rights statutes, their judicial application, and their interrelationships as a discretely significant body of law of increasing theoretical interest and practical importance.

LAWS 7035-2. Death Penalty in America. Focuses on the way the courts have attempted to deal with the multitude of problems in implementing the death penalty. Examines both the procedural aspects of a capital trial and how the courts handle issues of race and poverty.

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 7065-3. Immigration Law. Covers legal issues pertaining to noncitizens of the United States, especially their right to enter and remain as immigrants and nonimmigrants. Specific topics include admission and exclusion, deportation, and refugees and political asylum.
Simultaneously a course in constitutional law, in statutory interpretation, in planning, in ethics, in history, and in policy.

LAWS 7085-3. Law and Religion. Uses judicial decisions as well as historical and theoretical materials to explore significant aspects of the relationship between law and religion. The religion clauses of the first amendment will be a central but not exclusive subject of study.

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. Also considers 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 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.

LAWS 7415-3. Law and Medicine. Analyzes legal, moral, and economic issues raised by advances in biomedical technologies. Examines problems raised by behavior control through organic intervention, including psychosurgery, psychoactive drugs, and electrical stimulation of the brain; genetic engineering; amplification of human powers and faculties by artificial means, including organ transplantation, man-machine symbiosis, and pharmacologically induced enhancement of mental functioning; death and dying; and regulation of experimentation with human subjects.

LAWS 7455-3. Insurance Law. Covers the basics of insurance, including making and terminating of contracts, the concept of insurable interest, the insurer's protective devices, coverage and exclusions, the insured's duties and defenses, and subrogation. Also considers government regulation as well as "tort reform" legislation and its relation to the crisis in availability and affordability of some lines of insurance.

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 7735-2. Advanced Indian Law. Examines Alaska Natives and Hawaiian Natives, with emphasis both on development of existing law and on pending reform proposals. Also examines Indian religious freedom, economic development, and the Indian Child Welfare Act.

LAWS 7775-3. Women and the Law. Examines the treatment of women and women's issues under the federal constitution; developing feminist theory and practice; statutory regulation of sex discrimination; sexual harassment; gender, reproductive rights, and sexuality; violence and women; pornography; marriage and family; and women in the legal profession.

LAWS 8015-3. Seminar: Constitutional Theory. Examines the role of courts and other branches of government in defining and enforcing constitutional values. Rele-vant readings are from philosophy, social sciences, and legal scholarship, as well as cases.

LAWS 8055-2. Seminar: Church and State Relations. Explores religion clause issues on both a theoretical and a practical level. Initially considers themes or ideals that courts and commentators have thought pertinent to doctrine in this area, such as neutrality, separation of church and state, and voluntarism. Applies this theoretical analysis to recurring practical controversies that the courts have had to address, including 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 8065-2. Seminar: White-Collar Crime. Focuses on issues relating to the prosecution and defense of so-called "white-collar" criminal offenses. Includes substantive law under frequently used federal statutes such as mail fraud, RICO, and forfeiture provisions. In addition, the course examines the perceived tendency to undercriminalize the harmful conduct of purportedly "reputable" defendants of high social and economic standing.

LAWS 8075-2. Seminar: Race, Racism, and American Law. Focuses on issues of race reform law, in particular the group of issues dealing with Black Americans. (Students of all hues and persuasions are welcome.) The class has an interpretive or critical dimension, rather than a litigation-oriented one. The idea will be to gain an understanding of how race reform law works, and how attitudes and historical forces have shaped that body of law.

LAWS 8345-2. Seminar: Comparative Criminal Procedure. This seminar takes an in-depth look at some of the basic features of modern criminal justice systems that share the civil law tradition.

with the hope that such study will provide a vehicle for a deeper understanding of the strengths and weaknesses of the American system of criminal justice. Prereq., LAWS 7045.

LAWS 8415-2. 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 8435-2. Seminar: Tort and Insurance Law Reform. Examines causes of the recent crisis in the availability and affordability of liability insurance, and considers justification for and meaning and effect of the various statutes enacted in response to this crisis under the label of "tort reform legislation."

LAWS 8445-2. Seminar: Alternative Dispute Resolution. A study of alternative dispute resolution (ADR) theory, its application in specific contexts (e.g., civil rights), different procedural approaches to ADR, and advantages and disadvantages of using ADR procedures.

LAWS 8525-2. Seminar: Social Legislation. A study of governmental efforts to combat poverty and maintain income. Examines welfare programs, Social Security, unemployment and workers' compensation, fair labor standards, occupational safety and health, employment discrimination, and Title VII.

Research and Writing

LAWS 5226-2. Legal Writing. After intensive introduction to the resources available for legal research, students prepare written material of various kinds designed to develop research skills, legal writing style, and analysis of legal problems.

LAWS 6846-1, 6856-2. Advanced Legal Research. In-depth analysis of legal research methodology. Considers the types and classes of research sources. Includes preparation of a research bibliography. The second credit hour requires a special research project.

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 required before registering.

LAWS 7896-1, 7906-2. Independent Legal Research: *Law Review.* Participation in research, writing, and editing activities involved in publishing the *Colorado Law Review.* Standards for awarding of credit are set and applied by the faculty.

LAWS 7916-1 and 7926-2. Independent Legal Research: *International Environmental Law Journal.* Students participate in the research, writing, and editing activities involved in publishing the *Colorado Journal of Environmental Law and Policy.* 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 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 impact of the federal income tax system on the business enterprise. Emphasizes the partnership and corporate area. Based on a series of problems involving 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 7307-3. Taxation of Natural Resources. Considers 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 include oil and gas, hard minerals, and timber and water. Recommended prereq., LAWS 6007.

LAWS 7617-3. International Taxation. Covers basic aspects of the United States taxation of income earned abroad by its citizens and the taxation of income derived by foreign persons from U.S. sources, including the implications of income tax treaties.

LAWS 8407-2. Seminar: Tax Policy. Considers questions of fairness, efficiency, and promotion of social goals as they arise in federal, state, and local systems of raising revenue through user fees and through taxation of income, sales, property, and estates and gifts. Past seminar papers have covered the taxation of business organizations, the value added tax, the social security tax, the taxation of farming, and the tax exemption of religion.

Jurisprudence

LAWS 6128-3. Legislation. Examination of theories of legislation and of the relation between legislatures and courts, emphasizing problems of statutory interpretation and other issues in the judicial use or misuse of statutes.

LAWS 7058-3. Conflict of Laws. Discusses methods of choosing the appropriate law in cases or transactions involving the differing laws of several states. Reviews long-arm jurisdiction of courts and also covers 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. Considers a variety of themes and issues central to legal thought, including the controversy between positivism and natural law, the meaning of "interpretation" in law, the nature of judicial decision-making, and the strengths and weaknesses of "policy," or "rights," and other kinds of approaches to legal problems.

LAWS 7218-2. Legal History. Focuses on understanding and interpreting developments in Anglo-American legal history, including development of common law; origins of equity courts; the origins of the jury; and reception of English law in America.

LAWS 7228-2. Intellectual Origins of the Constitution. Examines the views of the Constitution's framers expressed in contemporaneous and antecedent writings and debates.

LAWS 8318-2. Seminar: Problems in Law and Economics. Examines 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: economics and law as contrasting systems of rhetoric, theory of property rights, intellectual property, and institutional design.

LAWS 8428-2. Seminar: Women in Law and Literature. Considers both legal and literary depictions of women and their legal and extralegal situations. Topics covered may include women as mothers, women as sexual beings, women's silence, women's violence, women as criminals, women at work, and women as the "other" in law and literature.

LAWS 8538-3. Seminar: Modern Legal Theory. Examines some of the theories that inform contemporary legal thought. Readings are drawn from a variety of approaches, including legal realism, rights and principles scholarship, law and economics, critical legal studies, and feminist jurisprudence.

LAWS 8548-2. Seminar: Theories of Criminal Punishment. Explores the various justifications that philosophers have developed to explain why we have the right to punish. Also examines the historical evolution of our punishment system, and focuses on the death penalty as a critical contemporary issue in the debate about the proper role of punishment in our society.

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 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. Provides thorough grounding in problems of criminal defense. Students defend indigent misdemeanants 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 6079-4. Legal Aid Criminal Practice. Provides thorough grounding in problems of criminal defense. Students defend indigent misdemeanants. Develops working knowledge of courtroom skills, advocacy, and evidence presentation. Concludes with full mock trial. A separate per-semester fee for malpractice insurance is charged for this course. Prereq. or coreq., LAWS 6353.

LAWS 6179-2. Trial Practice. See LAWS 6353, Evidence and Trial Practice.

LAWS 7029-2. Appellate Advocacy Clinic. Enables students to work on briefs of criminal cases being handled by the Appellate Division of the Public Defender.

LAWS 7109-2. Trial Advocacy. Student exercises simulate trial events: jury voir dire, opening statement, direct and cross examination of witnesses, and closing argument.

LAWS 7159-2. Advanced Trial Advocacy. Advanced course covering trial practice elements. Open only to students who have taken LAWS 7109.

LAWS 7169-2. Motions Advocacy. Provides practical training in preparing and arguing pretrial, post-trial, and chambers motions to an experienced federal judge based on materials from actual case files.

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. Affords an inside view into both complex environmental litigation as well as alternative dispute resolution. Students participate in traditional litigation, administrative advocacy, legislative drafting, and the conduct of complex negotiations and settlements.

LAWS 7409-3. Legal Negotiation and Dispute Resolution. Explores 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 adjudicarion.

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 limited to the top two teams (six students). Student finalists may continue involvement in regional and national competitions.

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Professional Staff

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College of Music

Robert R. Fink, Dean

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 provides specialized training in music to prepare students for professional work or advanced study, for teaching music in the elementary and secondary schools, and 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 recognize 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 students a balanced approach to musical understanding and musicianship. The faculty has assumed responsibility for 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 students' 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 provides 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.

Major Fields and Degrees

Undergraduate instruction in the College of Music leads to the bachelor of arts (B.A.) in music, the bachelor of music (B.Mus.), and the bachelor of music education (B.Mus.Ed.) degrees. In addition to a substantial core of studies in music, the B.A. in music program allows a wide choice of study in areas outside of music. B.Mus. areas of concentration are in composition, history and literature of music, performance, and voice theatre. The major areas in the B.Mus.Ed. program 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 double 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 (M.Mus.), master of music education (M.Mus.Ed.), doctor of musical arts (D.Mus.A.), and doctor of philosophy (Ph.D.). Major fields in the master of music and doctor of musical arts degrees are conducting, composition, pedagogy, and performance. The master of music education degree is designed to provide advanced instruction for teachers in the elementary and secondary schools. The Ph.D. 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.

Facilities

The Imig Music building and Macky Auditorium contain studios, classrooms, rehearsal rooms, and practice rooms in which students work. Macky Auditorium houses 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 library also houses the American Music Research Center, one of the largest collections of American music in the country. The collection contains books, music, reference materials, recordings, and a slide collection from the seventeenth through twentieth centuries.

The total facilities of the College of Music include 86 practice rooms; 54 studios and offices; band, choral, opera and orchestral rehearsal halls; a piano laboratory; three electronic music studios, including a microcomputer MIDI classroom; and auditoriums with seating capacities of 2,000, 500, 200 and 120.

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.

International Study

The college encourages the educational breadththat comes with study abroad. For instance, the program in Regensburg, Germany, offers study in music history and music education. Further information is available from the Office of International Education.

Student Organizations

The student body of the College of Music has its own government, represented by 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.

ACADEMIC EXCELLENCE

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.

Scholarships and Awards

Several scholarships and awards are designed specifically for students in the College of Music:

- Applied Music Scholarships
- Brownlow-Wilson Music Education Scholarship
- Charles A. Byers Scholarship in Choral Music Education
- Charles Haertling Piano Scholarship
- College of Music Associates Scholarship Endowment Awards
- Dean's Honor Awards
- Frank "Crick" Streamer Memorial Scholarship
- Glenn Miller Scholarships
- Honors String Awards
- Howard Waltz Scholarship
- Jessie and Albert Henry Scholarships
- Music History Academic Achievement Award
- Peercy-Roth Memorial Scholarship
- Phyliss Parmelee Memorial Piano Scholarship
- Talent and Creativity Awards
- Theodore Presser Scholarship
- Wallace F. Fiske Memorial Scholarships
- William Clendenin History Award

ACADEMIC STANDARDS

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 pteparation of reports, papers, etc., in order to avoid this and similar offenses.

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 three semesters. (Cumulative grade point average is calculated on grades earned at this University.) If, at the end of each semester and cumulative 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 1.00 or below will automatically be suspended for the following two semesters. However, students who are suspended may attend a summer term or continuing education classes to attempt to raise their grade point averages. Those attempting to do this must successfully complete 12 credits in one semester with no withdrawals and no incomplete grades.

Undergraduate students under scholastic suspension may petition for readmission and may receive a personal hearing before the associate dean for undergraduate studies.

Students who have been dismissed *must* reapply for admission to the University after being reinstated by the college, unless they are dismissed in May and raise their cumulative GPA to 2.00 during the following semester.

Graduate students should see "Quality of Graduate Work" under the Graduate School portion of this catalog for scholastic requirements.

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.

College of Music policies stated below are in addition to the campus policies found in this catalog.

ADMISSION AND ENROLLMENT POLICIES

Admission Requirements

In addition to the entrance requirements of the University outlined in the Undergraduate Admission section, freshman 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 is required for all entering undergraduate music majors. Auditions are typically held on the Boulder campus on Saturdays in late January and February, with a separate Saturday audition date for string instruments in early March. Additional dates may be arranged by calling the College of Music. Applicants may substitute a non-returnable cassette recording which should be approximately 10 minutes in length. Write to the Associate Dean for Undergraduate Studies, College of Music (see the Directory in this catalog) for audition-interview application forms or information.

Provisional Admission

Applicants who meet all admission requirements except the minimum academic preparation standards (MAPS) 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.

Nondegree Students

With the written permission of the instructor, nondegree 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.

Attendance Requirements

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 by the instructor.

Convocations and Recitals

All degree students are required to register for Music Convocation (CONV 1990) 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 only during the academic year.

Each semester, students will be given a list of 22 convocations and 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.

Ensembles

All students enrolled in applied music must participate in a University ensemble appropriate to and required by their degree program. Any student who studies applied music beyond degree requirements must participate concurrently in a University ensemble. Double majors can be in only one ensemble at a time. Waivers in degree requirements for ensembles, or substitutions, will be awarded only through 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, Collegium Musicum, and Piano Chamber Music/Accompanying.

Course Load

The normal academic load for an undergraduate student in the College of Music is 16 to 19 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 limitations on registration under the Graduate School portion of this catalog for graduate student course load stipulations.

Dropping a Course

Students may drop a course in the College of Music any time up to six weeks from the first day of class by obtaining the written permission of their instructor and their associate dean. However, students will be charged tuition for all classes in which they are registered after the thirteenth day of the semester.

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 can apply toward degree requirements from departments within the University are limited to 1 in every 8 semester hours earned in the College of Music.

Residence Requirement

Of the hours required for an undergraduate degree, 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 bachelor of arts in music.

Student Work

A copy of all scholarly student papers that 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 required for graduation will be recorded. Arrangements are to be made through the College of Music Concerts Office, and a recording fee will be charged. The original tape recording will be placed in the Music Library.

Withdrawal

Students may withdraw from the College of Music through the sixth week of the semester by obtaining the signature of the associate dean of undergraduate studies.

UNDERGRADUATE DEGREE PROGRAMS

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.

General Education in Music

The following areas of knowledge are central to the undergraduate degrees in music:

- knowledge of solo performance and technique, including knowledge of the various musical styles used in compositions for students' musical instruments,
- understanding of each composition performed, notation and editorial signs used in the compositions performed, and repertoire for students' performance medium;
- knowledge of ensemble performance, including familiarity with the names and styles of major composers in the student's performance medium and knowledge of the techniques necessary to blend a number of individual musicians into an ensemble;
- knowledge of concert and recital opportunities, including familiarity with literature composed for different performance forces;
- knowledge of theoretical studies, including tonal harmony, counterpoint, voice-leading, and notation; formal principles and analytical techniques for tonal music; and instruments in score, including the concert pitch of transposing instruments and nomenclature used in scores;
- knowledge of historical studies, including representative works in the canon of musi-

cal literature, from chant to the present, the general outlines of the history of music from the Middle Ages to the present, music in the United States, and musical cultures other than those of Europe.

In addition, students completing any of the degrees in music are expected to acquire:

- abilities in solo performance and technique, including the ability to communicate through the performance medium, technical ability to perform selections with demonstrated musicianship, competence to display musicality appropriate to innate talent, and proficiency to display musical style and interpretation appropriate to the composition;
- abilities in ensemble performance, including the ability to interact with fellow musicians;
- abilities in concert and recital opportunities, including the ability to select performances that will have the largest benefit to the student's musical growth;
- abilities in theoretical studies, including sight-reading ability and ear training skill; and
- abilities in historical studies, including the ability to analyze musical works in score or aurally for elements of style that determine historical placement; the beginning of an ability to integrate historical analysis and style into personal performance; and an appreciation of musics other than those immediately available upon entrance into the college.

BACHELOR OF ARTS IN MUSIC

The bachelor of arts in music degree has as its goal a broad education in music within a liberal arts context. Although students may elect within their programs special courses that 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 B.A. 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 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.

Students are 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.

Honors students in theory and history may elect to write a senior thesis in accord with their goals and interests. Topics are selected and prepared 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. Other students take the junior research seminar and elect a 4000-level music history or theory class to substitute for the thesis.

Students may choose to complete requirements from a wide selection of courses offered. If students wish 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. One semester of English composition and a passing grade on the University writing proficiency examination (or two semesters of English composition).
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. Of the nonmusic electives, 43 semester hours of credit must be fulfilled through the College of Arts and Sciences' content areas of study (see page 45).

Courses and Curricula

For the B.A. in music degree, students must complete the courses listed below.

	Semester Hours
Freshman Year	
CONV 1990 Convocation (two semesters)	0
Applied instruction (and literature class)	4
University ensemble	2
MUSC 1101, 1111 Semester 1 and 2 Theory	4
MUSC 1121, 1131 Aural Skills 1 and 2	2
MUSC 1802, 1812 Introduction to Music 1 and 2	6
English language or literature	6
Foreign language	8
Sophomore Year	
CONV 1990 Convocation (two semesters)	0
Applied instruction (and literature class)	2
MUSC 2101, 2111 Semester 3 and 4 Theory	4
MUSC 2121, 2131 Aural Skills 3 and 4	2
Foreign language	4
Electives in liberal arts	18
Free electives	4
Junior Year	
CONV 1990 Convocation (two semesters)	0
MUSC 3802, 3812 History of Music 1 and 2	6
MUSC 3987 B.A. in Music Research Seminar	1
MUSC 4061 Analysis 1	2
Elective in music history (4000-level)	3
Requirements and electives in liberal arts	15
Free electives	6
Senior Year	
4000-level elective in music theory or history	2-3
Requirements and electives in liberal arts	21
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 (30 minutes per week) in voice and/or American folk instruments—banjo, fiddle, guitar, mandolin. Among these five media, students have one major area (two semesters) and two minor areas (one semester each). Continuing education registration 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 4907), students are encour-

aged to take courses in the College of Business and Administration. These courses are considered 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, and 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 communication, 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 associate dean for undergraduate studies, after which the student must petition the business 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, counterpoint, 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 concentration in pedagogy.

BACHELOR OF MUSIC

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 (*IF*) or incomplete withdrawal (*IW*) and cannot progress to the next level until the proficiency is achieved. Advisors will provide students with proficiency and repertoire requirements. Attendance at a literature-performance class is required in conjunction with applied study.

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

	Semester Hours
Freshman Year	
CONV 1990 Convocation (two semesters)	0
PMUS 1616 Applied Organ Instruction (and literature class)	8
Class minor in performance	2
University ensemble	2
MUSC 1101, 1111 Semester 1 and 2 Theory	4
MUSC 1121, 1131 Aural Skills 1, 2	2
MUSC 1802, 1812 Introduction to Music 1, 2	6
Electives in liberal arts	6
Sophomore Year	
CONV 1990 Convocation (two semesters)	0
PMUS 2616 Applied Organ Instruction (and literature class)	8
University ensemble	2
MUSC 2265 Service Playing Techniques	2
MUSC 2101, 2111 Semester 3 and 4 Theory	4
MUSC 2121, 2131 Aural Skills 3, 4	2
MUSC 3176, 3186 Conducting 1, 2	4
Electives in liberal arts	9
Free electives	6
Junior Year	
CONV 1990 Convocation (two semesters)	0
PMUS 3616 Applied Organ Instruction (and literature class)	8
MUSC 4011 Sixteenth-Century Counterpoint	2
University ensemble	2
MUSC 4265, 4275 Improvisation	4
MUSC 3802, 3812 History of Music	6
Electives in liberal arts	9

Senior Year
PMUS 4616 Applied Organ Instruction (and literature class) 7
University ensemble 2
MUSC 4245, 4255 Church Music 6
MUSC 4957 Senior Thesis 2
MUSC 4997 Senior Recital 1
Electives in liberal arts 6
Free electives 6

Composition Concentration Area

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters) 0
Applied instruction (and literature class) 4
University ensemble 2
PMUS 1526 Composition (and Composition Seminar) 6
MUSC 1101, 1111 Semester 1 and 2 Theory 4
MUSC 1121, 1131 Aural Skills 1, 2 2
MUSC 1802, 1812 Introduction to Music 1, 2 6
Electives in liberal arts 6

Sophomore Year
CONV 1990 Convocation (two semesters) 0
Applied instruction (and literature class) 4
University ensemble 2
PMUS 2526 Composition (and Composition Seminar) 4
MUSC 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 2071 Instrumentation 2
Electives in liberal arts 16

Junior Year
CONV 1990 Convocation (two semesters) 0
Applied instruction (and literature class) 4
University ensemble 2
PMUS 3526 Composition (and Composition Seminar) 6
MUSC 4001 Contemporary Theory 2
MUSC 4011, 4021 Sixteenth-, Eighteenth-Century Counterpoint 4
MUSC 3802, 3812 History of Music 6
Electives in liberal arts 8

Senior Year
Applied instruction (and literature class) 4
University ensemble 2
PMUS 4526 Composition (and Composition Seminar) 6
MUSC 4957 Senior Thesis 0
MUSC 4041 Orchestration 2
MUSC 4061, 4071 Analysis 1, 2 4
MUSC 3176 Conducting 1 2
Free electives 12

Guitar Performance Concentration Area

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters) 0
PMUS 1566 Applied Guitar Instruction (and literature class) 8
PMUS 1105 Keyboard Musicianship Class 2
MUSC 1101, 1111 Semester 1 and 2 Theory 4
MUSC 1121, 1131 Aural Skills 1, 2 2
MUSC 1802, 1812 Introduction to Music 1, 2 6
MUSC 1326 Guitar Sight Reading 1
MUSC 2365 Introduction to Accompanying 2
Electives in liberal arts 6

Sophomore Year
CONV 1990 Convocation (two semesters) 0
PMUS 2566 Applied Guitar Instruction (and literature class) 8
PMUS 2105 Keyboard Musicianship 2
University ensemble 2
MUSC 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 3176 Conducting 1 2
Electives in liberal arts 14

Junior Year
CONV 1990 Convocation (two semesters) 0
PMUS 3566 Applied Guitar Instruction (and literature class) 7
MUSC 3997 Junior Recital 1
University ensemble 2
MUSC 3802, 3812 History of Music 6
Elective in theory 2
Electives in liberal arts 7
Electives in music 6

Senior Year
PMUS 4566 Applied Guitar Instruction (and literature class) 7
MUSC 4997 Senior Recital 1
University ensemble 2
MUSC 4061 Analysis 1 2
MUSC 4106 Guitar Literature 2
Electives in liberal arts 3
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.

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters) 0
Applied instruction (and literature class) 4
University ensemble 2
MUSC 1101, 1111 Semester 1 and 2 Theory 4
MUSC 1121, 1131 Aural Skills 1, 2 2
MUSC 1802, 1812 Introduction to Music 1, 2 6
English composition elective 6
Foreign language 8

Sophomore Year
CONV 1990 Convocation (two semesters) 0
Applied instruction (and literature class) 4
PMUS 1105 Keyboard Musicianship 2
University ensemble 2
MUSC 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 3802, 3812 History of Music 6
History of Western Civilization 1, 2 6
Elective in liberal arts 2
Foreign language 8

Junior Year
CONV 1990 Convocation (two semesters) 0
Applied instruction (and literature class) 4
University ensemble 2
Period and Topical Courses in Music History (4000 Level) 8
TMUS 5403 Special Studies 2
MUSC 4011 Sixteenth-Century Counterpoint 2
MUSC 4021 Eighteenth-Century Counterpoint 2
MUSC 4061, 4071 Analysis 1, 2 4
Free electives 6

Senior Year
Applied instruction (and literature class) 4
University ensemble 2
Period and topical courses in music history (4000 level) 8
MUSC 4957 Senior Thesis 4
MUSC 3176 Conducting 1 2
Free electives 8

Organ Performance Concentration Area

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters) 0
PMUS 1616 Applied Organ Instruction (and literature class) 8
Class minor in performance 2
University ensemble 2
MUSC 1101, 1111 Semester 1 and 2 Theory 4
MUSC 1121, 1131 Aural Skills 1, 2 2
MUSC 1802, 1812 Introduction to Music 1, 2 6
Electives in liberal arts 6

Sophomore Year
CONV 1990 Convocation (two semesters) 0
PMUS 2616 Applied Organ Instruction (and literature class) 8
Class minor in performance 2
University ensemble 2
MUSC 2265 Service Playing Techniques 2
MUSC 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 3176 Conducting 1 2
Electives in liberal arts 12
Free elective 3

Junior Year
CONV 1990 Convocation (two semesters) 0
PMUS 3616 Applied Organ Instruction (and literature class) 7
MUSC 3997 Junior Recital 1
University ensemble 2

MUSC 3802, 3812 History of Music.....6
MUSC 4011, 4021 Sixteenth, Eighteenth-Century Counterpoint.....4
MUSC 4265, 4275 Improvisation.....4
MUSC 4285, 4295 Organ Survey.....6

Senior Year
PMUS 4616 Applied Organ Instruction (and literature class).....7
MUSC 4997 Senior Recital.....1
University ensemble.....2
Electives in liberal arts.....12
Free electives.....9

Piano Performance Concentration Area

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters)....0
PMUS 1636 Applied Piano Instruction (and literature class).....8
Class minor in performance.....2
MUSC 1101, 1111 Semester 1 and 2 Theory.....4
MUSC 1121, 1131 Aural Skills 1, 2.....2
MUSC 1325 Sight Reading for Piano.....1
MUSC 1802, 1812 Introduction to Music 1, 2.....6
MUSC 2365 Introduction to Accompanying..2
PHIL 1100 Ethics or PHIL 1440 Introductory Logic.....3
Elective in liberal arts.....3

Sophomore Year
CONV 1990 Convocation (two semesters)....0
PMUS 2636 Applied Piano Instruction (and literature class).....8
Class minor in performance.....2
Chamber music.....1
MUSC 2101, 2111 Semester 3 and 4 Theory.....4
MUSC 2121, 2131 Aural Skills 3, 4.....2
MUSC 2325 Applied Harmony for the Keyboard.....2
MUSC 2365 Introduction to Accompanying.....2
Electives in liberal arts.....12

Junior Year
CONV 1990 Convocation (two semesters)....0
PMUS 3636 Applied Piano Instruction (and literature class).....7
Chamber music.....2
Band, orchestra, or choir.....2
MUSC 3176 Conducting 1.....2
MUSC 3345, 3355 Piano Pedagogy 1, 2.....4
MUSC 3802, 3812 History of Music.....6
MUSC 3997 Junior Recital.....1
Elective in theory.....2
Electives in liberal arts.....9

Senior Year
PMUS 4636 Applied Piano Instruction (and literature class).....7
Chamber music.....1
MUSC 4061 or 4071 Analysis 1 or 2.....2
MUSC 4325 Piano Literature.....2
MUSC 4997 Senior Recital.....1
Elective in liberal arts.....3
Free electives.....12

String Performance Concentration Area: Harp, String Bass, Viola, Violin, and Violoncello

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters)....0
Applied string instruction (and literature class).....8
PMUS 1105 Keyboard Musicianship.....2
Class minor in performance.....2
PMUS 1327 Orchestra.....2
MUSC 1101, 1111 Semester 1 and 2 Theory.....4
MUSC 1121, 1131 Aural Skills 1, 2.....2
MUSC 1802, 1812 Introduction to Music 1, 2.....6
Electives in liberal arts.....3

Sophomore Year
CONV 1990 Convocation (two semesters)....0
Applied string instruction (and literature class).....8
Class minor in performance.....2
Chamber music.....2
PMUS 1327 Orchestra.....2
MUSC 2101, 2111 Semester 3 and 4 Theory.....4
MUSC 2121, 2131 Aural Skills 3, 4.....2
MUSC 2071 Instrumentation.....2
MUSC 3176 Conducting 1.....2
Electives in liberal arts.....9

Junior Year
CONV 1990 Convocation (two semesters)....0
Applied string instruction (and literature class).....7
PMUS 3327 Orchestra.....2
PMUS 4517 Orchestral Repertoire.....2
MUSC 3802, 3812 History of Music.....6
MUSC 3997 Junior Recital.....1
Elective in theory.....2
Electives in liberal arts.....12

Senior Year
Applied string instruction (and literature class).....7
Chamber music.....1
EMUS 3327 Orchestra.....2
MUSC 4997 Senior Recital.....1
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.

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters)....0
PMUS 1726 Applied Voice Instruction (and literature class).....8
PMUS 1105 Keyboard Musicianship.....2
Choir.....2
MUSC 1101, 1111 Semester 1 and 2 Theory.....4
MUSC 1121, 1131 Aural Skills 1, 2.....2
MUSC 1802, 1812 Introduction to Music 1, 2.....6
MUSC 1444 Italian Diction and Repertoire.....2
MUSC 1454 English Diction and Repertoire.....2
Elective in liberal arts (including foreign language).....3

Sophomore Year
CONV 1990 Convocation (two semesters)....0
PMUS 2105 Keyboard Musicianship 2.....2
PMUS 2726 Applied Voice Instruction (and literature class).....8
Choir.....2
MUSC 2101, 2111 Semester 3 and 4 Theory.....4
MUSC 2121, 2131 Aural Skills 3, 4.....2
Electives in liberal arts (including foreign language).....15

Junior Year
CONV 1990 Convocation (two semesters)....0
PMUS 3726 Applied Voice Instruction (and literature class).....7
PMUS 4134, 4144 Opera Theatre.....3
Choir.....1
MUSC 3802, 3812 History of Music.....6
MUSC 3997 Junior Recital.....1
MUSC 4464 French/German Diction and Repertoire.....2
Elective in theory.....2
Electives in liberal arts (including foreign language).....10
Free elective.....3

Senior Year
PMUS 4726 Applied Voice Instruction (and literature class).....7
Choir.....2
Pedagogy elective.....2
MUSC 3176 Conducting 1.....2
MUSC 4772 History of Opera.....3
MUSC 4997 Senior Recital.....1
DNCE Beginning Ballet.....1
Electives in liberal arts.....5
Free electives.....9

Voice Theatre Concentration Area

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters)....0
PMUS 1105 Keyboard Musicianship.....2
PMUS 1726 Applied Voice Instruction (and literature class).....6
Choir.....2
MUSC 1101, 1111 Semester 1 and 2 Theory.....4
MUSC 1121, 1131 Aural Skills 1, 2.....2
MUSC 1444 Italian Diction and Repertoire.....2
MUSC 1454 English Diction and Repertoire.....2

MUSC 1802, 1812 Introduction to Music 1, 2 6
Elective in liberal arts 5

Sophomore Year
CONV 1990 Convocation (two semesters) 0
PMUS 2105 Keyboard Musicianship 2 2
PMUS 2726 Applied Voice Instruction (and literature class) 6
Choir 2
MUSC 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 3176 Conducting 1 2
THTR 2013 Performance of Literature 3
THTR 2003 Acting: Beginning 3
Electives in liberal arts 7
Free electives 2

Junior Year
CONV 1990 Convocation (two semesters) 0
PMUS 3167 Stagecraft 3
PMUS 3726 Applied Voice Instruction (and literature class) 6
PMUS 4138 Opera Theatre 2
MUSC 3802, 3812 History of Music 6
THTR 2023 Acting: Intermediate 3
Electives in liberal arts 12
Elective in theory 2

Senior Year
PMUS 4148 Opera Theatre 4
PMUS 4726 Applied Voice Instruction (and literature class) 6
MUSC 4997 Senior Recital (or major role, or design or direction of a major production) ..0
THTR 2095 History of Fashion 2 3
Elective in theatre and dance 3
Electives in liberal arts 4
Free electives 12

Wind/Percussion Instruments Performance Concentration Area

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters) 0
Applied wind/percussion instruction (and literature class) 8
PMUS 1105 Keyboard Musicianship 2
MUSC 1101, 1111 Semester 1 and 2 Theory 4
MUSC 1121, 1131 Aural Skills 1, 2 2
MUSC 1802, 1812 Introduction to Music 1, 2 6
Class minor in performance 2
Band or orchestra 2
Electives in liberal arts 6

Sophomore Year
CONV 1990 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 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 2071 Instrumentation 2
Electives in liberal arts 12

Junior Year
CONV 1990 Convocation (two semesters) 0
Applied wind/percussion instruction (and literature class) 7
Chamber music 2
Band or orchestra 2
MUSC 3176 Conducting 1 2
MUSC 3802, 3812 History of Music 6
MUSC 3997 Junior Recital 1
Elective in music theory 2
Electives in liberal arts 12

Senior Year
Applied Wind/Percussion Instruction (and literature class) 7
MUSC 4997 Senior Recital 1
Chamber music 2
Band or orchestra 2
Free electives 12

BACHELOR OF MUSIC EDUCATION

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 130 semester hours with an overall grade point average of 2.75 must be earned for the B.Mus.Ed. degree, with no grade below *C-* in a music course. Forty semester hours in the liberal arts are required.

Liberal Arts Requirements

All students entering the music education program, whether freshmen, transfers, or those holding a degree, shall take the general education core curriculum courses designated by the College of Music curriculum committee for the bachelor of music education degree. Students should check with their advisor 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 their 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 2.75.
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 completing 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 a student teaching assignment 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 2.75.
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.

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 6
Class minor in performance 2
University ensemble 2
MUSC 1101, 1111 Semester 1 and 2 Theory 4
MUSC 1121, 1131 Aural Skills 1, 2 2
MUSC 1802, 1812 Introduction to Music 1, 2 6
Electives in liberal arts 12

Sophomore Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 6
Class minor in performance 2
University ensemble 2
MUSC 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 2103 Introduction to Music Education 3
MUSC 3113 Introduction to the Arts.....3
MUSC 3133 Instruments in General Music ..2
MUSC 3193 Vocal Pedagogy and Literature for Young Voices 2
CDSS 2500 Voice and Diction 3
Electives in liberal arts 6

Junior Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 5
University ensemble 2
MUSC 3013, 3023, 3033 String/Woodwind/Brass Classes 3
MUSC 3123 Teaching Choral Music 3
MUSC 3176, 3186 Conducting 1, 2 4
MUSC 3802, 3812 History of Music.....6
MUSC 3997 Junior Recital.....1
EDUC 4102 Foundations of American Eduction 3
EDUC 4112 Educational Psychology 3
Theory Elective 2
Elective in liberal arts 3

Senior Year
Applied instruction (and literature class) 3
University ensemble 1
Instrumental or general music minor 3
MUSC 4103 Introduction to Student Teaching 1
MUSC 4193 Student Teaching Seminar.....1
EDUC 4122 Principles and Methods of Secondary Education 2
EDUC 4232 Teaching Reading in the Content Area.....3
EDUC 4463 Teaching Exceptional Children in the Regular Classroom 3
EDUC 4732 Student Teaching.....8
EDUC 4912 Practicum in Teacher Education.....1

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.

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 6
Class minor in performance 2
University ensemble 2
MUSC 1101, 1111 Semester 1 and 2 Theory 4
MUSC 1121, 1131 Aural Skills 1, 2 2
MUSC 1802, 1812 Introduction to Music 1, 2 6
Electives in liberal arts 12

Sophomore Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 6
Class minor in performance 2
University ensemble 2
MUSC 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 2103 Introduction to Music Education 3
MUSC 3113 Introduction to the Arts.....3
MUSC 3133 Instruments in General Music....2
MUSC 3193 Vocal Pedagogy and Literature for Young Voices 2
CDSS 2500 Voice and Diction 3
Electives in liberal arts 6

Junior Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 5
University ensemble 2
MUSC 3013, 3023, 3033 String/Woodwind/Brass Classes 3
MUSC 3123 Teaching Choral Music 3
MUSC 3176, 3186 Conducting 1, 2 4
MUSC 3802, 3812 History of Music.....6
MUSC 3997 Junior Recital.....1
EDUC 4102 Foundations of American Education 3
EDUC 4112 Educational Psychology 3
Theory elective 2
Elective in liberal arts 3

Senior Year
Applied instruction (and literature class) 3
University ensemble 1
Instrumental or general minor.....3
MUSC 4103 Introduction to Student Teaching 1
MUSC 4193 Student Teaching Seminar.....1
EDUC 4122 Principles and Methods of Secondary Education 2
EDUC 4232 Teaching Reading in the Content Areas 3
EDUC 4463 Teaching Exceptional Children in the Regular Classroom 3
EDUC 4732 Student Teaching.....8
EDUC 4912 Practicum Teaching.....1

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.

Semester Hours

Freshman Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 6
Class minor in performance 3
University ensemble 2
MUSC 1101, 1111 Semester 1 and 2 Theory 4
MUSC 1121, 1131 Aural Skills 1, 2 2
MUSC 1802, 1812 Introduction to Music 1, 2 6
Electives in liberal arts 12

Sophomore Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 6
Class minor in performance 2
University ensemble 2
MUSC 2101, 2111 Semester 3 and 4 Theory 4
MUSC 2121, 2131 Aural Skills 3, 4 2
MUSC 2103 Introduction to Music Education 3
MUSC 3113 Introduction to the Arts.....3
MUSC 3133 Instruments in General Music....2
MUSC 3193 Vocal Pedagogy and Literature for Young Voices 2
MUSC 3223 Teaching Brass Instruments 2
CDSS 2500 Voice and Diction 3
Electives in liberal arts 6

Junior Year
CONV 1990 Convocation (two semesters)....0
Applied instruction (and literature class) 5
University ensemble 2
MUSC 3143 Teaching Instrumental Music...3
MUSC 3153 Teaching Woodwind Instruments 2
MUSC 3163 Teaching String Instruments 2
MUSC 3176, 3186 Conducting 1, 2 4
MUSC 3243 Marching Band/Jazz Band/ String Techniques 2
MUSC 3802, 3812 History of Music.....6

MUSC 3997 Junior Recital....1
MUSC 4153 Percussion Class....1
EDUC 4102 Foundations of American Education....3
Elective in theory....2
Elective in liberal arts....3

Senior Year
Applied instruction (and literature class)....3
University ensemble....1
MUSC 4103 Introduction to Student Teaching....1
MUSC 4193 Student Teaching Seminar....1
EDUC 4112 Educational Psychology....3
EDUC 4122 Principles and Methods of Secondary Education....2
EDUC 4232 Teaching Reading in the Content Areas....3
EDUC 4463 Teaching Exceptional Children in the Regular Classroom....3
EDUC 4732 Student Teaching....8
EDUC 4912 Practicum Teaching....1

UNDERGRADUATE CERTIFICATE PROGRAMS

Certificate in Jazz Studies

The certificate in jazz studies is designed to allow a select number of students to study jazz more in depth and at a higher level than music degrees currently require. The curriculum is *in addition* to requirements of each degree plan and consists of a minimum of 18 credit hours, including topics such as jazz theory, aural foundations to jazz improvisation, jazz improvisation, history of jazz, scoring and arranging, jazz keyboard, electronic music, jazz combo, and jazz ensemble. Entrance into the program is by audition in the sophomore year.

Certificate in Music Technology

The certificate in music technology provides a limited number of students with an opportunity to study music technology in greater depth than music degrees currently allow. Each participating student must elect the certificate's curriculum *in addition* to the normal requirements of their degree program. The certificate is available to students in the College of Music only. The curriculum consists of 18 credit hours, and includes such topics as an introduction to music technology, computer programming for musicians, music and media, sound synthesis, and electronic music ensemble. Entrance into the program is by audition in the sophomore year.

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.

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 required both for fellowship grants and for admission to 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 College of Music before 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; and 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, or teaching practica. The teaching-area module is not normally used toward the minimum 30-hour course requirement for master's or D.Mus.A. programs.

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 fifty students each year. Applications for these positions must be filed with the Office of the Associate Dean for Graduate Studies by March 1 of the preceding academic year. There are also scholarships offered by the various faculties and grants-in-aid given for various college-related responsibilities.

MASTER OF MUSIC

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 (including guitar), voice, or wind/percussion instruments.

Major work in the conducting degrees includes 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 are required. In pedagogy, courses in the psychology of music and the pedagogy and literature of a specific performing area and a written thesis are required. In performance, students complete applied study, recitals, and recital-related papers.

Conducting, percussion, string, and wind majors are required to participate in a music ensemble. Faculty chairs 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.

Before admission, composition majors should 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 (M.Mus.) 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 three specific areas of study for the M.Mus. degree: composition, music literature, and performance/pedagogy (including conducting). A student must select a major (at least 10 hours) from one of these areas and a minor (at least 6 hours) from music education, music history and literature, or music theory. Students selecting music education as their minor area should check with the Office of the Associate Dean for Graduate Studies for a list of approved music education courses. Students 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 in music courses must be elected outside the major in all master of music degrees.

Each 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 that of the comprehensive-final examination.

Recital/Thesis Requirements

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.

For the major in conducting: a public practicum and a performance-related or other scholarly document.

For the major in music literature: two written projects that provide focus to the candidate's work.

For the major in performance: recital(s), performance preparation from a repertoire list, and research papers, or a combination of part or all of these, as required by the major faculty.

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

The master of music education (M.Mus.Ed.) 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

Applicants are expected to present undergraduate preparation equivalent to that required for the bachelor of music education degree at this University. No audition is required, except for those using conducting as a specialization. They should audition in person or send a videotape of a rehearsal or concert.

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 is 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 and Teaching Music through Performance.

The minor area of study is provided to develop both knowledge and craft in music to a more highly refined level. Six hours must be elected in music history, music performance/pedagogy, or music theory. 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 srudent 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 on 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 two summers. 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

The doctor of musical arts (D.Mus.A.) 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, literatute and petformance 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, original scores and tapes of compositions; a personal audition and interview, when possible; and evidence of writing proficiency (in English) and scholarly research, such as term papers or theses.

Program Requirements

The following program description 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 six years of first registration.

Residence Requirements. Residence includes 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. Students 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 as a new student. 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 TMUS 8019, Precandidate for Doctor of Musical Arts Degree, until having become a candidate for the degree. After becoming a candidate, the student will enroll in TMUS 8029, Candidate for Doctor of Musical Arts Degree, until the degree is completed. This continuous registration is independent of 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 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, one each in music history and theory, 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 examination.

Area Dissertation Requirements

Composition

TMUS 8219 Dissertation Project 1 (composition)
TMUS 8229 Dissertation Project 2 (composition)
TMUS 8239 Dissertation Project 3 (composition recital, or equivalent in performance of compositions)
TMUS 8249 Dissertation Project 4 (composition recital, or equivalent in performance of compositions)
TMUS 8259 Dissertation Project 5 (research-lecture)
TMUS 8269 Dissertation Project 6 (research-lecture)
TMUS 8339 Major Composition

Instrumental Conducting and Literature

TMUS 8219 Dissertation Project 1 (conducting practicum)
TMUS 8229 Dissertation Project 2 (conducting practicum)
TMUS 8249 Dissertation Project 4 (solution of problems in the crafts of arranging and editing)
TMUS 8259 Dissertation Project 5 (lecture-demonstration)
TMUS 8269 Dissertation Project 6 (lecture-demonstration)
TMUS 8279 Performance Research Document 1
TMUS 8289 Performance Research Document 2
TMUS 8319 Repertoire Project

Literature and Performance of Choral Music

TMUS 8219 Dissertation Project 1 (choral practicum)
TMUS 8229 Dissertation Project 2 (choral practicum)
TMUS 8239 Dissertation Project 3 (choral projects in arranging, editing, realizing *basso continuo*, transcribing mensural notation, and score reading)
TMUS 8259 Dissertation Project 5 (research-lecture)
TMUS 8279 Performance Research Document 1
TMUS 8289 Performance Research Document 2
TMUS 8329 Document

Performance: Organ, Piano, Strings

TMUS 8219 Dissertation Project 1 (solo recital)
TMUS 8229 Dissertation Project 2 (solo recital)
TMUS 8239 Dissertation Project 3 (chamber music recital)
TMUS 8249 Dissertation Project 4 (chamber music recital)
TMUS 8259 Dissertation Project 5 (research-lecture)
TMUS 8269 Dissertation Project 6 (research-lecture)
TMUS 8279 Performance Research Document 1 (not required in piano)
TMUS 8289 Performance Research Document 2 (not required in piano)
TMUS 8299 Performance Research Document 3 (not required in piano)
TMUS 8309 Performance Research Document 4 (not required in organ and piano)
TMUS 8319 Repertoire Project

Performance and Pedagogy: Piano, Strings, Wind/Percussion

TMUS 8219 Dissertation Project 1 (recital)
TMUS 8229 Dissertation Project 2 (recital)
TMUS 8239 Dissertation Project 3 (recital, or a third research-lecture)
TMUS 8259 Dissertation Project 5 (research-lecture)
TMUS 8269 Dissertation Project 6 (research-lecture)
TMUS 8279 Performance Research Document 1 (not required in piano)
TMUS 8289 Performance Research Document 2 (not required in piano)
TMUS 8299 Performance Research Document 3 (not required if TMUS 8239 is a research-lecture, and not required in piano)
TMUS 8319 Repertoire Project (not required of wind and percussion)
TMUS 8329 Document/Pedagogy Project

Performance and Pedagogy: Voice

TMUS 8219 Dissertation Project 1 (solo recital)
TMUS 8229 Dissertation Project 2 (solo recital)
TMUS 8239 Dissertation Project 3 (chamber-music recital)
TMUS 8259 Dissertarion Project 5
TMUS 8269 Dissertation Project 6 (a project on vocal literature or performance)
TMUS 8319 Repertoire Project
TMUS 8329 Document/Pedagogy Project

DOCTOR OF PHILOSOPHY IN MUSIC

The doctor of philosophy (Ph.D.) in music degree is intended for those students who seek a terminal degree with emphasis on research. The three principal areas of study are music education, musicology, and music theory; however, a combination of these or other emphases is possible, depending on student 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, dissertation credit-hour requirements, quality of work, advisory committees, residence, preliminary examinations, language requirements, comprehensive examinations, application for admission to candidacy, dissertation requirements, final examinations, and time limits. The sections that follow supplement 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 (the verbal, quantitative, and advanced test in music are required) are a part of the student's application for the degree. Upon acceptance to the degree program, students must pass the preliminary examinations 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 Examinations

A minimum of 30 hours of course work, distributed in qualifying and major areas, is required. At least two doctoral seminars must be taken at this University as part of the course work.

In completing the course requirements prior to taking the qualifying portion of the comprehensive examination, students should select courses in at least four of the following six categories: philosophy/aesthetics, history/culture, psychology/sociology/pedagogy, bibliography/historiography, theory/analysis, and experimental/descriptive research. Students must have two courses or more in at least two of these categories (minimum of 6 courses, normally 18 hours).

Planning for the qualifying portion of the degree is under the supervision of the Ph.D. advisory committee. At least 12 hours of course work are required in preparation for the major-area portion of the comprehensive examination. The major area should be under the guidance of the student's advisory committee.

Dissertation

See thesis requirements related to the doctor of philosophy degree in the Graduate School section of this catalog regarding dissertation work.

COURSE DESCRIPTIONS

The following courses are offered in the College of Music 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 current information on times, days, and instructors of courses, students should consult the *Registration Handbook and Schedule of Courses* issued at the beginning of each semester.

Some courses may be open to nonmajors. Students should check for current policies.

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.

Courses are organized by subject matter and are listed numerically *by last digit* (courses ending in the number "0" are listed before courses ending in "1," and so on). The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:

Prereq.—Prerequisite
Coreq.—Corequisite
Lab—Laboratory
Rec.—Recitation
Lect.—Lecture

Elective Music

EMUS 1081-3. 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.

EMUS 1832-3. 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.

EMUS 1842-3. American Musical Theatre. Overview of the role of musical theatre in U.S. culture, emphasizing the twentieth-century Broadway musical.

EMUS 1852-3. Music of the Rock Era. 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.

EMUS 2752-3. History of United States Folk and Popular Music. Stylistic and historical examination of trends that have influenced present-day American music.

EMUS 2762-3. 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 present.

EMUS 2772-3. World Musics. Musics outside western art tradition, using current ethnomusicological materials.

EMUS 3082-3. American Popular Music. Historical survey with focus on popular song literature of 1920-present, including the role of peripheral influences such as jazz, folk, country, etc.

EMUS 3642-3. History of Jazz. Study of origins, development, and current trends.

EMUS 3652-3. 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 use of synthesizers and global musical ensembles

featured as well as study of the future as history. For nonmusic majors.

EMUS 3822-3. Music Literature 1. Study of music literature from choral, orchestra, chamber music, and operatic repertoire. For nonmusic majors only.

EMUS 3832-3. Music Literature 2. Continuation of MUSC 3820.

EMUS 4752-3. Women Composers. Survey of western music through works composed by women, with emphasis on eighteenth through twentieth centuries.

EMUS 4892-3. Latin American Music. Music of cultures south of the United States—Mexico, Peru, Brazil, Cuba, and other countries having substantial musical heritage—emphasizing relationship of folk, popular, and art styles.

Music 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. Participation in all ensembles 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.

Music

Theory and Composition

MUSC 1001-3, 1011-3. Theory 1 and 2. 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 1021-1, 1031-1. Theory and Ear Training Laboratory 1 and 2. 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 1101-2. Semester 1 Theory. Introduces the fundamentals of tonal harmony and voice leading, focusing on four-voice writing and analysis of excerpts from music literature.

MUSC 1111-2. Semester 2 Theory. Continuation of MUSC 1101. Covers principles of harmony and voice leading, using all common diatonic triads and 7th chords. Introduces modulation, contrapuntal chord functions, and elementary structural analysis of excerpts from music literature. Prereq., MUSC 1101.

MUSC 1121-1. Aural Skills Lab, Semester 1. Sight singing and dictation of diatonic melodies in major and minor keys (treble, alto, and bass clefs). Covers identification of scale types, intervals, triads, and dominant 7th chords. Harmonic dictation using chords studied in MUSC 1101. Coreq., MUSC 1101.

MUSC 1131-1. Aural Skills Lab, Semester 2. Sight singing in major and minor keys (treble, alto, tenor, and bass clefs). Dictation of one- and two-voice examples. Harmonic dictation using vocabulary studied in MUSC 1111. Detection of pitch and rhythm errors in performed examples. Coreq., MUSC 1111.

MUSC 2001-3. Theory 3. Continuation of Theory 2.

MUSC 2021-1. Theory and Ear Training Laboratory 3. Continuation of Ear Training Laboratory 2.

MUSC 2101-2. Semester 3 Theory. Continuation of MUSC 1111. Reviews melodic and rhythmic figuration. Covers dissonance and chromaticism, including modal mixture, 7th chords with added dissonance, neapolitan 6th chord, and augmented 6th chords. Ptovides structural analysis of musical excerpts. Prereq., MUSC 1111.

MUSC 2111-2. Semester 4 Theory. Continuation of MUSC 2101. Advanced chromaticism: mixture, altered dominants, voice-leading techniques, and chromaticism in larger contexts. Post-tonal theory: impressionism, neoclassicism, "motivic" music (set theory), and twelve-tone theory. Prereq., MUSC 2101.

MUSC 2121-1. Aural Skills Lab, Semester 3. Continuation of MUSC 1131. Sight singing of chromatic melodies in major and minor keys (in four clefs). Dictation of one- through three-voice examples. Harmonic dictation using vocabulary studied in MUSC 2101. Detection of pitch and rhythm performance errors. Coreq., MUSC 2101.

MUSC 2131-1. Aural Skills Lab, Semester 4. Continuation of MUSC 2121. Sight singing of chromatic and atonal melodies. Dictation of one- through three-voice examples. Identification of sonorities studied in MUSC 2111. Detection of pitch and rhythm performance errors. Coreq., MUSC 2111.

MUSC 2071-2. Instrumentation. Introductory study of the instruments of the orchestra, and problems of scoring for diverse choirs and full orchestra.

MUSC 3051-2. Elementary Composition. A course for noncomposition majors. 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. Study of the style of Palestrina and his contemporaries through analysis and written examples.

MUSC 4021-2. Eighteenth-Century Counterpoint. Stylistic study of main contrapuntal forms of the period including invention, suite, and fugue. Stresses analysis and written examples.

MUSC 4031-2. Scoring and Arranging. Practical problems, creative arranging, and scoring for various choral and instrumental groups.

MUSC 4041-2. Orchestration. 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 4081-3. 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 4101-3. Theory and Aural Skills Review. A concentrated review of tonal harmony, voice leading, and essential aural skills. Includes diatonic triads and 7th chords, modulation, chromaticism, and structural analysis of representative compositions. Designed to prepare graduate students for more advanced work in music theory.

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. 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 synthesizets and recording equipment.

MUSC 5101-3. Advanced Counterpoint.

MUSC 5501-1. Theory Teaching Practicum. Expetience in planning, teaching, and evaluating undergraduate theory-composition courses.

MUSC 7801-3. Doctoral Seminar in Music Theory. Advanced studies in theory are undertaken. Each student presents results of research on individually chosen topics or aspects of a topic central to the class. A major paper or project is required.

History and Literature of Music

MUSC 1802-3. Introduction to Music 1. 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 3802-3, 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. 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 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 houts 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 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. 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), emphasizing relationship of folk, popular, and art styles.

MUSC 5902-3. Seminar: Women in Music. Meeting as a seminar, 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 7822-3, 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.

Music Education

MUSC 2103-3. Introduction to Music Education. *(Offered in fall only.)* 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 3013-1. String Class. *(Offered in fall only.)* Required course for music education majors with choral/general emphasis. Students gain substantial technique on violin, viola, cello, and double bass. Pedago-gical skills developed, using most recent methods as they relate to school teaching.

MUSC 3023-1. Woodwind Class. *(Offered in spring only.)* Presents techniques of playing and teaching woodwind instruments as well as selection of methods and equipment for use with students of woodwind instruments.

MUSC 3033-1. Brass Class. *(Offered in fall only.)* Presents techniques of playing and teaching brass instruments as well as selection of methods and equipment for use with students of brass instruments.

MUSC 3103-3. Teaching General Music. *(Offered in fall of even-numbered years.)* 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. *(Offered in spring only.)* Surveys the arts in western culture, including architecture, painting, sculpture, poetry, prose, music, dance, comedy, tragedy, and film, along with a presentation of various approaches relating to the arts.

MUSC 3123-3. Teaching Choral Music. *(Offered in fall of odd-numbered years.)* Music materials, pedagogical techniques, and administrative procedures used in choral music programs for junior and senior high school students.

MUSC 3133-2. Instruments in General Music. *(Offered in fall of odd-numbered years.)* Basic skills for understanding and using the recorder, guitar, autoharp, and percussion instruments in the general music classroom at all school levels.

MUSC 3143-3. Teaching Instrumental Music. *(Offered in fall only.)* Basic course covering broad principles for organizing, administering, and teaching instrumental music programs in public schools.

MUSC 3153-2. Teaching Woodwind Instruments. *(Offered in spring only.)* Instruction in playing and teaching all woodwind instruments. Students perform in heterogeneous and homogeneous groupings.

MUSC 3163-2. Teaching String Instruments. *(Offered in fall only.)* Instruction in playing and teaching all string instruments. Students perform in heterogeneous and homogeneous groupings.

MUSC 3193-2. Vocal Pedagogy and Literature for Young Voices. *(Offered in spring only.)* 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 knowledge and skills needed to work with singers in both private studio and public school choral settings.

MUSC 3203-2. Music for the Classroom Teacher. New approach to giving elementary teachers the knowledge and skills needed to meet the certification requirement; designed to develop minimum knowledge and skills.

MUSC 3223-2. Teaching Brass Instruments. *(Offered in fall only.)* Instruction in playing and teaching all brass instruments. Students perform in heterogeneous and homogeneous groupings.

MUSC 3243-2. Marching Band/Jazz Band/String Techniques. *(Offered in spring only.).* Techniques of charting and arranging for marching band, techniques and literature of the jazz ensemble, or alternative string ensemble techniques.

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. *(Offered in fall only.)*

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. Final project is 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 schools.

MUSC 6143-2. Teaching Music through Performance: The Conductor as Educator.

MUSC 6153-2. Administration and Supervision of Public School Music. Focuses on the organization, administration, and supervision of music education in the public schools. Topics addressed include contemporary issues relating to curriculum development, teacher training and guidance, program evaluation, and philosophy of music education.

MUSC 6173-2. Directions of Contemporary Aesthetic Education.

MUSC 6193-1. Selected Studies in Music Education. May be repeated for additional credit. Prereqs., consent of instructor and chairman of the music education faculty.

MUSC 7103-3. History of Music Teaching. Historical understanding of music teaching from Middle Ages to present. Students explore methods, materials, and philosophies from the past and study how these factors have evolved and influenced today's pedagogy.

MUSC 7113-3. Research Literature and Techniques.

MUSC 7123-2. Research Practicum—Music Education.

MUSC 7823-3. Seminar in Musicology.

MUSC 7833-3. Seminar in Musicology.

Voice

MUSC 1444-2. Italian/English Diction and Repertoire. Phonetics of Italian and English, and coaching of classic arias and art songs.

MUSC 3484-1. Music Theatre Stage Lab. Practical laboratory for learning aspects of technical theatre in actual performances.

MUSC 4464-2. French/German Diction and Repertoire. French and German diction and coaching in art song and lieder. Open to singers and pianists.

MUSC 5404-2. Words and Music. 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. Study of the physiology, acoustics, and functional interdependence of the singing voice. Recommended for all graduate students in voice.

MUSC 5454-2. Pedagogy 2: Repertoire for Young Voices.

MUSC 5464-2. French Song Literature. Extensive analytical and historical discussion of French song literature styles, from the middle ages through the twentieth century.

MUSC 5474-2. German Song Literature. Extensive analytical and historical discussion of German song literature styles, from the middle ages through the twentieth century.

MUSC 5484-2. Graduate Seminar in Vocal Pedagogy. Demonstration teaching by class members. Examination and evaluation of comparative methodology. Practical aspects of studio teaching, including corrective techniques, group procedures, and recital programming. Prereq., MUSC 5444 or instructor consent.

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 4245-3, 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 4265-2, 4275-2. Improvisation. Same as MUSC 5265, 5275.

MUSC 4285-3, 4295-3. 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 firsthand observation. Same as MUSC 5285, 5295.

MUSC 5235 (2-8). Church Music Research.

MUSC 5255-2. Service Playing Techniques. Thorough study of music of the liturgies of Lutheran and Anglican services. Includes techniques of hymn playing, modulation, transposition, and accompanying and directing from the console.

MUSC 5265-2, 5275-2. Improvisation. Same as MUSC 4265, 4275.

MUSC 5285-3, 5295-3. Organ Survey. Same as MUSC 4285, 4295.

Piano

MUSC 1325-1. Piano Sight Reading. Studies techniques for improving sight-reading skills at the keyboard, with practical work in solo, ensemble, choral, and theatrical literature. Also covers score reading and transposition.

MUSC 2325-2. Applied Harmony for the Keyboard. 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, emphasizing 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 5345-2, 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 5375-2. Opera Coaching for Pianists. Skills for opera coaches and rehearsal pianists.

MUSC 6345-3, 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 6365-3, 6375-3. Practicum. In-depth experiences in organizing, teaching, and critiquing all phases of the group-environments program. Registration required until the following are completed: performance examination consisting of all keyboard skills, TMUS 8239 Dissertation Project, 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.

Instrumental

MUSC 1326-1. Guitar Sight Reading. Studies 19th- and 20th-century approaches to improving sight reading, including practical applications and exercises.

MUSC 3176-2, 3186-2. Conducting 1, 2. Introduction to conducting and rehearsal techniques.

MUSC 4106-2. Guitar Literature. An analytical and historical study of guitar literature from the Middle Ages through the 20th century.

MUSC 4666-2. Chamber Music Literature: Winds and Percussion. Stylistic-historical survey in various genres from Baroque era to present. Same as MUSC 5666.

MUSC 5136-2. Advanced Conducting. Advanced work in conducting.

MUSC 5526-2, 5536-2. Suzuki String Pedagogy. Studies the history, philosophy, methodology, and repertoire of the Suzuki method of teaching violin and its adaptation to American music education.

MUSC 5666-2. Chamber Music Literature: Winds and Percussion. Same as MUSC 4666.

Theses and Recitals

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 3997-1. Junior Recital.

MUSC 4907-2. Arts Management Techniques. Includes marketing, fund raising, budget, personnel management, contracts, and other facets of arts management.

MUSC 4957-1. Senior Thesis.

MUSC 4997-1. Senior Recital.

Choral Music

MUSC 5138-2. Advanced Choral Conducting. Advanced work in conducting.

MUSC 5158-2. Symposium in Choral Music. Advanced conducting and analytical study. Required of all choral graduate students for three semesters.

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 7138-2. Contemporary Issues in College Teaching.

Performance Music

Courses in composition and vocal or instrumental technique and interpretation may be found under the PMUS section of the *Registration Handbook and Schedule of Courses.* For individual applied music instruction, the equivalent of one hour of individual recitation (lesson) and one hour of litetature class are required. Undergrad-uate 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 per semester. Graduate performance majors normally carry 3 hours per semester (including ensemble credit if required); minors, 2 hours per semester.

Thesis Music

TMUS 4403-4493 (1-3). Special Studies. Advanced studies in specific areas or special projects in selected areas. For undergraduate majors only. See current *Registration Handbook and Schedule of Courses* for specific course number. May be repeated for additional credit.

TMUS 5504-5594 (1-3). Special Studies. Graduate studies in specific areas or special projects in selected areas. For master's degree students only. See current *Registration Handbook and Schedule of Courses* for specific course number. May be repeated for additional credit.

TMUS 5605-5695 (1-3). Special Studies. Advanced graduate studies in specific areas or special projects in selected areas. For doctoral degree students only. See current *Registration Handbook and Schedule of Courses* for specific course number. May be repeated for additional credit.

TMUS 6948-3. Master's Degree Candidate.

TMUS 6956-2. Master's Thesis.

TMUS 6957-2. Master's Thesis 2.

TMUS 7997-3. Candidate for Master of Music.

TMUS 8019-1. Precandidate for Doctor of Musical Arts.

TMUS 8029-1. Candidate for Doctor of Musical Arts.

TMUS 8219-3. Dissertation Project 1 (Solo Recital, Choral Concert, Composition).

TMUS 8229-3. Dissertation Project 2 (Solo Recital, Choral Concert, Composition, Vocal Pedagogy Project).

TMUS 8239-3. Dissertation Project 3 (Chamber Music Recital, Vocal Pedagogy Project, Choral Project, Composition Recital).

TMUS 8249-3. Dissertation Project 4 (Chamber Music Recital, Choral Project, Composition Recital, Wind/Percussion Practicum).

TMUS 8259-3. Dissertation Project 5 (Research Lecture).

TMUS 8269-3. Dissertation Project 6 (Research Lecture).

TMUS 8279-1. Performance Research Document 1.

TMUS 8289-1. Performance Research Document 2.

TMUS 8299-1. Performance Research Document 3.

TMUS 8309-1. Performance Research Document 4.

TMUS 8319-3. Repertoire Project.

TMUS 8329 (2-6). Document/Pedagogy Project.

TMUS 8339 (4-6). Major Composition.

TMUS 8998 (1-10). Ph.D. Thesis.

FACULTY

ROBERT FINK, Dean; Professor (Theory). B.Mus., M.Mus., Ph.D., Michigan State University.

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FRANK BAIRD, Professor Emeritus.

GRETCHEN HIERONYMUS BEALL, Professor Emerita.

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CHARLES BYERS, Professor Emeritus.

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JOHN GALM, Associate Professor (History, Percussion). B.Mus., M.Mus., Performer's Certificate, Eastman School of Music.

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DEBORAH HAYES, Associate Professor (History and Literature). A.B., Oberlin College; A.M., Ph.D., Stanford University.

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EVERETT HILTY, Professor Emeritus.

WARNER IMIG, Dean and Professor Emeritus.

YOSHIYUKI ISHIKAWA, Associate Professor (Bassoon). B.M.E., M.M., Northwestern University; D.M.A., University of Michigan.

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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 Emeritus.

DENES KOROMZAY, Professor Adjunct (Viola). Artist Diploma, Franz Liszt Academy of Music.

DORIS PRIDONOFF LEHNERT, Associate Professor (Piano). Attended University of Southern California, The Juilliard School, and University of Connecticut.

OSWALD LEHNERT, Professor (Violin, Viola). Special Studies, Chicago Musical College; The Juilliard School; University of Connecticut.

ALAN LUHRING, Associate Professor (History and Literature). B.A., University of Minnesota; M.A., Ph.D., Stanford University.

JOSEPH LUKASIK, Director of Music Technology. B.M., Eastman School of Music; M.M., University of Michigan.

KATHARINE MASON, Assistant Professor. B.Mus.Ed., B.M., Murray State University; M.M., University of Illinois; Ph.D., University of Wisconsin.

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.

JANET MONTGOMERY, Associate Professor (Music Education). B.Mus.Ed., M.Mus.Ed., Wichita State University; Ph.D., University of Wisconsin-Madison.

TOM MYER, Instructor (Saxophone), Assistant Director of Bands, Director of Jazz Ensembles. B.S., University of Wisconsin-LaCrosse; M.M., North Texas State University.

LAURA OKUNIEWSKI, Lecturer. B.M., Cleveland Institute of Music; M.M., Cleveland State University.

PAUL PARMELEE, Professor Emeritus.

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.

BRENDA ROMERO-HYMER, Instructor (History and Literature, Erhnomusicology). B.M., M.M., University of New Mexico.

BARBARA KINSEY SABLE, Professor Emeritus.

GORDON SANDFORD, Professor (Music Education). A.B., San Jose State College; A.M., University of Redlands; Ph.D., University of Southern California.

TERRY SAWCHUK, Assistant Professor (Trumpet). B.M., M.M., University of Michigan.

F. WAYNE SCOTT, Professor Emeritus.

JULIE SIMSON, Assistant Professor (Voice). B.Mus., Western Michigan University; M.Mus., University of Illinois.

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.

RICHARD TOENSING, Professor (Theory and Composition). B.Mus., St. Olaf College; M.Mus., D.M.A., University of Michigan.

DON VOLLSTEDT, Professor Emeritus.

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.

KEITH WALLINGFORD, Professor Emeritus.

DOUGLAS WALTER, Assistant Professor (Percussion). B.M., University of North Texas; M.M., University of Michigan; D.M.A., Temple University.

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, Assistant Professor (Guitar). B.Mus., San Francisco Conservatory; M.Mus., D.Mus.A., University of Colorado.

KAREN YONOVITZ, Associate 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.

Presidents Leadership Class

The Presidents Leadership Class is a specially designed two-year curriculum that focuses on leadership development, personal development, and community service initiatives. Skills are developed in an interdisciplinary, experiential environment through exposure to government, education, the humanities, business, and science. Students from each of the schools and colleges participate in the Presidents Leadership Class curriculum in addition to their regular course work.

The Presidents Leadership Class is a program of the Student Leadership Institute and is overseen by a 30-member Board of Trustees representing the Colorado business, educational, and governmental community.

Admission and Enrollment

Admission to the Presidents Leadership Class is considered one of the highest honors awarded to incoming University of Colorado at Boulder students. Presidents Leadership Class scholars are admitted prior to the beginning of their first year. Selection criteria include academic excellence, a demonstrated commitment to community service, and leadership potential. A separate admissions application must be obtained from the Student Leadership Institute Office and returned prior to February 1. Applications may be obtained by writing the Institute's Executive Director, Campus Box 363, University of Colorado at Boulder, Boulder, CO 80309-0363 or by calling the institute office at (303) 492-8342.

Only students who are accepted into the Presidents Leadership Class are eligible to enroll in PRLC courses. Each year, approximately 60 first-year scholars are enrolled, comprising 50 Colorado residents and 10 out-of-state students. Only first-year scholars may continue into the sophomore year program. Students are awarded credit hours for participating in PRLC, which vary by school and college.

Upper-division scholars (juniors and seniors) are encouraged to continue their participation in the Presidents Leadership Class as class advisors and administrative staff members. Staff members continue to receive merit-based scholarships during their tenure in the Presidents Leadership Class.

Two-Year Academic Program

The Presidents Leadership Class is a rigorous academic and experiential two-year program that focuses on leadership development at personal, organizational, community, and global levels. The curriculum is centered on empowerment of others, open mindedness, a bias toward action, service to the broader good, the ability to balance reason and intuition, the ability to recognize and work with interconnectedness, ethical considerations, and the ability to inspire a shared vision.

Fundamental skills are developed in the program, including effective research ability, speaking and writing, multicultural and gender communication, critical thinking, ethical thinking, interdisciplinary thinking, introspection and self-awareness, facilitation of group processes, and basic teaching ability.

First-year courses focus on leadership theory and its application, ethical considerations of leadership, and community issues in leadership. Experiential programs include outward bound activities, a weekly speaker series, off-campus seminars, and a group community service project.

Sophomore-year courses focus on global issues in leadership (such as environmental issues, hunger, and human rights) and multilevel analyses of leadership issues (issues originating at the organizational level that carry community and global implications). Experiential programs include outward bound activities, a monthly workshop series, individual contract learning, and a group community service project. An important capstone experience is the "walkabout," a semester-long 15-hour-per-week internship with an area institution.

Scholarship Programs and Opportunities

First-year and sophomore scholars receive a minimum merit-based scholarship of $2,000 ($500 each semester of participation). Scholars must enroll in PRLC course work to maintain their scholarship.

Scholars are also eligible to be selected for a variety of other merit-based scholarship programs, including the Roger L. Reisher Scholarship Fund ($6,000 over four years) and the Alvin G. Flanagan Scholarship Fund (annual $1,000 minimum awards).

Junior and senior staff members also receive merit-based scholarship awards.

COURSE DESCRIPTIONS

PRLC 1810-3. Ethical Leadership. Students are introduced to fundamental principles of leadership and ethics. Emphasizes application of the principles for self-development and organizational effectiveness.

PRLC 1820-3. Community Issues in Leadership. Explores major community issues such as drug abuse, poverty, decline of infrastructure, care of the aged, etc. Gives particular attention to the development of effective leadership responses to community difficulties at university, city, state, and national levels.

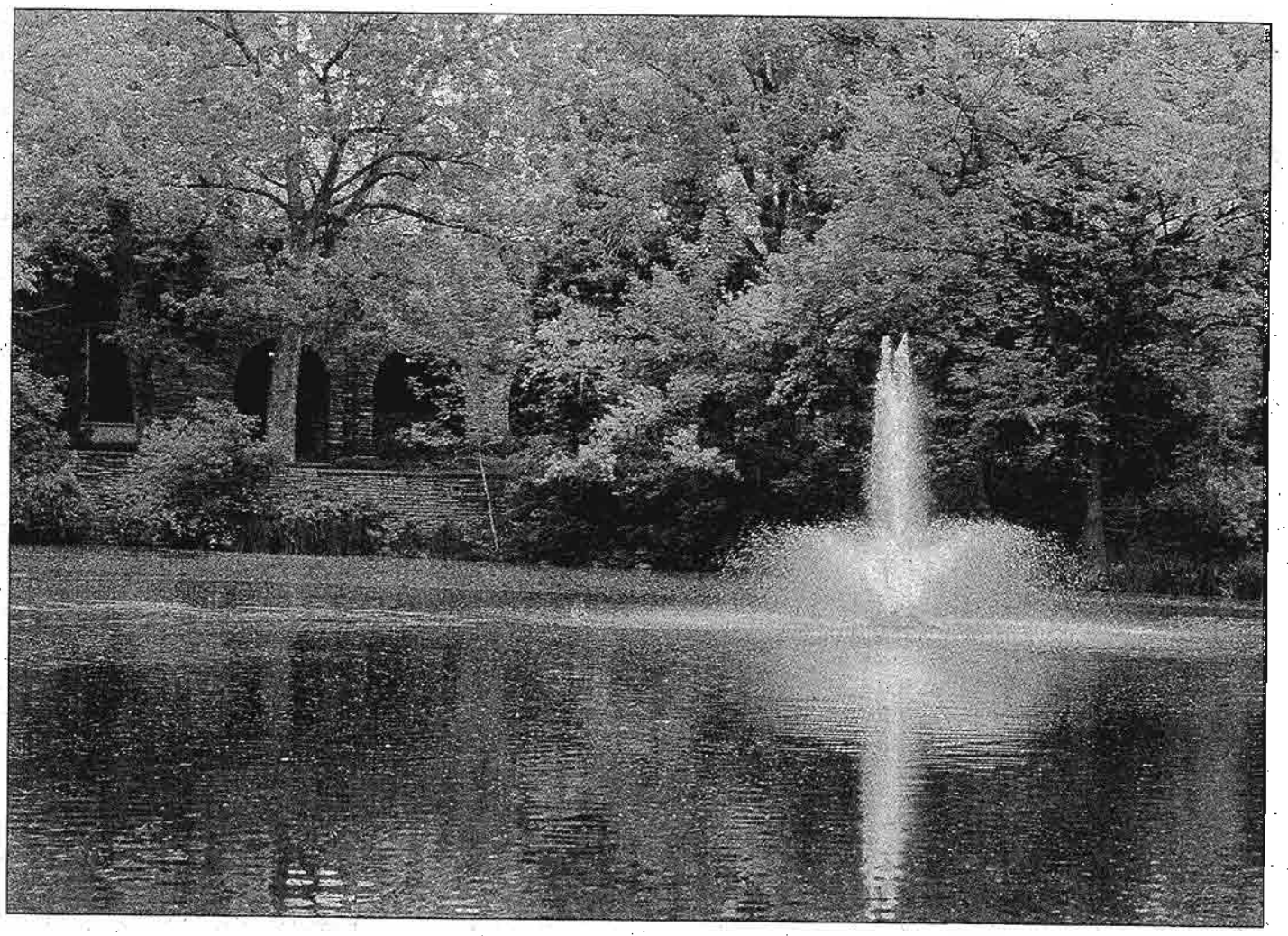
PRLC 2810-3. Global Issues in Leadership. Examines the challenges of leadership posed by major global issues affecting everyone. Explores issues such as human rights, hunger, disease, large-scale collective violence, and environmental deterioration with a special emphasis on effective, long-term leadership strategies.

PRLC 2820-3. Multilevel Issues in Leadership. Studies multilevel issues that originate in organizational settings but carry community and global implications. Students are encouraged to fully explore the complexity and interrelatedness of issues with a special emphasis on leadership and ethical implications.

FACULTY

RONALD G. BILLINGSLEY, Associate Director; Associate Professor of English. A.B., University of Redlands; M.A., Ph.D., University of Oregon.

ADAM J. GOODMAN, Executive Director. B.S., M.P.A., University of Colorado.



Reserve Officers Training Corps

Enrollment in Reserve Officers Training Corps 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 a regular or reserve commission (regular only for AFROTC) upon graduation. The Navy also offers a program leading to a regular or reserve commission in the Marine Corps.

AIR FORCE AEROSPACE STUDIES

U.S. Air Force ROTC offers several programs leading to a commission in the U.S. Air Force in conjunction with the receipt of a baccalaureate or graduate degree.

Standard Four-Year Program

This program is composed of three parts: the general military course for lower-division (normally freshman and sophomore) students, the professional officer course for upper-division (normally junior and senior) 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 summer training course is required prior to commissioning.

Modified Two-Year Program

This program is offered to full-time, regularly enrolled degree students. It requires at least two years of full-time college work at the undergraduate or graduate level. Students 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 semester.

Other Air Force ROTC Programs

Other programs are frequently available, based on current Air Force needs. Any AFROTC staff member at CU-Boulder can discuss alternative programs. As selection is on a competitive basis, interested students should contact the office, (303) 492-8351, as early as possible to learn about opportunities. There is no obligation until a prospective candidate enters into a formal contract.

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 offered scholarships that pay up to full tuition, a book allowance, nonrefundable educational fees, and a subsistence of $100 per month, tax free. All cadets enrolled in the professional officer course receive $100 per month subsistence during the regular academic year. Scholarships that are available include two, two-and-one-half, three, and three-and-one-half year scholarships. These scholarships are available to both men and women in all academic disciplines.

Flight Opportunities

During the third year of the AFROTC program, qualified AFROTC students can compete for pilot allocations. In the summer following their junior year, qualified pilot candidates generally attend light aircraft training near San Antonio, Texas.

USAF Medical Programs

Qualified students can compete for premed or nursing scholarships and programs. These scholarships and programs can lead to a rewarding career as an Air Force Officer, serving as a doctor or nurse.

MILITARY SCIENCE (U.S. ARMY)

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 receipt of 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 as well as military leadership and management. Laboratory sessions provide the opportunity to apply leadership skills while learning basic military skills. 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. A 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 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 to enroll 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 three-year scholarships is open to all University of Colorado students, whether or not they are currently enrolled in ROTC. Scholarship students receive tuition ($7,500 or 80%, whichever is higher), 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 a professor of military science no later than the beginning of the spring semester to apply for the following academic year.

Simultaneous Membership Program

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

The Army ROTC course curriculum cuts across traditional subject boundaries. It involves elements of various disciplines and encourages students to integrate their academic training with the problem-solving and decision-making challenges they will encounter as junior officers in the Army. Additionally, the formal curriculum is supplemented by field trips, guest speakers, and specialized military training. 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.

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 needed in the Army. Diagnostic evaluations are administered during laboratory periods.

Professional Military Education. This program provides 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, military history, computer literacy, and mathematics. 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.

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.

Preprofessional Programs. Students pursuing medical or nursing degrees may enroll in military science and may be eligible for specially funded programs in these disciplines.

NAVAL SCIENCE

Naval science course work is offered in the fall and spring semesters only.

All naval science students enroll in NAVR 1010, 3030, 3040, and 2020. Those desiring commissions in the U.S. Navy enroll in NAVR 3020, 4010, 4020, and 4030 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 students are 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, one year of English, one year of American military affairs or national security policy, one semester of computer science, and a foreign language. Students should check with their naval science instructor 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 consider their college's policy when formulating their degree plan.

Commissioned Service

Opportunities for commissioned service are presently available in the unrestricted line (surface, subsurface, and aviation) and staff corps (nursing, intelligence, cryptology, public affairs, supply and civil engineering) 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 commissioning programs require that the student be working toward, and receive, a college degree.

COURSE DESCRIPTIONS

The following courses are offered in the ROTC programs 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 current information on times, days, and instructors of courses, students should consult the *Schedule of Courses* issued at the beginning of each semester.

Courses are organized numerically by ROTC unit. The number after the course number indicates the semester hours of credit that can be earned in the course.

Abbreviations used in the course descriptions are as follows:

Prereq.—Prerequisite
Coreq.—Corequisite
Lab—Laboratory
Rec.—Recitation
Lect.—Lecture

Air Force Aerospace Studies

AIRR 1010-1. Development of Air Power 1. One 1-hour lect.-rec. and one 1 1/2-hour lab per week. Introduction to the development of air power, management, and use of aerospace power today. 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 1/2-hour lab per week.

AIRR 2010-1. The Air Force Today 1. One 1-hour lect.-rec. and one 1 1/2-hour lab per week. A survey course describing aerospace support functions of U.S. military forces. Laboratory introduces students 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 1/2-hour lab per week.

AIRR 3010-3. Air Force Management and Leadership 1. Two 1 1/2-hour seminars plus one 1 1/2-hour lab per week. Individ-ual motivation, 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 1 1/2-hour seminars and 1 1/2-hour lab per week. Emphasizes basic managerial processes, communicative and counseling skills development.

AIRR 4010-3. National Security Forces in Contemporary American Society 1. Two 1 1/2-hour seminars and one 1 1/2-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, emphasizing communicative skills.

AIRR 4020-3. National Security Forces in Contemporary American Society 2. Continuation of AIRR 4010. Two 1 1/2-hour seminars and one 1 1/2-hour lab per week. Special themes include defense strategy and conflict management, formulation and 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)

MILR 1011-2. History and Evolution of the United States Army 1. 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. $35.00 lab fee.

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. $35.00 lab fee.

MILR 2031-3. Methods of Leadership and Management 1. Comprehensive review of contemporary leadership and management concepts including motivation, attitudes, communication skills, problem solving, human needs and behavior, and leadership self-development. $35.00 lab fee.

MILR 2041-3. Methods of Leadership and Management 2. Continuation of MILR 2031 stressing practical application of leadership concepts. Students are required to be mid-level leaders for their cadet organization. $35.00 lab fee.

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 practiced in small unit operations. $35.00 lab fee.

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. $35.00 lab fee.

MILR 4072-3. Officer Leadership and Development 1. 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. $35.00 lab fee.

MILR 4082-3. Officer Leadership and Development 2. Examines the characteristics of a profession; the historical evolution of a profession; and ethical reasoning and decision-making. Also examines personal and professional values and value conflicts. Students are introduced to the military justice system. $35.00 lab fee.

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 2020-3. Seapower and Maritime Affairs. 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 3020-3. Naval Operations and Maneuvering. 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, ship handling procedures, weather, communications, and tactical operations.

NAVR 3030-3. Naval Ship Systems. Detailed study of ship propulsion and related auxiliary systems. Emphasizes fossil fuel and nuclear steam and gas turbine systems, and stresses design constraints imposed by unique marine environment.

NAVR 3040-3. Weapons and Systems Analysis. Introduction to theoretical concepts upon which modern naval weapons systems are designed and constructed. Specific areas of study include physics of underwater sound propagation, pulse radar theory, automatic tracking principles, and fundamentals of missile guidance.

NAVR 3101-3. Evolution of Warfare. Traces the development of warfare, focusing on the impact of military theorists and technical developments. 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. Surveys the development of amphibious doctrine. Emphasizes the evolution of amphibious warfare in the twentieth century. Explores present-day potential and limitations on amphibious operations, including the rapid deployment force concept.

NAVR 4010-3. Leadership and Management 1. 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 4030-3. 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.

FACULTY

Aerospace Studies

BRENT W. BALAZS, Colonel, USAF; Professor of Aerospace Studies. B.S., United States Air Force Academy; M.S., North Carolina State University; M.A., U.S. Naval War College, R.I.

RUSSELL A. ARMSTRONG, Major, USAF; Assistant Professor of Aerospace Studies. B.A., University of Akron; M.A., Wright State University.

ROBERT S. COLBURN, Captain, USAF; Assistant Professor of Aerospace Studies. B.A., University of Kansas; M.S., Air Force Institute of Technology.

BARRY P. THOMA, Captain, USAF; Assistant Professor of Aerospace Studies. B.S., United States Air Force Academy; M.S., Air Force Institute of Technology.

Military Science (U.S. Army)

JOHN F. TROY, JR., Professor of Military Science. B.S., Loyola University; M.S.A., Alabama University.

KEVIN BOSTICK, Assistant Professor of Military Science. B.A., Fresno State University; M.Ed., Drury University.

JOHN P. CUMMINGS, Assistant Professor of Military Science. B.S., East Stroudsburg University; M.B.A., Oklahoma City University.

BRENDAN L. WILSON, Assistant Professor of Military Science. B.S., James Madison University; M.B.A., Oklahoma City University.

Naval Science

GEORGE M. MILLER III, Captain, USN; Professor of Naval Science. B.S., U.S. Naval Academy; M.S., Naval Post Graduate School. Nuclear Propulsion Plant Engineer Qualified.

DONALD G. MARTIN, Lieutenant, USN; Assistant Professor of Naval Science. B.S., University of Colorado. Nuclear Propulsion Plant Engineer Qualified.

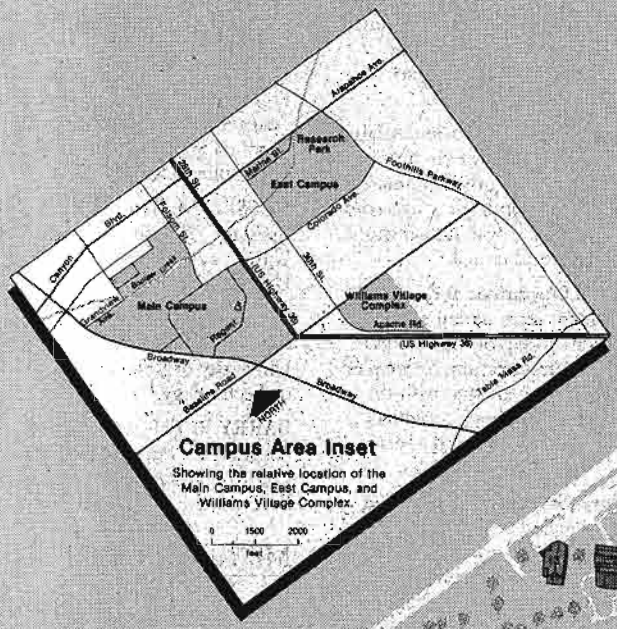
JAMES T. McMANUS, Lieutenant, USN; Instructor. B.A., Fordham University.

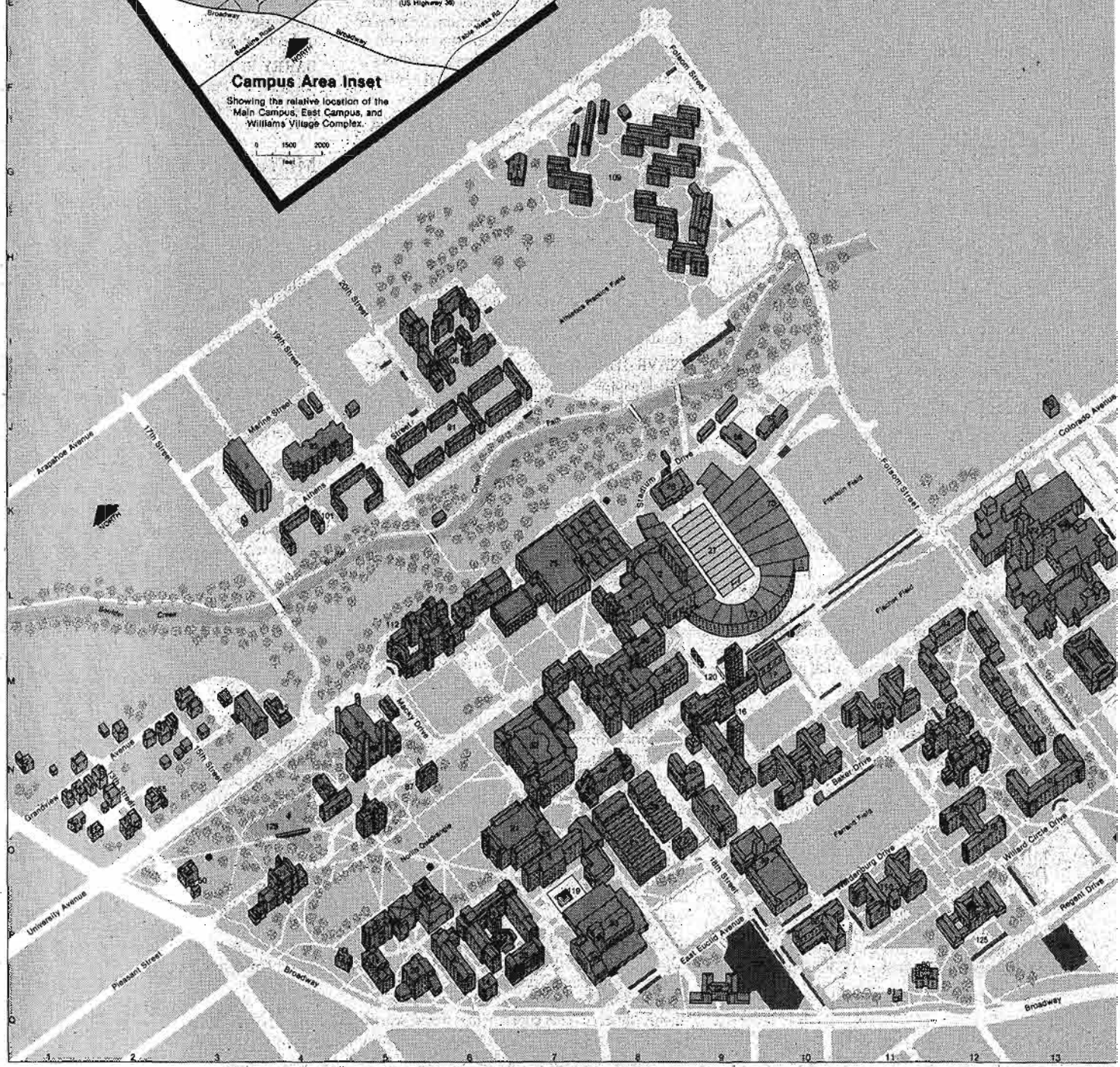
JAMES L. MORFELD, Lieutenant Commander, USN; Assistant Professor of Naval Science. B.S., University of Kansas; M.S., University of West Florida.

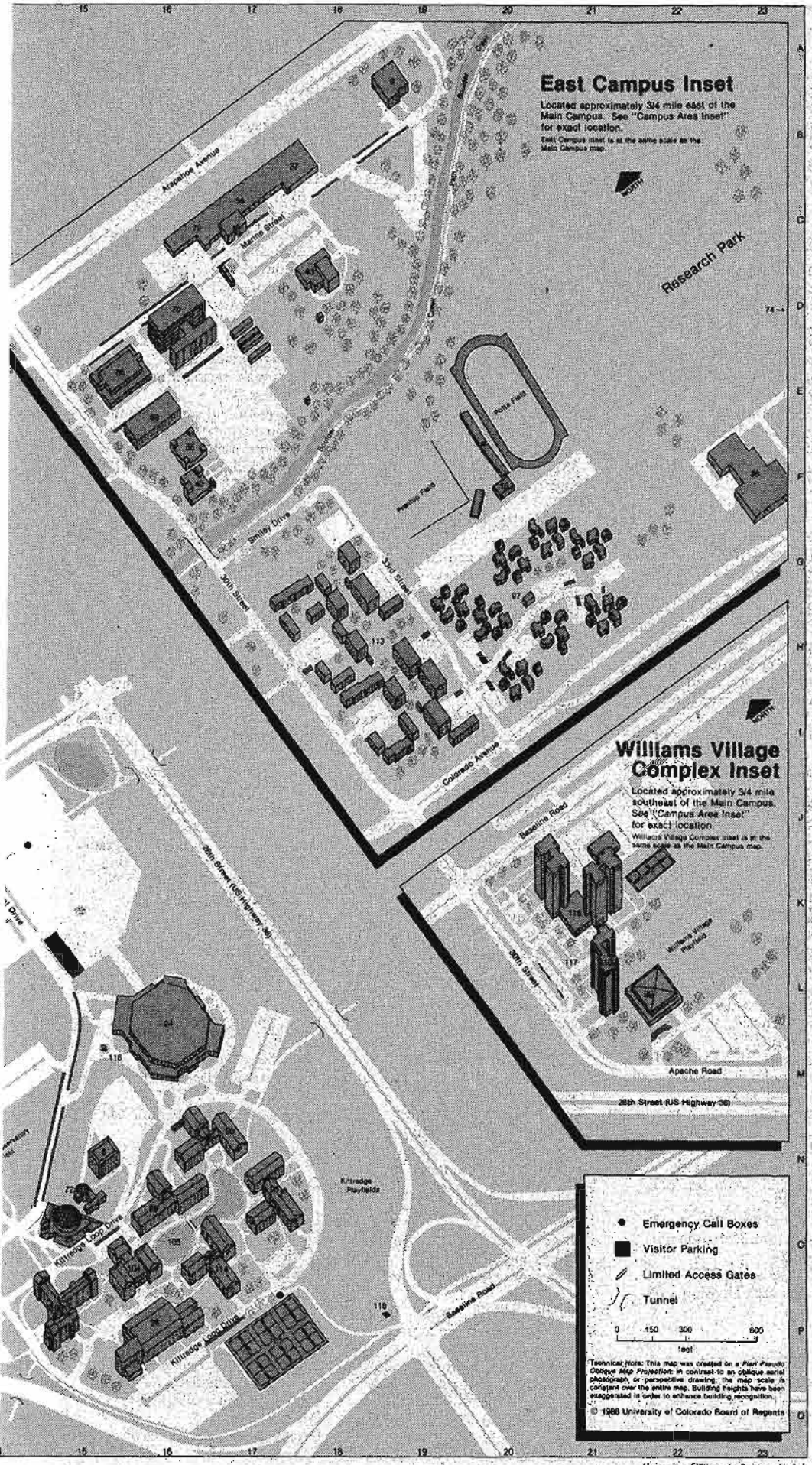
MARK S. MURPHY, Captain, USMC; Assistant Professor of Naval Science. B.A., Northern Michigan University; M.A., University of Michigan.

JOHN R. PLETT, Commander, USN; Associate Professor of Naval Science. B.S., U.S. Naval Academy; M.S., Naval Post Graduate School; M.B.A., C.W. Post Center of Long Island University.

University of Colorado at Boulder







University of Wisconsin Cartographic Lab

University Buildings

1. Armory (1511 University Ave.) (M-3)
2. Balch Fieldhouse (L-8)
3. Business Building (M-13)
4. Carlson Gymnasium (L-8)
5. Chemistry Building (O-7)
6. Clare Small Arts and Sciences Building (L-6)
7. College Inn Conference Center (1729 Athens St.) (J-3)
8. Communication Disorders and Speech Science Bldg. (N-16)
9. Computing Center (A-19)
10. Continuing Education Center (1221 University Ave.) (O-2)
11. Cooperative Institute for Research in Environmental Sciences (CIRES) (O-7)
12. Cottage No. 1 (P-4)
13. Day Care Center (2202 Arapahoe Ave.) (G-7)
14. Denison Arts and Sciences Building (O-6)
15. Distribution Center (2000 Central Ave.) (not on map)
16. Duane Physical Laboratories Complex (M-9)
17. Duane Physics and Astrophysics (M-10)
18. East Campus Ski Building (F-20)
19. Economics Building (P-5)
20. Education Building (P-5)
21. Ekeley Chemical Laboratories Complex (O-6)
22. Engineering Center (K-13)
23. Environmental Design Building (O-9)
24. Events/Conference Center (L-16)
25. Fiske Planetarium and Science Center (O-15)
26. Fleming Law Building (P-16)
27. Folsom Stadium (K-9)
28. Garnow Tower (M-9)
29. Geology Building (P-5)
30. Guggenheim Geography Building (P-5)
31. Hale Science Building (O-4)
32. Health Physics Laboratory (J-10)
33. Heating Plant (N-9)
34. Hellems Arts and Sciences Building (P-6)
35. Henderson Building (University of Colorado Museum) (P-7)
36. Housing System Maintenance Center (1255 38th St.) (until late 1989) (F-23)
37. Housing System Support Center (3381 Marine St.) (B-18)
38. Hunter Science Building (N-6)
39. Imig Music Building (O-10)
40. Institute for Behavioral Genetics (F-16)
41. Institute of Behavioral Science No. 1 (1416 Broadway) (O-2)
42. Institute of Behavioral Science No. 2 (1540 Broadway) (N-1)
43. Institute of Behavioral Science No. 3 (1424 Broadway) (O-1)
44. Institute of Behavioral Science No. 4 (1220 Grandview Ave.) (N-1)
45. Institute of Behavioral Science No. 5 (1201 17th St.) (M-4)
46. Institute of Behavioral Science No. 6 (1243 Grandview Ave.) (N-1)
47. International English Center (1333 Grandview Ave.) (N-2)
48. Joint Institute for Laboratory Astrophysics (JILA) (N-9)
49. Ketchum Arts and Sciences Building (N-8)
50. Koenig Alumni Center (O-3)
51. Laboratory for Atmospheric and Space Physics (LASP) (M-9)
52. LASP Engineering Center (5525 Central Ave.) (not on map)
53. Lesser House (2501 Colorado Ave.) (J-13)
54. Life Sciences Laboratories Complex (M-8)
55. Life Sciences Research Laboratory (F-15)
56. Litman Research Laboratory (E-15)
57. Macky Auditorium (N-5)
58. Maintenance and Operations Center (J-9)
59. Marine Street Science Center (3215 Marine St.) (C-17)
60. McKenna Languages Building (N-4)
61. Muenzinger Psychology (M-8)
62. Norlin Library (N-7)
63. Nuclear Physics Laboratory (O-18)
64. Old Main (O-5)
65. Page Foundation Center (1309 University Ave.) (N-2)
66. Porter Biosciences (M-8)
67. Ramaley Biology Building (M-8)
68. Regent Administrative Center (P-12)
69. Research Laboratory No. 2 (WICHE) (E-16)
70. Research Laboratory No. 3 (NOAA, NCAR) (D-16)
71. Sibell Wolle Fine Arts Building (O-6)
72. Sommers-Bausch Observatory (N-15)
73. Stadium Building (K-10)
74. Stazio Recreation Complex (38th St. and Colorado Ave.) (until late 1989) (D-23)
75. Student Recreation Center (L-7)
76. Team House (K-8)
77. Telecommunications Center (O-9)
78. Temporary Building No. 1 (L-6)
79. Transportation Center (3295 Marine St.) (C-16)
80. University Administrative Center (914 Broadway) (P-11)
81. University Administrative Center Annex (924 Broadway) (Q-11)
82. University Club (972 Broadway) (O-9)
83. University Memorial Center (UMC) (P-6)
84. University Theatre (incl. Charlotte York Ivey Studios) (P-6)
85. Wardenburg Student Health Center (P-10)
86. Willard Administrative Center (North Wing) (O-12)
87. Woodbury Arts and Sciences Building (N-5)

University Housing

88. Aden Hall (M-12)
89. Andrews Hall (Kittredge Complex) (O-16)
90. Arnett Hall (Kittredge Complex) (N-17)
91. Athens Court (1951 Grandview Ave.) (J-5)
92. Athens North Court (J-4)
93. Baker Hall (N-10)
94. Brackett Hall (L-12)
95. Buckingham Hall (Kittredge Complex) (N-17)
96. Cockerell Hall (L-12)
97. Colorado Court (3333 Colorado Ave.) (G-20)
98. Crosman Hall (M-12)
99. Darley Commons (Williams Village Complex) (L-22)
100. Darley Towers (Williams Village Complex) (L-21)
101. Faculty-Staff Court (18th St. and Athens St.) (K-4)
102. Farrand Hall (N-12)
103. Hallett Hall (N-13)
104. Kittredge Commons (Kittredge Complex) (O-16)
105. Kittredge Complex (O-18)
106. Kittredge West Hall (Kittredge Complex) (P-15)
107. Libby Hall (M-11)
108. Marine Court (1350 20th St.) (I-8)
109. Newton Court (1475 Folsom St., 2300 Arapahoe Ave.) (G-8)
110. Cheyenne Arapaho Hall (O-11)
111. Read Hall (N-13)
112. Sewall Hall (L-5)
113. Smiley Court (1300 30th St.) (H-18)
114. Smith Hall (Kittredge Complex) (O-17)
115. Stearns Towers (Williams Village Complex) (K-21)
116. Willard Hall (South Wing) (O-12)
117. Williams Village Complex (L-21)

Outdoor Spaces and Features

118. Buffalo Statues (P-19) and (M-15)
119. Fountain Court (P-7)
120. Information Booth (in roadway) (M-8)
121. Kittredge Tennis Courts (P-17)
122. Mary Rippon Outdoor Theatre (P-6)
123. Nakagawa Garden (O-14)
124. Recreation Center Tennis Courts (K-7)
125. Regent Visitor Information Center (P-12)
126. Varsity Lake (O-4)
127. Visitor Parking Lot (attendant/coin operated; enter from Euclid Ave.) (P-9)
128. Visitor Parking Lot (meters; enter from Regent Dr.) (P-13)

A

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C

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