

# UNIVERSITY OF COLORADO CATALOG

BOULDER 1997-1998

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The 1997-98 *University of Colorado at Boulder Catalog* contains a summary of campus facilities, programs, and services; descriptions of colleges, schools, and individual departments; and degree requirements, course descriptions, and faculty listings as of early 1997. Students should refer to the degree, major, and certification requirements in the catalog at the time they formally enter a program. For additional information, students should consult their dean's office.

The photographs on the cover and throughout the catalog feature some of the architectural and academic elements of the campus, and are courtesy of the Office of Public Relations. The cover features Sewall Hall, which houses a residential academic program in American Studies.

Because the catalog is compiled well in advance of the academic year it covers, changes in programs, policies, and the academic calendar may well occur. Up-to-date information may be obtained by consulting departmental advisors, checking departmental bulletin boards, and reading the *Registration Handbook and Schedule of Courses* as well as registration materials distributed each semester.

All catalog information is subject to change without notice or obligation.

The *University of Colorado at Boulder Catalog* is published yearly by Student Affairs Communication Services in cooperation with academic departments and the Office of the Registrar.

The University of Colorado at Boulder does not discriminate on the basis of race, color, national origin, sex, age, disability, creed, religion, or veteran status in admission and access to, and treatment and employment in, its educational programs and activities. The University takes affirmative action to increase ethnic, cultural, and gender diversity; to employ qualified disabled individuals; and to provide equal opportunity to all students and employees.

The Department of Human Resources is responsible for educational and employment opportunity, implementation of affirmative action programs, and coordination of Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1973, the Vietnam Era Veteran's Readjustment Act of 1974, Section 504 of the Rehabilitation Act of 1973, and the Americans with Disabilities Act of 1990. For further information about these provisions, or about issues of equity, discrimination, or fairness, write Garnett K. Tatum, Director of Affirmative Action and Services, 1511 University Avenue, Campus Box 475, University of Colorado at Boulder, Boulder, CO 80309-0475, or call (303) 492-6706.

## Academic Calendar

The campus operates year-round on a semester system, with fall and spring semesters of 16 weeks each and a 10-week summer session.

### Summer Session 1997

May 29-30 (Thurs.-Fri.)—Orientation and registration for first 5-week term and 8- and 10-week terms

June 2 (Mon.)—Classes begin, 7:30 A.M.

July 4 (Fri.)—Independence Day holiday, campus closed

July 2-3 (Wed.-Thurs.)—Final examinations for first 5-week term

July 7 (Mon.)—Registration for second 5-week term

July 8 (Tues.)—Classes begin for second 5-week term

July 24-25 (Thurs.-Fri.)—Final examinations for 8-week term

Aug. 7-8 (Thurs.-Fri.)—Final examinations for second 5-week and 10-week terms

Aug. 9 (Sat.)—Commencement

### Fall Semester 1997

June through July—New student orientation and registration (see page 7)

Aug. 25 (Mon.)—Classes begin, 8:00 A.M.

Sept. 1 (Mon.)—Labor Day holiday, campus closed

Nov. 27-28 (Thurs.-Fri.)—Thanksgiving holidays, campus closed

Dec. 10 (Wed.)—Last day of classes

Dec. 11-12 (Thurs.-Fri.)—Reading days

Dec. 12-19 (Fri.-Fri.)—Final examinations (The first final examination is given at 7:30 P.M. on Friday, December 12.)

Dec. 20 (Sat.)—Commencement

### Spring Semester 1998

Jan. 8-9 (Thurs.-Fri.)—New student orientation and registration

Jan. 12 (Mon.)—Classes begin, 8:00 A.M.

Jan. 19 (Mon.)—Martin Luther King, Jr. holiday, campus closed

Mar. 23-27 (Mon.-Fri.)—Spring break

May 4 (Mon.)—Last day of classes

May 5-6 (Tues.-Wed.)—Reading days

May 7-13 (Thurs.-Wed.)—Final examinations (The first final examination is given at 7:30 A.M. on Thursday, May 7.)

May 15 (Fri.)—Commencement

The University's calendar committee requests that make-up time be provided to students who may be absent for religious reasons.

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# GENERAL INFORMATION

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.

## THE UNIVERSITY SYSTEM

Today, the University of Colorado 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. To meet the needs of its students, the University offers numerous fields of study.

The University of Colorado ranks 16th among public universities and colleges in overall research expenditures and 9th among public universities in federally funded research. Sponsored research within the University system represents annual awards amounting to approximately \$310

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.

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 administrative officer of the four-campus system and is responsible for providing leadership to the University. *The Board of Regents of the University of Colorado reserves the right to establish enrollment levels for all academic areas.*

## The Boulder Campus

*The University of Colorado at Boulder is a diverse community of advanced learning with the highest standards of scholarship, in which research and creative work enrich the teaching of students who thrive in an academic environment.*

*The strategic plan is consistent with the following mission statement for the Boulder campus: to advance and impart knowledge across a comprehensive range of disciplines to benefit the people of Colorado, the nation, and the world by educating undergraduate and graduate students in the accumulated knowledge of humankind, discovering new knowledge through research and creative work, and fostering critical thought, artistic creativity, professional competence, and responsible citizenship.*

*From the Strategic Plan for the Boulder Campus, 1996*

The mission of the University of Colorado at Boulder (CU-Boulder) is to lead in the discovery, communication, and use of knowledge through instruction, research, and service to the public. As a comprehensive university, CU-Boulder is committed to the liberal education of students and to a broad curriculum ranging from the baccalaureate through the postdoctoral levels. The educational experience of CU-Boulder, 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.

With a total enrollment of just under 25,000 students, the University of Colorado at Boulder is the largest campus in the four-campus system. The student population

## Board of Regents

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Vice Chancellor for Academic Affairs and Dean of Faculties; Professor of Law. B.A., Grinnell College; M.A., Cornell University; Ph.D., University of Michigan; J.D., Yale Law School.



comes from every state in the nation and from 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.

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 student affairs 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 participate in campus governance 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).

Full-time instructional faculty members number over 1,200, with more than 94 percent holding doctorates or appropriate terminal degrees. The faculty includes nationally and internationally recognized scholars with many academic honors and awards, including Tom Cech, winner of 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 six 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.

Research conducted at CU-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. For a detailed description of research institutes and other important research facilities associated with the University, see the Graduate School chapter of this catalog.

To enhance its research capabilities and to provide collaborative opportunities with government and business, CU-Boulder has developed a 200-acre research park east of

the main campus. The 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 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; also, study abroad programs have gained popularity. For students whose interests cross traditional disciplinary lines, a number of interdisciplinary programs are available.

#### *The Campus Setting*

CU-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 generally pleasant days and cool evenings. On the average, the area enjoys about 340 sunny or partly sunny days each year. The main campus covers 600 acres and includes over 150 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 1919. The Norlin Quadrangle, including the original Old Main building, is listed in the State and National Register of Historic Places. The campus has been noted as one of the most aesthetic in the country.

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 has some of the most spectacular scenery in the United States. The city of Boulder, an attractive community of just over 90,000 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 international airport is served by most major carriers and is located 60 to 90 minutes southeast of Boulder. Boulder and Denver International Airport are connected by a public transportation system.

#### *Undergraduate Enrollment and Graduation Rates*

CU-Boulder's fall 1996 entering freshman class numbered about 4,000. Of these, 50 percent were males, 56 percent residents of Colorado, and 15 percent members of minority groups (African Americans, Asian Americans, Hispanics, and Native Americans). Seventy-one percent enrolled in the College of Arts and Sciences, 12 percent in the College of Engineering and Applied Science, 11 percent in the College of Business and Administration, and 3 percent combined enrolled in the College of Architecture and Planning and the College of Music. Almost 12 percent of freshmen entering CU-Boulder transfer to another college or school within the University before they graduate.

Of the freshmen entering in summer or fall 1990 who enrolled full time, 36 percent graduated within four years; 61 percent graduated within five years; and 66 percent graduated within six years. Four- and five-year graduation rates for the 1991 and 1992 entering classes are similar. Eighty-one percent of students who entered in fall 1995 returned for their second fall semester, and 68 percent of those who entered in fall 1994 remained enrolled into their third year.

#### **CU-Boulder Academic Programs**

The Boulder campus offers more than 2,500 different courses in over 150 fields of study. There are approximately 60 academic programs available at the bachelor's level, 50 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 individual college and school chapters for additional accreditation information.)

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

**College of Architecture and Planning**

Environmental Design B

**College of Arts and Sciences**

American Studies B  
 Anthropology B M D  
 Applied Mathematics M D  
 Art History M  
 Asian Studies B  
 Astrophysical, Planetary, and Atmospheric Sciences M D  
 Basic Science M  
 Biochemistry B  
 Central and East European Studies B  
 Chemical Physics D  
 Chemistry B M D  
 Chinese B  
 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  
 East Asian Languages and Literatures M  
 Economics B M D  
 English B M D  
 Environmental Studies B  
 Environmental, Population, and Organismic Biology B M D  
 Ethnic Studies B  
 Film Studies B  
 Fine Arts B M  
 French B M D  
 Geography B M D  
 Geology B M D  
 Geophysics D  
 Germanic Studies B M  
 History B M D  
 Humanities B  
 Individually Structured Major B  
 International Affairs B  
 Italian B  
 Japanese B  
 Kinesiology B M  
 Latin American Studies B  
 Linguistics B M D  
 Mathematical Physics D  
 Mathematics B M D  
 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 Research and Evaluation M D  
 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

**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 bachelor of environmental design degree is offered through the College of Architecture and Planning.

All undergraduate programs in the College of Arts and Sciences lead to the bachelor of arts degree.

The College of Business and Administration offers the bachelor of science degree in business administration. Areas of emphasis within the degree program include accounting, finance, information systems, management, and marketing. Areas of application include entrepreneurship and small business management, international business, tourism management, transportation and logistics, and real estate. Areas of emphasis within the Graduate School of Business Administration for the master of science degree include accounting, finance, management science, marketing, and organizational management.

Within the School of Journalism and Mass Communication, sequences are offered at the bachelor's level in advertising, broadcast news, broadcast production management, media studies, and news-editorial. 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 chapter of this catalog.

**Colorado Springs Campus**

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.

**Academic Programs**

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

**Denver Campus**

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.

**Academic Programs**

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

**Health Sciences Center**

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 also includes University Hospital and the Colorado Psychiatric Hospital. University Hospital became a separate entity in 1991. Eight renowned research institutes are also affiliated with the center.

**Academic Programs**

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

## ACADEMIC AFFAIRS

### 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. CU-Boulder offers 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 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.

### 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.

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 credit courses in such fields as computer science, arts, humanities, social sciences, and human relations. Noncredit programs are offered in management, computer applications, and real estate. Methods of instruction include classroom learning, guided correspondence study, individualized instruction, audioconferencing, and courses via the Internet.

For more information, write to the University of Colorado at Boulder, Division of

Continuing Education, Campus Box 178, Boulder, CO 80309-0178, or call (303) 492-5148 (toll free in Colorado, 1-800-332-5839; out of state, 1-800-331-2801).

### 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.

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 Lyric Theatre 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 to the University of Colorado at Boulder, Office of Admissions, Campus Box 30, Boulder, CO 80309-0030, or call (303) 492-2456. The summer catalog is usually available by mid-February.

### Office of Undergraduate Academic Affairs

This office serves undergraduate students, and those, including faculty, staff, and parents, who are interested in the academic development and success of undergraduates. The Assistant Vice Chancellor for Academic Affairs heads the office, which also includes the Advising Resource Center, Assessment and Diversity, First Year Experience Program, and Orientation.

### Advising Resource Center

The Advising Resource Center provides comprehensive advising services to students who are undecided about their major or are thinking of changing their major to other CU-Boulder colleges or schools. Advisors and peer counselors work closely with college, school, and individual departments to provide up-to-date information about curriculum and core requirements. Information flyers on academic majors are produced by the center, and training is available to assist advisors across campus.

The center is also home to a preprofessional advisor, for those students who are preparing for study in medicine, law, or other preprofessional fields.

### Assessment and Diversity Office

This office delineates various undergraduate initiatives on campus, especially those relating to diversity; helps units assess their impact on the students served; and provides assistance and support in the development and training of faculty, staff, and students in building an effective and supportive diverse campus community. The office also houses resources and information on diversity issues in higher education.

### First Year Experience Program

This program focuses on the needs and concerns of first-year students. The goals are to pay particular attention to first-year students and create a supportive environment for a diverse student population. First Year Experience staff members help new students identify and use existing Boulder campus programs that support students in their transition to the University learning community. The First Year Experience programs promote numerous outreach efforts often in collaboration with other campus departments also working to facilitate student success.

### Office of Orientation

The purpose of the Advising, Registration, and Orientation Program is to effect a smooth entryway into the University community for new students and their parents. The program presents new students and their parents with the academic expectations and requirements of the colleges, acquaints them with campus life issues, and identifies resources available to assist them in attaining their educational objectives. Addressing the needs of both students and parents is critical to creating the necessary link which aids the persistence and retention of students toward graduation.

Orientation plans and presents all orientation sessions for the College of Arts and Sciences. The office also assists and serves as a consultant for the orientations of the Colleges of Architecture and Planning, Business and Administration, Engineering and Applied Science, and Music.

## 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 Tests of General Educational Development

(GED), evaluation of work taken in high school and at other educational institutions, and results of the SAT I or the American College Test (ACT). In addition, a personal statement highlighting academic goals and other background information is required.

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

University of Colorado at Boulder  
Office of Admissions  
Campus Box 30  
Boulder, CO 80309-0030  
(303) 492-6301

TTY (303) 492-5998 (for hard of hearing persons)

CU-Boulder's home page on the World Wide Web is <http://www.colorado.edu>

For admission requirements to the Graduate School, see the Graduate School chapter and individual college and school chapters of this catalog.

### Visiting the Campus

Prospective students and their parents are welcome to visit the Office of Admissions at any time, Monday through Friday, from 9:00 A.M. to 5:00 P.M. (8:30 A.M. to 4:30 P.M. during the summer) except for holidays. Although interviews are not used in the decision-making process, you are welcome to visit campus.

Prospective students and parents may want to take a campus tour or attend an information session. The best time to see the campus is when classes are in session (September through mid-December and mid-January to mid-May, with the exception of spring break, the last week in March).

Monday through Friday, information sessions with an admission representative begin at 9:30 A.M. and 1:30 P.M. Following the information sessions, walking tours of the campus, led by student guides, begin at 10:30 A.M. and 2:30 P.M. Information sessions and campus tours will not be given the week following spring graduation (May 19-23, 1997) and during other University holidays. Campus tours are not scheduled during spring break (March 24-28, 1997), but information sessions will be provided. Reservations are required for information sessions and tours. Please call the Office of Admissions at (303) 492-6301.

Combined tours and information sessions are held at 10:30 A.M. every Saturday except July 5, August 30, November 29, December 20 and 27, 1997, and during May. Reservations are required for Saturday tours and information sessions. To make a reservation, call the Office of Admissions at (303) 492-6301.

### Visit Programs

An excellent way to become acquainted with the campus is to participate in one of the campus visit programs specially designed for prospective students.

The *Be a CU Student for a Day* program offers prospective students and their parents the opportunity to visit the campus on a school day, take a tour, attend classes with current CU students, interact with student and parent panels, attend special information sessions highlighting various academic programs, and have lunch with campus representatives in a residence hall. These programs are held throughout the academic year on selected Fridays.

The *CU Sampler* program, held on selected Saturdays, also introduces prospective students and their parents to the campus and its academic programs. Highlights include a sample lecture, a campus tour, student/faculty panel discussions, information sessions featuring academic programs, 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, April, 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 University of Colorado at Boulder, Office of Admissions, Campus Box 30, Boulder, CO 80309-0030, (303) 492-6301. Reservations are required for each program.

### Statement on Diversity

*We are committed to making the University of Colorado at Boulder a community in which diversity is a fundamental value. People are different and the differences among them are what we call diversity. Diversity is a natural and enriching hallmark of life. It includes, but is not necessarily limited to, ethnicity, race, gender, age, class, sexual orientation, religion, and physical abilities. A climate of healthy diversity is one in which people value individual and group differences, respect the perspectives of others, and communicate openly.*

—From the *Guidelines for Diversity Planning*, 1995

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 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 enhanced, as is the academic environment, thereby fostering a diversity of ideas.

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

### *Multicultural Access and Community Affairs*

The Multicultural Access and Community Affairs (MACA) team in the Office of Admissions provides a mechanism through which ethnic minority students can gain access to a wealth of information about the educational opportunities available at CU-Boulder. This team of admissions counselors provides information and counseling to minority students interested in learning about the academic and social programs offered at the Boulder campus. Specific information about admissions and financial aid, as well as other support services, is also available.

Professional staff from the Cultural Unity Student Center, Student Academic Services Center, the Minority Arts and Sciences Program, and the Minority Engineering Program, among others, work closely with MACA admissions staff to ensure that ethnic minority students have a quality educational experience.

Students who are from an ethnic minority background (e.g., African American, American Indian, Asian American, or Latino/Hispanic) or from a migrant or educationally or economically disadvantaged background can participate in a vast array of outreach and support programs designed to address their specific academic and nonacademic needs. Students can take advantage of MACA counseling during staff visits to high schools, visits to the Boulder campus, or by calling a MACA staff member at (303) 492-6301.

### All Applicants

#### *Application and Admission Notification*

Applications for degree candidates may be submitted beginning September 1 for the

following spring, summer, and fall terms. Applicants are notified of admissions decisions on a rolling basis after October 1.

Applications that are completed (including all required credentials) and postmarked by the date listed below will be given priority consideration. Applications received after these dates will be reviewed on a space-available basis.

We recognize that some students may be faced with financial constraints in paying the application fee. Therefore, waivers will be granted to those students with documented hardships who submit to the admissions office the College Board ATP Fee-Waiver Service form available in high schools. Please contact the Office of Admissions for other documents that may be used to document financial hardship.

#### APPLICATION DEADLINES

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

Submitting applications early 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 postmarked by the dates listed below (or by later dates established by the Office of Admissions) will be accepted. *After these dates, confirmations can be accepted only if space is still available.*

#### CONFIRMATION POSTMARK DEADLINES

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

Students who have decided to enroll at CU-Boulder, but are unable to pay the deposit by the confirmation deadline due to financial hardship, should call or write the associate director of admissions operations for information about requesting a deposit deferral.

In general, the enrollment deposit is not refundable; however, if there are extenuating

circumstances, students may send a written appeal to the director of admissions.

Appeals for deposit-deferral or refund should be sent to University of Colorado at Boulder, Office of Admissions, Campus Box 30, Boulder, CO 80309-0030.

If students register for classes and then decide not to attend, they may receive a refund or be assessed tuition depending upon the circumstances. Guidelines are given in the "Withdrawal Refund or Assessment Schedule" in the *Registration Handbook and Schedule of Courses* for spring and fall and the summer catalog for summer terms. Close attention must be given to statements regarding new, readmitted, and transfer students.

The enrollment deposits are used as registration deposits each semester as long as registration is completed by the published deadline. Once students have attended CU-Boulder, the deposit (minus any fees or other charges owed) will be returned when they graduate or officially withdraw from the University according to established deadlines.

#### *Credentials*

To be considered for admission, applicants must submit complete and official credentials as required by their desired program of study. Official transcripts are those that are sent directly to the University from each of the secondary or postsecondary institutions the applicant attended. Official transcripts exhibit the official seal and signature of the registrar or high school official. Transcripts marked "student copy," "issued to the student," or "unofficial" are not accepted as official. Prospective students must supply documentation of every part of their previous educational background. *Failure to list on the application and 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 the professional degree program; a student must submit a separate application to the professional school at the appropriate time.

Students interested in one of the undergraduate health sciences programs offered at the University of Colorado Health Sciences Center (UCHSC) in Denver (child health associate, dental hygiene, medical technology, nursing, or pharmacy) 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 nontesidents.

For more information, see Preprofessional Programs in the Other Academic Programs section of this catalog.

### Teacher Licensure

Through the School of Education, students interested in elementary or secondary school teaching may take programs approved for Colorado licensure 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 education includes kindergarten through middle school. Secondary teacher education includes teaching endorsements for middle school through high school in English, French, German, Japanese, Latin, mathematics, Russian, science, social studies, and Spanish. Teacher education programs are also available in music education for grades kindergarten through 12.

Persons holding a baccalaureate degree who seek *initial* teacher licensure must submit the required application and credentials to the School of Education. Licensed teachers with a baccalaureate degree who seek only a *renewal* of the license currently held and who do not require institutional endorsement or recommendation may qualify for the University's nondegree student classification (see Nondegree Students on page 14).

Refer to the School of Education section of this catalog for further information about teacher education. Interested students may also write to the University of Colorado at Boulder, Teacher Education Office, Campus Box 249, 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 of success are appropriate course preparation, grades earned in those courses, class rank, and the results of either the SAT I or ACT. Admission officers review these and other factors that have a bearing on academic success. 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 15. 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.

#### Guaranteed Admission for Colorado Resident Freshmen

The University of Colorado at Boulder guarantees admission to first-time Colorado resident freshmen who meet specific criteria. For a copy of the guaranteed admission guidelines, write to University of Colorado at Boulder, Office of Admissions, Campus Box 30, Boulder, CO 80309-0030, or call (303) 492-6301. Guarantee information also is available in all Colorado high school guidance offices.

#### How to Apply

1. Obtain an application for admission from the University of Colorado at Boulder, Office of Admissions, Campus Box 30, Boulder, CO 80309-0030, (303) 492-2456. You may also obtain an application for admission by using the undergraduate admission application request form on the World Wide Web home page (<http://www.colorado.edu/admissions>), or by sending an e-mail to [apply@colorado.edu](mailto:apply@colorado.edu).

2. When you are preparing to apply to the University, request that official transcripts be sent to CU-Boulder. Official transcripts are those that are sent directly to the University from each of the secondary or postsecondary institutions the applicant attended. Official transcripts exhibit the official seal and signature of the registrar or high school official. Transcripts marked "student copy,"

"issued to the student," or "unofficial" are not accepted as official.

3. 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. an official transcript (must be sent directly to the Office of Admissions by the high school) 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 I or ACT test scores (the only applicants who are exempt from submitting test scores are those who have completed 30 semester hours or more of college work at the time of review);
- f. a personal statement as described in the application for admission;
- g. the required audition, if the student is applying to the College of Music; and
- h. official transcripts from each college or school attended while in high school.

The fact that college entrance test scores (SAT I 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.

Applicants who are currently attending high school should give their completed application to their counselor. Applications must include the nonrefundable \$40 fee, transcript, grade point average, and rank-in-class information in a single mailing packet. Processing of an application will be delayed until all required information is received.

#### 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. Results from SAT I or ACT tests taken in January or later may be received too late for those who wish to be considered for summer or fall admission of the same year.

The University of Colorado accepts either the SAT I 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. SAT II tests are not required, but scores may be submitted if the tests are taken.

For exact testing dates and further information regarding college entrance tests, consult with a high school counselor, or write or call the following:

College Board SAT Program  
P. O. Box 6200  
Princeton, NJ 08541-6200  
(609) 771-7600  
e-mail: sat@ets.org  
home page: <http://www.collegeboard.org>

ACT Registration  
P.O. Box 414  
Iowa City, IA 52243  
(319) 337-1270

### 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 11.

### 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 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 CU-Boulder. These courses should include any minimum academic preparation standards (MAPS) not met in high school. See the MAPS requirements on page 15.

### Transfer Students

Applicants are considered transfer students if they have attempted or enrolled for any college-level course work (at another college or university, or other campus of the University of Colorado), full-time or part-time, since graduating from high school. Applicants are *not* considered transfer students if the only college-level classes they have taken were while enrolled in high school. To be considered for admission, transfer students must report all previous college work and have a high school diploma or its equivalent.

Transfer applicants are considered for admission on the basis of transfer as well as freshman criteria, including minimum academic preparation standards (MAPS) as listed on page 15. All transfer applicants who graduated from high school in 1988 or later are expected to have completed MAPS requirements 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.*

Credit transfer agreements, also known as articulation programs, have been established with Colorado two-year and four-year programs. Students should contact their current Colorado school for more information about how credit will transfer to CU-Boulder.

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 and have it certified by the community college will receive credit equivalent to the lower-division degree requirements of the college at CU-Boulder. 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 community college advisors and use the transfer guide to assure that appropriate courses are taken prior to transfer. Students wishing to enter the College of Architecture and Planning or the College of Engineering and Applied Science 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. The grade point average required for a student to be fully considered for transfer into any undergraduate degree program at the University of Colorado at Boulder shall be no higher than what is required for graduation from those undergraduate degree programs. Professional accreditation requirements for student grade point averages, however, shall supersede this policy in degree programs leading to professional accreditation, such as in the School of Journalism and Mass Communication. In admission decisions, past course work taken

is as important as the student's grade point average. Since the University of Colorado at Boulder selects students on a competitive basis, not all students who meet the minimum grade point criteria can be admitted. Competitive criteria 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. Courses in progress are not considered in computing the cumulative grade point average. See each specific college or school section for more information. GPA will be calculated by the admissions office using transcripts from all institutions attended and will include grades from failed courses, repeated courses, and courses withdrawn from while failing.

All transfer students need to submit SAT I or ACT scores, except those who have completed 30 semester hours or more of college work at the time of review.

All students must submit a high school transcript *and* an official transcript from each collegiate institution attended. Official transcripts are those that are sent directly to the University from each of the secondary or postsecondary institutions the applicant attended. Official transcripts exhibit the official seal and signature of the registrar or high school official. Transcripts marked "student copy," "issued to the student," or "unofficial" are not accepted as official. *Failure to list on the application and submit transcripts from all institutions previously attended is cause for cancelling the admission process or for dismissal.* 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 document set.

### COLLEGE OF ARCHITECTURE AND PLANNING

Admission preference is given to students who have taken college-level courses in architecture, planning, or environmental studies. Completion of courses in related fields of social science, natural science, fine arts, or humanities is also considered in admission review. See the Admission Criteria section above.

### COLLEGE OF ARTS AND SCIENCES

See the Admission Criteria section above.

### COLLEGE OF BUSINESS AND ADMINISTRATION

Preference is given to those applicants who will have completed courses (including calculus) equivalent to those taken by CU-Boulder business students. Refer to the Undergraduate Degree Requirements on page 258. See the Admission Criteria section above.

## ADVANCED PLACEMENT (AP) CREDIT

Advanced Placement Examination Title	Examination Score	CU-Boulder Course Equivalent	Semester Hours	Architecture & Planning	Arts & Sciences	Business Administration	Engineering & Applied Science	Journalism	Music
<b>BIOLOGY</b>									
Biology	5, 4	EPOB 1210, 1220, 1230, and 1240	8				a		
<b>CHEMISTRY</b>									
Chemistry	5, 4, 3	CHEM 1111 and 1131 CHEM 1111	10 5				b		
<b>CLASSICS</b>									
Latin-Vergil	5, 4, 3	CLAS 2114 and 2124 CLAS 2114	8 4						
Latin Literature	5, 4, 3	CLAS 2114 and 3024 CLAS 2114	7 4						
<b>COMPUTER SCIENCE</b>									
Computer Science	5, 4	CSCI 1200	4				c		
<b>ECONOMICS</b>									
Economics: Micro	5, 4	ECON 2010	4						
Economics: Macro	5, 4	ECON 2020	4						
<b>ENGLISH</b>									
English Literature and Composition	5, 4, 3	ENGL 1012 and 1500 ENGL 1500	6 3						
English Language and Composition	5, 4, 3	UWRP 1150 and 1250 UWRP 1150	6 3				d		
<b>FINE ARTS</b>									
Studio-Drawing Portfolio or Studio-General Portfolio	5, 4	FINE 1012 and 2002	6				d		
Art History	5, 4	FINE 1309 and 1409	6						
<b>FOREIGN LANGUAGE</b>									
French Language	5, 4, 3	FREN 2120 and 2500 FREN 2120	6 3				c		
French Literature	5, 4, 3	FREN 3110 and 3120 FREN 3120	6 3				c		
German Language	5, 4, 3	GRMN 3010 and 3020 GRMN 2020 GRMN 2010	6 4 4				c		
Spanish Language†	5, 4, 3	SPAN 2110, 2120 and 3000 SPAN 2110 and 2120 SPAN 2110	11 6 3				c		
Spanish Literature†	5, 4	SPAN 3700 and 3800 SPAN 3700	6 3				c		
<b>GOVERNMENT &amp; POLITICS</b>									
United States	5, 4	PSCI 1101	3						
Comparative	5, 4	PSCI 2012	3						
<b>HISTORY</b>									
U.S. History	5, 4	HIST 1015 and 1025	6						
European History	5, 4	HIST 1020	3						
<b>MATHEMATICS</b>									
Math-Calculus AB	5, 4	MATH 1300 or APPM 1350 (Engineering)	5 4				c		c
Math-Calculus BC	5, 4, 3	MATH 1300 and 2300 or APPM 1350 and 1360 (Engineering) MATH 1300 or APPM 1350 (Engineering)	10 8 5 4		c	c	c		c
<b>MUSIC</b>									
Music Listening and Literature	5, 4, 3	EMUS 1832 and 2752 EMUS 1832	6 3						
Music Theory	5, 4, 3	MUSC 1101, 1121, 1111, and 1131 MUSC 1101 and 1121	6 3				c		
<b>PHYSICS</b>									
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						
<b>PSYCHOLOGY</b>									
Psychology	5, 4	PSYC 1001	4						

\* Credits may apply to graduation in the specific college or school.  
 † Does not apply. Computer science majors, bio-engineering, and premedical option students check with faculty advisor.  
 ‡ CHEM 1111 fulfills departmental requirements in all areas. CHEM 1131 fulfills chemical engineering and computer science requirements.  
 § Check with faculty advisor in major department.  
 ¶ Does not apply.  
 †† Students who want to continue taking Spanish courses beyond their AP credit level must take the Spanish Department Placement Test. If the results of this test place them below their AP level, the Spanish Department strongly recommends that they enroll at the lower of the two levels.



**SCHOOL OF EDUCATION**

Programs for elementary and secondary teacher education are available through the School of Education. All persons seeking initial elementary or secondary teacher licensure must apply for admission to the Teacher Education Program through the School of Education. All teacher education candidates at the undergraduate level must be working toward a bachelor's degree in a college or school other than the School of Education. Upon completion of the Teacher Education Program and a bachelor's degree, a Certificate in Education is awarded.

To be considered for admission to the Teacher Education Program, an undergraduate must have completed a minimum of 56 semester hours (or 84 quarter hours) of course work. During the first semester of enrollment in the Teacher Education Program, a personal interview, completion of a basic skills assessment, verification of successful recent experience with youth, and competence in oral communication may also be required.

Specific information about admission to the Teacher Education Program can be obtained from the University of Colorado at Boulder, School of Education, Campus Box 249, Boulder, Colorado 80309-0249.

See the Admission Criteria section on page 10.

**COLLEGE OF ENGINEERING AND APPLIED SCIENCE**

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 two semesters of calculus-based physics and/or college-level chemistry before they enroll at Boulder. Chemical engineering students should have completed two semesters of general college chemistry before enrolling at CU-Boulder. See the Admission Criteria section on page 10.

**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. To be considered for admission, applicants must also have an overall grade point average of at least 2.25 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

should apply to the College of Arts and Sciences as pre-journalism and mass communication majors. See the Admission Criteria section on page 10.

**COLLEGE OF MUSIC**

The College of Music requires an audition of all applicants. More information may be found in the College of Music section of this catalog. See the Admission Criteria section on page 10.

**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 requirements for specific CU-Boulder colleges are listed on page 15.

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 of work in high school.

**How to Apply**

1. Obtain an application for admission 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. an official transcript (must be sent directly to the Office of Admissions by the high school) 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 I or ACT test scores (the only applicants who are exempt from submitting test scores are those who have completed 30 semester hours or more of college work at the time of review);
  - f. a personal statement as described in the application for admission; and
  - g. an official transcript from each college or university attended (except the University of Colorado). Official transcripts are those that are sent directly to the University from each college attended. Official transcripts exhibit the official seal and signature of the registrar. Transcripts that are marked "student copy," "issued to student," or "unofficial" are not accepted as official. All institutions must be included, regardless of the length of attendance, whether or not courses

were completed; and whether or not students feel the record will affect admission or transfer credit. This includes any institutions attended during summers, interim terms, and high school.

Note: Former degree students who have attended CU-Boulder within the last two years and have previously submitted their high school transcripts, SAT I or ACT 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. Transcripts 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* transcripts of attempted work must be received by the Office of Admissions as soon as possible. Transfer students should arrange to have their final official transcripts sent directly to the Office of Admissions after 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 to the student by the Office of Admissions.

*There is no guarantee that all transfer credits 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 makes the final determination on applicability of transfer credits toward degree requirements.* 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.

**TIME LIMIT ON TRANSFER OF CREDIT**

Credit hours required for graduation that were earned no more than ten years prior to transferring into an undergraduate degree program at the University of Colorado at Boulder

shall apply to the completion of the student's graduation requirements, provided that the content of these courses meet the degree program requirements. Any determination of acceptance of credit toward the degree based on the content and the age of the credit is made in the college or school dean's office.

#### NUMBER OF CREDIT HOURS REQUIRED FOR GRADUATION

Transfer students are not required to complete a greater number of credit hours than are required of students who began in those same undergraduate degree programs on the Boulder campus, provided those credit hours are in courses comparable in level and content to those required for graduation from an undergraduate degree program at the Boulder campus. Residency requirements, meaning the number of hours required to be taken on the Boulder campus, are the same for transferring and nontransferring students.

#### MINIMUM GRADES FOR TRANSFER

Only courses taken at a college or university of recognized standing with grades of C- 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 post-secondary 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. Official college transcripts of work taken must be received in order for transfer credit to be awarded.

#### 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 11.

#### 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.

#### INTERNATIONAL BACCALAUREATE EXAMINATIONS

Credit will be granted for approved International Baccalaureate (IB) examinations with higher level passes when the grade is 4 or better. An IB certificate or diploma must be submitted for evaluation.

#### 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 University of Colorado at Boulder, Office of the Registrar, Regent Administrative Center 105, Campus Box 7, Boulder, CO 80309-0007, (303) 492-6970. 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, 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.
6. Courses or programs identified as college orientation.

#### TRANSFER CREDIT CONVERSION

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

## Other Applicants

### *Foreign Students*

The University invites applications from qualified foreign students. Foreign applicants are those who will apply for or who already have a temporary nonimmigrant United States visa or immigration status.

Over 1,000 foreign students from over 85 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. 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.

Intensive English instruction is also offered by the International English Center.

Applicants who have established permanent resident status in the United States are *not* considered foreign. 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 University of Colorado at Boulder, Office of Admissions, Campus Box 65, Boulder, CO 80309-0065, (303) 492-2456, to obtain a foreign student application form and instructions. The foreign student application for admission can also be obtained by using the undergraduate admission application request form on the World Wide Web home page at <http://www.colorado.edu/admissions>, or by sending an e-mail to [apply@colorado.edu](mailto:apply@colorado.edu). Prospective graduate students should also write to the specific academic department in which they are interested. The letter should be addressed to the University of Colorado at Boulder, specific department, 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 the University of Colorado at Boulder, Foreign Student and Scholar Services, Campus Box 123, Boulder, CO 80309-0123, (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 the *Application for Former CU-Boulder Degree Students*. No application fee is required. 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 on page 12.

Degree students who withdraw from CU-Boulder during the fall or spring semester must reapply for admission.

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.

Degree students who withdraw from CU-Boulder during summer session need not reapply to continue into the fall semester.

### *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, nondegree students must be at least 18 years of age and have a high school diploma or its equivalent to qualify for admission. Students applying as nondegree students for spring or fall must do so through the Division of Continuing Education; for summer admission, students will need to apply through the Office of Admissions.

If students have been denied admission to an undergraduate degree program, 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 degree program admission. Nondegree student admission does not guarantee future admission to any degree program.

In the fall and spring semesters, permission to register for Boulder campus courses is contingent on availability of space.

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

Nondegree students may also 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 University of Colorado at Boulder, Division of Continuing Education, Campus Box 178, Boulder, CO 80309-0178, (303) 492-5148.

Prospective nondegree students for summer session may obtain further information from the University of Colorado at Boulder, Office of Admissions, Campus Box 30, Boulder, CO 80309-0030, (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.

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, SAT I or ACT 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 an unlimited number of credits taken as a nondegree student on any University of Colorado

campus. However, applicability of these hours toward degree requirements is established by the schools and colleges. It is suggested that a student apply to a degree program as soon as admission requirements, including MAPS deficiencies, have been met. It is essential that former nondegree students actively seek academic advising from the appropriate dean's office once they have been accepted into a degree program. There are opportunities for advising at mandatory degree orientation programs.

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. Second undergraduate degree applicants in the College of Architecture and Planning are encouraged to investigate graduate programs.

d. 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.

e. Students who have already completed an undergraduate degree will be considered on an individual basis in the College of Business and Administration. A written request for consideration must be sent to the Office of Admissions. Students are strongly encouraged to investigate graduate study.

f. The School of Education offers graduate and teacher education 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 Transfer Students on page 10. These stu-

dents must send a high school transcript, SAT I or ACT scores, and an official transcript from each college or university attended (outside the University of Colorado system) to the Office of Admissions. Currently enrolled degree students are not required to pay the application fee. Some admission preference is given 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.*

#### ARCHITECTURE AND PLANNING

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.

#### ARTS AND SCIENCES

16 units: 4 of English (includes 2 of composition); 3 of mathematics (includes 2 of algebra and 1 of geometry); 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

17 units: 4 of English (includes 2 of composition); 4 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.

*Note: The above business MAPS requirements apply only to those students graduating from high school in spring 1994 or later.*

#### 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.

Prospective engineering students are encouraged to complete the 4 units of mathematics

courses before attempting calculus or pre-calculus courses.

#### 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 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. Appropriate 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 may 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.

7. Students who graduate from a foreign high school are exempt from MAPS.



## GRADUATE ADMISSION

Graduate student admission is handled by individual academic departments. Please see the Graduate School section of this catalog for more information.

## 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	90-123.9
Fifth-Year Senior	124 and above

The normal course load for most undergraduate students is 15 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 of course work, or any number of thesis hours according to the program. For enrollment verification purposes, a full-time graduate student is one who is enrolled for 5 credit hours of course work or any number of thesis hours. For financial aid or program requirements for full- or part-time status, consult the Financial Aid Office or the appropriate dean's office for clarification. Law students must be enrolled for a minimum of 10 credit hours to be considered full-time in the fall or spring, or 5 credit hours minimum in the summer. Students should consult their dean's office and financial aid for clarification of their status. A maximum of 15 semester hours may be applied toward a 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, 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.

### Reasonable Academic Progress

Reasonable academic progress 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. Students must maintain reasonable academic progress to receive financial aid.

### 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; changed to *F* if not completed within one year

*IW* = incomplete; changed to *W* if not completed within one year

*IP* = in progress; thesis at the graduate level or specified graduate-level courses

*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* = no-credit

*W* = withdrawal or drop without discredit

\*\*\* = class grades were not submitted when final grades were processed, or the 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 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 grants 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, 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 reregister 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, for example, *B+IF* or *IW*.

At the end of one year, *IF* and *IW* grades for courses that are not completed or repeated are automatically changed to *F* or *W*, respectively.

#### Grade Point Average

The overall University of Colorado grade point average (GPA) is computed as follows: The credit hours and 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*, \*\*\* (grade not yet entered), *W*, *IP*, *IW*, and *IF* are excluded when totaling the hours, however, grades of *F* earned for courses graded on a pass/fail option are included in the GPA. *IFs* that are not completed within one year are calculated as *F* in the GPA at the end of the one-year grace period.

Grades Earned	Credit Points per Hour	Credit Hours	Credit Point 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
<i>IW</i>	—	4 (exclude)	—
		15	44
		Credit Hours	Points

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

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 GPA calculations as they relate to academic progress and graduation from their college or school.

### 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 University of Colorado at Boulder, Tuition Classification Coordinator, Regent Administrative Center 105, Campus Box 68, Boulder, CO 80309-0068, telephone (303) 492-6868, FAX (303) 492-4884.

#### Basic Requirements for Establishing Colorado Residency

Colorado in-state tuition classification requires domicile (legal residence) in Colorado for 12 consecutive months. Domicile is defined as a person's true, fixed, and permanent home and place of habitation. To establish domicile, a person must reside in Colorado and demonstrate that Colorado is his or her permanent home.

In addition to establishing domicile in Colorado, a person must be either 21 years of age or older (22 years of age for students who first matriculated at a Colorado college or university on September 1, 1996, or later), married, a graduate student, or be an emancipated minor to begin the 12-month period. Unemancipated minors qualify for in-state status if their parents have been domiciled in Colorado for one year.

#### Emancipation

To be emancipated, students cannot be supported by their parents in any way. College savings funds and other income-producing assets established by the parents

prior to the 12-month period are considered to be parental support.

#### 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 residence in Colorado while not enrolled as a student

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 as old as 21 (22 for students who first matriculated at a Colorado college or university on September 1, 1996, or later) may 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. In certain circumstances, students may qualify through their parents up to age 23.

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.

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.

#### In-State Status: Other Circumstances

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), and Olympic athletes in training at the United States Olympic Training Center in Colorado Springs, are eligible for in-state classification, regardless of domicile or length of residence.

Nonimmigrant aliens who have lived in Colorado for one year for purposes other than education qualify for in-state classification after one year of Colorado residence.

#### Official Transcripts

Official transcripts include the complete undergraduate and graduate academic record of courses taken at all campus locations or divisions of the University of Colorado. Students may request a complete transcript from the registrar of any University of Colorado campus. It contains the signature of the registrar and the official seal of the University. Official transcripts are primarily used to support applications for transfer to other academic institutions and for employment purposes. Transcripts sent to students are labeled "issued to student."

On the Boulder campus, transcripts may be ordered in person or by phone, FAX, or mail from the University of Colorado at Boulder, Office of the Registrar, Transcript Section, Regent Administrative Center 105, Campus Box 68, Boulder, CO 80309-0068, (303) 492-8987, FAX (303) 492-4884. Ordering transcripts by telephone is the most efficient method.

If students attend more than one campus, it is not necessary to request a transcript from each campus.

There is no charge for official transcripts, which are prepared at the student's request. Typically, transcript requests are processed within three to five working days in a first-in, first-out order. However, for a rush-transcript fee, official transcripts and unofficial FAX transcripts are processed in one working day. A student having unpaid financial obligations to the University that are due will not be granted a transcript.

Official transcripts that include end-of-term grades are available approximately two weeks after final examinations. Degrees are recorded approximately six weeks after graduation.

#### Unofficial Transcripts

Unofficial transcripts are also a complete academic record of graduate and undergraduate courses taken 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 for next-day service and \$5 for rush service.

### Credit by Examination

In limited instances, students enrolled in a degree program may earn additional credit without otherwise registering for and taking certain courses if they pass a written examination. 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. The following signatures are 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 prevents a 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.

### Confidentiality of Student Records

*Annual Notice to Students:* The University of Colorado complies fully with the provisions of the Family Educational Rights and Privacy Act (FERPA) 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 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 come to the Academic Records section of the Office of the Registrar and present proper identification. All other records inquiries must be directed to the proper office, i.e., Financial Aid, Bursar's Office, etc.*

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 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* for personnel within the institution, officials of other institutions in which the student seeks to enroll, persons or organizations providing the student with financial aid (this includes the parents upon whom the student is financially dependent), 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 twelfth day of classes in a term. Once requested, nondisclosure remains 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.

## EXPENSES

### 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 non-transferable 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 toward 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. Students should update their permanent address at the Bursar's Office before they graduate or withdraw to be sure they receive their refund.

### 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 1996-97. 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 1997-98.

	In-state	Out-of-state
Tuition and fees	\$2,840	\$14,432
Room and board (on campus)	\$4,370-5,072	\$4,370-5,072
Total	\$7,210-7,912	\$18,802-19,504

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. Con-

## 1996-97 Tuition Rates Per Semester

sult the *Registration Handbook and Schedule of Courses* for notation of special fees.

Tuition and fees for 1997-98 were not set when this catalog went to press in early 1997. The tuition rates *per semester* for the 1996-97 school year are listed on this page.

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.

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 schedule on this page.

**Housing Security Deposit**

Beginning with the fall 1996 semester, all students who live in the residence halls are required to pay a one-time security deposit of \$200. This security deposit is held by the Department of Housing is released to your tuition and fee account within 60 days after the expiration of your housing agreement.

Note: The security deposit required for housing is distinct and separate from the enrollment deposit required for admission to the University.

**Fees****Matriculation Fee**

All new degree students pay a one-time nonrefundable matriculation fee of \$35. This fee is assessed at the time of initial registration and covers adding and dropping courses and official transcript orders. Non-degree students who are admitted to degree status are assessed the \$35 matriculation fee at the time of their first registration as degree students.

**Course Fees**

Instructional fees are charged on an individual basis to help offset the higher costs of specialized supplies and equipment unique to these courses. Course fees for 1996-97 ranged from \$10-\$50 per credit hour and \$13-\$50 per course. Consult the *Registration Handbook and Schedule of Courses* for more detailed information, or contact the Bursar's Office at (303) 492-5381, TTY (303) 492-3528, or send e-mail to [bursars@spot.colorado.edu](mailto:bursars@spot.colorado.edu). Other fees also exist in the College of Architecture and Planning. In addition, lab courses<sup>1</sup> for linked to a lecture course may require payment of a course fee.

**Late Registration Fee**

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

Undergraduate In-State Tuition					Undergraduate Out-of-State Tuition				
Semester Credit Hours	Business	Engineering	Journalism/Music	All Other	Semester Credit Hours	Business	Engineering	Journalism/Music	All Other
1-3	\$495	\$507	\$429	\$423	1-3	\$7,254	\$7,281	\$7,038	\$6,957
4	660	676	572	564	4	7,254	7,281	7,038	6,957
5	825	845	715	705	5	7,254	7,281	7,038	6,957
6	990	1,014	858	846	6	7,254	7,281	7,038	6,957
7	1,155	1,183	1,001	987	7	7,254	7,281	7,038	6,957
8	1,320	1,352	1,144	1,128	8	7,254	7,281	7,038	6,957
9-18	1,363	1,399	1,186	1,161	9-18	7,254	7,281	7,038	6,957
Each hour over 18	\$161	\$169	\$143	\$141	Each hour over 18	\$806	\$809	\$782	\$773

**Graduate In-State Tuition**

Semester Credit Hours	Business	MBA	Engineering	Law	All Other
1-3	\$579	612	\$594	\$663	\$516
4	772	816	792	884	688
5	965	1,020	990	1,105	860
6	1,158	1,224	1,188	1,326	1,032
7	1,351	1,428	1,386	1,547	1,204
8	1,544	1,632	1,584	1,768	1,376
9-18	1,748	1,828	1,777	1,992	1,542
Each hour over 18	\$193	\$204	\$198	\$221	\$172

**Graduate Out-of-State Tuition**

Semester Credit Hours	Business	MBA	Engineering	Law	All Other
1-3	\$2,319	2,361	\$2,328	\$2,457	\$2,283
4	3,092	3,148	3,104	3,276	3,044
5	3,865	3,935	3,880	4,095	3,805
6	4,638	4,722	4,656	4,914	4,566
7	5,411	5,509	5,432	5,733	5,327
8	6,184	6,296	6,208	6,552	6,088
9-18	6,957	7,083	6,984	7,371	6,849
Each hour over 18	\$773	\$787	\$776	\$819	\$761

## 1996-97 Mandatory Fees Per Semester

Student Activity Fee (assessed by UCSU)	Student Computing Fee
One class of 5 or fewer credit hours	Credit hours of 6 or fewer
One class of more than 5 credit hours	Credit hours of 7 or more
More than one class (any amount of hours)	RTD Fee *
Note: Graduate status of "D" fees only (plus insurance)	All students
Student Information System Fee	Matriculation Fee
Mandatory for all students	All first time degree students
Athletic Fee	Arts Fee
Credit hours of 3 or fewer	All students
Credit hours of 4 or more	

\* The student RTD bus pass program fee entitles students to unlimited free or discounted rides on local, regional, and express bus routes.



their assigned registration period. The late registration fee is \$50. This fee is separate and distinct from any penalty that may be assessed for late payment of tuition and fees.

#### *Student Health Insurance*

All Boulder campus students are encouraged to maintain adequate health insurance. Students who are 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 by the published deadline. Waiver forms are available at Wardenburg. Please see Wardenburg Student Health Center on page 36 for further information, or call the Insurance Office at (303) 492-5107. There will be no automatic student insurance adjustments for students who either increase or decrease their credit hours after the waiver deadline.

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 Wardenburg.

### **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 Academic Records on page 16.

#### *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 enrolled in undergraduate courses are assessed tuition at the undergraduate student rate. Nondegree students enrolled in graduate courses are assessed tuition at the graduate student rate. Nondegree students enrolled in both gradu-

ate and undergraduate courses are assessed tuition at the graduate student 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. Out-of-state students enrolled for doctoral dissertation will pay 60 percent of the out-of-state per-hour rate for each semester hour of enrollment. In-state students enrolled for doctoral dissertation will pay the in-state 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, student loan proceeds, research and teaching assistant tuition waivers, and other credits to your tuition and fees account. All checks containing restrictive endorsements are null and void and nonbinding on the University.

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 (\$50), 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. If you need assistance with financial planning, call the Student Debt Management department in the Bursar's Office at (303) 492-5571. Tuition and fee billing information is available on the World Wide Web at: <http://www.colorado.edu/plus>.

#### *Deferred Payment Plan*

Students may apply for a deferred tuition payment plan by filling out a tuition deferral 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 amount due 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. Registration for future terms will not be allowed. If the student is already registered for courses for a future term, the registration may be canceled.
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
\$ 1.00- 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.

5. All past due accounts are referred to the University's Student Debt Management department for collection, where you must pay any assessed collection charges.

6. Colorado law requires the University to place all delinquent accounts with the state's Central Collection Services Office (CCS). If your account is referred to CCS, you must pay any collection costs allowed by the Uniform Consumer Credit Code.

#### Personal Check Policy

If you write a bad check (regardless of the amount) to the University, you may be subject to late charges and service charges, and a stop will be placed on your record. A \$17 returned-check charge is assessed, in addition to the amount due to the University. You may also be liable for collection costs and prosecution under the Colorado Criminal Statutes. Specific inquiries concerning reporting of bad checks should be directed to the Student Debt Management 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:

- If students withdraw on or before the third Wednesday of instruction, the full amount of their enrollment deposit is retained by the University.
- After the third Wednesday of instruction through the fifth Wednesday of instruction, 40 percent of full tuition and mandatory fees is assessed.
- After the fifth Wednesday of instruction through the seventh Wednesday of instruction, 60 percent of full tuition and mandatory fees is charged.
- After the seventh Wednesday of instruction, 100 percent of full tuition and fees is due the University.

To comply with federal financial aid regulations, financial aid recipients' tuition and fee assessment for withdrawals may differ.

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 *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.

#### FINANCIAL AID

The Office of Financial Aid's primary goal is to ensure that students who have been admitted to the University will not be prevented from enrolling or continuing enrollment solely for lack of financial resources. Approximately 50 percent of CU-Boulder students receive financial aid each year from federal, state, University, and private sources.

The Office of Financial Aid, located in the Environmental Design Building, is open from 9:00 A.M. to 5:00 P.M., Monday through Friday, and 9:00 A.M. to 4:30 P.M. in the summer. During office hours, aid counselors are available to talk with prospective students and/or their parents with regards to financing their education at CU-Boulder. The automated phone service at (303) 492-5091 provides general financial aid information as well as office hours, directions, application materials, scholarship, and scholarship search information.

#### Applying for Financial Aid

Students who wish to apply for financial aid should submit the *Free Application for Federal Student Aid (FAFSA)* or the *Renewal Free Application for Federal Student Aid*. Students are encouraged to submit their application as soon as possible after January 1. Awarding begins in early April. 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 signed 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, so students are encouraged to apply as early as possible.

Students who apply for financial aid at CU-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 (GPA). Students must also complete at least 67 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 including any transfer hours. Students are encouraged to read the complete policy, published in a fact sheet available in the Office of Financial Aid.

#### Financial Aid Programs

The Federal Pell Grant program provides grant assistance to undergraduate students who have no previous baccalaureate degree.

The Federal 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 Federal Pell Grant.

The Colorado Student Grant is a state-funded grant program awarded 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 Federal Perkins Loan is a loan program with a 5 percent interest rate that is awarded to undergraduate students who demonstrate financial eligibility. CU-Boulder awards Federal Perkins Loans primarily from its own funds, which are generated from former students repaying these loans. Repayment of the loan begins nine months after students leave school or cease to be enrolled on at least a half-time basis. Students have up to 10 years to repay the loan.

The Federal Direct Stafford/Ford and PLUS Loans are available to students and parents from the federal government. These educational loans are low-interest funds guaranteed by the federal government. In some cases the loans are subsidized, meaning the student does not have to pay interest while in school; the interest is paid for them. The interest on unsubsidized loans is paid by the borrower and can be paid while the student is in school or can be added to the principal until repayment begins. All loans have flexible repayment terms, as well as in-school deferment and forbearance options.

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 at UMC 165 to obtain a job. Students should be aware 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 Community Service program develops, improves, and expands work-study job opportunities related to community service. The jobs provide an opportunity to work with low-income persons or to help solve particular problems within the community. Job openings, when available, are posted in a separate section of the job boards.

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 in UMC 165. 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 CU-Boulder Scholarships*. The publication can be obtained in the Office of Financial Aid, Environmental Design Building, Room 2 or UMC 165. Incoming freshmen should refer to the *Application for Admission and Guide to Financial Aid and Scholarships* for information about financial aid and scholarships.

## 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 gender.

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 no cost. Some halls offer special facilities, such as a dark room, computer room, an academic skills lab, or music room. Further, minicourses 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. Streak nights, ice cream socials, and late-night coffee and cookie breaks during exam week are among the special activities planned during the semester. A recent change in the dining program permits students (regardless of hall assignment) to eat in any residence hall dining room.

For more information about University housing options and/or permission to reside off campus, prospective students may write the University of Colorado at Boulder, Supervisor of Reservations, Campus Box 154, 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 University of Colorado at Boulder, Academic Program Director, Campus Box 180, Boulder, CO 80310, or call (303) 492-8848.

The Sewall Residential Program is limited to approximately 325 freshman and sophomore students. At the heart of the Sewall experience is the academic program in American Culture and Society, which requires that students take one course (3 credits) each semester. Courses satisfy core curriculum requirements in most colleges of the University. Although the Sewall program is designed for students enrolled in the College of Arts and Sciences, students from other colleges may apply. In addition to the required courses, Sewall students may enroll in certain sections of some popular University lecture courses. For information, write the University of Colorado at Boulder, Program Director, Sewall Residential Academic Program, Boulder, CO 80310, or call (303) 492-6004.

During the 1996-97 academic year, both Farrand and Sewall charged \$525 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. An additional fee of \$250 was charged in 1996-97.

For additional information, write to the University of Colorado at Boulder, Honors Center, Campus Box 184, 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, Brackett, 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 fee of \$65 per semester was charged in 1996-97 to cover the support activities.

### **Williams Village Residential Academic Program**

The Williams Village Residential Academic Program (WRAP) is designed for freshmen and sophomores interested in environmental studies, environmental sciences, or in environmental subdisciplines in areas such as business, law, journalism, planning, and education. The program offers courses that satisfy various core curriculum requirements in the College of Arts and Sciences and are taught in small classes at Williams Village. Co-curricular activities include guest lectures, field trips, and social events. During the 1996-97 academic year, the program charged \$525 in additional fees. For more information, see page 53.

### **Other Academic Programs in the Residence Halls**

The Council on Academic Programs in the Residence Halls (CAPRH) develops aca-

dem programs in CU-Boulder's residence halls. Funded projects include a music enrichment program in Cheyenne Arapaho Hall; a faculty luncheon program in the halls; and special arts and sciences core curriculum courses 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 1996-97 academic year have been established as follows:

21 meals/week and single room	\$2,530
21 meals/week and double room	\$2,185

Different meal plans are available to upper-class students. A modest rate increase should be expected for the 1997-98 year. Also, as previously indicated, the Farrand, Sewall, Kittredge Honors, Engineering and Science Residential, and Williams Village Residential Academic programs all require an additional fee.

### **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-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 informa-

tion regarding admission notification and confirmation procedures, see Undergraduate Admission on page 7.

A security deposit (\$200 in 1996-97) 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. An early termination of contract is subject to financial penalties as stated in the residence halls 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 University of Colorado at Boulder, Family Housing Office, 1350 Twentieth Street, Boulder, CO 80302.

### **Off-Campus Student Services**

Off-Campus Student Services (a service of UCSU) maintains listings of rooms, houses, and apartments for rent in the Boulder community. Students may come to the office in UMC 336 to obtain a set of computerized rental listings (available for a small fee), use the free phones to search for a rental or roommate, and talk with assistants about the Boulder area.

Students wishing to receive information through the mail may do so by sending \$10 (within the United States) and \$15 (outside the United States) to Off-Campus Student Services, Campus Box 206, Boulder, CO 80309-0206. Checks should be payable to the University of Colorado. The packet will include an apartment complex summary, a Boulder map, the *Boulder Tenant's Guide*, and other pertinent information on living and renting in Boulder.

Office assistants are available to advise students about leases, security deposits, effective techniques for sharing a room, and ways to avoid landlord/tenant problems. 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 additional information, write 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.

## 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.

If you require accommodations because of a disability, notify the University of Colorado at Boulder, Office of the Registrar, Campus Box 20, Boulder, CO, 80309-0020, or call (303) 492-4822 or, if deaf or hard of hearing, call 492-5841 (TTY).

### Enrollment Deposit

All degree students pay a one-time-only \$200 enrollment deposit that allows them to enroll without paying a registration deposit each 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 later than eight weeks after graduation or two weeks after official withdrawal. Interest earned from enrollment deposits is used for student financial aid.

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.

All questions regarding the enrollment deposit policy should be directed to the Office of the Registrar, Regent 105, (303) 492-6970.

### 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 long distance.

Registration instructions are sent to new freshman, new transfer, new graduate, and readmitted students when they have confirmed their intent to enroll with the exception of new freshmen and transfer students in arts and sciences and business who receive their registration instructions at orientation.

Continuing students are notified each semester of times, places, and requirements for registration.

### Schedule/Bill Distribution

Combined schedule/bills are distributed to students before each semester begins. Schedule/bill distribution information is listed in each semester's *Registration Handbook and Schedule of Courses* or the *Summer Session Catalog*.

### Schedule Adjustment

Students can adjust their schedules by dropping and adding classes via CU Connect during registration. Once the semester begins, terminals are also available on campus for schedule-adjustment activities. For fall and spring semesters, schedule-adjustment activity takes place by time assignment during the first two days of the semester. After that, the system is available to all students, both by terminal and by telephone, through the drop/add deadline.

For further information, refer to the *Registration Handbook and Schedule of Courses* or the *Summer Session Catalog*.

### Schedule Adjustment Deadlines

Specific schedule-adjustment (drop/add) deadlines for each fall and spring semester are listed in that semester's *Registration Handbook and Schedule of Courses*. Summer deadlines appear in the *Summer Session Catalog*.

1. Students are allowed to drop and/or add courses through the drop/add deadline with no authorization signatures required, unless enrollment levels are reached earlier. Courses cannot be added after this deadline. Tuition and fees are not assessed for courses dropped by this deadline. Individual colleges and schools may have further restrictions.

2. After the drop/add deadline, 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. Summer courses dropped after the drop/add deadline appear on the transcript with a *W* grade and no tuition adjustment is made. In a fall and spring semester, students can drop courses within three business days after the drop/add deadline without being assessed tuition for the dropped courses and without the courses appearing on the transcript with a grade of *W*. During these three days, the student doesn't have to be passing the course to drop it but the instructor's signature is still required. After this, the student must be passing the course to drop it. Courses dropped appear on the transcript with a grade of *W*, and no tuition adjustment is made.

3. Six weeks after classes begin in the fall or spring semester, courses may not be dropped unless there are documented circumstances clearly beyond the student's control, e.g., 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 Withdrawal Procedures on page 25 for more information.

### 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 the drop/add deadline. Tuition is the same whether or not credit is received in a course.

### 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. Exceptions to the pass/fail regulations are permitted for certain courses that are offered only on a pass/fail basis. Procedures for requesting pass/fail enrollment can be found in each semester's *Registration Handbook and Schedule of Courses* or the *Summer Session Catalog*.

Students who wish to register for a course on a pass/fail basis should do so when they register or during the schedule-adjustment period. Changes to or from a pass/fail basis are not permitted after the drop/add deadline.

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 have a *P/F* designation are automatically converted. Grades of *D-* and above convert to grades of *P*. A grade of *F* remains an *F*.

### Variable Credit

All independent study courses and, occasionally, 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* or the *Summer Session Catalog* 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, Regent Administrative Center 105. A nonrefundable \$40 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.

Note: Students registered for the semester they plan to begin TOP must formally withdraw. See the withdrawal section below. Call (303) 492-8673 for further information.

### Withdrawal Procedures

Before classes start and through the final schedule-adjustment deadline of each semester, students may withdraw from the University by filling out a withdrawal form in the Office of the Registrar, Regent Administrative Center 105, or by sending a letter of withdrawal to CU-Boulder, Office of the Registrar, Campus Box 20, Boulder, CO 80309-0020.

After the final schedule-adjustment deadline in the fall or spring semesters, 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 21 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 read the *Registration Handbook and Schedule of Courses* or the *Summer Session Catalog* for specific withdrawal procedures. More information is available in the Office of the Registrar, Regent Administrative Center 105, (303) 492-8673.

Withdrawing students (including students applying for the Time Out Program) with Federal Perkins/NDSL loans must complete a loan exit interview before leaving the University. Failure to do so will result in a "stop" on your record. This stop will prevent you from receiving a diploma or an academic transcript of work at the University and from registering for future terms. In order to complete a loan exit interview, contact the University Student Loans department in the Bursar's Office at (303) 492-5571, TTY (303) 492-3528.

Students who withdraw from either 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.

The course work must be required for their degree program, students 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.

Note: Graduate students should check with the Office of the Registrar for exceptions to the home-campus registration requirement and limitation on credit hours at the host campus.

Students taking required courses in the College of Business and Administration or in the Graduate School of Business Administration may only exercise the concurrent registration option if they are in their graduating semester; business students who are two semesters from graduating and who cannot obtain courses necessary to complete a prerequisite sequence may also be allowed to use this option. The courses must either be required for graduation or unavailable on the Boulder campus, or the courses must conflict with another required course in which the student is enrolled.

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, Regent Administrative Center 105, from 9:00 A.M. to 4:00 P.M. Registration will take place only during the designated schedule-adjustment period of the host 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, 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 campuses, except 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 just before the semester begins. 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 and are eligible for late registration are subject to a \$50 late registration fee.

Graduate students registering as candidates for degree or for thesis hours must register during the assigned registration period or be subject to the \$50 late registration fee, if late registration is held for their category. For further information, call (303) 492-4822.

#### Registration for Faculty and Staff

All permanent faculty and staff are eligible to take 1 to 6 free credit hours each fiscal year. Faculty and staff who wish to enroll in courses must bring a copy of their current Personnel Action Form (PAF) to the Bursar's Office, Regent 150. All participants of this program must be admitted to the University as nondegree or degree-seeking students. If there has been a break in your attendance at CU, not including summers, you must reapply. Applications are available at the Bursar's Office. Faculty and staff members who are applying to a degree program must follow the regular application procedures of the Office of Admissions and return their applications to the Bursar's Office.

To take advantage of the free credit hours, faculty and staff must wait until the second day of the drop/add period of a fall

or spring semester to register. However, the PAF must be submitted by the published deadline in the *Registration Handbook and Schedule of Courses* or the *Summer Session Catalog*. Registration materials are issued when the PAF is received.

For further information, refer to the current *Registration Handbook and Schedule of Courses* or call the Bursar's Office at (303) 492-5381.

### Commencement

Students must apply for graduation to their dean's office at least one semester before they intend to graduate. Graduation ceremonies are held in May, August, and December and are open to the public. No tickets are required. The May and August commencements are held outdoors and the December ceremony is held in the Coors Events/Conference Center. Details concerning the ceremony are sent to graduating students approximately one month before each ceremony.

Only doctoral and law graduates receive their diplomas at commencement. Diplomas are mailed to all other students approximately two and one-half months after the ceremony. Students may request by the date of their graduation that their diplomas be held for pick-up by notifying the University of Colorado at Boulder, Commencement Office, Office of the Registrar, Campus Box 7, Boulder, CO, 80309-0007.

Graduating students with Federal Perkins/NDSL loans must complete a loan exit interview before leaving the University. Failure to do so will result in a "stop" on your record. This stop will prevent you from receiving a diploma or an academic transcript of work at the University and from registering for future terms. In order to complete a loan exit interview, contact the University Student Loans department in the Bursar's Office at (303) 492-5571, TTY (303) 492-3528.

## CAMPUS FACILITIES

### 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 Hellem's Hall and under the direction of the College of Arts and Sciences, ALTEC is open to the entire University community.

### Budget and Planning

The Office of Budget and Planning provides direction and support for campus budgeting, planning, and management. The office is responsible for developing and managing master and strategic planning; developing, coordinating, and providing information to management on which to base decisions; supporting campus data definitions, quality, and security; leading appropriate campus planning groups; and serving as the liaison with the system office and the Colorado Commission on Higher Education (CCHHE) on planning issues and requirements. For further information, call (303) 492-8631.

### Computing Resources

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

Major computing resources include an IBM RS/6000 Powerserver 370 and 390, a Sun SparcServer 1000E, a Sun SparcServer 1000, and a Sun SparcStation 20/61, 20/712, and 20/HS14. These computers are available through the campus data networks and via dial-up ports.

CNS also maintains 60 student computing labs housing more than 1,200 systems and their peripherals. Many of these facilities are general-purpose labs, available for individual use. Facilities include Macintosh labs, two statistics labs, a graphics lab, and several instructional labs equipped with Sun, Zenith, Dell, IBM, Hewlett-Packard, and Macintosh workstations. All are connected to the campus network. Some of the labs are focused on specific disciplines or applications, such as foreign language instruction, statistics, or graphics, while most are available for general purpose use.

The campus provides information services through an extensive set of World Wide Web pages. The CU-Boulder web site is a rich collection of information and includes calendars, directories, available courses, job listings, department and individ-

ual home pages, weather, transportation, and maps. PLUS (personal lookup services) allows students to check their class schedules, grades from previous semesters, and billing information from more than 60 kiosks in campus buildings and residence halls.

The DISC Center (Demonstrations and Information on Small Computers) provides professional consulting and maintains an array of the newest equipment and software for review and evaluation.

CNS is responsible for the major data communications networks on campus, which provide communications within the campus and gateways to national computing networks. These networks allow CU-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 library catalogs, databases, and research institutes. CNS participates in a number of state and regional networks and supports local initiatives such as the Boulder Community Network and the Boulder Valley School District Internet Project. 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. UnixOps, a CNS subsidiary, offers Unix system administration and operation for campus departments.

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

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.

### 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.

## CU Heritage Center

The CU Heritage Center, located in the oldest building on campus, is a museum that reflects the 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 *Coloradoan* 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 depict the University's contributions to space exploration (including Apollo 13 artifacts), campus architecture, the accomplishments of CU athletes, photographs and accounts of distinguished CU alumni, and an overview of the University's history. Located on the third floor of Old Main, the Heritage Center is open Tuesday through Friday from 10:00 A.M. until 4:00 P.M., and before most home football games. Call (303) 492-6329 for information and to schedule tours.

## Fiske Planetarium and Science Center

Fiske is considered one of the finest planetarium facilities in the world. Seating 210 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 dozen pre-recorded 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, laser shows, and space science presentations to school children and the general public in the Boulder-Denver area.

## Libraries

The University Libraries system is comprised of Norlin Library and five branch libraries. Norlin houses the book stacks and Periodicals Room for the general humanities and social sciences; Circulation and Reserve, Central Reference, and Interlibrary Loan services; Archives, Government Publications, and Special Collections departments; and Art/Architecture, East Asian, Map, Media, and Science libraries. The William M. White Business Library is in the business building, the Earth Sciences Library is in the Geology Building, the Leonard H. Gemmill Engineering Library is in the Mathematics Building, the Oliver C. Lester Library of Mathematics and Physics is in Duane Physics, and the Music Library is in the Imig Music Building. A Law Library is located in and administered by the School of Law.

This system, a constantly expanding network of resources, connects users with:

- Dedicated libraries and staff who provide reference assistance, extended consultations, computer searches, and instruction.
- The largest library collection in the Rocky Mountain region—exceeding 10 million books, periodicals, government publications, microforms, audiovisual materials, maps, manuscripts, papers, artifacts, and computer-based resources.
- An on-line system, Chinook, that provides access from dedicated terminals in the libraries, CU-Boulder accounts, the campus ethernet or ISN, the Internet, and other information services (such as CARL and ACLIN) to the Libraries catalog; national, state, and local services ranging from the Library of Congress to the University of California and the Boulder Public Library; and periodical article databases such as FIRSTSEARCH and UNCOVER.
- Special collections and archives including English, American, and children's literature; mountaineering; photography; the book and book arts; medieval manuscript leaves; human rights; history of Colorado and the West; environmentalism; women's history; and labor.
- A regional depository of Colorado, the U.S. government, United Nations, European communities, and GATT, with extensive holdings for World Bank, International Monetary Fund, OECD, UNESCO, and other U.N.-affiliated organizations, as well as British documents.

For more information, call 492-8705.

## 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. The auditorium also houses the Andrew J. Macky Gallery, with art work by local and national artists. 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. The museum is nationally recognized for its holdings of specimens from the Rocky Mountain Region and beyond, making it a primary resource for faculty and student research. A program of foreign and domestic exchange of specimens and information has given the museum an international reputation.

The Museum administers the interdisciplinary Master of Basic Science, Museum and Field Studies Program. A Collections/Field Track is provided for students interested in the curatorial and research aspects of museum work. An Administrative/Public Track is provided for students interested in the public aspects of museum work.

Through internships and assistantships, the museum provides professional experience to students in the field and in the laboratory. Museum faculty members teach courses in their areas of specialty, which include Central American and Southwestern archaeology and ethnology, plant systematics, invertebrate zoology, entomology, and paleontology. 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 in the Henderson building are open daily to the public. The Geology Hall exhibits fossils and focuses on local paleontology. The Biology Hall shows animals of Colorado and the Rocky Mountain region. The Anthropology Hall emphasizes CU-Boulder research. Temporary exhibits are presented each year. In addition, the museum offers extensive outreach programs to the schools and presents a number of special events and activities for the community.

## Recreation Services

Funded largely by student fees, the Student Recreation Center is one of the finest facilities of its type in the country. The center includes a 25-yard swimming pool and a 14-foot 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, diving, speed and figure skating, lacrosse, soccer, baseball, and many others through the club sports program.

The recreation center also offers many other programs geared toward specific

interests and instructions. 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, lifeguard training, 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.

### 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. Call (303) 492-5002 for reservations.

### 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 14,000 meetings and events 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 Student Services Office, and the Environmental Center are also located in the UMC.

The facilities include a reception desk for campus information, the CU Book Store, meeting rooms, a copy center, a computerized ticket service, banking and check cashing facilities, a travel agency, an art gallery, video rental store, music listening rooms, and a games area. Also located in the UMC are two 450-seat dining areas and a cafeteria

that includes a fast food grill, a Subway sandwich shop, a Chinese food kiosk, full-meal service, a pizza parlor, a bakery, Mexican food, ice cream, and a salad, fruit, and soup bar. The UMC also has a complete catering service.

## CAMPUS 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, and the University. By fostering loyalty among CU-Boulder alumni and providing opportunities for involvement, the Alumni Association creates a foundation for life-long contact with the University.

Students can join the Student Organization for Alumni Relations, an active, vibrant group that provides leadership for Homecoming and the annual Teaching Recognition Awards, among other activities. After leaving CU-Boulder, alumni can become involved in their local alumni clubs and the Alumni Association's constituent clubs, such as the Black Alumni Association, the Hispanic Alumni Association, the Asian Pacific American Alumni Association, or one of several academically based groups.

By joining the Alumni Association or one of its geographic or constituent clubs, alumni become powerful ambassadors for CU-Boulder in their communities. Finding and recruiting the best students, including those from minority groups, has proven to be one of the most valuable contributions alumni can make. The association also encourages advocacy on behalf of the campus by keeping alumni informed through several publications. News about alumni and candid coverage of CU-Boulder and the people and issues affecting it help maintain mutually supportive relationships between the campus and its friends.

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

### Artist Series

The Artist Series features a wide array of internationally renowned performing artists, from the hot sounds of jazz, to the rhythms of world music and dance, to the finest of the classical repertoire. Branford Marsalis, Tito Puente, Pinchas Zukerman, Yo-Yo Ma, Sonny Rollins, and Ballet Hispanico are just a few of the outstanding performers who have appeared in recent Artist Series events. Student discounts are available. Call (303) 492-8008 for a free brochure.

## Clubs and Organizations

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

All clubs and organizations provide an excellent way for students to become involved in current events, student activities, and community service. For more information, interested students can consult the University of Colorado Student Union's *Club Guide*, available in UMC 333, talk with their associate dean's office or an academic advisor, or stop by a student organization's office in the UMC. Students interested in forming clubs and organizations on campus can contact the Student Organizations Finance Office in UMC 231 or call (303) 492-6366.

## 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 space science experiments. Students in a variety of disciplines are trained to carry NASA and the U.S. space program into the twenty-first century. 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 they are recruited by prospective employers.

Scholarships, research assistantships, and/or independent research credit is awarded to students who participate. The Colorado Space Grant College provides numerous courses to prepare students for designing, building, operating, and analyzing data from space missions. These include Introduction to Space Experimentation, Small Payload Operations, Small Satellite Design, Independent Research Studies, and enhancement seminars.

### 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 payloads to be flown on the space shuttle in July 1997 and again

in October 1997 are part of a series of student-run research projects to be flown by the Space Grant College.

Other space grant students, along with students from colleges and universities throughout Colorado are designing both a rocket mission and a small satellite to measure the ozone in the Earth's atmosphere. For further information, contact the University of Colorado at Boulder, Colorado Space Grant College, Campus Box 520, Boulder, CO 80309-0520, (303) 492-3141.

### CU Art Galleries and Colorado Collection

The CU Art Galleries, located in the Sibell Wolfe Fine Arts building, are the visual art museum of the University. The galleries have an established track record of involvement in multicultural concerns. The people, art, and issues of the Americas are the foremost programmatic interest. In recent years there have been exhibitions with artists from Chile, Jamaica, Puerto Rico, Cuba, Mexico, and with Mexican Americans and Native Americans. The galleries also feature the work of CU's finest graduating students, at both the bachelor and master of fine arts level. The artworks of CU's nationally known Fine Arts faculty members, and of distinguished visiting artists and alumni, are also displayed.

All shows are accompanied by education programs—lectures, panel discussions, and gallery talks, as well as by publications. These products are targeted to specific academic and/or community groups. Staff members from the galleries are active both on and off-campus and have worked with partners to create one of the most provocative visual art programs in Colorado.

The galleries are also home to the Colorado Collection, CU's teaching collection of visual art. This resource is used in classroom instruction, at shows in the galleries, and as the source of exhibitions for "CU this Summer," a national award-winning cultural outreach program of CU-Boulder.

The CU Art Galleries are open six days a week and are always free. Phone (303) 492-8300 for current information or to join the direct mailing list.

### 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 (FTEP) provides an array of programs for CU-Boulder faculty to improve the key components of undergraduate and graduate education—teaching and learning. For fac-

ulty members who wish to enhance their teaching, the program offers symposia on teaching and consultation to teaching that includes videotaping. The teaching portfolio consultation guides faculty in the development and selection of materials that document teaching performance. The curriculum development consultation assists faculty in designing course content to include multicultural perspectives. Publications available to all faculty are: *Memo to the Faculty*, a reprint series distributed to faculty about current research on teaching and learning; *A Compendium of Good Teaching Ideas*, a compilation of teaching tips authored by CU faculty; the brochure series *On Diversity in Teaching and Learning*; and three volumes of essays written from a personal and practical point of view by Boulder campus faculty titled, *On Teaching*.

An emphasis on how students learn, as well as how teachers teach, is incorporated within all of the program's offerings. Exemplifying this dual focus is the Faculty and Student Seminar on Teaching and Learning, established by the program in fall 1994. Having both faculty and students participate in the seminar gives the students the benefit of hearing faculty perspectives on the hows and whys of education, while giving the faculty the benefit of student perspectives. The seminar addresses the question: How can research on how people learn shape university education? The faculty and student participants read and discuss the work of scholars whose work covers a range of disciplines and who represent different theoretical perspectives on learning and teaching. The scholars visit the campus to meet with the seminar participants and to present public lectures on their research, giving faculty and students the opportunity to interact directly with them about the interpretation of their work.

#### 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 all four campuses of the University. Faculty selected for the program design and develop projects aimed at strengthening confidence in the art and craft of teaching and 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.

### Fraternities and Sororities

Over 2,700 students currently participate in CU-Boulder's 30 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. The Greek Liaison office also connects with both the Black and Latino Greek organizations.

### 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), Delta Phi Alpha (German), 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 12 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. In each of the last three years, 11 programs were ranked in the top 25 in the nation. CU-Boulder won the national championship in skiing in 1995, the second time the Buffs were crowned in this decade, and the football team won its first national title in 1990.

Men's varsity sports include football, basketball, cross country, track and field, skiing, golf, and tennis. Women's varsity sports

include basketball, cross country, golf, track and field, skiing, soccer, tennis, and volleyball.

Folsom Field, a 51,808-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 11,198 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 Carlson Gymnasium for matches and practices. The soccer team utilizes the brand-new Pleasantview Soccer Complex in Boulder for its games.

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 (OIE) in the Division of Student Affairs houses the Foreign Student and Scholar Services and the Study Abroad Programs. The OIE 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, foreign students, faculty members, and visitors who come to the University of Colorado at Boulder, and all members of the campus 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 Center for International Research and Education Projects (CIREP), which promotes the international interdisciplinary activities of Boulder's faculty.

The Office of International Education maintains a small resource library on foreign study and work opportunities, including temporary summer jobs and volunteer internships abroad.

### Study Abroad Programs

The Office of International Education offers study abroad programs in over 45 sites around the globe and on every continent except Antarctica. Undergraduate students are strongly encouraged to consider a

study abroad program to enhance their studies and to experience a unique opportunity for intellectual and personal growth. All participants in CU-Boulder study abroad programs remain enrolled at the University and all credit earned while abroad is considered earned in residence. Financial aid from the University may be applied to program costs in most cases. Students may also apply for special study abroad scholarships.

The University's study abroad programs are of various types. Students may study abroad for a summer, the winter interim, a semester, or a year. Some programs offer students the opportunity to be fully integrated in a foreign university system where they take classes from host country faculty and study alongside host country students. This is possible in Ghana, Egypt, Israel, Costa Rica, Mexico, Argentina, Brazil, Chile, the Dominican Republic, Canada, Australia, England, France, Germany, Sweden, and Spain. Other semester or year-long programs offer a special curriculum for foreign students that generally focuses on fields in the social sciences and humanities, although some also offer courses in the natural sciences, architecture, business, and engineering. This type of program exists in Israel, Mexico, China, Japan, Indonesia, Taiwan, Thailand, Vietnam, Denmark, Belgium, the Netherlands, the Czech Republic, Hungary, Poland, France, Spain, and Russia.

In general, summer programs focus on language learning or the study of a specific discipline. Specialized summer and winter interim programs are offered in conjunction with academic departments at the University. Students may study with CU professors on programs focusing on art history in Italy, theatre and music in London, or international finance in London. Other summer programs are offered in Israel, Costa Rica, Mexico, China, Japan, Thailand, Denmark, Iceland, France, Germany, Russia, and Spain.

Most programs have prerequisites and some programs have language requirements. Generally, students must have a *B* average in their college-level work to qualify for CU study abroad programs. Planning ahead is essential and students are encouraged to consult with their academic advisors and with study abroad advisors in order to select a program that fits their needs.

More information about study abroad is available at the University of Colorado at Boulder, Office of International Education, Environmental Design Building, Room 1B01, Campus Box 123, Boulder, CO 80309-0123, (303) 492-7741, internet: [studyabr@colorado.edu](mailto:studyabr@colorado.edu). OIE also maintains a World Wide Web page at <http://www.colorado.edu/OIE/StudyAbroad>.

### Foreign Student and Scholar Services

The University of Colorado has welcomed foreign students and scholars for many years. Currently more than 1,100 foreign students and over 450 scholars and visiting faculty members from more than 85 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 advice.

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 University of Colorado at Boulder, International English, Campus Box 463, Boulder, CO 80309-0463, in person at the IEC offices at 1333 Grandview Avenue, by telephone: (303) 492-5547, or by facsimile (FAX), (303) 492-5515.



## 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 Early Music Ensemble.

Guest artists, speakers, and special events provide a vibrant and diverse musical atmosphere at the University. Acclaimed artists Dalton Baldwin, Trevor Wye, Spiro Malas, Martin Isepp, Nelita True, and Yevgeny Yevtushenko have appeared on campus, in addition to annual events like the holiday festival and the Colorado Lyric Theatre Festival.

## Rocky Mountain Film Center

The Rocky Mountain Film Center (RMFC) is perhaps best known for presenting the International Film Series, which has been operating for over 50 years. 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.

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, CU-Boulder offers a 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. The only cost, outside of books if the auditors wish to buy them, is a low processing fee due upon registration. 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.

## Theatre and Dance

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 six to eight major theatre productions each academic year. The 1995-1996 season included *Dracula*, *Crimes of the Heart*, *Dames at Sea*, and *Caucasian Chalk Circle*. The dance program presents four concerts featuring student, faculty, and guest artist work.

The Colorado Shakespeare Festival (CSF) is presented each summer in the outdoor Mary Rippon Theatre. One of the few repertory groups in the nation to have completed the entire Shakespearean canon, the festival has had 40 years of distinguished history, and features the most advanced students in the CU-Boulder theatre and dance program as well as professional actors, direc-

tors, designers, and outstanding performers and technicians from advanced training programs throughout the country. CSF "alums" include Jimmy Smits, Annette Bening, Joe Spano, Tony Church, and Val Kilmer. Also in the summer, the Department co-sponsors the Colorado Dance Festival and hosts the Jazz Dance Workshop.

## 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 ongoing 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, depending upon 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 Honors Program on page 51 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 upon 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 all deadlines must be met. Students should consult with their associate dean's office about any special provisions.

### Undergraduate Research Opportunities Program

The Undergraduate Research Opportunities Program (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. For information concerning opportunities for undergraduate research, contact the UROP office in Norlin M400H, (303) 492-2596.

### United Government of Graduate Students

The United Government of Graduate Students (UGGS) represents more than 5,000 graduate students, law students, and business students on the Boulder campus. UGGS, the graduate student link to the Graduate School and other administrative bodies, actively pursues goals intended to enrich the quality of life on campus and the quality of graduate work for the University. As such, UGGS is committed to full health and child care benefits for graduate student employees of CU, elimination of the mandatory Athletic Department fee, clarification of policies regarding research and teaching assistants, improved teacher training programs, and providing a multicultural campus.

UGGS holds bimonthly meetings during the academic year and monthly meetings during the summer. Graduate students from each department choose or elect representatives for the legislative governing body; UGGS officers are elected from among the departmental representatives. All are welcome to the general meetings.

For further information on the United Government of Graduate Students, call (303) 492-5068, or drop by at UMC 327. You can also access the World Wide Web at <http://uggs.colorado.edu>.

### 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 more than \$22 million, half of which comes from student fees and the other half from self-generated revenues, UCSU is the nation's largest student government. 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 off-

campus housing assistance, legal counseling, and many other services.

UCSU is divided into executive, legislative, and judicial branches. The UCSU Executives, elected each spring 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 an 18-member Legislative Council. Nine seats are occupied by representatives of the colleges and schools; the remaining nine 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.

The Appellate Court is UCSU's judicial branch. The seven students appointed by the executives as Justices to the Court are responsible for interpreting the UCSU constitution and ruling on specific appeals brought before them.

For more information regarding UCSU and getting involved, please call (303) 492-7473 or stop by UMC 333 between 9:00 A.M. and 4:00 P.M.

## CAMPUS SERVICES

### Academic Media Services

Dedicated to providing leadership in the integration of technology into CU-Boulder instructional programs, Academic Media Services (AMS) supports and encourages the use of films, video and audio tapes, slides, transparencies, computer graphics, and multimedia and Web-based presentations, as well as a variety of audiovisual equipment. Staff members, assisted by student employees, work closely with faculty in 67 self-service media-equipped classrooms and nine operator-assisted, media-equipped lecture halls. Of these 76 rooms, 17 are smart classrooms, equipped for projection of computer images and for Ethernet accessibility.

Video programs are produced in studios and on location, shown on the campus TV network, and broadcast to sites along the Front Range. Qualified technicians repair personal computers and peripherals. Camcorders, TV/VCR units, 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; fax: (303) 492-7017; home page: <http://www.colorado.edu/AMS>.

### Career Services

The center offers career planning, cooperative education and internships, and assistance in finding post-graduate employment. 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 career assistance services. Call (303) 492-6541 for more information.

### 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 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.). *Discover* is a computerized career counseling system with information on nearly 500 occupations, graduate schools, self assessment, career decision-making, and job strategies. *Discover* is available by appointment. 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 analyzes, 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 ten 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 network is located in the career library.

#### *Career Assistance Services*

These services are available to all graduating students.

**On-Campus Interviewing.** Career interviews are coordinated with over 400 employers annually. These interviews take place on campus or at the employer site. Students are encouraged to attend the required orientation session the first week of classes during the fall semester of their graduating year.

**Information Meetings.** These meetings allow employers to give presentations about their organization and career positions on campus.

**Ambassador Program.** This program provides opportunities for students to network with employers at their information meetings.

**Resume Referral.** Throughout the year, over 14,000 resumes are referred to employers who screen for candidates and contact them for interviews.

**Career Hotline.** Approximately 5,000 positions are listed annually on the Career Hotline, which can be accessed by a touch-tone phone anytime.

**Credentials.** Letters of recommendation in support of graduate school or educational employment are kept on file and sent out upon request.

#### *Cooperative Education/ Internship Program*

Participating in a cooperative education or an internship program helps students explore and experience career possibilities firsthand. Both co-op and internship placements are carefully structured and well supervised, offering students professional-level challenge, instruction, and responsibility. Part- and full-time placements are available to degree-seeking students with good academic standing in their college or school. All students are encouraged to enroll in this program. A \$45 fee is charged for the application process and referral that runs for a full year. Freshmen can enroll in the program for a fee of \$30.

Counselors assist student in obtaining an internship or co-op placement. Students interested in finding out more about enrolling in the Cooperative Education/ Internship Program should attend an orientation. Stop by the office in Willard Administrative Center 18, or call 492-4129.

To get a preview of available internships, check CUline (Internship Listings under Campus Services).

#### *National and Institutional Testing*

The center administers the following tests: Foreign Service Exam, GMAT, GRE, LSAT, MCAT, SAT, Achievement, and TOEFL. Registration and information packets for these tests can be picked up at the west entrance to Willard Administrative Center or in Willard 29.

The department also administers the ACT-Residual, CLEP (to test out of classes in biology, general chemistry, general psychology, introductory sociology, and calculus with elementary functions), the Graduate School Foreign Language Test (to test out of a CU-Boulder foreign language requirement), and the MAT. The following exemption tests from arts and sciences requirements are also administered: geography, quantitative reasoning, and mathematical skills, undergraduate foreign language (French, German, Russian, and Spanish), and written communication. Registration and information sheets for these tests can be picked up in Willard 29. For updated recorded information on these tests, please call (303) 492-1253 at any time.

#### *Child Care*

The University Family Housing Children's Center includes toddler and pre-school-compatible programs and 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, staff, 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. A stuttering group, a pragmatics group, and a Parkinson's group are examples of services. The clinic dispenses and services hearing aids and offers instruction on using aids and on speech reading. The clinic also houses the Child Learning Center, which includes a parent/infant-toddler program and inclusive preschool classrooms. For more information about the clinic's programs and services, call (303) 492-5375.

#### *Counseling 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 academic, personal, and career 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 and psychologists, undergraduate paraprofessional peer counselors provide student-to-student assistance, academic counseling, and serve in an active student outreach effort.

**Groups and Workshops.** Group counseling and workshop programs provide small group experiences and workshops in skill development and personal growth. Issues and concerns addressed by the groups include assertiveness, minority and cultural support, parenting, coping with trauma, and interest exploration. In addition, educational workshops are offered throughout the year on stress management, eating disorders, drug and alcohol awareness, relationship skills, perfectionism, grief and loss, procrastination, and more.

**Center for Educational and Career Transition.** This service provides educational, personal, and career counseling, as well as testing 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 through the Institute for Multicultural Development. In addition, assistance is available in the areas of cross-cultural communication and counseling skills.

**Consultation.** Consultation is designed to support the efforts of those who work within the University community. A team of consultants works with academic departments, staff units, and student groups to resolve conflicts, build collegial cooperation, and improve 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 and self-assessment tests

are available through the center. The tests include the Strong Interest Inventory and the Myers-Briggs Type Indicator. A small testing fee is charged.

**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. E-mail can also be sent to [counsel@spot.colorado.edu](mailto:counsel@spot.colorado.edu), or the World Wide Web can be accessed at <http://stripe.colorado.edu/~raj/counseling>. No appointment is necessary. 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.

### Cultural Unity Student Center

The Cultural Unity Student Center (CUSC) is staffed by a diverse team of University personnel and students. Working with undergraduate students of color throughout their college career, they help students form caring partnerships that are supportive of their goals.

**Student Development.** CUSC is concerned with helping students feel connected as a vital part of the campus community. As students settle into the campus routine, it is helpful for them to become acquainted with the many services and resources available. CUSC helps students become connected as they offer not only direct services such as personal and cultural counseling and guidance, educational planning and orientation, and career development and referral, but also help to ensure that students become connected to the many other campus and community resources through their Resource and Referral Network.

**Community Development.** Through the efforts of a sensitive and caring CUSC staff and a host of other identified resources, undergraduate students of color are assisted to proactively use programs and services that link them to mentors and invaluable resources on and off-campus. An active CUSC outreach program contacts and communicates directly with students and student groups and connects them with University and community resources such as the Leadership Institute, Faculty/Student Mentorship Program, White Antelope Memorial Seminar, and African American Student Partnership Program, as well as with a host of other programs, activities, and resources on and off campus.

Advocacy of student rights and issues involving gender, racial, cultural, and other forms of difference are also offered by the

CUSC team through its diverse staff and through the Institute for Multicultural Development. This team is a joint enterprise of culturally diverse professionals from CUSC, Counseling Services, and other departments who offer workshops, seminars, and other forms of assistance to individuals and groups on campus concerned about multicultural development and the valuing of diversity.

For more information on CUSC, stop by Willard Administrative Center 118 or 112, or call (303) 492-5666 or (303) 492-5667 between 8:00 A.M. and 5:00 P.M., Monday through Friday.

### Disability Services

Disability Services provides support services to students with disabilities so they can take 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. Disability Services also coordinates reader services for blind students and interpreters for deaf students, as well as a TTY-TDD-TT phone system for deaf and hard of hearing individuals.

The Learning Disabilities Program provides support services to students with learning disabilities. These support services include diagnostic testing and interpretation (there is a \$250 fee), individual sessions with a learning disabilities specialist, advocacy within the University community, testing accommodations, and strategy development. Emphasis is placed on the student understanding his/her learning disability and empowering the student to take ownership for learning.

For further information about services to students with disabilities, call (303) 492-8671 or write to the University of Colorado at Boulder, Disability Services, Campus Box 107, Boulder, CO 80309-0107.

### Environmental Health and Safety

Environmental Health and Safety (EH&S) is a division of the Public Safety Department. The mission of EH&S is to promote, protect, and ensure the health and safety of all persons and property on the CU-Boulder campus.

Four programs within the division focus on these goals through preventative, remedial, and emergency response measures.

The Health Physics Laboratory oversees the safe and responsible use of radioactive materials and radiation producing machines.

Staff in the Hazardous Materials Management Unit educate and move the Uni-

versity towards the minimization, safe handling, and appropriate disposal of hazardous materials.

The Environmental Compliance Unit ensures that the University is in compliance with all applicable environmental regulations through on-site inspections, training, and program review.

The Industrial Hygiene Unit investigates incidents and initiates policy with regard to occupational health and environmental controls within fields such as indoor air quality, water quality, and health exposures.

Campus safety is a responsibility shared by every member of the University. In this sense, EH&S is both a service and a collaborative division. Call for more information at (303) 492-6025, fax at (303) 492-2854, or e-mail at [ehs@stripe.colorado.edu](mailto:ehs@stripe.colorado.edu).

### Ombuds Office

The Ombuds Office assists students, faculty, and staff in resolving complaints or disputes with other individuals, offices, or departments within the University.

The office maintains impartiality and confidentiality in working with individuals and operates independently of the usual administrative authorities. Ombuds Office duties include hearing and investigating concerns and complaints; 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 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 University of Colorado at Boulder, Ombuds Office, Campus Box 112, Boulder, CO 80309-0112, (303) 492-5077.

### Parking Services

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

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 registration at the time of purchase. Student permit fees ranged from \$72 to \$120 per semester for fall 1995 and spring 1996 (fees are subject to change). Most permits are sold at the Coots Events/Conference Center at the start of each semester. Student permit fees may be transferred to your tuition bill (except summer session).

Faculty/staff permit fees range from \$18 to \$30 per month (fees are subject to change). 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 validated photo ID to obtain student services such as those provided by the University Libraries, Wardenburg Student Health Center, and the Student Recreation Center. A validated ID also entitles students to unlimited free or discounted rides on local, regional, and express RTD bus routes.

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 each semester in order to take advantage of the student services described above, and will receive a validation sticker when they receive their schedule/bill.

### Student Academic Services Center

The Student Academic Services Center (formerly the University Learning Center)

offers academic support services designed to assist students in improving their learning potential.

**Tutorial services.** The Tutorial Services Program (TSP) offers an array of flexible services that can be customized to meet the needs of individual students: consultation, one-to-one and group tutorials, workshops, test proctoring, and referrals. Scholarships are available to qualified students.

**Academic Skills Program.** The Academic Skills Program offers individual study sessions, cooperative learning seminars, group presentations, and individual test proctoring for students with test anxiety or nonnative speakers. Academic skills instructors are available for individual appointments.

**Academic Excellence Program.** The Academic Excellence Program offers academic, logistical, and counseling assistance to qualified students wishing to improve their academic success. Program activities include individual sessions, tutor-supervised study halls, and workshops on such topics as note taking, reading strategies, test preparation, career exploration, and time management. Undergraduate students who will be the first generation in their family to receive a four-year college degree, are low income, and/or have a physical or learning disability may be eligible to participate.

**Academic Access Institute.** Through this program, the Student Academic Services Center offers courses in writing and college algebra, as well as support services in English as a second language, science, study skills, and academic advising to a selected group of freshman students who have been provisionally admitted to CU-Boulder.

**Location.** The administrative office, Academic Skills, and Tutorial Services Program are located in Willard 334, (303) 492-5474. The Academic Access Institute is located in Norlin Library, lower level, room E1B-36, (303) 492-1416. The Academic Excellence Program is located in Room 305 of the University Memorial Center, (303) 492-3842.

### Student Affairs Communication Services

Student Affairs Communication Services provides the student community and the University administration with timely and informative print and electronic publications. Major projects include a viewbook for prospective students, academic catalogs, *Ralphie's Guide to Student Life*, brochures on study abroad programs, and Student Affairs World Wide Web sites. For further information, call (303) 492-7067.

### Student Affairs Research Services

Student Affairs Research Services 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 institutional research on recruitment and retention of students. The office also administers the faculty course questionnaire (FCQ), which gives students the opportunity to evaluate their courses and instructors. For further information, call (303) 492-7067.

### Veterans' Services

The Veterans' Services 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 students receive VA educational 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' Services 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' Services 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' Services 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. Interested persons should contact the Department of Veterans' Services Vocational Rehabilitation at (303) 914-5550.

**Payment.** Students may request advance payment by completing the proper forms at the Veterans' Services 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' Services 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 Office of Financial Aid, Environmental Design, room 2. For further information, call (303) 492-7322.

## Wardenburg Student Health Center

As a service of the University of Colorado Student Union (UCSU) and the Joint Health Board, the Wardenburg Student

Health Center provides high quality, affordable health care to all campus students, faculty, staff, retirees, and their families. Wardenburg is staffed by fully credentialed physicians in internal medicine, family practice, psychiatry, and several other specialties. In addition, advanced practice nurses and many other health care professionals are available to provide high quality services at the lowest possible rates. Wardenburg is accredited by the Joint Commission on Accreditation of Healthcare Organizations.

Eligibility reflects paying a fee and includes the following classifications: all students, including those registered through Continuing Education and SAVE; faculty and staff (through Workers' Compensation and other University sponsored benefit programs); spouses and dependents of students, faculty, staff, CU retirees and their families; and campus visitors (i.e., conference participants, parents, and visiting faculty) on an urgent care basis. Faculty and staff are also eligible for immunizations (flu and measles).

### Confidentiality

A personal health record, including a complete medical history, is established during a patient's first visit. 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 authorization, upon court order, or to meet the requirements of local, state, or federal statutes. Records are maintained, and destroyed, in compliance with Colorado Department of Health regulations.

### Student Primary and Urgent Care Clinic Fall and Spring Semesters Hours

Monday-Friday 8:00 A.M.-8:00 P.M.  
Saturday-Sunday 10:00 A.M.-6:00 P.M.

### Faculty and Staff Health Services

Please call 492-8600.

### General Telephone Numbers and Available Services

General Information	(303) 492-5101
Administration	(303) 492-5661
FAX-Administration	(303) 492-1747
Billing Information	(303) 492-4196
Insurance Office	(303) 492-5107
Appointments	
Dental Clinic	(303) 492-2030
Faculty and Staff	(303) 492-8600
HIV Testing	(303) 492-2030
Medical Clinic	(303) 492-5432
Physical Therapy	(303) 492-2043
Psychiatry Clinic	(303) 492-5654
Specialty Clinic	(303) 492-5432
Women's Health Clinic	(303) 492-2030
Immunization Office	(303) 492-2005
Pharmacy (The Apothecary)	(303) 492-8553

Workers' Compensation (303) 492-8600

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 Wardenburg Urgent Care Clinic. The after-hours care entrance is located adjacent to the southwest parking lot. Students should bring their student ID card for eligibility verification.

### Student Health Insurance and Fee Information

Students enrolled for 6 or more credit hours will automatically be charged for Plan A insurance. Plan A provides 100 percent coverage for most services at Wardenburg due to illness or injury. The plan also provides some coverage for preventative care and prescription medications. Outside Wardenburg, the plan provides 90 percent coverage for outpatient care and professional services and 100 percent coverage for in-patient hospitalization when network providers are utilized and the \$200 deductible per year is satisfied. Outside of the network, plan A provides 75 percent coverage of allowable charges on a worldwide basis after the deductible is satisfied. After \$20,000 in medical expenses is reached, the coverage increases to 100 percent for eligible expenses up to \$250,000 per illness or injury. Dependents of students are also eligible for student insurance coverage and may be seen at the Wardenburg Student Health Center. Coverage at Wardenburg is not the same for dependents as it is for students and spouses. Please contact the Student Insurance Office at 492-5107 for complete information.

Students who are enrolled for 5 or fewer credit hours or are on Space-Available Voluntary Education (SAVE), Time-Out Program (TOP), or Continuing Education must come to the Student Insurance Office to enroll in the insurance plan.

Business office personnel are available to answer questions and accept payments. Wardenburg mails a monthly statement to each patient that can be used for filing claims with insurance companies. Wardenburg will bill health insurance carriers directly for insurance claims. To participate in this insurance billing program, students should provide the health insurance carrier policy information. Wardenburg also participates in several major managed care networks. Payment for services should be made to the University of Colorado, in care of the Wardenburg Business Office. For more information, call the Business Office at 492-4196 or stop in to submit the health insurance information.



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

When the health center 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.

#### *Parking Information*

Emergency and handicapped parking is available at no cost at Wardenburg's southwest entrance.

Within certain restrictions, free parking is available to all Wardenburg patients at the Euclid Avenue AutoPark, one-half block from Wardenburg.

A Euclid Avenue AutoPark ticket can be validated by the Wardenburg Business Office for the duration of your stay in the health center. Call (303) 492-4196 for details.

## CAMPUS POLICIES

### Academic Integrity

A university's intellectual reputation depends on maintaining 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 doc-

ument 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 specific charges, 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.

### Academic Program Discontinuance

In the event a degree program is discontinued, students currently enrolled in the program have a four-year period in which to complete their degree requirements. This four-year period starts with the date of the Colorado Commission on Higher Education (CCHE) action to discontinue the program. No new or returning students will be admitted into a discontinued degree program. Students not completing the degree requirements in the four-year period are not permitted to receive the discontinued degree. In such cases, credits accumulated may be applied to the overall number of credits required toward graduation, but the student must seek the advice of their college or school to determine how these credits might apply to a new degree program.

### 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 campus policy that addresses the inappropriate use of alcohol and other drugs.

The University complies with all federal, state, and local laws concerning alcohol and illegal drugs. As a CU-Boulder student, you are responsible for acquainting yourself with the laws and University policies regarding alcohol and illegal drugs. 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 Judicial Affairs; *A Guide to Residence Hall Living*, available at the Department of Housing; and *Ralphie's Guide to Student Life*, distributed to new and continuing students. 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 Judicial Affairs, (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.

### 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 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.

2. 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 seven days preceding the start of the examination period. However,

lab practicums and seminar presentations may be scheduled in that week.

3. 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, and that such an exception for an early or late examination will not prejudice the interests of other students in the course.

4. 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. Students are expected to provide evidence that they have three or more examinations to qualify for exceptions.

5. 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

While the University of Colorado at Boulder is a relatively safe place to be, the campus is not a haven from community problems. The Committee on Personal Safety (COPS), composed of students and representatives from across campus, is taking steps to promote safety issues on campus and striving to make the campus a safe and pleasant place.

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 are located on campus to provide direct access to the police dispatcher. See the University's parking and traffic map in the Parking Services Office or *Ralphie's Guide to Student Life* for exact locations of these phones.

In compliance with the Federal Crime Awareness and Campus Security Act of 1990 and the Higher Education Amendments of 1992, students and employees receive (at the start of the fall semester) information on campus security policies and programs, including crime rate information.

Members of the University community are encouraged to report any incident of threatening or harmful behavior to the administrator closest to the situation and/or the University Police at (303) 492-6666.

Other resources include the Office of Judicial Affairs at (303) 492-5550 and the Ombuds 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, this protective University policy does not preclude disciplinary actions against individuals who are found to have made intentionally false and malicious complaints of sexual harassment.

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 Ombuds 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 on others.

The Boulder Campus Smoking Policy states:

- There shall be no smoking or sale of tobacco products in any Boulder Campus-owned or leased building except as provided below.

- Smoking may be permitted in accordance with the policies of Boulder Campus Housing Administration in buildings providing overnight accommodations.

- Smoking is not permitted in the seating areas of Folsom Stadium and the Mary Rippon Theatre and their contiguous buildings.

- Smoking and the sale of tobacco products may be permitted in designated food-service areas and lounges in accordance with the policies of that facility. Designated smoking areas must be well posted and have adequate ventilation and separation from nonsmokers.

- Smoking may be permitted in laboratories conducting sponsored research on the effects of smoking.

- Smoking areas will be permitted outside of University facilities provided that these areas are located far enough away from doorways, windows, and ventilation systems to prevent smoke from entering enclosed buildings and facilities.

- Signs posted at all building entrances shall state that smoking is prohibited in the building.

- All members of the University community will be responsible for compliance with this policy.

For those employees who may choose to stop smoking, please call the Employee Assistance Program (492-6766) for information on available programs.

For more information on the campus smoking policy, please contact the Office of the Vice Chancellor for Administration.

### Student Conduct

The University of Colorado at Boulder has a code of conduct based on maintaining the general welfare of the University community. The University strives to make the campus community a place of study, work, and residence where everyone is treated with respect and courtesy.

The code of conduct and the operation of the Office of Judicial Affairs adhere to the Boulder campus policy on matters of discrimination. That policy is straightforward: The Boulder campus does not and will not tolerate discrimination of any kind, for any reason, against any member of the University community.

Admission to the University carries with it the expectation that the student will be a responsible member of the campus community. When you enroll in the University as a student, you assume the obligation to observe the standards of conduct.

You must accept responsibility to maintain an atmosphere conducive to education and scholarship by respecting the personal safety and individual rights of all in the University community, by conducting yourself in accordance with accepted standards of social behavior, and by abiding by the regulations of the University and the laws of the city, state, and nation while on University premises.

The University Standards of Conduct that follow clearly state the University's expectations for student behavior. You are expected to become familiar with these standards to fully understand your responsibility as a University community member and to avoid jeopardizing your relationship with the University. You are also expected to participate in conduct proceedings if requested to do so by a University official.

### *Standards of Conduct*

These standards help to promote a safe and civilized campus environment. All students enrolled at CU-Boulder must follow these standards.

If a standard is violated, students may be subject to discipline. An attempt to commit an act prohibited by these rules, or attempts to aid, abet, or incite others to commit acts prohibited by these rules, is subject to discipline and sanction to the same extent as a completed act. In accordance with this responsibility, then, the following acts are prohibited:

1. Interfering with, obstructing, or disrupting:
  - a. a University activity. This includes all normal University activities, such as teaching, research, recreation, meetings, public events, and disciplinary proceedings;
  - b. the freedom of expression and movement of students or other members of the University community and their guests.
2. Interfering with, obstructing, or disrupting police or fire responses. Tampering with, impairing, disabling, or misusing fire protection systems such as fire or smoke detectors, fire extinguishers, sprinklers, or alarms.
3. Failing to comply with the direction of University officials who are performing

their duties. This includes, but is not limited to, requests to present identification.

4. Entering or using a University facility in any way that is unauthorized, illegal, or otherwise prohibited (this includes using University property for any illegal purpose).

5. Violating any federal, state, or local laws while on University premises.

6. Violating any University policy or regulation while on University premises, (e.g. Housing, Recreation Services, and University Memorial Center policies).

7. Forging, altering, or falsifying any documents or records. Use of forged or altered documents is also prohibited, even if someone else made the changes.

8. Stealing, embezzling, or issuing checks to the University with insufficient funds or funds drawn from closed accounts. Possessing property known to be stolen, and taking the property of another person without permission, even if it is meant to be returned, is included.

9. Damaging University property or property belonging to another.

10. Providing false information to University officials or to the Student Conduct Hearing Board.

11. Possessing firearms, explosives, or other dangerous or illegal weapons while on University premises. Only police officers and individuals with written permission from the chief of police or from the chancellor after consultation with the chief of police can possess weapons on campus.

A harmless instrument designed to look like a firearm, explosive, or dangerous weapon that is used by or is in the possession of a person with the intent to cause fear in or assault to another person is expressly included within the meaning of a firearm, explosive, or dangerous weapon.

The minimum disciplinary sanction shall be expulsion in the case of a student who is found guilty via a due-process procedure to have intentionally or recklessly used or possessed such weapon(s) in a way that would intimidate, harass, injure, or otherwise interfere with the learning and working environment of the University.

12. Harassing another person. This includes but is not limited to stalking, plac-

ing other people in fear of their personal safety through words or actions, or interfering with the working, learning, or living environment of a person.

13. Assaulting or physically abusing, threatening, or endangering the health or safety of another person.

14. Sexually assaulting or inflicting unwanted sexual contact upon another person. Conduct will be considered "without consent" if no clear consent is given; if inflicted through force, threat of force, or coercion; or when inflicted upon a person who is unconscious or who is otherwise without the physical or mental capacity to consent.

15. Possessing, using, manufacturing, distributing, or selling alcoholic beverages on University premises in violation of the law or University policies.

16. Possessing, using, manufacturing, distributing, or selling illegal drugs.

17. Failing to abide by or complete in a satisfactory manner a University sanction.

18. Misuse of computer facilities and/or systems, including but not limited to the following acts:

- a. unauthorized use of a terminal, file, password, or account;
- b. attempts to degrade system performance or capability;
- c. breach of computer security;
- d. abuse of communal resources (e.g. unauthorized batch programs);
- e. misappropriation of intellectual property or licensed software;
- f. invasion of privacy;
- g. harassment or threats.

19. Hazing. Any action or situation which recklessly or intentionally endangers the health, safety, or welfare of an individual for the purpose of initiation, admission into, or affiliation with any organization at the University. Hazing includes any abuse of a mental or physical nature; forced consumption of any food, liquor, drugs, or substances; or any forced physical activity which could adversely affect the health or safety of the individual.

Hazing also includes any activity which would subject the individual to embarrassment or humiliation, the willingness of the participant in such activity notwithstanding.



*Students in the College of Architecture and Planning participate in project critique sessions. In this photo, world-famous architect Lebbeus Woods, seated at left, agreed to sit on the committee that evaluated one student's final project.*



# COLLEGE OF ARCHITECTURE AND PLANNING

PATRICIA O'LEARY, DEAN

The College of Architecture and Planning at the University of Colorado (at both the Boulder and Denver campuses) prepares students for careers in architecture, planning, landscape architecture, urban design, and other design and planning-related fields. The college offers the only undergraduate and graduate education in these fields in the state of Colorado. Students intending to enter these design and planning professions normally first complete the college's undergraduate degree at CU-Boulder as preparation for entry into the college's graduate-level professional programs at CU-Denver. Graduate programs are also available for those who already hold an undergraduate degree in a field unrelated to design and planning.

The College of Architecture and Planning is unique in that it offers its 900 students exceptional educational experiences in two distinctive and different locations. The college's undergraduate program is offered on the Boulder campus in an environment ideally suited to the needs of undergraduate students, and the graduate programs in architecture, landscape architecture, urban design, and urban and regional planning are taught on the Denver campus in the heart of a vital downtown. With a diverse faculty committed to excellence in teaching, research, scholarship, and professional work, the college provides students with a broad range of learning opportunities. For detailed information on the college's graduate programs, see the University of Colorado at Denver catalog.

## Undergraduate Programs

Study at the undergraduate level leads to the bachelor of environmental design (B.Envd.) degree as preparation for entry into graduate and professional degree programs.

At the undergraduate level, 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, architecture and planning 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 actively integrate and synthesize knowledge gained in studio and related lecture courses.

The college 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 the college's programs in 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 a model shop with a variety of power tools for student use 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*

According to the National Architectural Accrediting Board, which is responsible for accreditation of all architecture programs in the United States, "Most states require that an individual intending to become an architect hold an accredited degree. There are two types of degrees that are accredited by the National Architectural Accrediting Board: (1) The Bachelor of Architecture, which requires a minimum of five years of study, and (2) the Master of Architecture, which requires a minimum of three years of study following an unrelated bachelor's degree or two years following a related preprofessional

bachelor's degree. These professional degrees are structured to educate those who aspire to registration and licensure to practice as architects. The four-year preprofessional degree, where offered, is not accredited by NAAB. The preprofessional degree is useful to those wishing a foundation in the field of architecture, as preparation for either continued education in a professional degree program or for employment options in fields related to architecture."

The College of Architecture and Planning at the University of Colorado offers the four-year preprofessional Bachelor of Environmental Design (B.Envd.) degree at its Boulder site and the NAAB-accredited Master of Architecture (M.A.) on its Denver site.

The B.Envd. alone is not accepted as sufficient education to become a licensed architect in most 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 reciprocally licensed in additional states.

**Graduate Study in Denver.** Students from the undergraduate architecture program who choose to continue their studies in the graduate professional architecture program in Denver are given advanced standing when they are accepted into the program. The amount of advanced standing received is directly related to the specific course work completed in the undergraduate program. Copies of the policies relating to advanced standing, together with a listing of those courses for which advanced standing is automatically granted, are available in the college office. Typically, architecture students who continue in the graduate architecture program receive between 39 and 48 semester credits of advanced standing, and complete their graduate studies in two years.

**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 should receive approximately two semesters 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 16 areas 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.

**Graduate Study in Denver.** Students from the undergraduate program who continue their studies in the graduate professional planning program in Denver are given advanced standing when accepted into the program. Copies of the policies relating to advanced standing are available in the college office. Though the amount of advanced standing received is directly related to the specific course work completed in the undergraduate program, undergraduate planning students who continue in the graduate planning program typically receive between 36 and 42 semester hours of credit, and complete their graduate studies in approximately three semesters.

### *Design Studies*

Students who do not wish to enter the options in architecture or planning, but who are nonetheless interested in issues concerning the built environment, may pursue the

design studies option. Students may use this option to broaden their undergraduate program, integrating several related disciplines. There is an increasing demand in the design, construction, and management industries for people who combine an understanding of design with a specialized understanding of related fields like computing, management, finance, or marketing. Some students may use it as general preparation for graduate study in any number of academic fields that also are concerned with the design and planning of the built environment, including anthropology, geography, sociology, psychology, historic preservation, and architectural history. Other students may use this option to prepare for further graduate study in a professional field related to architecture and planning, including business, law, journalism, public administration, or landscape architecture.

As the design studies curriculum is individually tailored to each student, students in this option must outline and receive approval of their individual course plan by a faculty sponsor and the appropriate academic administrator before entering the design studies option. Participants in this option will be expected to attain a competent level of understanding and skill in either architecture or planning. Additionally, they will be expected to attain a high level of understanding and skill in one specialized aspect of these fields. Such specializations might include computer applications, resource management, housing policy, environmental psychology, history of architecture, or building systems analysis. In support of their specialization, students will further be expected to attain a competent level of understanding of a relevant cognate field outside the college (e.g., anthropology, civil engineering, business, or fine arts).

Students in the design studies option take core courses within the college and general requirements outside the college in parallel with the architecture and planning emphases. Additionally, design studies students must complete foreign language courses through level 3 (third-year level in high school, or third-semester at the college level). With approval of their faculty sponsor, students may substitute computer programming languages for the foreign language requirement. A minimum of 30 hours of course work must be completed after official approval of entry into the design studies option, and this 30-hour residency requirement in this option will not be waived under any circumstances.

### *Landscape Architecture*

Though the College of Architecture and Planning does not offer a separate option in

landscape architecture at the undergraduate level, a graduate professional degree (the master of landscape architecture or M.L.A.) is offered by the college on the Denver campus of the University of Colorado. Undergraduates may complete one of the undergraduate options in architecture, planning, or design studies as preparation for entry into the Denver campus M.L.A. program or other graduate-level landscape architecture programs offered elsewhere.

### *Study Abroad*

The College of Architecture and Planning and the Office of International Education urge design students to participate in one of the various study abroad programs offered for University credit.

Each summer, faculty of the college offer course work abroad through the University of Colorado at Denver campus. In recent years, sites have included Prague, Rome, Helsinki, Paris, and St. Petersburg. These studio-based courses offer students an opportunity to study the process of design in another culture and to examine their own perceptions and attitudes toward design.

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 and study opportunities in other European nations, including the former Soviet Union. For more information about these programs, contact the University of Colorado at Boulder, Office of International Education, Campus Box 123, Boulder, CO, 80309-0123, (303) 492-6016.

### *College Lecture Series*

The college's lecture series enables students and faculty to meet people whose work significantly contributes to the design and planning fields. All students registered in the College of Architecture and Planning 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 AIA (American Institute of Architects) Denver and AIA Colorado present 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 Architecture and Planning 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. Honors will be based on course work completed at the University of Colorado.

### Scholarships, Loans, Awards, and Prizes

Several scholarships are awarded upon recommendation of the faculty of the college. In 1961, the Educational Fund of AIA Colorado 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 AIA Colorado, forms the board of directors of the fund. This board has granted scholarships annually to students and alumni of the College of Architecture and Planning.

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. Architecture and planning students may apply for the 1998 and 2000 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

### Student Rights and Responsibilities

The College of Architecture and Planning is part of an academic community whose mission requires an open learning and working environment for students, faculty, staff, and administrators. An open learning and working environment values and protects individual dignity and the integrity of human relationships, and is based upon mutual trust, freedom of inquiry, freedom of expression, and the absence of intimidation and exploitation. Any infringement upon these freedoms and rights may be cause for review by the college or by other university offices. Students in both graduate and undergraduate programs of the College of Architecture and Planning are subject to the policies and procedures governing student rights and responsibilities on the CU-Denver campus. Please refer to the CU-Denver

catalog for explicit policies governing issues of sexual harassment and for the full code of student conduct.

### 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 that may lead to suspension or expulsion. Any reported act of academic dishonesty may be referred by faculty to a college committee for study and disciplinary decision. Students in either the college's undergraduate or graduate program are subject to the CU-Denver academic honor code and discipline policies (for details, refer to the CU-Denver catalog).

### Grade Point Average Requirements and Scholastic Suspension

A student must achieve a grade of *C-* or better in all courses applied toward 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 college.

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 college 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.

## ADMISSION AND ENROLLMENT POLICIES

### Requirements for Admission

Candidates for regular admission to the College of Architecture and Planning are expected to meet the general requirements for admission to the University. Please see Undergraduate Admission in the General Information chapter of this catalog for specific requirements.

### Transfer Students

Qualified students transferring from other institutions will be accepted into the College of Architecture and Planning. 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 Architecture and Planning has a limited enrollment, all qualified students are not guaranteed admission. 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.

Normally, students should transfer by the beginning of the second year of college-level work, as the College of Architecture and Planning requires approximately three years of design and/or planning related course work. All transfer students will be required to take a minimum of 30 semester hours in the College of Architecture and Planning. Transfer students are admitted for the fall, spring, and summer terms 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. Transfer agreements between the University of Colorado and all Colorado community colleges outline approximately one year of prescribed general education courses that may be completed as preparation for transfer into the College of Architecture and Planning. As noted above, students should plan to transfer to the University of Colorado by

the beginning of their sophomore year. See Undergraduate Admission in the General Information chapter of this catalog for admission standards for transfer students.

### 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) must, at minimum, have completed or be enrolled in the introductory media course, ENVD 1002. 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 sole determinant, and interested students in good academic standing 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 will be held for additional review 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 college office 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. Granted college credit is treated as transfer credit without a grade, but will count toward graduation and meet other specific requirements for which it is appropriate.

#### Denver Campus Credits

Students in residence on the Boulder campus in the College of Architecture and Planning 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 Architecture and Planning does not give incomplete grades except in cases of extreme emergency. By petition of the instructor, a grade of *IF* may be granted.

### Independent Study

Ordinarily, only 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 the work 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 department chair 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. Credits earned as a teaching assistant, research assistant, or intern are not subject to the 6 credit-hour limitation on independent study credit. Teaching assistantships and internships are offered on a pass/fail basis only.

### Pass/Fail Credits

A student may choose to take up to 15 semester hours toward the B.Envd. degree on a pass/fail basis, but these credits must fall in the category of general electives. Courses that meet requirements or categories of required electives may not be taken on a pass/fail basis. No more than 6 credit hours (or two courses) may be taken pass/fail during a single semester.

### Repeated Courses

Students should confer with the college's academic advisor regarding specific academic standards for repeating laboratory, studio, and other undergraduate courses. Credits for repeated courses are not counted toward the 128 semester hours needed for graduation.

### ROTC Credit

Students matriculating in the College of Architecture and Planning 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 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.

### 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 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 CU grade point average.

For more information on transfer credit policies, see Transfer of College-Level Credit on page 12.

### Residence Requirement

A student must complete 30 course credits within the major from the College of Architecture and Planning and be in residence as a full-time student for the last semester of the senior year.

### Retention of Student Work

The College of Architecture and Planning 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 presentations 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 Architecture and Planning

The following areas of knowledge are central to the undergraduate programs in architecture and planning:

- 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 design and planning, including those of the related professional fields 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 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 the B.Envd. degree 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 architecture and planning professionals.

### Advising

Academic advising for students presently enrolled or anticipating enrollment in the college's undergraduate program is provided in a variety of forms. High school students

or prospective transfer students from other universities are encouraged to participate in the "Be a CU Student for a Day" or other visitation programs co-sponsored by the college and the CU-Boulder Office of Admissions. Further information on campus visitation programs may be obtained by contacting the Office of Admissions at 492-6301.

Students already enrolled in Boulder campus programs who are interested in intrauniversity transfer (IUT) into the College of Architecture and Planning should contact the college office at (303) 492-7711 for group meeting times focusing on the IUT transfer process.

Students enrolled in the college's undergraduate programs receive academic advising from faculty or professional staff in the college. Information on appointments and open office hours for advising is available at the college office, ENVD 168, or by calling (303) 492-7711.

### Orientation

In order to receive an overview of educational opportunities and the philosophy of 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.

### Curriculum

By the end of their first year, students in the College of Architecture and Planning must choose to emphasize either architecture, planning, or design studies. Each option is designed to prepare students for graduate studies.

All students in the college must take certain core courses common to architecture, planning, and design studies. These include an introductory survey course, a design studio, a graphics course, 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 Degree Requirements

Students must complete a minimum of 128 semester hours, subject to the maxima outlined in this document, and maintain a GPA of 2.00 or better. Students must complete one course from each subject area.

#### Writing

UWRP 1150 .....3  
Students must also demonstrate advanced-level writing skills. If they cannot, they may be required to complete additional course work.

**Social Science**

ANTH 1030, 1040, 2100, 2200; ECON 2010, 2020; GEOG 1982, 1992; HIST 1010, 1015, 1020, 1025, 1030, 1035, 1038, 1040, 1045, 1051, 1061, 1113, 1123, 2117, 2170, 2180, 2437, 2537; PSCI 1101, 2012, 2101; PSYC 1001; SOCY 1001, 1002, 1031, 2011, 2041; WMST 2000 .....3

**Humanities**

CHST 1031; ENGL 1200, 1260, 1300, 1400, 1500, 1600, 2260, 2600, 2610; FINE 1309, 1409, 2409; HUMN 1010, 1020; PHIL 1000, 1100, 1200, 1400, 1440, 1600, 1700, 1750 .....3

**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 this option as a foundation for graduate work.

**General Education Requirements** .....9  
(see Writing, Social Science, and Humanities under the general degree requirements section.)

**Math**

MATH 1300 .....5

**Natural Science**

PHYS 2010 (includes lab) .....5

**Studios**

ENVD 2000 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

**Methods**

ENVD 1002 Environmental Design Media (Note 1) .....4  
ENVD 3002 Design Theory and Methods .....4  
ENVD 3112 Research Issues and Programming for Architecture .....3

**History and Theory**

ENVD 1014 Introduction to Environmental Design (Note 1) .....3  
ARCH 3114 History and Theories of Architecture 1 .....3  
ARCH 3214 History and Theories of Architecture 2 .....3

**Social Factors**

ENVD 2001 Introduction to Social Factors in Environmental Design (Note 1) .....3  
ENVD 3001 Environment and Behavior (Note 1) .....3

**Physical Factors**

ENVD 2003 Ecology and Design (Note 1) .....3

**Technology and Practice**

ENVD 3115 Introduction to Building Materials and Systems .....3  
AREN 3050 Environmental Systems 1 .....3  
AREN 3060 Environmental Systems 2 .....3  
AREN 4035 Structures 1 .....3  
AREN 4045 Structures 2 .....3

**Electives** .....35

At least 12 credits must be taken within the College of Architecture and Planning, and at least 9 credits must be taken from other University offerings. The remaining credits may be taken from either category. Three of the elective courses with the college must be chosen from separate categories (i.e., design, methods, history, social factors, physical factors, and technology).

**Curriculum Note**

1. Curriculum core course that must be taken by all students in the College of Architecture and Planning, 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. It is expected that most students will continue on for a master's degree in planning, urban design, geography, law, or public administration.

**General Education Requirements** .....9  
(see Writing, Social Science, and Humanities under the general degree requirements section.)

**Math** (complete one of the following)

MATH 2510; OPMG 2010; PSYC 2101; SOCY 3061; ECON 3818; GEOG 3023 .....3-4

**Natural Science** (complete one of the following)

EPOB 1030 plus 1050; EPOB 1210 plus 1230; EPOB 3040; CHEM 1111; PHYS 2010 .....4-6

**Studios**

ENVD 2000 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

**Methods**

ENVD 1002 Environmental Design Media (Note 1) .....4  
ENVD 3122 Research Issues and Methods for Planning .....3

**History and Theory**

ENVD 1014 Introduction to Environmental Design (Note 1) .....3  
ENVD 4794 History of Urban Design and Planning .....3  
ENVD 4824 Senior Planning Seminar .....3

**Social Factors**

ENVD 2001 Introduction to Social Factors in Environmental Design (Note 1) .....3  
ENVD 3001 Environment and Behavior (Note 1) .....3  
ENVD 4311 Housing Policies and Practices .....3

plus three upper-division courses from any of the following arts and sciences areas: economics, human and cultural geography (GEOG xxx2), 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 (GEOG xxx1), or geographic technique (GEOG xxx3) .....6

**Electives** .....37-40

At least 9 credits must be taken from within the College of Architecture and Planning, 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 that must be taken by all students in the College of Architecture and Planning, regardless of option area.

**Design Studies Option**

The design studies option is intended for those students who do not wish to pursue a professional career in architecture or planning, but who are interested in issues concerning the built environment. Students in this option will be expected to attain a moderate level of understanding and skill in either the architecture or planning field. In addition, they will be expected to attain a high level of understanding and skill in one specialized aspect of these fields, and a moderate level of understanding in a cognate discipline outside the college.

A minimum of 30 semester credit hours must be completed after official approval of entry into the design studies option.

**General Education Requirements** .....9  
(see Writing, Social Science, and Humanities under the general degree requirements section.)

**Foreign Language**

Complete any level 3 course in a foreign language (Note 2) .....0-15  
(Hours may be applied to required electives outside the college, as noted below.)

**Math** (complete one of the following)

MATH 1300; MATH 2510; OPMG 2010; PSYC 2101; SOCY 3061; ECON 3818; GEOG 3023 .....3-5

**Natural Science** (complete one of the following)

EPOB 1030 plus 1050; EPOB 1210 plus 1230; EPOB 3040; CHEM 1111; PHYS 2010 .....4-6

**Studios**

ENVD 2000 Environmental Design Studio (Note 1) .....6  
complete one of the following pairs:  
ENVD 2110 Architectural Studio 1 .....6  
ENVD 3210 Architectural Studio 2 .....6  
or  
ENVD 2120 Planning Studio 1 .....6  
ENVD 3220 Planning Studio 2 .....6

**Methods**

ENVD 1002 Environmental Design Media (Note 1) .....4  
ENVD 3002 Design Theory and Methods .....4

**History and Theory**

ENVD 1014 Introduction to Environmental Design (Note 1).....	3
Complete the following course: ENVD 4794 History of Urban Design and Planning.....	3
or the following pair of courses: ARCH 3114 History and Theories of Architecture 1.....	3
ARCH 3214 History and Theories of Architecture 2.....	3

**Social Factors**

ENVD 2001 Introduction to Social Factors in Environmental Design (Note 1).....	3
ENVD 3001 Environment and Behavior (Note 1).....	3

**Physical Factors**

ENVD 2003 Ecology and Design (Note 1).....	3
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**Electives.....64-71**

Electives must be approved by the student's faculty sponsor and the director of the undergraduate program. At least 24 credits must be taken within the College of Architecture and Planning; of which at least three courses must be chosen from separate categories (i.e., design, methods, history, social factors, physical factors, and technology). At least 30 credits (inclusive of hours meeting the foreign language requirement) must be taken from outside the College of Architecture and Planning. Elective hours beyond these specified 54 may be taken either within or outside the college.

**Curriculum Note**

1. Curriculum core course that must be taken by all students in the College of Architecture and Planning, regardless of option area.
2. Completion of three years in a single foreign language in high school will meet this requirement. Alternatively, with approval of the student's faculty sponsor, students may substitute course work in computer programming languages.

**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 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 undergraduate students must complete the general education requirements and the requirements for their specific option area within the College of Architecture and Planning 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 Architecture and Planning 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 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 2000-6. Environmental Design Studio.** Required introductory design studio. Examines a range of architectural and planning problems; presents basics of 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 1002 and 2000.

**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 1002 and 2000.

**ENVD 3210-6. Architecture Studio 2.** See ENVD 2110. Prereq., ENVD 2110.

**ENVD 3220-6. Planning Studio 2.** See ENVD 2120. Prereq., ENVD 2120.

**ENVD 3320-2. Planning Practicum.** Supervised practicum in some aspect of urban or regional planning. Prereq., ENVD 3220.

**ENVD 4300-1-6. Special Topics: Design.** Advanced studio or seminar course exploring new and emerging themes in design. May be repeated for credit by petition. Prereq., instructor consent.

**ENVD 4310-6. Architecture Studio 3.** See ENVD 2110. Prereq., ENVD 3210.

**ENVD 4320-6. Planning Studio 3.** See ENVD 2120. Prereq., ENVD 3220.

**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. Prereq., ENVD 4310.

**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 3001-3. 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 4031-3. Thinking Like a Mountain: A New Land Ethic.** Critical review and analysis of land use policies, the ethics and economics of air and water pollution, regional sustainability, and resource management. Includes critical evaluation of empirical methodologies, and criteria of cultural and social equity. Prereqs., junior or senior standing in the college.

**ENVD 4311-3. 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. Prereq., ENVD 2001 and 3091.

**ENVD 4361-1-6. 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. May be repeated for credit by petition.

#### *Methods and Techniques*

**ENVD 1002-4. 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.

**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 transferable 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 3022-3. Technical Photography.** 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 1002.

**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 1002, 2003, 3001, and 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 1002.

**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 1002.

**ENVD 4122-3. 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 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 1002.

**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 4322-1-6. Special Topics: Graphics.** Advanced seminar on special issues in design communications. Open to nonmajors. May be repeated for credit by petition. Prereq., upper-division standing.

**ENVD 4352-1-6. Special Topics: Computer Methods.** Topics include animation and environmental simulation, computational methods

of technical evaluation and optimization, and computational mapping and analysis. May be repeated for credit by petition.

#### *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 4363-1-6. 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. May be repeated for credit by petition. 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 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 4364-1-6. 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 4764-1-6. 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 nineteenth and twentieth 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 and 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.

**ENVD 4365 (1-6). Special Topics: Technology and Practice.** Advanced seminar on new technologies and issues of professional practice in the environmental design professions. May be repeated for credit by petition.

**Miscellaneous**

**ENVD 3909 (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. Available for pass/fail credit only.

**ENVD 4909 (1-6). Independent Study.** 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. Available for pass/fail credit only.

**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. Available for pass/fail credit only.

**FACULTY**

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**WILLEM K. T. VAN VLIET,** Professor. Doctorandus, Free University of Amsterdam; Ph.D. (Urban Sociology/Planning), University of Toronto.

**DIANE WILK,** Associate Professor. B.S., University of Southern California; M.Arch., Yale.

**PING XU,** Assistant Professor. B.A., M.A. (Architecture), Tsinghua University (PRC); M.L.A., University of Pennsylvania; D.D. (Landscape Architecture and Planning), Harvard.

COLLEGE OF ARTS AND SCIENCES

*Students in the College of Arts and Sciences study a wide range of subjects from the sciences to the fine arts, so that they may leave the University with a broad base of knowledge.*



# COLLEGE OF ARTS AND SCIENCES

PETER D. SPEAR, 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 a 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, the core curriculum, 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.

## PROGRAMS OF SPECIAL INTEREST

### Fall Freshman Experience Success Teams

The College of Arts and Sciences, along with the First-Year Experience Program, sponsors the Fall Freshman Experience Success Teams (FallFEST). Designed for incoming freshman students, this program brings together sets of two to four courses that have a common theme or focus to form a single FEST. The themes range from Western Civilization to Global Change to Analytical Reasoning. Most of the courses that form the groupings meet either core curriculum or major requirements. Groups of 18 to 25 freshman students

are registered for all the courses of a FEST as a block. In addition to the course work, these same students participate in an accompanying workshop that deals with a variety of topics and issues ranging from academic skills to student social life. These noncredit workshops are led by a trained undergraduate arts and sciences peer advisor with participation by staff and faculty mentors.

The intent behind each FEST is to ease the decision-making process of what courses to take; by choosing a FEST of interest, students are also well on their way toward constructing a fundamentally sound first-semester schedule. Also, by having groups of students taking courses and the FEST workshops in common, a starting point is established for the formation of study groups.

### Minority Arts and Sciences Program

The Minority Arts and Sciences Program (MASP) is an academic excellence program designed to assist students toward successful matriculation in the University of Colorado College of Arts and Sciences, with emphasis on study leading to a bachelor of arts degree in chemistry; biochemistry; environmental, population, and organismic biology; molecular, cellular, and developmental biology; kinesiology; physics; mathematics; or applied mathematics.

A large number of mathematics and science professions include a small percentage of minorities. MASP is designed to increase the number of underrepresented students of color who graduate in such fields with the necessary skills to advance in science-oriented careers.

MASP helps facilitate the often difficult transition from high school to the college learning environment. It provides a personally supportive community and intense academic instruction, and helps develop a strong sense of group cohesiveness and spirit.

MASP provides scholarships to promising students from underrepresented groups. Grade point average (GPA) and other academic indicators assist in determining scholarship amounts. MASP also provides academic advising and clustering, academic excellence workshops, a Summer Bridge Program for new freshman students, self-management and leadership workshops, and a MASP networking and study center.

### Honors Program

The Honors Program is designed to provide special educational opportunities for highly motivated students. It is open to well-prepared freshmen, as well as sophomores and upper-division students. The Honors Program offers a guide to a curriculum in the liberal arts, thoughtful advising, close contact with faculty and other honors students, and an opportunity to write an honors thesis. Each year over 50 honors courses are offered in a wide variety of areas; with one or two exceptions, each course is limited to an enrollment of approximately 15 students.

Faculty members teaching honors seminars are carefully selected for special interests and enthusiasm, teaching excellence in small discussion classes, and insistence on high academic standards. Honors seminars are designed for the student who welcomes challenge, who knows that the mind expands only with effort, and who actively seeks academic and intellectual challenges. Honors courses encourage students to combine and synthesize concepts and methodologies from other courses and disciplines. Many honors courses are consciously interdisciplinary, but all encourage students to read widely and think critically.

The honors council, consisting of faculty from all participating academic departments, is responsible for deciding 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.

Students may graduate with 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. All departments require an honors thesis. Each department has information pertaining to its own particular program. Students who pursue general honors must have a cumulative GPA of 3.50 or higher, have completed 12 credit hours of required honors courses, and have written a thesis on an interdisciplinary topic.

Kittredge Honors Program (KHP) is the optional residential component of the pro-

gram. KHP, open to a limited number of qualified entering first-year students, consists of small classes offered in the Kittredge residence hall as well as opportunities to participate in extracurricular activities. There is an additional charge for the Kittredge Honors Program.

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.

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 GPA 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.

## 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 first-year 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. Because helping others has such a beneficial effect on the community both inside and outside Farrand, service learning is emphasized. Service-learning classes give students the chance to apply what they study to the world beyond the classroom—in a homeless shelter, a humane society, or a tutoring program, for instance—in ways that expand academic learning as well as volunteer experience. These classes include Gandhian Philosophy; Social Conflict and Social Values; Sex, Gender, and Society; and Writing

in Arts and Sciences. The Farrand curriculum also offers a wide range of popular core curriculum classes taught by award-winning faculty. Introduction to the Humanities, an integrated survey of western art and culture; American Political System; Film and the Quest for Truth; and Biology: A Human Approach are just a few examples.

Farrand also provides the chance to participate in many student-sponsored activities, such as an unusually active student governing board, the Farrand Improv nights (amateur talent shows), diversity dinners, dramas put on by the Farrand Players, and special film and lecture series. One-credit-hour classes provide a context for small-group discussion of contemporary issues as well.

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

The program is sponsored jointly by the College of Arts and Sciences and the Department of Housing and is designed primarily for students in arts and sciences. It is administered by academic directors 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 University of Colorado at Boulder, Farrand Residential Academic Program, Campus Box 180, Boulder, CO 80310-0180, (303) 492-8848.

### Kittredge Honors Program

The Kittredge community is home to the Kittredge Honors Program (KHP). This residential academic honors program brings in 125 high-ability students as integral members of the Kittredge complex. Members of KHP live in Buckingham and Arnett, two adjacent buildings in the Kittredge Complex.

The Kittredge Honors Program seeks to build a program based both on academics and community. Each semester KHP offers a selection of honors courses in the residence hall that satisfy arts and sciences core curriculum requirements. Students are required to take at least one of these courses each semester. Honors courses are limited to 15 students and faculty pursue a discussion and writing based approach to teaching.

KHP strives to combine the academic and social aspects of the college experience. KHP sponsors evening activities once a week to

meet this goal. A monthly lecture series provides students with an opportunity to gain exposure to some of the great teachers and researchers in the University community. Social events are sponsored in order to create community.

The program is sponsored by the College of Arts and Sciences, the Honors Program, and the Department of Housing. Students in KHP may draw on the resources of the Honors Program for advising and information. The director of KHP is available in the KHP office in Buckingham Hall for academic advising and as a liaison to the rest of the campus.

Students who are invited into the Arts and Sciences Honors Program may choose this residential component on a space available basis. The Honors Program invites students to participate in honors based on high school GPA, class rank, and test scores. To remain eligible for honors courses (including those in KHP) students must maintain a University of Colorado GPA of 3.30 or above.

Initial invitations are issued beginning in mid-February. Final decisions on KHP participation are made by May 1. Students who have questions about the program should address them to the University of Colorado at Boulder, KHP Director, Honors Program, Campus Box 184, Boulder, Colorado 80309-0184, (303) 492-3695.

### Sewall Residential Academic Program

The Sewall Residential Academic Program in American Culture and Society provides freshmen and sophomores with the opportunity to participate in a unique residential community experience at the University of Colorado at Boulder. Limited to 330 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 2010 (Themes in American Culture). The core American studies courses are historically oriented and focus on the diverse groups—African Americans, Asian Americans, European Americans, Latinos, Native Americans, and others—whose experiences have shaped the political, social, and cultural landscape of the United States.

The program offers courses taught by psychologists, sociologists, and legal and literary scholars whose work addresses American society. Classes are usually lim-



ited to 20 students, carry 3 semester hours of credit, count toward a degree, and many 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 and assistant director of the Sewall Residential Academic Program, who are members of the University faculty, provide academic assistance to the students in planning their individual programs, choosing courses, and making contact with their major departments. The director and assistant director also offer personal counseling and guide students to find the proper University resources.

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.

Interested freshmen and sophomores should indicate Sewall Hall as their first choice on the housing application form and return it to the Housing Reservation Center as early as possible. Students are admitted on a first-come, first-served basis, determined by date of receipt of the housing application form. Students with a serious interest in American culture and society and who want a liberal arts education are encouraged to apply. There is an extra charge for participation in the program in addition to regular tuition, fees, room, and board. Some scholarships are available to students enrolled in the College of Arts and Sciences.

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

### Williams Village Residential Academic Program

The Williams Village Residential Academic Program (WRAP) is designed primarily for freshman and sophomore students who are interested in environmental studies, environmental sciences, or an environmental subdiscipline in areas such as business, law, planning, journalism, or education. The program also provides an array of courses

that satisfy various core curriculum requirements in the College of Arts and Sciences and in the interdisciplinary Environmental Studies major.

Some of the most important applications of an environmental education are in natural resource management, business, and domestic and international policy, involving issues such as the conservation of biodiversity; management of air, water, soil and mineral resources; control of pollution; and achievement of sustainable economic development. An understanding of environmental issues will be a very important element of citizenship in the twenty-first century and growing concern with many complex environmental problems will continue to create new career opportunities.

WRAP provides students with many of the benefits of a small liberal arts college within a major research university. The program offers small classes taught at Williams Village, academic advising, career counseling, student internships, guest speakers, field trips, and close faculty contact. WRAP freshmen live at Williams Village. Although other WRAP students are encouraged to live at Williams Village, they may live in any CU-Boulder residence hall.

WRAP courses include two-semester sequences of both introductory biology and global change. The first sequence is a full survey of biological science, with an emphasis on environmental applications. The global change sequence focuses on air, water, and geology, while still emphasizing environmental applications. WRAP also offers an introductory two-semester sequence of biology for nonscience major that emphasizes human applications, including those relating to people and the environment.

WRAP provides introductory courses in geography, economics, mathematics, and expository writing that satisfy College of Arts and Sciences core curriculum requirements in the interdisciplinary Environmental Studies major and in the Departments of Environmental, Population, and Organismic Biology, Geological Sciences, Geography, Chemistry and Biochemistry, Economics, Kinesiology, and Psychology. Upper-division courses are presented in ecology, environmental economics, environmental policy, independent study, and independent research. Students usually take two to three of the above courses per semester and also enroll in other courses outside of the program to meet the typical university load of approximately five courses per semester. WRAP also reserves seats for its students in certain high-demand courses taught outside the program, including introductory biology laborato-

ries, introductory chemistry lectures and laboratories, and tropical field biology.

A fee is charged for participation in WRAP, in addition to regular charges for tuition, fees, room and board. A limited number of merit-based scholarships are available at the start of each spring semester. Student eligible for financial aid may request that the WRAP fee be added to their financial aid packages. Students interested in the program should write to the Williams Village Residential Academic Program, Campus Box 452, Boulder, CO 80310-0452, or call (303) 492-3188.

## ACADEMIC EXCELLENCE

### Dean's List

Students in the College of Arts and Sciences who have completed at least 12 semester hours of CU-Boulder 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 Old Main, and receive a notation on their transcript.

### 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, including the quality of original scholarly work. 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 at least 30 semester hours completed at the University of Colorado at Boulder, have a grade point average of 3.75 or higher for all course work completed at the University of Colorado, and have a cumulative grade point average of 3.75 or higher for all college course work completed. 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

### Good Academic Standing

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 system are used in determining a student's scholastic standing and progress toward the degree in the College of Arts and Sciences.

### Probation

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 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 latter 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.

### Academic Ethics

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 faculty member at the University of Colorado. Cheating; plagiarism; illegal possession and distribution of examinations or answers to specific questions; alterations, 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 that may lead to suspension or expulsion. Reported acts of academic dishonesty may be referred to the Arts and Sciences Academic Ethics Committee. The policy document describing this committee's procedures is available in the Arts and Sciences Student Academic Affairs Office.

### Appeals and Petitions

Students have the right to appeal accusations of academic dishonesty. These appeals should be directed to the Committee on Academic Ethics.

Petitions for exceptions to the academic policies stated in this catalog should be submitted to the Appeals Committee on Academic Rules and Policies. Both committees are located in the Office of the Associate Dean for Student Academic Affairs.

## GENERAL CREDIT AND ENROLLMENT POLICIES

Students are required to follow the graduation requirements listed in the catalog at the time of their initial entry into the College of Arts and Sciences. Students who attended a Colorado community college must follow the requirements in the transfer guide in effect during the time of their enrollment in the community college.

### 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 exami-

nation is given. Failure to do so may result in receipt of an *F* in the course.

### Credit Policies

#### *Advanced Placement Program*

See Undergraduate Admission in the General Information chapter 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 (see Undergraduate Admission on page 13 for subjects accepted). 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 Career Services, (303) 492-5854.

#### *Cooperative Education/Internships*

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 or Career Services for information regarding the possibility of enrolling in a cooperative education program in their major. Many internships are graded on a pass/fail basis only. Participation in an internship with mandatory pass/fail grading does not affect the total semester hours of pass/fail a student may apply toward a degree. Some departments further restrict the use of internship credit.

#### *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.

#### *Credit/No Credit*

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

#### *Credit Taken as a Nondegree Student*

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. Students should



consult with an advisor in the dean's office once they have been accepted to a degree program in the College of Arts and Sciences.

### *Credit Taken Outside the College of Arts and Sciences*

Students may count a total of 30 semester hours from the other colleges and schools at CU-Boulder as well as specified ROTC and President's Leadership Class 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. Transferred courses that were taught by departments considered to be outside the College of Arts and Sciences will be counted as part of the allowed 30 hours. If a course has been approved to meet a core curriculum requirement and the course is taught outside the College of Arts and Sciences, the credit for this course will not be included as part of the 30 semester hour limitation.

### *Cross-Listed Courses*

Courses that are cross-listed in two or more departments are credited in the department in which the student has the most semester hours, irrespective of the department in which the student formally enrolled for the course.

### *Foreign Language Courses*

Once a student passes a college-level foreign language course, that student cannot receive credit toward the degree for a course at a lower level in the same language.

### *Independent Study*

With departmental approval, students may register for independent study during the normal registration 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 credit hours of independent study, taken in a single department or program can be applied toward the total hours needed for graduation. A maximum of 16 hours of independent study may count toward the degree. The minimum expectation for each semester hour of credit is 25 hours of work.

A student may not use independent study projects to fulfill the college's general education requirements. Some departments further restrict the use of independent study hours.

### *Maximum Allowed Hours from any One Department*

Normally, no student may apply more than 45 hours in one department toward graduation. Exceptions are:

a. Students 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.

### *Pass/Fail<sup>a</sup>*

Students in the College of Arts and Sciences may not use the pass/fail option for courses taken to fulfill general education requirements, courses used to satisfy the foreign language requirement, courses used to fulfill the Minimum Academic Preparation Standards (MAPS), or courses used to complete the minimum requirements for the major.

Students may take elective courses pass/fail, to a maximum of 6 credit hours. Courses offered only on a mandatory pass/fail basis are not counted toward the maximum allowed. The pass/fail option may be used only for elective credit.

### *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 not included on this list do not count toward any degree requirements. Transfer ROTC course work must be evaluated as equivalent to course work on this list to count toward degree requirements.

AIRR 3010 and 3020  
 AIRR 4010 and 4020  
 MILR 1011 and 1021  
 MILR 2031 and 2041 (students may not receive credit for either course if they have credit in OPMG 3000)  
 MILR 4072 and 4082  
 NAVR 2020  
 NAVR 3030  
 NAVR 3040  
 NAVR 3101  
 NAVR 4010 and 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. Remedial or vocational course work does not transfer.

Courses taken at a junior or community college are not 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. This limitation, however, is currently under review.

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. A transfer plan is also in place for the University of Colorado and Colorado public four-year institutions.

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. For additional information on transfer of credit policies, please see Transfer of College-Level Credit on page 12.

### **Withdrawal**

See Registration on page 25 for specific withdrawal procedures and Universitywide policies.

Students in the College of Arts and Sciences who withdraw two semesters in a row will have a dean's stop placed on their registration. Summer session is not counted as a regular semester. They will not be permitted 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.

## **UNDERGRADUATE DEGREE REQUIREMENTS**

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. Arts and sciences students have 10 years to complete the requirements for a declared major. If the 10-year limit is exceeded, the student may be required to satisfy current

major requirements. The requirements, rules, and policies stated in this catalog apply to all students first entering the College of Arts and Sciences during the 1997-98 academic year.

### 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, advising, and registration 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 core curriculum, the foreign language requirement, transfer credit, grade point averages, and preparation for graduation. Workshop schedules are available across the hall from Old Main 1B-85.

Following attendance at one of these workshops, students with special concerns can schedule individual appointments with advisors within approximately 10 days. Students may schedule appointments in Old Main 1B-85 or by calling (303) 492-7885. Freshman and sophomore students who have declared a major may consult with their core advisors. Open option students may contact the Advising Resource Center.

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 Student Academic Affairs, 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 incorrect advice given by someone other than an appropriate staff member of the college.

### Four-Year Graduation

The College of Arts and Sciences has adopted a set of guidelines to define the conditions under which a student should expect to graduate in four years. Further information is available through the Office of the Dean and major program and department offices.

The University of Colorado at Boulder guarantees that if the scheduling of essential courses is found to have prevented a student in the College of Arts and Sciences from completing all course work necessary for a B.A. or B.F.A. degree from the University by the end of his or her eighth consecutive fall and spring semester, the college will provide tuition plus any course fees for all courses required for completion of the degree requirements. Students must satisfy all the conditions described in the section titled Four-Year Guarantee Requirements to be eligible for this guarantee.

This guarantee will extend to all students who matriculate summer 1994 or after into the College of Arts and Sciences as first-semester freshmen without MAPS deficiencies and who satisfy all the requirements described below. This guarantee cannot be extended to include completion of a second major, a double degree, a minor, or a certificate program. Some CU-Boulder study abroad programs may not provide a sufficient range of courses to allow students to meet the requirements and thus students who participate in study abroad are not included in this guarantee.

#### Four-Year Guarantee Requirements

1. Students should enroll in University of Colorado at Boulder course work for eight consecutive fall and spring semesters.

2. No fewer than 60 semester hours of applicable course work should be completed with passing grades by the end of the second year (24 calendar months), 90 hours by the end of the third year (36 calendar months), and 120 hours by the end of the fourth year. Students should enroll in and pass an average of 15 credit hours each semester.

3. A minimum of 30 semester hours of college core curriculum courses should be completed by the end of the second year, including college core curriculum courses that also meet major requirements. All remaining college core curriculum requirements must be fulfilled by the end of the eighth semester.

4. Students should complete 45 upper-division hours by the end of the eighth semester of study.

5. A GPA of at least 2.00 must be earned each semester.

6. Grades of C- or better in all course work required for the major should be earned, and students should have a cumulative GPA of 2.00 in all major course work attempted.

7. A recommended plan of study must be started toward the major no later than the start of the second semester of study (see note below for exceptions) and there-

after students must make adequate progress toward completing the major (defined by each major). A statement of adequate progress is available from the major or departmental office at the time the major is declared.

8. The major must be declared no later than the start of the second semester of study (\*see note below for exceptions), and students must remain in that major until graduation.

9. Students should meet with both a college staff advisor and an advisor for the major during the fifth and seventh semesters of study.

10. Students must register each semester within one week of the assigned registration time.

11. Students should avoid taking courses that are in conflict with the written advice of a college or faculty advisor.

12. Students should adhere to General Credit and Enrollment Policies on page 54 of this catalog and Minimum Major Requirements on page 63.

13. Courses in conflict with major or college core curriculum requirements should be avoided.

14. The college should be notified in writing of the student's intent to graduate no later than the beginning of the seventh semester of study, and a graduation packet should be filed no later than the deadline for the appropriate graduation date (see Graduation Deadlines section).

15. Documentation should be kept proving that these requirements were satisfied (e.g., records of advising meetings attended, advising records and instructions, etc.).

Note: The recommended plan of study for the following majors must be begun in the first semester of study to be eligible for this guarantee: B.A. in biochemistry; chemistry; environmental, population, and organismic biology; Japanese; kinesiology; molecular, cellular and developmental biology; geology; physics and all B.F.A. degree programs, and all majors that require foreign language course work when student proficiency falls below the entry-level language course of that major. If a student changes majors, the College of Arts and Sciences advisors, in consultation with the new major advisor, will review the courses taken to date to determine whether the college will continue to extend the four-year guarantee.

### General Requirements

Arts and sciences students must fulfill the following requirements for graduation:

1. Pass a total of 120 hours.
2. Maintain a 2.00 (C) grade point average in all University of Colorado work and

2.00 (C) in all major course work attempted.

3. Pass 45 semester hours of upper-division work (courses numbered in the 3000s and 4000s).

4. Complete 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. This requirement, however, is currently under review. Courses taken at the Colorado Springs campus or at the Denver campus (excluding Metropolitan State College and Community College of Denver 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 credit hours (for a total of 51 credit hours), provided that all of the excess hours are taken in designated departmental honors courses and/or in honors thesis credit.

6. For the bachelor of fine arts degree, students may take a maximum of 67 credit hours in their major department.

7. Complete a major. Students are subject to the major requirements in force when they declare the major. See the sections Majors and Other Areas of Interest and Minimum Major Requirements on page 63.

8. Complete the general education (college core curriculum) and MAPS requirements with the following limitations:

a. Students may not use courses taken to complete a 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 more than one core area, a student may use it to meet only one area requirement.

c. Neither independent study nor pass/fail courses may be used to meet MAPS deficiencies, core requirements, or the minimum major requirements.

### Core Curriculum

The mainstay of the general education requirements is the College of Arts and Sciences core curriculum. The core curriculum requirements are divided into two parts, Skills Acquisition and Content Areas of Study. The following sections provide descriptions of the individual requirement areas, their underlying educational philosophies and goals, and the list of approved courses. The updated lists of approved core courses are printed in each semester's *Registration Handbook and Schedule of Courses*.

### 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 who graduate with more than one exempt major may apply their exemptions cumulatively.

### Skills Acquisition

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

1. **Foreign Language.** 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 proficiency 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.

The goal of the language requirement is to encourage students to confront the structure, formal and semantic, of another language, significant and difficult works in that language, and one or more aspects of the culture lived in that language. This enables students to understand their own language and culture better, analyze texts more clearly and effectively, and appreciate more vividly the dangers and limitations of using a translated document. The language requirement is a general education requirement and so concentrates on reading. In some languages other abilities may be emphasized as well. Understanding what it means to read a significant text in its original language is essential for general education according to the standards of this University.

Courses offered at CU-Boulder that satisfy this requirement include the following:

CDSS 2324-4 American Sign Language 3  
CHIN 2110-5 Intermediate Chinese 1  
CLAS 2114-4 Intermediate Latin 1  
CLAS 3113-4 Intermediate Classical Greek 1  
FREN 2110-3 Second-Year French Grammar Review and Reading 1  
GRMN 2010-4 Intermediate German 1  
ITAL 2110-3 Second-Year Italian Reading, Grammar, and Composition 1  
JPNS 2020-10 Intensive Intermediate Japanese  
JPNS 2110-5 Intermediate Japanese 1

NORW 2110-3 Second-Year Norwegian Reading and Conversation 1

PORT 2110-3 Second-Year Portuguese 1  
PORT 2150-5 Intensive Second-Year Portuguese

RUSS 2010-3 Second-Year Russian Grammar and Composition 1

SPAN 2110-3 Second-Year Spanish 1

SPAN 2150-5 Intensive Second-Year Spanish  
SWED 2110-3 Second-Year Swedish Reading and Conversation 1

2. **Quantitative Reasoning and Mathematical Skills (QRMS)** (3-6 semester hours). Liberally educated people should be able to think at a certain level of abstraction and to manipulate symbols. This requirement has two principal objectives. The first is to provide students with the analytical tools used in core curriculum courses and in their major areas of study. The second is to help students acquire the reasoning skills necessary to assess adequately the data which will confront them in their daily lives. Students completing this requirement should be able to: construct a logical argument based on the rules of inference; analyze, present, and interpret numerical data; estimate orders of magnitude as well as obtain exact results when appropriate; and apply mathematical methods to solve problems in their university work and in their daily lives.

Students can fulfill the requirement by passing one of the courses or sequences of courses listed below or by passing the CU-Boulder QRMS proficiency exam.

ECEN 1200-3 Telecommunications 1

ECON 1078-3 Mathematical Tools for Economists 1

GEOL 1600-3 Order, Chaos, and Complexity  
MATH/QRMS 2380-3 Mathematics for the Environment

MATH 1110-3 and 1120-3 The Spirit and Uses of Mathematics 1 and 2

PHYS 1010-3 Physical Science for Nonscientists 1

PHYS 1020-4 Physical Science for Nonscientists 2

QRMS 1010-3 Quantitative Reasoning and Mathematical Skills

Any three 1-credit math modules: MATH 1000, 1010, 1020, 1030, 1040, 1050, 1060, 1070, 1080, 1090, 1100, or 1025. It is recommended that students register for clusters of three modules, for example, MATH 1000-1020, 1020-1040, 1050-1070, or 1080-1100.

Any 3 credits of mathematics courses numbered MATH 1300 and above or applied mathematics courses numbered APPM 1350 and above.

3. **Written Communication** (3 lower-division and 3 upper-division semester hours). Writing is a skill fundamental to all intellectual endeavors. While some college courses require more writing than others, good writing is recognized as a necessary means of communication in every scholarly

discipline. The core curriculum 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. Students may meet the lower-division component of this requirement by first passing one of the approved lower-division courses or by receiving a score of 3, 4, or 5 on the English Language and Composition Advanced Placement exam. The lower-division requirement may be waived if a student scores appropriately on the SAT verbal or ACT English examinations. Students may then complete the upper-division component of this requirement by passing one of the approved upper-division courses or by passing the written communication proficiency exam.

#### Lower-Division Courses

ARSC 1100 (3-4) Advanced Expository Writing  
 ARSC 1150-3 Writing in Arts and Sciences  
 ENGL 1001-3 Freshman Writing Seminar  
 EPOB 1950-3 Introduction to Scientific Writing  
 FARR 1900-3 Farrand Writing Seminar  
 HONR 2020-3 Honors Writing Workshop  
 JOUR 2001-3 Mass Media Writing  
 KINE 1950-3 Introduction to Scientific Writing in Kinesiology  
 PSYC 1020-3 Writing in Psychology  
 UWWRP 1150-3 Introduction Composition: Expository Writing  
 UWWRP 1250-3 Introduction Composition: Argumentative Writing

#### Upper-Division Courses

ARSC 3020-3 Advanced Writing in Arts and Sciences  
 ARSC 3100-3 Advanced Writing and Research: Multicultural Perspectives  
 EPOB 3940-3 Arguments in Scientific Writing  
 FINE 3007-3 Writing in the Visual Arts  
 HONR 3220-3 Advanced Honors Writing Workshop  
 KINE 3700-3 Scientific Writing in Kinesiology  
 PHYS 3050-3 Writing in Physics: Problem Solving and Rhetoric  
 PSYC 3020-3 Advanced Writing in Psychology  
 RLST 3020-3 Advanced Writing in Religious Studies  
 UWWRP 3020-3 Topics in Writing  
 UWWRP 3030-3 Writing on Science  
 UWWRP 3040-3 Writing on Business and Society  
 WMST 3800-3 Advanced Writing in Feminist Studies

**4. Critical Thinking** (3 upper-division semester hours). Courses in this area encourage the active practice of critical reasoning, evaluation, and discussion. They do so by providing opportunities for student participation beyond those offered in ordinary lecture courses, labs, or seminars. Critical thinking courses address matters of controversy within a given field of study or in the society at large. Students will learn how to

construct, defend, and criticize arguments; how to identify and assess tacit assumptions; and how to gather and evaluate evidence. Critical thinking courses emphasize some combination of the methodology of acquiring knowledge in a specific discipline, key arguments in the discipline, and problems of interpreting original literature and data. In addition, they may subject arguments within the discipline to scrutiny from competing cultural, social, or methodological perspectives. Students must take 3 credit 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.

Courses offered at CU-Boulder that satisfy this requirement include the following:

ANTH 4180-3 Anthropological Perspectives, Contemporary Issues  
 ANTH 4520-3 Symbolic Anthropology  
 ANTH 4590-3 Urban Anthropology  
 ANTH 4740-3 Peoples and Cultures of Brazil  
 ASTR 4800-3 Space Science: Practice and Policy  
 ASTR 4810-3 Science and Pseudoscience in Astronomy  
 BLST 4670-3 The Sixties: Critical Black Views  
 CDSS 4000-3 Multicultural Aspects of Communication Differences and Disorders  
 CHEM 4181-4 Instrumental Analysis  
 CHEM 4761-4 Biochemistry Lab  
 COMM 3100-3 Current Issues in Communication and Society  
 ECON 4309-3 Economics Honors Seminar I  
 ECON 4999-3 Economics in Action: A Capstone Course  
 ENGL 4030-3 Critical Thinking in English Studies  
 EPOB 4180-3 Ecological Perspectives on Global Change  
 EPOB 4210-3 Arguments in Evolutionary Biology  
 EPOB 4240-3 Advances in Animal Behavior  
 EPOB 4270-3 Population Genetics and Evolution  
 EPOB 4380-3 Respiratory Adaptations to the Environment  
 EPOB 4420-3 Environmental Animal Physiology  
 EPOB 4570-3 Advanced Plant Physiology  
 EPOB 4590-3 Plants and Human Affairs  
 EPOB 4800-3 Critical Thinking in Biology  
 FILM/HUMN 4004-3 Film Theory  
 FINE 3109-3 Critical Thinking: Art in Society  
 FINE 3227-3 Critical Thinking: Women's Art—Issues and Controversies  
 FINE 3409-3 Critical Thinking: Contemp. Painting, Sculpture, and Intermedia  
 FINE 4087-3 Selected Topics in Contemp. Art  
 FINE 4729-3 Readings/Issues in Photography  
 FINE 4739-3 Intellectual Roots of Italian Renaissance Art  
 FREN 3200-3 Introduction to Literary Theory and Advanced Critical Analysis  
 GEOG 3002-3 Introduction to Research in Human Geography  
 GEOG 4173-3 Research Seminar  
 GEOG 4430-3 Seminar: Conservation Trends

GEOG 4622-3 City Life  
 GEOG 4742-3 Environment and Peoples  
 GEOG 4892-3 Geography of Western Europe  
 GEOL 3620-3 Controversies in Planetary Geology  
 GEOL 3630-3 Great Geological Controversies  
 GEOL 4080-3 Societal Problems and Earth Sciences  
 GEOL 4500-3 Critical Thinking in Earth Sciences  
 HIST 3000-3 Seminar in History (nonmajors)  
 HIST 3010-3 Communist Societies in Historical Perspective  
 HIST 3011-3 Seminar in Ancient History  
 HIST 3012-3 Seminar in Modern European History  
 HIST 3018-3 Seminar in Latin American History  
 HIST 3019-3 Seminar in Asian and African History  
 HIST 3110-3 Honors Seminar  
 HIST 3112-3 Seminar in Renaissance and Reformation  
 HIST 3113-3 Seminar in Medieval and Early Modern English History  
 HIST 3115-3 Seminar in Early American History  
 HIST 3116-3 Seminar in American Diplomatic History  
 HIST 3133-3 Seminar in Britain Since 1688  
 HIST 3212-3 Seminar in Early Modern Europe  
 HIST 3317-3 Seminar in the American West  
 HIST 3328-3 Seminar in Middle Eastern History  
 HIST 3414-3 Seminar in European Intellectual Thought  
 HIST 3415-3 Seminar in Recent American History  
 HIST 3416-3 Seminar in American Society and Thought  
 HIST 3436-3 Seminar in American Economic History  
 HIST 3511-3 Seminar in Medieval History  
 HIST 3616-3 Seminar in Women's History  
 HIST 3628-3 Seminar in Recent Chinese History  
 HIST/WMST 3656-3 History of Women in Progressive Social Movements  
 HIST 3713-3 Seminar in Russian History  
 HIST 3718-3 Seminar in Japanese History  
 HONR 4055-3 Discourse Analysis and Cultural Criticism  
 HONR 4250-3 State and Individual: Civil Disobedience  
 HONR 4260-3 The Individual and Individualism  
 HUMN 4155-3 Philosophy, Art, and the Sublime  
 HUMN 4555-3 The Arts of Interpretation  
 IAFS 4500-3 The Post-Cold War World  
 IAFS 4800-3 Honors in International Affairs  
 KINE 4660-3 Topics in Exercise Physiology  
 KINE 4760-3 Critical Thinking in Motor Behavior  
 LING 4100-3 Perspectives on Language  
 MATH 3000-3 Introduction to Abstract Mathematics  
 MCDB 3330-3 Evolution, Creationism, and the Origins of Life  
 MCDB 4000-3 Searching the Biomedical Literature: (Topic)  
 MCDB 4140-3 Plant Molecular Biology and Biotechnology  
 MCDB 4400-3 Ethical, Legal, and Social Implications of Genetics

MCDB 4410-3 Human Molecular Genetics  
 MCDB 4426-3 Cell Signaling and Developmental Regulation  
 MCDB 4471-3 Regulation of Gene Expression in Development  
 MCDB 4480-3 Great Literature in the Nucleic Acids  
 MCDB 4610-3 Topics in Mammalian Developmental Biology  
 MCDB 4680-3 Mechanisms of Aging  
 MCDB 4750-3 Animal Virology  
 MCDB 4790-3 Experimental Embryology  
 PACS 4500-3 Senior Seminar in Peace and Conflict Studies  
 PACS/PSCI 4732-3 Critical Thinking in Development  
 PHIL 3180-3 Critical Thinking: Contemporary Topics  
 PHIL 3480-3 Critical Thinking and Writing in Philosophy  
 PHIL/PHYS 4450-3 History and Philosophy of Physics  
 PHIL 4830-3 Senior Seminar in Philosophy  
 PHYS 3340-3 Introduction to Research in Optical Physics  
 PHYS 4420-3 Nuclear Particle Physics  
 PHYS 4430-3 Introduction to Research in Modern Physics  
 PSCI 4701-3 Symbolic Politics  
 PSCI 4703-3 Alternative World Futures  
 PSCI 4704-3 Politics and Language  
 PSCI 4711-3 Selected Policy Problems  
 PSCI 4714-3 Liberalism and Its Critics  
 PSCI 4718-3 Honors in Political Science  
 PSCI 4721-3 Rethinking American Politics  
 PSCI 4731-3 Progress and Problems in American Democracy  
 PSCI 4734-3 Politics and Literature  
 PSCI 4741-3 Goals: Spending and Revenues  
 PSCI 4751-3 The Politics of Ideas  
 PSCI 4752-3 Seminar in Central and East European Studies  
 PSCI 4761-3 Rethinking Political Values  
 PSCI 4771-3 Civil Rights and Liberties in America  
 PSCI 4782-3 Global Issues  
 PSCI 4792-3 Issues in Latin American Politics  
 PSYC 4001-3 Honors Seminar 2  
 PSYC 4521-3 Critical Thinking in Psychology  
 RLST 3500-3 Religion and Play  
 RLST 3700-3 Religion and Psychology  
 RLST 4800-3 Critical Studies in Religion  
 SOCY 4461-3 Critical Thinking in Sociology  
 SPAN 3100-3 Literary Analysis in Spanish  
 THTR 4081-3 Senior Seminar  
 WMST 3090-3 Critical Thinking in Feminist Theory

### Content Areas of Study

**5. Historical Context** (3 semester hours). Courses that fulfill this requirement enable students to study historical problems or issues and to develop an understanding of earlier ideas, institutions, and cultures. Courses explore the times and circumstances in which social, intellectual, artistic or other developments occurred. The purpose of this exploration is to analyze subjects in their context, that is, to investigate both the processes and the meanings of

change. Among the educational aims of these courses are the following: to contribute to historical perspectives that may help to clarify issues that arise today or will arise tomorrow, to arouse the curiosity of students concerning historical conditions that may be relevant to subjects studied in other courses, and to expand the imagination by generating an awareness of the diverse ways in which our common humanity has expressed itself.

Students may choose to meet this 3-hour requirement by passing any course listed below.

CEES 1000/HIST 1002-3 Introduction to Central and East European Studies  
 CLAS/HIST 1051-3 The World of Ancient Greeks  
 CLAS/HIST 1061-3 The Rise and Fall of Ancient Rome  
 CLAS 1140-3 Roman Civilization  
 ECON 4514-3 Economic History of Europe  
 ENGL/HIST 3163-3 History and Literature of Georgian England  
 ENGL/HIST 4113-3 History and Culture of Medieval England  
 HIST 1010-3 Western Civilization 1: Antiquity to the 16th Century  
 HIST 1020-3 Western Civilization 2: 16th Century to the Present  
 HIST 1038-3 Introduction to Latin American History  
 HIST 1040-3 Honors: Western Civilization 2  
 HIST 1113-3 History of England to 1660  
 HIST 1123-3 History of England 1660 to Present  
 HIST 1180-3 History of Christianity: From the Reformation  
 HIST 1208-3 Sub-Saharan Africa to 1800  
 HIST 1308-3 Introduction to Middle Eastern History  
 HIST 1608-3 Introduction to Chinese History  
 HIST 1708-3 Introduction to Japanese History  
 HIST 2100-3 Revolution in History  
 HIST 2113-3 Early Modern England (1450-1700)  
 HIST 2222-3 War and Society in the Modern World  
 HIST 2543-3 Medieval Nations  
 HUMN 1010-6 Introduction to Humanities 1  
 HUMN 1020-6 Introduction to Humanities 2  
 PHIL 1010-3 Introduction to Western Philosophy: Ancient  
 PHIL 1020-3 Introduction to Western Philosophy: Modern  
 PHIL 3000-3 History of Ancient Philosophy  
 PHIL 3010-3 History of Modern Philosophy  
 PHIL 3410-3 History of Science: Ancients to Newton  
 PHIL 3430-3 History of Science: Newton to Einstein  
 RLST 3000-3 The Christian Tradition  
 RLST 3100-3 Judaism  
 RUSS 2211-3 Introduction to Russian Culture  
 SCAN 2202-3 The Vikings

**6. Cultural and Gender Diversity** (3 semester hours). Courses fulfilling this requirement increase the student's understanding of the world's diversity and plu-

ralism through the study of two broad and interrelated areas: (A) the nature and meaning of the categories of women, race, ethnicity, and gender; (B) 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.

**Gender and Ethnic Diversity:** Courses in this area are designed to expand the range of each student's understanding of the origin, definition, and experience of the categories of women, gender, ethnicity, and race. They apply new approaches to knowledge and scholarly inquiry and explore the ways in which nonsexist and non-racist language expand understanding of social groups. They are concerned with recovery of knowledge about individuals and groups excluded from traditional studies of societies and share the fundamental goal of identifying the way these social categories define and therefore shape human thought and experience.

**Non-Western Cultures:** These courses are designed to expand the range of the student's understanding of cultures that are not derived principally from the Western experience. A comparative perspective will introduce students to the commonality and diversity of cultural responses to universal human problems. Each course seeks to cultivate insight into and respect for diversity by requiring students to explore a cultural world quite different from their own. Courses satisfying this requirement are intended to portray culture in the most integrated sense, including aspects of material adaptation, social pattern, ideas and values, and aesthetic achievement.

Students are required to pass 3 hours of course work from any course listed below.

AAST 1015-3 Introduction to Asian American Studies  
 AIST 1125-3/ANTH 1120-3 Exploring a Non-Western Culture: Hopi and Navajo  
 AIST 2000-3 Introduction to American Indian Studies: Precontact Native America  
 AIST 2015-3 Topical Issues in Native North America  
 AIST/RLST 2700-3 American Indian Religious Traditions  
 AIST 3023-3 Native Americans and Environmental Ethics  
 AIST 4565-3/ANTH 4560-3 North American Indian Acculturation  
 ANTH 1100-3 Exploring a Non-Western Culture: The Tamils  
 ANTH 1110-3 Exploring a Non-Western Culture: Japan  
 ANTH 1130-3 Exploring a Non-Western Culture: Amazonian Tribal Peoples  
 ANTH 1140-3 Exploring a Non-Western Culture: The Maya  
 ANTH/BLST 1150-3 Exploring a Non-Western Culture: Regional Cultures of Africa

ANTH 1160-3 Exploring a Non-Western Culture: The Ancient Egyptian Civilization  
 BLST 2000-3 Introduction to Afro-American Studies  
 BLST 2200-3 Contemporary Black Protest Movements  
 BLST 2210-3 Black Social and Political Thought  
 BLST 2800-3 Afro-American Music/History Appreciation 1  
 BLST 2810-3 Afro-American Music/History Appreciation 2  
 BLST/SOCY 3023-3 African American Family in U.S. Society  
 BLST/PSCI 3101-3 Black Politics  
 CHIN/JPN 1011-4 Introduction to Traditional East Asian Civilizations  
 CHST 1015-3 Introduction to Chicano Studies  
 CHST 1031-3 Chicano Fine Arts and Humanities  
 CHST/HIST 2537-3 Chicano History  
 CHST/WMST 3135-3 Study of Chicanas  
 CHST 3153-3 Folklore and Mythology of the Hispanic Southwest  
 CHST 4133-3/PSCI 4131-3 Latinos and the U.S. Political System  
 CLAS/WMST 2100-3 Women in Antiquity: Greece  
 CLAS/WMST 2110-3 Women in Antiquity: Rome  
 ECON 4626-3 Economics of Inequality and Discrimination  
 EMUS 2772-3 World Musics  
 ENGL/WMST 1260-3 Introduction to Women's Literature  
 ENGL/ETHN 1800-3 American Ethnic Literatures  
 ENGL 3677-3 Jewish-American Fiction and Old World Backgrounds  
 FARR 2400-3 Understanding Privilege and Oppression in Contemporary Society  
 FILM 3013-3 Women and Film  
 FINE 3209-3 Renaissance Art Out of the Canon: Cultural and Gender Diversity 1400-1600  
 FINE/WMST 4809-3 Women Artists from the Middle Ages to the Present  
 FREN 1700-3 Francophone Literature in Translation  
 FREN 4500-3 Reading the Orient: French Literature and Exoticism  
 GEOG/WMST 3672-3 Gender and Global Economy  
 GRMN 3501-3 Jewish-German Writers: Enlightenment to Present Day  
 HIST 2616-3 Women's History  
 HIST 2626-3 Gender and Culture  
 HIST 2437-3 Afro-American History  
 HONR 1025-3 First-Year Diversity Seminar  
 HONR 4025-3 Heroines and Heroic Tradition  
 HUMN 3065-3 Feminist Theory/Women's Art  
 HUMN 3145-3 African America in the Arts  
 HUMN 4064-3 "Primitivism" in Art and Literature  
 ITAL 4150-3 *The Decameron* and the Age of Realism  
 ITAL 4730-3 Italian Feminisms: Culture, Theory, and Narratives of Difference  
 LAMS 1000-3 Introduction to Latin American Studies  
 LING 2400-3 Language and Gender  
 LING 3220-3 American Indian Languages in Social-Cultural Context

PHIL/WMST 2290-3 Philosophy and Women  
 PSCI/WMST 4271-3 Sex Discrimination: Constitutional Issues  
 PSCI/WMST 4291-3 Sex Discrimination: Federal and State Law  
 PSYC/WMST 2700-3 Psychology of Contemporary American Women  
 RLST/WMST 2800-3 Women and Religion  
 RLST 3510-3 Australian Religions  
 SOCY/WMST 1006-3 The Social Construction of Sexuality  
 SOCY/WMST 1016-3 Sex, Gender, and Society 1  
 SOCY/WMST 3012-3 Women, Development, and Fertility  
 WMST 2000-3 Introduction to Feminist Studies  
 WMST 2020-3 Social Construction of Femininities and Masculinities  
 WMST 2050-3 Women and Society

**7. United States Context** (3 semester hours). Courses fulfilling the United States Context 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 which 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.

These courses teach an appreciation of American culture while inviting students to ask probing questions about American values and ideals. How have Americans derived a sense of identity from geography, language, politics, and the arts? How do Americans view and influence the world beyond their borders? How have the rights and responsibilities of citizenship changed over time? How have Americans dealt with opposing values in their culture? Completing this requirement, students will develop both a better understanding of the American present and past, and a considerable interest in the American future.

This 3-hour requirement may be fulfilled by passing any course listed below.

AAST/HIST 1717-3 Asian American History  
 AAST 3013-3 Asian Pacific American Communities  
 AIST 2015-3 Topical Issues in Native North America  
 AIST 3023-3 Native Americans and Environmental Ethics  
 AMST 2000-3 Themes in American Culture: 1600-1900  
 AMST 2010-3 Themes in American Culture: 1865-Present  
 AMST 4500-3 American Autobiography  
 ANTH 3170-3 America: An Anthropological Perspective  
 BLST/SOCY 3023-3 African American Family in U.S. Society  
 CHST/HIST 2537-3 Chicano History  
 ECON 1524-3 Economic History of the U.S.

ECON 4524-3 Economic History of the U.S.  
 ECON 4697-3 Industrial Organization and Regulation  
 EMUS 2752-3 History of the United States: Folk/Popular Music  
 ETHN/SOCY 1015-3 U.S. Race and Ethnic Relations  
 FINE 3509-3 American Art  
 HIST 1015-3 History of the United States to 1865  
 HIST 1025-3 History of the United States since 1865  
 HIST 1035-3 Honors: History of the United States to 1865  
 HIST 1045-3 Honors: History of the United States since 1865  
 HIST 2117-3 History of Colorado  
 HIST 2126-3 Modern U.S. Politics and Diplomacy  
 HIST 2166-3 The Vietnam Wars  
 HIST 2215-3 The Era of the American Revolution  
 HIST 2437-3 Afro-American History  
 HIST 4315-3 Civil War and Reconstruction  
 HIST 4516-3 U.S. Society in the Nineteenth Century  
 HIST 4526-3 U.S. Society in the Twentieth Century  
 HUMN 3145-3 African America in the Arts  
 LING 1000-3 Language in U.S. Society  
 PHIL 1200-3 Philosophy and Society  
 PHIL 2220-3 The Nature of Law  
 PSCI 1101-3 American Political System  
 PSCI 3011-3 The American Presidency  
 PSCI 3054-3 American Political Thought  
 PSCI 3061-3 State Government and Politics  
 PSCI 3071-3 Urban Politics  
 PSCI 3163-3 American Foreign Policy  
 PSCI 3171-3 Government and Capitalism in the U.S.  
 PSCI 4021-3 Legislatures and Legislation  
 RLST 3050-3 Religion and Literature in America  
 SOCY 1012-3 Population Issues in the United States  
 SOCY/WMST 3016-3 Marriage and the Family in U.S. Society  
 SOCY 3151-3 Self in Modern Society  
 WMST 2500-3 History of the U.S. Feminist Movement

**8. Literature and the Arts** (6 semester hours, 3 of which must be upper division). These courses promote a better understanding of fundamental aesthetic and cultural issues. They sharpen critical and analytical abilities so that students may develop a deeper appreciation of works of art. The goal of this requirement is to enhance the student's 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. Emphasis in courses which fulfill this requirement will be on works that are generally recognized as central to and significant for one's cultural literacy and thereby enhance the student's understanding of our literary and artistic heritage.

Courses stress literary works as well as the history and criticism of literature and



the arts. They may utilize creative projects as a means of arriving at a better understanding of the art form, but students may not use studio or performance classes to satisfy this requirement.

Students are required to pass 6 hours of course work in literature and the arts, of which at least 3 hours must be upper division, unless either Humanities 1010 or Humanities 1020 is completed.

If students graduate with a major dealing in depth with literature and the arts (Chinese, Classics, Dance, English, Fine Arts, French, Germanic Studies, Humanities, Italian, Japanese, Portuguese, Russian, Spanish, or Theatre), they are exempt from this requirement.

Courses offered at CU-Boulder that satisfy this requirement include the following:

#### Lower-Division Courses

- CHIN 1051-3 Masterpieces of Chinese Literature in Translation  
 CLAS/FINE 1009-3 Introduction to Greek Art and Archaeology  
 CLAS 1100-3 Greek Mythology  
 CLAS 1110-3 Masterpieces of Greek Literature in Translation  
 CLAS 1120-3 Masterpieces of Roman Literature in Translation  
 DNCE 1029-3 Dance as a Universal Language  
 EMUS 1832-3 Appreciation of Music  
 EMUS 2762-3 Music and Drama  
 ENGL 1500-3 Masterpieces of British Literature  
 ENGL 1600-3 Masterpieces of American Literature  
 FINE 1109-3 Introduction to Western Art 1  
 FINE 1209-3 Introduction to Western Art 2  
 FINE 1309-3 History of World Art 1  
 FINE 1409-3 History of World Art 2  
 FINE 1709-3 Experiencing Art—Image, Artist, and Idea  
 FINE 2409-3 Introduction to Asian Arts  
 FREN 1200-3 Medieval Epic and Romance  
 FREN 1800-3 Contemporary French Literature in Translation  
 GRMN 1602-3 Metropolis and Modernity  
 GRMN 2501-3 Twentieth Century German Short Story  
 HUMN 1010-6 Introduction to Humanities 1  
 HUMN 1020-6 Introduction to Humanities 2  
 JPNS 1051-3 Masterpieces of Japanese Literature in Translation  
 RLST 2200-3 Religion and Dance  
 SPAN 1000-3 Cultural Difference through Hispanic Literature  
 THTR 1009-3 Introduction to Theatre  
 THTR 1011-3 Development of Theatre 1: Classical Theatre and Drama

#### Upper-Division Courses

- CLAS 4110-3 Greek and Roman Epic  
 CLAS 4120-3 Greek and Roman Tragedy  
 CLAS 4130-3 Greek and Roman Comedy  
 DNCE 4017-3 History and Philosophy of Dance  
 EMUS 3822-3 Music Literature 1  
 EMUS 3832-3 Music Literature 2

- ENGL 3000-3 Shakespeare for Non-majors  
 ENGL 3060-3 Modern and Contemporary Literature  
 FILM 3051-4 Film History 1 (Silent Era)  
 FILM 3061-4 Film History 2 (Sound Film)  
 FINE 4329-3 Modern Art  
 FINE 4619-3 Quattrocento Art of Florence and Central Italy  
 FINE 4659-3 The Roman Baroque  
 FINE 4759-3 17th Century Art and the Concept of the Baroque  
 FREN 3110-3 Main Currents of French Literature 1  
 FREN 3120-3 Main Currents of French Literature 2  
 FREN 3200-3 Introduction to Literary Theory and Advanced Critical Analysis  
 FREN 4300-3 Theatre and Modernity in Seventeenth Century France  
 FREN 4500-3 Reading the Orient: French Literature and Exoticism  
 GRMN 3502-3 Literature in the Age of Goethe  
 GRMN/HUMN 4504-3 Goethe's Faust  
 HUMN 3065-3 Feminist Theory/Women's Art  
 HUMN 3440-3 Literature and Medicine  
 HUMN 4064-3 "Primitivism" in Art and Literature  
 HUMN/RUSS 4821-3 Twentieth Century Russian Literature and Art  
 ITAL 4140-3 The Age of Dante: Readings from the Divine Comedy  
 ITAL 4150-3 *The Decameron* and the Age of Realism  
 ITAL 4730-3 Italian Feminisms: Culture, Theory, and Narratives of Difference  
 RUSS 4811-3 Nineteenth Century Russian Literature in Translation  
 SPAN 3700-3 Selected Readings: Spanish Literature in Translation  
 SPAN 3800-3 Selected Readings: Modern Latin American Literature in Translation  
 THTR 3009-3 American Musical Theatre  
 THTR 4001-3 Development of Theatre 4: American Theatre and Drama

**9. Natural Science** (13 semester hours, including a two-course sequence and a laboratory or field experience). These courses study the nature of matter, life, and the universe. They enhance literacy and knowledge of one or more scientific disciplines, and enhance those reasoning and observing skills that are necessary to evaluate issues with scientific content. Courses are designed to demonstrate that science is not a static list of facts, but a dynamic process that leads to knowledge. This process is one of subtle interplay between observation, experimentation, and theory, enabling students to develop a critical view toward the conclusions and interpretations obtained through the scientific process.

Through a combination of lecture courses and laboratory or field experiences, students will have hands-on experience with scientific research. They will develop observational skills of measurement and data interpretation and will learn the relevance of these

skills to the formation and testing of scientific hypotheses.

The goal of this requirement is to enable 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 observation 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 scientific issues, to evaluate it critically, and to make informed decisions.

The natural science requirement, which consists of passing 13 hours of approved natural science course work, includes one two-semester sequence of courses and at least 1 credit hour of an associated lab or field experience. No more than two lower-division courses may be taken from any single department (1-credit-hour lab/field experience courses are excepted).

Students who graduate with a major in the natural sciences (Biochemistry, Chemistry, EPOB, Geology, Kinesiology, MCDB, or Physics) are exempt from completing the natural science requirement.

Courses offered at CU-Boulder that satisfy this requirement include the following:

#### Two-Semester Sequences

- (Note: Although not recommended, the first semester of a sequence may be taken as a single course. Also, some sequences have included or optional laboratories.)  
 ANTH 2010-3 and 2020-3 Introduction to Physical Anthropology 1 and 2 (optional labs ANTH 2030, 2040)  
 ANTH 2050-4 and 2060-4 Honors: Human Origins 1 and 2 (optional labs ANTH 2030, 2040)  
 ASTR 1010-4 and 1020-3 Introductory Astronomy 1 and 2 (lab included)  
 ASTR 1030-4 and 1040-4 Accelerated Introductory Astronomy (lab included in ASTR 1030)  
 ATOC 1050-3 and 1060-3 Weather and Atmosphere and Atmosphere, Ocean, and Climate  
 CHEM 1011-3 and 1031-4 Environmental Chemistry 1 and 2 (lab included)  
 CHEM 1051-4 and 1071-4 Introduction to Chemistry and Introduction to Organic and Biochemistry (lab included)  
 CHEM 1111-5 and 1131-5 General Chemistry 1 and 2 (lab included)  
 CHEM 1111-5 and 1071-4 General Chemistry 1 and Introduction to Organic Biochemistry (lab included)  
 CHEM 1151-6 and 1171-6 Honors General Chemistry 1 and 2 (lab included)  
 EPOB 1030-3 and 1040-3 Biology: A Human Approach 1 and 2  
 EPOB 1210-3 and 1220-3 General Biology 1 and 2 (optional labs EPOB 1230, 1240)

- EPOB 1610-4 and 1620-3 Honors General Biology 1 and 2 (optional lab EPOB 1230, 1240)
- GEOG 1001-4 and 1011-4 Environmental Systems 1 and 2: Climate and Vegetation, Landforms and Soils (lab included)
- GEOL 1010-3 and 1020-3 Introduction to Geology 1 and 2 (optional labs GEOL 1080, 1090)
- GEOL 1060-4 and 1070-3 Global Change 1 and 2—An Earth Science Perspective (optional lab GEOL 1110)
- GEOL 1130-3 and 1140-3 Dynamic Earth 1 and 2: Introduction and the Solid Earth
- GEOL 1410-4 and 1420-4 The Earth 1 and 2 (optional lab GEOL 1430)
- MCDB 1150-3 and 2150-3 Introduction to Molecular and Biology and Principles of Genetics (optional labs MCDB 1151, 2151)
- PHYS 1010-3 and 1020-4 Physical Science for Non-Scientists 1 and 2 (lab included)
- PHYS 1110-4 and 1120-4 General Physics 1 and 2 (optional lab PHYS 1140)
- PHYS 2010-5 and 2020-5 General Physics 1 and 2 (lab included)
- PSYC 2012-3 and 2022-3 Biological Psychology 1 and 2

#### Non-Sequence Courses

- ANTH 3000-3 Primate Behavior
- ANTH 3010-3 The Human Animal
- ASTR 1110-3 General Astronomy: The Solar System
- ASTR 1120-3 General Astronomy: Stars and Galaxies
- ASTR 2000-3 Ancient Astronomies of the World
- ASTR 2010-3 Modern Cosmology: Origin and Structure of the Universe
- ASTR 2020-3 Introduction to Space Astronomy
- ASTR/ASEN 3060-3 Introduction to Space Experimentation
- ASTR 3210-3 Intermediate Astronomy: Solar System
- ASTR 3220-3 Intermediate Astronomy: Stars and Galaxies
- ATOC 3180-3 Aviation Meteorology
- ATOC 3300-3 Analysis of Climate and Weather Observations
- ATOC 3500-3 Air Chemistry and Pollution
- ATOC 3600-3 Principles of Climate
- CHEN 1000-3 Creative Technology
- CLAS 2020-3 Science in the Ancient World
- EPOB 3150-3 Introduction to Tropical Conservation Biology
- EPOB 3180-3 Global Ecology
- EPOB 3190-3 Tropical Marine Ecology
- GEOG 3191-3 Atmospheric Science 1: Meteorology
- GEOG 3201-3 Atmospheric Science 2: Climatology
- GEOG 3511-4 Introduction to Hydrology
- GEOG/GEOL 4241-4 Principles of Geomorphology (lab included)
- GEOL 1600-3 Order, Chaos, and Complexity
- GEOL 3040-3 Global Change: The Geological Record
- GEOL 3070-3 Introduction to Oceanography
- GEOL 3500-3 Mineral Resources, World Affairs, and the Environment

- GEOL 3520-3 Environmental Issues in Geosciences
- GEOL 3720-3 Evolution of Life: The Geological Record
- GEOL 4950-3 Natural Catastrophes and Geologic Hazards
- KINE 3420-3 Nutrition, Health, and Performance
- MCDB 1030-3 Plagues, People, and Microorganisms
- MCDB 1041-3 Fundamentals of Human Genetics
- MCDB 3150-3 Biology of the Cancer Cell
- MCDB 3330-3 Evolution, Creationism, and Origins of Life
- MCDB 3351-3 Success and Failure in Human Reproduction
- PHIL 1400-3 Philosophy and the Sciences
- PHIL 3410-3 History of Science: Ancients to Newton
- PHIL 3430-3 History of Science: Newton to Einstein
- PHYS 1230-3 Light and Color
- PHYS 1240-3 Sound and Music
- PHYS 2900-4 Science, Computer Images, and the Internet
- PHYS 3070-3 Energy in a Technical Society
- PHYS 3080-3 Physics of Contemporary Social Problems

#### 1-Credit-Hour Lab/Field Courses

- (Note: Each course below has a prerequisite or corequisite.)
- ANTH 2030-1 Lab in Physical Anthropology 1
- ANTH 2040-1 Lab in Physical Anthropology 2
- ATOC 1070-1 Weather and the Atmosphere Laboratory
- EPOB 1050-1 Biology: A Human Approach Lab
- EPOB 1230-1 General Biology Lab 1
- EPOB 1240-1 General Biology Lab 2
- GEOL 1080-1 Introduction to Geology Lab 1
- GEOL 1090-1 Introduction to Geology Lab 2
- GEOL 1110-1 Global Change Lab
- GEOL 1430-1 The Earth Lab
- MCDB 1151-1 Introduction to Molecular Biology Lab
- MCDB 2151-1 Principles of Genetics Lab
- PHYS 1140-1 Experimental Physics

**10. Contemporary Societies** (3 semester hours). All individuals function within social frameworks. Courses in contemporary societies introduce students to the study of social groups, including social institutions and processes, the values and beliefs shared by their members, and the forces that mold and shape social groups. They prepare students to approach social phenomena of all kinds in an informed and critical way, and to describe, analyze, compare, and contrast them. Such study will also provide students with new vantage points from which to view their own socio-cultural assumptions and traditions.

These courses, which treat societies of the twentieth century, study an individual society or compare several societies. All explicitly attempt to deepen the students' un-

derstanding of the cultural, political, economic or social contexts that shape people's lives. Their scope may be global or specific, but all courses that fulfill this requirement treat social processes, institutions, values, forces and beliefs.

Students who graduate with a major in a social science department (Anthropology, Economics, International Affairs, Political Science, Psychology, or Sociology) are exempt from the contemporary societies requirement. Students may satisfy this 3-hour requirement by passing any course listed below.

- AAST 1015-3 Introduction to Asian American Studies
- AAST 3013-3 Asian Pacific American Communities
- AIST 4565-3/ANTH 4560-3 North American Indian Acculturation
- BLST 2200-3 Contemporary Black Protest Movements
- BLST 2210-3 Black Social and Political Thought
- BLST/PSCI 3101-3 Black Politics
- BLST/RLST 3125-3 Black Religious Life in America
- COMM 2400-3 Communication and Society
- CDSS 1010-3 Disabilities in Contemporary American Society
- ECON 1000-3 Introduction to Economics
- ECON 2010 (3-4) Principles of Microeconomics
- ECON 2020 (3-4) Principles of Macroeconomics
- ECON 3403-3 International Economics and Policy
- ECON 3535-3 Natural Resource Economics
- ECON 3545-3 Environmental Economics
- FARR 2400-3 Understanding Privilege and Oppression in Contemporary Society
- GRMN 1601-3 Introduction to Modern German Culture and Civilization
- HIST 2126-3 Modern U.S. Politics and Diplomacy
- HIST 2166-3 The Vietnam Wars
- HONR 1820-3 Critical Issues: Late Twentieth Century
- HUMN 4835-3 Literature and Social Violence
- LAFS 1000-4 Global Issues and International Affairs
- LING 1000-3 Language in U.S. Society
- PACS/PSCI 4732-3 Critical Thinking in Development
- PHIL 2230-3 Law and Morality
- PSCI 1101-3 American Political System
- PSCI 2012-3 Introduction to Comparative Politics
- PSCI 2223-3 Introduction to International Relations
- PSCI 3032-3 Latin American Political Systems
- PSCI 3082-3 Political Systems of Sub-Saharan Africa
- PSCI 3143-3 International Relations
- PSCI 4002-3 Advanced Comparative Politics: Western Europe
- PSCI 4012-3 Global Development
- PSCI 4062-3 Emerging Democracies of Central and East Europe

PSCI 4223-3 Soviet and Russian Diplomacy  
 PSCI 4272-3 Political Economy of Industrial States  
 PSYC 4406-3 Social Psychology  
 RLST 2400-3 Religion and Contemporary Society  
 RUSS 2221-3 Introduction to Modern Russian Culture  
 SCAN 2201-3 Introduction to Modern Scandinavian Culture and Society  
 SOCY 1001-3 Analyzing Society  
 SOCY 1005-3 Social Conflict and Social Values  
 SOCY 4024-3 Juvenile Delinquency  
 WMST 2600-3 Gender, Race, and Class in Contemporary U.S. Society

**11. Ideals and Values** (3 semester hours). Ideals and values have usually been determined by long-standing traditions and fixed social practices. In our modern world, the interaction of different cultures, movement from place to place, electronic media, and the rapidity of change, even within a given society, have combined to generate new constellations of ideals and hard choices among values.

Courses meeting the ideals and values requirement will inquire into some specific sphere of human value (e.g. moral, religious, intellectual, aesthetic, environmental, etc.). In these courses students will be encouraged to reflect upon fundamental ideals and values, their own and others, and the sources from which those value orientations derive. Such inquiry will demand the development of the critical skills which will help students identifying the assumptions and ramifications of value structures. It will also require consideration of approaches by which value systems are constructed, justified, and applied, especially in regard to the personal, societal, and in some cases cross-cultural contexts.

Students may complete this 3-hour requirement by passing any course listed below.

AIST/RLST 2700-3 American Indian Religious Traditions  
 ARSC 1700-3 The Meaning of the University  
 BLST/RLST 3125-3 Black Religious Life in America  
 CDSS 1010-3 Disabilities in Contemporary American Society  
 CLAS/PHIL 2610-3 Paganism to Christianity  
 FARR 2660-3/HONR 2250-3 The Ethics of Ambition  
 FARR 2820-3/HONR 2850-3 The Future of Spaceship Earth  
 FILM 2013-3 Film and the Quest for Truth  
 GRMN 2502-3 Representing the Holocaust  
 GRMN 3505-3 The Enlightenment: Tolerance and Emancipation  
 GRMN/HUMN 4502-3 Nietzsche: Literature and Values  
 HONR 4155-3 Problems of Ancient and Modern Democracy

HUMN 3440-3 Literature and Medicine  
 HUMN 4155-3 Philosophy, Art, and the Sublime  
 PHIL 1000-3 Introduction to Philosophy  
 PHIL 1100-3 Ethics  
 PHIL 1200-3 Philosophy and Society  
 PHIL 1600-3 Philosophy and Religion  
 PHIL 2200-3 Major Social Theories  
 PHIL 3100-3 Ethical Theory  
 PHIL/WMST 3110-3 Feminist Practical Ethics  
 PHIL 3140-3 Environmental Ethics  
 PHIL 3160-3 Bioethics  
 PHIL 3190-3 War and Morality  
 PHIL 3200-3 Social and Political Philosophy  
 PHIL 3260-3 International Human Rights  
 PHIL 3600-3 Philosophy of Religion  
 PSCI 2004-3 Survey of Western Political Thought  
 PSCI 3054-3 American Political Thought  
 RLST 1620-3 The Religious Dimension in Human Experience  
 RLST 2200-3 Religion and Dance  
 RLST 2300-3 Religions of Traditional Peoples  
 RLST 2600-3 World Religions: West  
 RLST 2610-3 World Religions: India  
 RLST 2620-3 World Religions: China and Japan  
 RLST 3250-3 Gandhi: Life and Teaching  
 RUSS 3502-3 Ideals and Values in Modern Russia  
 SOCY 1003-3 Ethics and Social Issues in U.S. Health and Medicine  
 SOCY 1004-3 Deviance in U.S. Society  
 SOCY 1005-3 Social Conflict and Social Values  
 SOCY 2031-3 U.S. Values, Social Problems, and Change  
 SOCY 3151-3 Self in Modern Society

### Majors and Other Areas of Interest

To be eligible for the four-year guarantee, a student must begin the program of study and declare the major by the start of the second semester or earlier for some select majors. For complete information on the four-year guarantee, see page 56.

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 sixtieth semester hour of work, including transfer work). See page 5 for a listing of bachelor's programs.

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.

### Minimum 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 in the major area, all with grades of C- (1.70) or higher.

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

4. Twelve hours of upper-division course work for the major on the Boulder campus.

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

6. Special requirements as stipulated by the major department.

7. No more than 8 semester hours of independent study.

Students are subject to those major requirements in effect at the time they formally declare the major. All College of Arts and Sciences students have 10 years to complete the requirements for a declared major. If this 10-year limit is exceeded, students may be required to satisfy the current major requirements. Students with further questions should consult a major advisor.

### 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 course work taken during the freshman and sophomore years can be applied toward the general education requirements of the college. Open option students must declare a major by the end of their sophomore year. The major must be declared by the start of the second semester of study or earlier for certain majors to maintain eligibility for the four-year guarantee.

### 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 120 total semester hours is required for double majors.

### Minors

A number of departments and programs in the College of Arts and Sciences offer minor programs. Participation in a minor program is optional for students pursuing a bachelor's degree. Course work applied to a minor may also be applied toward general education (core curriculum or college list) and major requirements. Students may not earn a major and a minor in the same program of study.

Departments and programs with approved minor programs currently include applied mathematics; astrophysical, planetary, and atmospheric sciences; chemistry and biochemistry; classics; dance; economics; envi-

ronmental, population, and organismic biology; ethnic studies; French; geography; geology; German; history; Italian; Japanese; kinesiology; linguistics; mathematics; philosophy; physics; political science; religious studies; Russian; theatre; and women studies. Minors are also available in business offered by the College of Business Administration and in computer science offered by the College of Engineering and Applied Science. Interested students should contact the college, department, or program office for further information.

Although the structure of specific minor programs may differ, all minors offered in the College of Arts and Sciences must have the following restrictions or minimum requirements:

1. A minimum of 18 credit hours must be taken in the minor area, including a minimum of 9 upper-division hours.
2. 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.
3. Students pursuing an individually structured major, or a major in distributed studies, are not eligible to earn a minor.
4. Students are allowed to apply no more than 9 credit hours, including 6 upper-division credit hours, of transfer work toward a minor.
5. Students may earn no more than one minor.

### **Areas of Interest and Certificate Programs**

The college also sponsors programs—but not undergraduate majors—in the following areas of interest. Successful completion of specified course work in some of these areas (noted below) entitles students to a certificate issued by the dean of the college. Students interested in these programs should contact the Office of the Dean. Course work in these general areas is open to all interested students:

American Indian Studies  
 Asian American Studies  
 American Western Studies (certificate)  
 Astrophysical, Planetary, and Atmospheric Sciences (APAS)  
 Bibliography  
 British Studies (certificate)  
 Chicano Studies  
 History and Philosophy of Science and Honors  
 Lesbian, Gay, Bisexual, and Transgender Studies (certificate)  
 Medieval Studies

Museum  
 Peace and Conflict Studies (certificate)

### **Multiple Degrees**

#### **Double Degrees**

Two different degrees (i.e., a 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 meets the residency requirements of, and is enrolled in, both arts and sciences and the college or school granting the second degree.
2. The student presents a total of at least 150 semester hours passed.
3. For the B.A. and B.F.A. degrees, 90 semester hours of liberal arts course work are required.
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 have been met. (Students are subject to the general degree requirements in effect the semester they enter the second baccalaureate degree program.)
2. The major in the B.A. or B.F.A. 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.

#### **Graduation Deadlines**

Arts and sciences seniors must meet appropriate application deadlines in order to graduate. To apply for graduation, students must attend an advising workshop and complete the graduation packet. Workshop schedules are available in the handout racks in the basement of Old Main. Students must submit graduation packets to Old Main 1B-85 by the deadlines listed below.

Commencement Date	Date Due
May	November 15
August	April 15
December	July 15

### **GRADUATE STUDY**

Curricula leading to advanced degrees are offered by most of the departments in the College of Arts and Sciences (see page 349). Students should consult the Graduate School chapter 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 chapter of this catalog.

### **AFRO-AMERICAN STUDIES**

See Ethnic Studies.

### **AMERICAN STUDIES**

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

American Studies 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 following major requirements.

### Major Requirements Semester Hours

Two semesters of introductory American Studies courses (or equivalent): AMST 2000 Themes in American Culture: 1600-1900 and 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 that 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.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in American Studies, students should meet the following requirements:

- Declare an American Studies major by the beginning of the second semester.
- Complete AMST 2000 and 12 additional credit hours of major requirements in American Studies by the end of the fourth semester.
- Complete 30 total credit hours of major requirements by the end of the sixth semester.
- Complete AMST 4500 and one additional 3-credit major requirement by the end of the eighth semester.

### Tracks in American Studies

**American Democracy: Institutions, Governance, and Public Policy**

- BLST 3103 Blacks in the U.S. Educational System
- BLST/PSCI 3101 Black Politics
- CHST 4133 Latinos and the U.S. Political System
- ECON 3535 Natural Resource Economics
- ECON 3545 Environmental Economics
- ECON 4524 Economic History of the United States

- ECON 4697 Industrial Organization and Regulation
- 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
- PSCI 3011 The American Presidency
- PSCI 4021 Legislatures and Legislation
- PSCI 3031 Political Parties and Pressure Groups
- PSCI 3054 American Political Thought
- PSCI 3071 Urban Politics
- PSCI 4111 Urban Problems and Public Policies
- PSCI 4131 Latinos and the U.S. Political System
- PSCI 4141 Bureaucratic Power in American Politics
- PSCI 4161 Political Ethics in Policy Analysis
- PSCI 3171 Government and Capitalism in the United States
- PSCI 3191 National Security Organization and Policy Making
- PSCI 3201 The Environment and Public Policy
- PSCI 4241 Constitutional Law 1
- PSCI 4251 Constitutional Law 2
- PSCI 3261 The Judicial System
- PSCI 4271 Sex Discrimination: Constitutional Issues
- PSCI 4291 Sex Discrimination: Federal and State Law

### Diversity in America:

- Race, Gender, and Ethnicity**
- AAST 3013 Asian/Pacific American Communities
- AAST 3420 Selected Topics: Asian-American Studies
- AAST/HIST 4717 Chinese American History
- AAST/HIST 4727 Japanese American History
- AIST 3010 Marxism and Native Americans
- AIST 3135 North American Indians: Traditional Cultures
- AIST 3400 Indian/Government Conflicts
- ANTH 3130 North American Indians: Traditional Cultures
- ANTH 4560 North American Indian Acculturation
- BLST 3020 Selected Topics in Black Studies
- BLST/RLST 3125 Black Religious Life in America
- BLST 3103 Blacks in the U.S. Educational System
- BLST/WMST 3505 Historical and Contemporary Issues of Black Women
- BLST/PSCI 3101 Black Politics
- BLST 4650 Contemporary Issues in Black Studies
- BLST 4670 The Sixties: Critical Black Views
- BLST 4692/ENGL 4697 Contemporary African-American Literature 1
- CHST/SOCY 3026 Women of Color: Chicanas in U.S. Society
- CHST/WMST 3135 Study of Chicanas
- CHST 3153 Folklore, Mysticism, and Myth of the Hispanic Southwest
- CHST 4000 Hispanic and Native American Culture of the Southwest

- CHST 4133/PSCI 4131 Latinos and the U.S. Political System
- CHST 4681 Special Topics
- ENGL 3268/WMST 3262 Women Writers
- ENGL 3677 Jewish-American Fiction and Old World Backgrounds
- ETHN 3000 Race, Class, and Gender
- FILM 3013 Women and Film
- FINE 3509 American Art
- HIST 4026 U.S.-Indian Relations
- 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 4101 Education in Multilingual Communities
- Regional Studies: The American West**
- AAST 3013 Contemporary Asian/Pacific American Communities
- AAST 3420 Selected Topics: Asian-American Studies
- AIST 3135/ANTH 3130 North American Indians
- AIST 3400 Indian/Government Conflicts
- AIST 4565/ANTH 4560 North American Indian Acculturation
- AIST/HIST 4627 Indian in American History-West
- ANTH 4200 North American Archaeology
- ANTH 4210 Southwest Archaeology
- ANTH 4270 Plains Archaeology
- CHST/SOCY 3026 Women of Color: Chicanas in U.S. Society
- CHST/WMST 3135 Study of Chicanas
- CHST 3153 Folklore, Mysticism, and Myth of the Hispanic Southwest
- CHST/SPAN 4000 Hispanic and Native American Culture of the Southwest
- CHST 4133/PSCI 4131 Latinos and the U.S. Political System
- FINE 4439 North American Indian Art
- GEOG 4501 Water Resources and Management of the Western U.S.
- HIST 3317 Seminar in the American West
- HIST 4026 U.S.-Indian Relations
- HIST 4217 The American West in the Nineteenth Century
- HIST 4227 The American West in the Twentieth Century
- HIST 4327 American Southwest
- HIST 4617 The Indian in American History: The Eastern Region
- PSCI 3201 Environment and Public Policy
- RLST 4300 Topics in Native American Religions
- RLST 4350 Native American Religions: Regional Studies

**Representation:**

**Nature, Culture, and Society**  
 AAST 3420 Selected Topics: Asian-American Studies  
 AAST/HIST 4717 Chinese American History  
 AAST/HIST 4727 Japanese American History  
 ANTH 3170 America: An Anthropological Perspective  
 BLST/WMST 3505 Historical and Contemporary Issues of Black Women  
 BLST/PSCI 3101 Black Politics  
 BLST 4692 Contemporary African-American Literature 1  
 CHST 3824 Chicano Prose Fiction  
 CHST 4000 Hispanic and Native American Culture of the Southwest  
 ENGL 3654 Survey of American Literature 1  
 ENGL 3664 Survey of American Literature 2  
 ENGL 3677 Jewish-American Fiction and Old World Backgrounds  
 ENGL 3682 Twentieth Century American Literature  
 ENGL 4030 Critical Thinking in English Studies  
 ENGL 4234 American Novel 1  
 ENGL 4244 American Novel 2  
 ENGL 4654 Studies in American Literature to 1900  
 ENGL 4664 Studies in American Literature after 1900  
 ENGL 4697 Contemporary African-American Literature 1  
 ENVD 4114 History of American Architecture and Urbanism  
 ETHN 3000 Race, Class, and Gender  
 ETHN 3703 Culture, Racism, and Alienation in America  
 FINE 3509 American Art  
 FINE 4529 American Art 1945-1970  
 FINE 4539 Contemporary Art 1970-Present  
 HIST 3416 Seminar in American Society and Thought  
 HIST 4316 Origins of American Culture 1600-1830  
 HIST 4336 Nineteenth Century American Intellectual History  
 HIST 4346 Twentieth Century American Intellectual History  
 HIST 4516 American Society in the Nineteenth Century  
 HIST 4526 American Society in the Twentieth Century  
 HIST 4616 History of Women in the U.S. to 1890  
 HIST 4626 History of Women in the U.S. since 1890  
 EMUS 3082 American Popular Music  
 EMUS 3642 History of Jazz  
 PHIL 3140 Environmental Ethics  
 PSCI 3051 Public Opinion and Political Behavior  
 PSCI 3054 American Political Thought  
 PSCI 4151 Political Socialization  
 PSCI 3201 The Environment and Public Policy  
 PSCI 4701 Symbolic Politics  
 RLST 3050 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 2  
 SOCY/WMST 4086 Family and Society  
 THTR 3009 Development of the American Musical Theatre  
 THTR 4001 Development of Theatre 4: American Theatre and Drama.

## AMERICAN INDIAN STUDIES

See Ethnic 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 methods, concepts, alternative theories and approaches, and modes of explanation appropriate to each of the three main subfields of the discipline (archaeology, physical anthropology, and cultural anthropology);
- understanding of basic archaeological techniques, including 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, patterning, and creativity in human social behavior and symbolic systems, including ecological, social, cultural, and psychological factors, and the kinds of ethnographic 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 global interactions and cultural movements); and
- a basic understanding of primate evolution, including knowledge of theories of human evolution, and familiarity with the basic data of the hominid fossil record.

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.)

<i>Major Requirements</i>	<i>Semester Hours</i>
ANTH 2010 Introduction to Physical Anthropology 1 .....	3
ANTH 2100 Frontiers of Cultural Anthropology .....	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)

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in Anthropology, students should meet the following requirements:

- Declare a major in anthropology by the beginning of the second semester.
- Complete ANTH 2010, 2100, and 2200 by the end of the fourth semester.
- Complete 12 credits of upper-division anthropology courses by the end of the sixth semester, including fulfilling at least two of the four upper-division requirements.
- Complete 6 additional anthropology credits by the end of the seventh semester, including the two remaining upper-division requirements.
- Complete one 3-credit upper-division anthropology course during the eighth semester.

### Graduate Degree Programs

Prerequisites. To be considered for admission as a regular degree student, applicants should have a minimum undergraduate grade point average of 3.00 (4.00=A) or a master of arts degree in anthropology. Graduate Record Ex-



amination 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 fewer than 18 semester hours of previous course work in anthropology are considered deficient and may be 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 January 5. 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, but they may be required to complete specific remedial requirements in some cases.

**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 year in residence.

As partial fulfillment for a graduate degree, all students must complete three graduate core courses, one from each of three subdisciplines of anthropology (cultural, physical, and archaeology). Core courses must be taken during the first two semesters in residence.

Other specific course requirements are established through a qualifying interview and consultation with 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 a primary specialization in any of the major subfields of anthropology: archaeology, cultural, or physical anthropology. Further specialization in applied anthropology, human ecology, ethnography, and cultural theory 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 maintain a breadth of competence in general 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 Department of Applied Mathematics in the College of Arts and Sciences offers courses and degree programs for undergraduate and graduate students. Course offerings at the undergraduate level focus on providing students with the mathematical tools and problem-solving strategies that are useful in science and engineering. The undergraduate bachelor of science degree is offered through the College of Engineering and Applied Science. A minor degree in applied mathematics is available to arts and sciences as well as engineering students.

The department offers a range of courses and research opportunities in many areas, including computational mathematics, probability and statistics, nonlinear phenomena, and physical applied mathematics. Each of these areas is described below.

### *Computational Mathematics*

The study of computational mathematics has grown rapidly over the past 15 years and has allowed mathematicians to answer questions and develop insights not possible only 20 to 30 years ago. Modern computational methods require in-depth knowledge of a variety of mathematical subjects including linear algebra, analysis, ordinary and partial differential equations, asymptotic analysis, elements of harmonic analysis, and nonlinear equations. Since computers are invaluable tools for an applied mathematician, students are expected to attain a highly professional level of computer literacy and gain a substantial knowledge of operating systems and hardware. Computational mathematics courses include the study of computational linear algebra, optimization, numerical solution of ordinary and partial differential equations, solution of nonlinear equations, and advanced seminars in wavelet and multi-resolution analysis.

### *Probability and Statistics*

Almost all natural phenomena in the technological, biological, physical, and social sciences have random components. Applied probability is the application of probabilistic methods to understand the random elements in real-life problems. Statistics is the science of using data that typically arise from the randomness inherent in nature to gain new knowledge. Research areas of the applied math and affiliated faculty exhibit this interplay between mathematics and real-life problems. Areas of current interest include optimization of stochastic networks; the study of stochastic processes and stochastic differential equations in hydrology and telecommunications; probabilistic

models, and statistical tests based on these models; in genetics and RNA sequencing; and extreme value theory in estimation of maximal wind speeds. Appropriate course work includes analysis, probability and statistics, as well as background courses in one of the sciences or engineering fields in which one intends to do research.

### *Nonlinear Phenomena*

In recent years there has been an explosion of interest in the study of nonlinear waves and dynamical systems with analytical results, often motivated by the use of computers. The faculty in the Department of Applied Mathematics are actively and intensively involved in this growing field. Research areas include integrable systems, conservative and dissipative chaos, numerical computation, wavelets and multi-resolution analysis, solitons, integrable systems, cellular automata, pattern formation, qualitative structure and bifurcation theory, onset of chaos and turbulence, analytic dynamics, and transport phenomena. Program courses in this field include dynamical systems, nonlinear wave motion, and many advanced seminars. Suitable background courses are analysis, computation, and methods in applied mathematics. Valuable supplemental courses include mechanics and fluid dynamics.

### *Physical Applied Mathematics*

Physical applied mathematics is a term that generally refers to the study of mathematical problems with direct physical application. This area of research is intrinsically interdisciplinary. In addition to mathematical analysis, it requires an in-depth understanding of the underlying applications: area, and usually requires knowledge and experience in numerical computation. The program has approximately 30 affiliated faculty who can direct thesis research in areas such as atmospheric and fluid dynamics, theoretical physics, plasma physics, genetic structure, parallel computation, etc. The course requirements of the program are designed to provide students with a foundation for their study (analysis and computation). The program also requires supplemental courses in one of the sciences or engineering fields that are needed to begin doing thesis research in physical applied mathematics.

### *Bachelor's Degree Programs*

A bachelor of science degree in applied mathematics is currently offered by the College of Engineering and Applied Science.

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 may be 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.

### Minor Program

The department also offers a minor in applied mathematics that is available to engineering and arts and sciences students. A minor in applied mathematics indicates that a student has received in-depth training in mathematical techniques and computational methods well beyond the training usually received by science and engineering majors.

### 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 (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.

### M.S. Degree

The Department of Applied Mathematics offers the M.S. degree jointly with the Department of Mathematics.

The program requires a candidate to complete an approved program of study consisting of at least 30 semester hours. At least 18 of these 30 hours must be in applied mathematics courses at the 5000 level or above. In addition to the required sequence, APPM 4350 and 4360, all students are required to take a two-semester course sequence of applied mathematics or math courses numbered 4000 and above. Upon approval by petition to the graduate committee, a more advanced course in an area, or graduate work done elsewhere, can be used to satisfy part of this requirement. Furthermore, all students are required to

take a year-long sequence in an area where mathematics has significant application (advisor approval required).

### Ph.D. Degree

The Department of Applied Mathematics 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.

A minimum of 60 credit hours are required for the degree, including 30 in courses numbered 5000 or above and 30 hours of dissertation credit. A grade of *B*- or higher must be attained in each course. Students must take the core sequences in APPM 5440 and 5450 (Applied Analysis) and APPM 5600 and 5610 (Numerical Analysis). An additional core sequence in an application area (APPM 5470 Partial Differential and Integral Equations and APPM 5480 Approximation Methods; or APPM 5560 Introduction to Probability Models and APPM 5520 Introduction to Mathematical Statistics) is also required. Students must take at least two semesters of seminar courses (APPM 8000 Applied Mathematics, APPM 8100 Dynamical Systems, or APPM 8200 Computational Mathematics). Finally, each student must take a year-long graduate sequence outside of applied mathematics in an area where mathematics has significant applications. Faculty advisor approval of the sequence is required.

Further information on the program and degree requirements is available from the Applied Mathematics office and the Graduate School.

## ASIAN AMERICAN STUDIES

See Ethnic Studies.

## ASIAN STUDIES

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

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

Students planning to major in Asian Studies may participate in study abroad programs with prior approval from the Asian Studies Program and the Office of International Education.

## Bachelor's Degree Program

The requirements for the Asian Studies major are currently being revised. Please contact the director for details, 492-7241.

### Approved Asian Studies Courses

Most classes are offered for 3 credit hours. Not all classes are taught every semester or even every year.

- ANTH 1110 Exploring a Non-Western Culture: Japan
- ASIA 1840 Independent Study
- ASIA 2840 Independent Study
- ASIA 3840 Independent Study
- ASIA 4830 Senior Thesis in Asian Studies (required of all majors; only offered to seniors in the spring)
- ASIA 4840 Independent Study
- CHIN 1010, 1020 First-Year (Beginning) Chinese
- CHIN 1051 Masterpieces of Chinese Literature in Translation
- CHIN 1900 Independent Study
- CHIN 2110, 2120 Second-Year (Intermediate) Chinese
- CHIN 2900 Independent Study
- CHIN 3110, 3120 Third-Year (Advanced) Chinese 1 and 2
- CHIN 3210 Introduction to Classical Chinese
- CHIN 3220 Readings in Classical Chinese
- CHIN 3900 Independent Study
- CHIN 4110, 4120 Readings in Modern Chinese Literature 1 and 2
- CHIN 4230 Seminar in Classical Chinese
- CHIN 4811 Worlds of Ancient and Medieval Poetry
- CHIN 4821 Reality and Dream in Traditional Chinese Fiction
- CHIN 4831 Chinese Drama in Translation
- CHIN 4841 Women and the Supernatural in Chinese Literature (taught in English)
- CHIN 4900 Independent Study
- ECON 4433 Economic Relations Among the United States, Japan, and Canada
- FINE 2409 Introduction to Asian Art
- FINE 4459/5459 The Arts of Japan
- FINE 4469/5469 The Arts of China
- FINE 4669 Asian Arts in Context: Study Abroad
- FINE 5919 Graduate Seminar: Selected Topics in Art History (Asian Arts)
- GEOG 4742 Environments and Peoples: Environment and Development in China
- HIST 1608 Introduction to Chinese History
- HIST 1708 Introduction to Japanese History
- HIST 3628 Seminar in Recent Chinese History
- HIST 3718 Seminar in Japanese History
- HIST 4618 History of Traditional China
- HIST 4619 Women in Asian History
- HIST 4628 Rise of Revolutionary China
- HIST 4658 History of Modern Chinese Intellectual Thought
- HIST 4718 Ancient and Medieval Japanese History
- HIST 4728 Modern Japanese History
- HIST 4738 Japan at War
- HIST 4748 Modern Japanese Intellectual History
- HIST 6019 Readings in Third-World History (Asian Women)

HIST 6618 Readings in Chinese History  
 HIST 6718 Readings in Modern Japanese History  
 JPNS 1010, 1020 Beginning Japanese  
 JPNS 1051 Masterpieces of Japanese Literature in Translation  
 JPNS 2110, 2120 Intermediate Japanese  
 JPNS 3110, 3120 Advanced Japanese  
 JPNS 3210, 3220 Advanced Japanese Conversation and Composition  
 JPNS 3441 Language and Society  
 JPNS 4030 Japanese Syntax  
 JPNS 4110, 4120 Readings in Modern Japanese  
 JPNS 4300 Open Topics  
 JPNS 4310, 4320 Classical Japanese  
 JPNS 4811 Classical Japanese Literature in Translation  
 JPNS 4821 Medieval Japanese Literature in Translation  
 JPNS 4831 Early Modern Japanese Literature in Translation  
 JPNS 4841 Modern Japanese Literature in Translation  
 JPNS 4900 Independent Study  
 JPNS 4950 Honors Thesis  
 PSCI 4028 Politics of Contemporary Japan  
 PSCI 4052 Political Systems of China, Japan, and Korea  
 RLST 2620 World Religions: Eastern  
 RLST 3400 Japanese Religions  
 RLST 3800 Chinese Religions  
 RLST 4250/5250 Topics in Buddhism  
 RLST 4700/5700 Confucianism  
 RLST 4750/5750 Taoism

## ASTROPHYSICAL AND PLANETARY SCIENCES

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

Although an undergraduate major is not offered, a minor degree is available that may be satisfied by taking various combinations of courses among the diverse possibilities offered by the department. A total of 18 credit hours is required for the minor. For guidance, see an Astrophysical and Planetary Sciences (APS) faculty advisor or request written information from the departmental office. APS courses may also be used in undergraduate distributed studies 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 emphasizes three major areas: astrophysics, planetary sciences, and atmospheric and oceanic sciences. APS offers the third area of emphasis in collaboration with the Program in Atmospheric and Oceanic Sciences (PAOS). See the PAOS listing below for further information and course descriptions.

The department offers both M.S. and Ph.D. degrees. During the first year of graduate study students generally obtain a

broad background in courses regarded as basic to all three areas in addition to more specialized studies. Many students take graduate-level courses in other departments (e.g., Departments of Physics, Chemistry, or Aerospace Engineering) depending upon their particular interests or participation in interdisciplinary programs (see below). Examples of basic first-year courses in the three areas include:

ASTR 5110 Internal Processes 1  
 ASTR 5120 Internal Processes 2  
 ASTR 5540 Mathematical Methods  
 ASTR 5700 Stellar Structure and Evolution  
 ASTR 6400 Introduction to Planetary Sciences  
 ATOC 5050 Physical Processes of the Atmosphere and Ocean

Descriptions of more specialized courses follow. Students interested in applying to this department are invited to write to the University of Colorado at Boulder, Chair, Department of Astrophysical and Planetary Sciences, Campus Box 391, 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:

ASTR 5700 Stellar Structure and Evolution  
 ASTR 5710 High-Energy Astrophysics  
 ASTR 5720 Galaxies and Cosmology  
 ASTR 5730 Stellar Atmospheres and Radiative Transfer  
 ASTR 5740 Interstellar Astrophysics  
 ASTR 5750 Observational Astronomy  
 ASTR 6000 Seminar in Astrophysics

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

Stellar atmospheres, radiative transfer, and stellar winds of hot and cool stars  
 Star formation  
 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. Opportunities for

graduate research are also found with the University's Laboratory for Atmospheric and Space Physics (LASP), the Center for Astrophysics and Space Astronomy (CASA), and JILA (see descriptions in the Graduate School chapter). 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), the Hubble Telescope (HST), and the ROSAT, ASCA, and RXTE x-ray telescopes.

### Planetary Sciences

Research and courses related to the physics and dynamics of the atmospheres of other planets, planetary interiors, and other solar system studies are available in programs leading to the M.S. and Ph.D. degrees. Courses related to the physics and dynamics of the Earth's atmosphere are offered through PAOS under the ATOC acronym. Graduate-level courses in these areas are:

ASTR 5110 Internal Processes 1  
 ASTR 5250 Planetary Astronomy  
 ASTR 5300 Introduction to Magnetospheres  
 ASTR 5410 Fluid Instabilities and Waves  
 ASTR 5560 Radiative Processes in Planetary Atmospheres  
 ATOC 5050 Physical Processes of the Atmosphere and Ocean  
 ATOC 5960 Theories of Climate and Climate Variability

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

Atmospheric dynamics, planetary circulations, wave propagation, hydrodynamic instability, experimental geophysical fluid dynamics, physical oceanography, and climate dynamics  
 Atmospheric photochemistry, radiative transfer, upper atmospheric dynamics and transport of radiatively active species (ozone), effects of solar variability, dynamical-photochemical coupling, and diurnal and seasonal variations  
 Planetary aeronomy, airglow and aurora, UV and IR spectroscopy, noctilucent clouds, structure and composition of planetary atmospheres (Venus, Mars, Jupiter, 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, and magnetospheric dynamics

Graduate research opportunities exist with individual faculty members, as well as jointly with academic and research units such as the Program in Atmospheric and

Oceanic Sciences (PAOS), the National Center for Atmospheric Research (NCAR), the National Oceanic and Atmospheric Administration (NOAA), and the Laboratory for Atmospheric and Space Physics (LASP). The latter is involved in space investigations of the Earth and planets. Financial support is available in connection with all of the above research activities.

### *Atmospheric and Oceanic Sciences*

This interdisciplinary program provides an educational and research environment to examine the dynamical, physical, and chemical structures of the atmosphere and the ocean and the manner in which they interact. APS is a active departmental participant in this program. For further information, see the PAOS listing below.

### *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 chapter of this catalog.

### *Departmental Requirements*

Those wishing to pursue graduate work in APS leading to candidacy for an advanced degree should carefully read requirements for advanced degrees in the Graduate School chapter 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 Interview.** Students in the Department of Astrophysical and Planetary Sciences are given an oral interview 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 APS courses num-

bered 5000 or above. 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 APS 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.

## ATMOSPHERIC AND OCEANIC SCIENCES

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

The Program in Atmospheric and Oceanic Studies (PAOS) is a new interdisciplinary program that provides an educational and research environment to examine the dynamical, physical, and chemical structures of the atmosphere and the ocean and the manner in which they interact. A major theme is the establishment of a physical basis for climate and global change.

Although an undergraduate degree program is not yet offered, a number of undergraduate courses are available through PAOS, many of them approved to fulfill general education requirements.

PAOS offers a comprehensive graduate program with a core course structure that emphasizes the fluid dynamical, chemical, and physical structure of the Earth system. The goals of the program are achieved by a collaborative effort between a number of

departments with subspecialization in research and curricula. Graduate students, research staff, and faculty work together on a wide range of research topics, and opportunities also exist for involvement in field programs. Graduate core courses comprise the following:

ATOC 5050 Physical Processes in Atmospheres and Oceans  
 ATOC 5060 Dynamics of the Atmosphere  
 ATOC 5061 Dynamics of Oceans  
 ATOC/CHEM 5151 Atmospheric Chemistry  
 ATOC/ASEN 5225 Thermodynamics of Atmospheres and Oceans  
 ATOC/ASEN 5235 Remote Sensing of Atmospheres and Oceans  
 ATOC/ASTR 5400 Introduction to Fluid Dynamics  
 ATOC/ASTR 5540 Mathematical Methods  
 ATOC/ASTR 5560 Radiative Processes in Atmospheres & Oceans

In addition to these core courses, there are several courses offered either by PAOS alone, or in conjunction with other departments, that PAOS students are encouraged to consider (e.g., Modeling the Environment and Climate; Predicting Weather and Climate; Nonlinear Dynamics; Fluid Instabilities and Waves; Introduction to Fluid Dynamics; and others).

Each student must be admitted to the Graduate School and either to PAOS or to one of the following major departments:

Department of Aerospace Engineering  
 Department of Astrophysical and Planetary Sciences  
 Department of Chemistry and Biochemistry  
 Department of Electrical and Computer Engineering  
 Department of Geography

Students admitted directly to PAOS will be eligible for degrees titled "Astrophysical; Planetary, and Atmospheric Sciences."

For more information about the program or application procedure, please contact the PAOS office at (303) 492-7167.

## BIBLIOGRAPHY

Several courses in bibliography and library research methods are offered to students who wish to explore the structure, organization, retrieval, and evaluation of information for their study and career needs. See the course descriptions for further information.

## BIOLOGICAL SCIENCES

Course work and degree programs in the biological sciences are offered through the Department of Environmental, Population, and Organismic Biology (EPOB) and the Department of Molecular, Cellular, and Developmental Biology (MCDB). Students

should refer to program and course descriptions listed for each department.

The former Natural Science Program merged with EPO Biology on July 1, 1993. Most natural science (NASC) courses were retained, but have been assigned EPOB course numbers.

## 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.

## CENTRAL AND EAST EUROPEAN STUDIES

### Degree ..... B.A.

Central and East European Studies is an interdisciplinary program involving courses in the social sciences, history, and languages and literatures of Russia and Central and Eastern Europe. The B.A. degree prepares students for graduate work in the field, or for careers in business, government, or private agencies involved in the region.

Students are required to structure their curriculum in close consultation with the program director, or a faculty advisor from one of the related disciplines.

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

- historical developments prior to 1918, including the evolution of the sovereign states of Central and Eastern Europe; social and cultural developments, the emergence of nationalism and problems of national minorities;
- familiarity with the political and social institutions of the region, and their evolution in the twentieth century;
- familiarity with the literature of the region;

- knowledge of the economic and political relations between the former Soviet Union and the states of Central and Eastern Europe;
- an awareness of the recent changes in Central and Eastern Europe and of the chief factors that gave rise to them.

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 Central and Eastern Europe;
- the ability to communicate their findings orally and in grammatically correct writing; and
- the ability to read and speak with competence in Russian, German, or another language of the region.

### Bachelor's Degree Program

In addition to the general requirements of the College of Arts and Sciences, students must complete a minimum of 30 semester hours of course work with a grade of C or better. This work must include CEES 1000 Introduction to Eastern Europe, and either the sixth semester of one appropriate Central or East European language, or the fourth semester of one such language and the second semester of another.

#### Major Requirements Semester Hours

Students must complete at least 21 semester hours from the following courses. No more than four courses may be taken from a single department.

GEOG 4882 Russian Commonwealth.....	3
GRMN 1601 Introduction to Modern German Culture and Civilization.....	3
GRMN 3140 Current Issues in German Literature.....	3
GRMN 3520 Open Topics—The Cultural Context.....	3
GRMN 3501 German-Jewish Writers: From the Enlightenment to the Present.....	3
GRMN 4503 Issues in German Thought.....	3
HIST 3010 Communist Society, a Historical Perspective.....	3
HIST 3713 Readings in Russian History.....	3
HIST 4413 German History to 1849.....	3
HIST 4423 German History since 1849.....	3
HIST 4433 Nazi Germany.....	3
HIST 4613 History of Eastern Europe to 1914.....	3
HIST 4623 History of Eastern Europe since 1914.....	3
HIST 4713 History of Russia Through the Seventeenth Century.....	3
HIST 4723 Imperial Russia.....	3
HIST 4733 Russian Revolution and Soviet Regime.....	3
JOUR 4201 International Mass Communication.....	3
PSCI 4062 Emerging Democracies of Central and East Europe.....	3

PSCI 4223 Soviet and Russian Diplomacy.....	3
PSCI 4752 Seminar in Central and East European Studies.....	3
RUSS 2213 Introduction to Russian Culture.....	3
RUSS 2221 Introduction to Modern Russian Culture.....	3
RUSS 3301 Contemporary Issues in Russian Film.....	3
RUSS 4210 Open Topics: Russian Literature and Culture.....	3
RUSS 4421 Gogol.....	3
RUSS 4431 Dostoevsky.....	3
RUSS 4441 Tolstoy.....	3
RUSS 4451 Chekhov.....	3
RUSS 4811 Nineteenth Century Russian Literature.....	3
RUSS 4821 Twentieth Century Russian Literature.....	3
SLAV 4610 Ukrainian Literature World War I-II.....	3
SLAV 4620 Ukrainian Literature Since World War II.....	3

#### Electives

Students must complete no more than 6 semester hours from the following courses:

ANTH 4580 Power: The Anthropology of Politics.....	3
ECON 4514 Economic History of Europe.....	3
GRMN 2501 Twentieth Century German Short Story.....	3
GRMN 3110 German Literature 1.....	3
GRMN 3120 Modern German Literature 2.....	3
GRMN 3520 Open Topics in Cultural Context.....	3
GRMN 4330 Seminar: Age of Goethe.....	3
GRMN 4370 Introduction to German Literary History 1.....	3
GRMN 4380 Introduction to German Literary History 2.....	3
GRMN 4550 Senior Seminar.....	3
HIST 4222 War and the European State, 1618-1793.....	3
HIST 4312 Nineteenth Century Europe.....	3
HIST 4412 Twentieth Century Europe.....	3
PSCI 3143 International Relations.....	3
PSCI 4012 Global Development.....	3
PSCI 4284 General History of Law.....	3
PSCI 4703 Alternative World Futures.....	3

In addition to these courses, each department may offer "special topics" courses which may be acceptable as elective courses. A CEES faculty member may grant written permission for these additions.

#### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in Central and East European studies, students should meet the following requirements:



- Declare the Central and East European studies major by the beginning of the second semester.
- Complete 12 credit hours of a Central and East European language by the end of the fourth semester.
- Complete CEES 1000 by the end of the fourth semester.
- Complete 12 credit hours of CEES courses by the end of the sixth semester, including at least 9 credit hours from the list of major requirements.
- Complete 15 credit hours of CEES courses during the final two semesters, including at least 9 credit hours from the list of major requirements.

## 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
- 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

<b>Chemistry</b> (A minimum of 36 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 for Chemistry and Biochemistry Majors 1 and 2 or CHEM 3311 and 3331 Organic Chemistry 1 and 2.....	6
CHEM 3361 and 3381 Laboratory in Organic Chemistry 1 and 2 for Chemistry Majors....	4
CHEM 4011 Inorganic Chemistry.....	3
CHEM 4181 Instrumental Analysis.....	4
CHEM 4511 and 4531 Physical Chemistry 1 and 2 or CHEM 4411 and 4431 Physical Chemistry with Biochemistry Applications 1 and 2.....	6
CHEM 4561 Experimental Physical Chemistry.....	3
PHYS 1110 and 1120 General Physics 1 and 2.....	8
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 4021, 4711, 4731, 4901, 5011, 5161, or 5181.	
<b>Biochemistry</b> (A minimum of 34 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 students with advanced high school training in mathematics and physics).....	10-12
CHEM 3351 and 3371 Organic Chemistry for Chemistry and Biochemistry Majors 1 and 2 or CHEM 3311 and 3331 Organic Chemistry 1 and 2.....	6
CHEM 3321 and 3341 Laboratory in Organic Chemistry 1 and 2 or CHEM 3361 and 3381 Laboratory in Organic Chemistry for Majors 1 and 2.....	2-4
CHEM 4411 and 4431 Physical Chemistry with Biochemistry Applications 1 and 2 or CHEM 4511 and 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 2.....	8
PHYS 1140 Experimental Physics 1.....	1
MATH 1300, 2300, and 2400 Analytical Geometry and Calculus 1, 2, and 3.....	14
MCDB 1150 Introduction to Molecular Biology, MCDB 1151 Introduction to Molecular Biology Lab, MCDB 2150 Principles of	

Genetics, and MCDB 2151 Principles of Genetics Lab or EPOB 1210 and 1220 General Biology 1 and 2 and EPOB 1230 and 1240 General Biology Laboratory 1 and 2 (the latter is recommended for premedical students).....8

One of the following: MCDB 2150, 2151, (if not taken above), MCDB 3120, 3500, EPOB 3200, 3400, 3430, or 3530.....3-5

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in chemistry and biochemistry, students should meet the following requirements:

Declare chemistry or biochemistry as the major in the first semester.

Students must consult with a major advisor to determine adequate progress toward completion of the major.

### Minor Program

The Department of Chemistry and Biochemistry offers minors in both chemistry and biochemistry. A list of the requirements for each is available in the undergraduate office.

### 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 Chemistry and Biochemistry office.

### Chemistry Honors Program

Opportunity is provided for qualified chemistry and biochemistry majors to participate in the departmental honors program and graduate with honors (*cum laude*, *magna cum laude*, or *summa cum laude*) in chemistry or biochemistry. 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 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 chapter. 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 chapter 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 stu-

dents' 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 Ethnic Studies.

## CLASSICS

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

Through consultation with the undergraduate advisor, the bachelor's degree in classics is tailored to the student's interests in the field. Major and minor programs can be arranged with a concentration in either Latin or Greek or a combination of the two, or a broadly based program in classical antiquities (mythology, literature, philosophy, religion, art, archaeology, and history). Prospective majors and minors should consult with the undergraduate advisor and review the departmental list.

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

- an awareness of the fundamental outlines of the history of Greek and Roman literature, from Homer to the end of classical antiquity;
- familiarity with the historical and cultural contexts of particular works; and
- general knowledge of the art, religion, and philosophy of ancient Greece and Rome and their role in world cultural history.

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 in ancient Greek or Latin where relevant, as well as in translation;
- the ability to communicate in spoken and written form with adequate clarity and complexity 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,

including at least 18 semester hours of upper-division courses.

#### Major Requirements Semester Hours

##### Track I: Greek and/or Latin

Greek and/or Latin .....30

Note: The major is offered in Greek, Latin, or Greek and Latin. Students must designate one language as the primary field of study. The first year of this language does not count toward the major.

Electives (general classics courses dealing with the ancient world, ancient history, classical archaeology, classical tradition, or ancient philosophy) .....6

##### Track II: Classical Studies

General classics (CLAS 1010, 1100, 1105, 1110, 1115, 1120, 4110, 4120, 4130, 4600; or 4820) .....12

Ancient history, philosophy, and/or classical archaeology (CLAS 1009, 1051, 1061, 1140, 2020, 2100, 2110, 2610, 3330, 4021, 4031, 4041, 4049, 4051, 4059, 4061, 4079, 4081, 4091, 4419, 4429, 4761, 4799, PHIL 3000, or HIST 3011) .....18

Greek and/or Latin .....6

Note: Students must designate either Greek or Latin as the primary field of language study.

The first year of this language does not count toward the major. With the approval of the undergraduate advisor, upper-level Greek or Latin courses may be substituted for general classics, ancient history, or archaeology courses.

#### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in classics, students should meet the following requirements:

Declare the classics major by the beginning of the second semester.

Students must consult with a major advisor to determine adequate progress toward completion of the major.

#### Minor Program

The Department of Classics also offers a minor program. Please contact the departmental office for further information.

## 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.

**Degree Requirements.** Candidates for the M.A. degree in Latin or Greek are required to pass a written examination in translation of the major language. Students intending to pursue the Ph.D. in classics are strongly advised to develop proficiency in both Latin and Greek, and to acquire a reading knowledge of German, French, or Italian.

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 pass a written examination in two 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 credit hours of thesis) take an oral comprehensive examination in defense of the thesis. Candidates for the M.A. plan II (30 credit hours without thesis) must have departmental approval and pass an oral comprehensive examination covering their course work.

Candidates for the M.A. degree with emphasis on the teaching of Latin must pass 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 for the Ph.D. in Classics must meet the following requirements:

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. One course each in Greek prose composition, Latin prose composition, and a special field such as epigraphy, paleography, literary theory, linguistics, or religion.
4. Two courses in ancient history or classical archaeology.
5. The candidate is tested in Greek and Latin languages (translation tests) and must pass a written examination on one Greek and one Roman author. There is an oral comprehensive examination in which the student is expected to demonstrate overall factual knowledge of Greek and Latin literature.
6. 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 analytic 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 and scientific traditions;
- understanding of the basic contexts in which communication is enacted (e.g., interpersonal, small group, and organizational and public contexts);
- understanding of the various processes of influence within these contexts;
- understanding of communication codes and coding;
- familiarity with the basic methods of investigating questions about problems in communication;
- understanding of the ethical issues and responsibilities of communication practice, particularly the role of debate and discussion in a free society; and
- understanding of the diversity of communication styles associated with gender and cultural differences.

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

Students majoring in communication must fulfill the following requirements in addition to the College of Arts and Sciences general education requirements.

<i>Major Requirements</i>	<i>Semester Hours</i>
Majors must present a minimum of 33 credit hours of course work in communication and 18 of these hours must be upper division (3000 or above).	
COMM 1300 Public Speaking .....	3
COMM 1600 Interaction Skills .....	3
COMM 2310 Principles and Practices of Argumentation .....	3

COMM 3100 Current Issues in Communication and Society .....

Two of the following:

COMM 2210 Perspectives on Human Communication .....	3
COMM 2400 Communication and Society .....	3
COMM 2500 Interpersonal Communication .....	3
COMM 2600 Organizational Communication .....	3

One of the following is required (the second may be taken as an elective, thus requiring only 3 courses from the last group of classes):

COMM 3210 Human Communication Theory .....	3
COMM 3300 Rhetorical Foundations of Communication .....	3

Three or four of the following:

COMM 3250 Empirical Research Methods .....	3
COMM 3360 Rhetorical Criticism .....	3
COMM 4000 Special Topics .....	3
COMM 4220 Senior Seminar: Functions of Communication .....	3
COMM 4300 Senior Seminar: Rhetoric .....	3
COMM 4400 Senior Seminar: Communication Codes .....	3
COMM 4510 Senior Seminar: Interpersonal Communication .....	3
COMM 4600 Senior Seminar: Organizational 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 will be advised of any changes in this list of requirements.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in communication, students should meet the following requirements:

Declare the major in communication by the beginning of the second semester of study. Students must consult with a major advisor to determine adequate progress toward completion of the major requirements within the time frame of the four-year guarantee. Majors are encouraged to register at the designated times.

## 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 chapter 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 contributes to the overall liberal arts education of students with other professional goals by providing an understanding of the role played by disorders of speech, hearing, and language in contemporary society. 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 mechanisms, as well as the processes of speech production, transmission, and reception;
- an understanding of the development of language;
- an understanding of the etiologies, manifestations, and treatments 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 37 semester hours of course work in the recommended sequence below.

### Sophomore Year

*Fall Semester*  
EPOB 3420 Human Anatomy.....5

*Spring Semester*  
CDSS 4560 Language Development.....3

### Junior Year

*Fall Semester*  
CDSS 4522 Clinical Phonetics and Phonological Disorders.....2  
PSYC 2101 Statistics and Research Methods in Psychology.....4  
Psychology elective.....3-4

### Spring Semester

CDSS 3130 Speech and Hearing Science.....5

### Senior Year

*Fall Semester*  
CDSS 4502 Language Disorders: Child and Adult.....2  
CDSS 4704 Audiological Evaluation.....3  
CDSS 4918 Introduction to Clinical Practice.....2  
PSYC 4072 Clinical Neuroscience.....3

### Spring Semester

CDSS 4512 Speech Disorders: Voice, Cleft Palate, Motor Disorders, Stuttering.....3  
CDSS 4714 Audiology Rehabilitation.....3  
CDSS 4918 Introduction to Clinical Practice.....2  
(Only one semester of CDSS 4918 is required and may be taken in either the fall or spring.)

## Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in communication disorders and speech science, students should meet the following requirements:

Declare the major in communication disorders and speech science by the beginning of the second semester.

Complete the prerequisite biology courses (EPOB 1210 and 1220) before the fall of the junior year.

Complete Human Anatomy (EPOB 3420) by the fall of the junior year. This is the latest

date that EPOB 3420 can be taken in order to meet prerequisites for junior and senior year CDSS courses.

Complete the major requirements in the sequence listed above.

## 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 chapter 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. Within departmental and ASHA guidelines, master's students in audiology and speech-language pathology devise individualized programs of academic and clinical study which allow them to experience clinical specialties of their choosing. (Students in speech-language pathology may experience four out of seven possible clinical specialties.) Clinical assignments are initiated in the department's on-site Communication Disorders Clinic; later, student input is obtained in making off-campus clinical assignments in educational and medical settings.

Students with an undergraduate degree in speech-language pathology and audiology can expect to complete the program in two calendar years. Those without such a background are required to make up undergraduate deficiencies, which normally require at least an additional 28 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 is grounded in research and it 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 AND HUMANITIES

<i>Comparative Literature Degrees</i> .....	M.A., Ph.D.
<i>Humanities Degree</i> .....	B.A.

### Bachelor's Degree Program

The humanities major takes an interdisciplinary and comparative approach to the study of arts (e.g., literature, fine arts, music, and film) and cultures within their historical contexts. As currently constituted, the introductory sequence in humanities (HUMN 1010 and 1020) looks critically at that tradition whose beginning is often defined by Greece and Rome as well as our habit of still doing so. As students progress through the major, they sharpen their critical skills of analysis and interpretation as they broaden their cultural knowledge, enabling them to decode and compare multiple modes of representation and, to the extent possible, other perspectives.

The undergraduate degree in Humanities emphasizes:

- awareness of the ways cultures and traditions define both themselves and each other;
- awareness of the formal, rhetorical and ideological properties of cultural texts in a variety of forms and media (literature, history, philosophy, film, music, visual arts, architecture, dance, theatre, performance);
- awareness of the dynamic relations between texts and their social and historical contexts;
- awareness of the genres and modes of texts and their production, transformation, and reception; and
- critical awareness of the theoretical and ideological underpinnings and implications of one's own and others' interpretive approaches and assumptions.

In addition, Humanities majors are expected to acquire:

- the ability to analyze and interpret texts in a variety of forms and media;

- the ability to articulate such analyses and interpretations at a sophisticated level in both written and oral form;
- the ability to discern similarities and differences among individual works;
- the ability to discern similarities and differences among artistic media;
- the ability to discern similarities and differences among historical periods and cultural traditions;
- the ability to reason critically; and
- the ability to explore the connections between contemporary issues and academic work.

The major consists of three parts: interdisciplinary work within the Department of Comparative Literature and Humanities; course work in the literature of a single language (English, French, German, etc.) or in related fields such as history, art history, or anthropology, 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.

<i>Major Requirements</i>	<i>Semester Hours</i>
HUMN 1010 and 1020 Introduction to Humanities 1 and 2.....	12
Upper-division humanities courses.....	18
Area of concentration: either a single language/literature (English or a foreign language, ancient or modern; first-year courses may not be counted) or a field related to the humanities, such as history, art history, anthropology, etc.....	18
Secondary field: courses chosen from one other humanities-related discipline such as fine arts, music, dance, theatre, film, philosophy, foreign language literature (first-year courses may not be counted), or other discipline.....	12

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in humanities, students should meet the following requirements:

Because the Department of Comparative Literature and Humanities is unique in requiring courses from a number of different departments in addition to its own courses, it is

imperative that students wishing to graduate in four years declare the major early and meet regularly with a departmental advisor.

Complete the lower-division sequence HUMN 1010-1020 by the end of the fourth semester.

Complete at least two lower-division courses in the secondary field and/or area of concentration by the end of the fourth semester.

Complete 15 of the remaining 42 credit hours at the upper-division level by the end of the sixth semester—at least two of these must be upper-division humanities courses.

Complete all remaining required courses (no more than 27 credits) by the end of the eighth semester.

## Graduate Degree Programs

### *Comparative Literature*

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 information provided in the Graduate School chapter 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 University of Colorado at Boulder, Department of Comparative Literature and Humanities, Ketchum 233, Campus Box 331, Boulder, CO 80309-0331.

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 those who have had 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) early in their course of study. 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 should 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 should be either a classical or a modern non-European language.

**Requirements.** Students take the Proseminar in Comparative Literature (COML 5000) and Introduction to Literary Theory (COML 5610) early in their course of study. 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 Department of Comparative Literature and Humanities. At least 9 credit hours are in graduate courses in the department of the primary literature, and 6 credit hours are in the department of the secondary literature. Students should 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.

## 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 and Planetary 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. In each department, students must have a 2.00 grade point average for all work attempted in the department, and at least 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 two 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 all course work attempted in the primary area and at least 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 all course work attempted 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.

For further information, please contact the College of Arts and Sciences Advising Office.

## EAST ASIAN LANGUAGES AND LITERATURES

*Chinese or Japanese Degree* ..... B.A.

*East Asian Languages Degree* ..... M.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

### 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 sufficient 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.

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

### 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 and 2120 Intermediate Chinese 1 and 2 .....	10
CHIN 3110 and 3120 Advanced Chinese 1 and 2 .....	6
CHIN 3210 Introduction to Classical Chinese .....	4
CHIN 3220 Readings in Classical Chinese ....	4



Any two of the following courses:

CHIN 4811 Worlds of Ancient and Medieval Poetry.....	3
CHIN 4821 Reality and Dream in Traditional Chinese Fiction.....	3
CHIN 4831 Chinese Drama in Translation.....	3
CHIN 4841 Women and the Supernatural in Chinese Literature.....	3
CHIN 4851 Twentieth-Century Literature in Translation.....	3

### *Graduating in Four Years with a B.A. in Chinese*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in Chinese, students should meet the following requirements:

- Declare the major in the first semester.
- Students wishing to major in Chinese and who have no prior knowledge of the language should begin the required major courses no later than the sophomore year.
- Students must consult with a major advisor to determine adequate progress toward completion of the major.

### *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 sufficient 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 above JPNS 2110. JPNS 2120 or its equivalent is the prerequisite to upper-division courses required for the major. At least 25 credit hours must be at the upper-division level.

JPNS 2120 Intermediate Japanese.....	5
JPNS 3110-3120 Advanced Japanese 1 and 2.....	6
JPNS 4110 and 4120 Readings in Modern Japanese 1 and 2.....	6
Thirteen additional credit hours selected from the following courses:	
JPNS 3210 and 3220 Advanced Japanese Conversation and Composition 1 and 2.....	4
JPNS 3441 Language and Japanese Society.....	3
JPNS 4030 Japanese Syntax.....	3
JPNS 4310 and 4320 Classical Japanese 1 and 2.....	6
JPNS 4811 Classical Japanese Literature in Translation.....	3
JPNS 4821 Medieval Japanese Literature in Translation.....	3
JPNS 4831 Early Modern Japanese Literature in Translation.....	3
JPNS 4841 Modern Japanese Literature in Translation.....	3
JPNS 4300 Open Topics.....	3
JPNS 4900 Independent Study.....	1-3
JPNS 4950 Honors Thesis.....	3

### *Graduating in Four Years with a B.A. in Japanese*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in Japanese, students should meet the following requirements:

- Declare the major in the first semester.
- Students wishing to major in Japanese and who have no prior knowledge of the language should begin the required major courses no later than the sophomore year.
- Students must consult with a major advisor to determine adequate progress toward completion of the major.

### *Minor Program*

The Department of East Asian Languages and Literatures offers a minor program in Japanese. Please contact the departmental office for further information.

### *Courses Taught in English*

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

département or not. They provide excellent introductions to Chinese or Japanese literary and cultural history.

CHIN 1051 is a core curriculum course in the area of literature and the arts that focuses on the "Great Books" of China, both ancient and modern. CHIN 4811, 4821, 4831, 4841, and 4851 focus, respectively, on Chinese poetry, fiction, drama, the worlds of women and the supernatural, and contemporary literature.

JPNS 1051 is a core curriculum course in the area of literature and the arts focusing on both ancient and modern "Great Books of Japan. JPNS 4811, 4821, 4831, and 4841 focus, respectively, on classical, medieval, early modern, and modern Japanese literature.

CHIN/JPNS 1011 is an interdisciplinary introduction to the history, literature, religion, and art of both China and Japan before major contact with the Western world; it is a core curriculum course in the area of cultural and gender diversity.

### *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 Peking, Nanjing, and Fudan Universities in China; National Chengchi University in Taiwan; and Kansai Gaidai and Tsukuba Universities in 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*

Applicants to the graduate program in East Asian Languages (Chinese or Japanese emphasis) should have successfully completed the equivalent of the undergraduate major in Chinese or Japanese.

Please contact the department for newly revised degree requirements and descriptions of graduate courses in Chinese and Japanese.

## **ECONOMICS**

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

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

- knowledge of the conditions for efficient in free market production and exchange;
- knowledge of contemporary theories concerning economic growth, inflation, unemployment, distribution of income, an international environment;

- knowledge of a few of the specialized fields of economics, such as international economics and finance, natural resources and environment, the economics of gender and discrimination, and public 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 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

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

<i>Major Requirements</i>	<i>Semester Hours</i>
ECON 1000 Introduction to Economics or ECON 2010 and 2020 Principles of Microeconomics and Macroeconomics .....	4-8
ECON 1078 and 1088, or 6 credit hours of math modules (MATH 1050, 1060, 1070, 1080, 1090, and 1100) or equivalent, or MATH 1050 Linear Equations and Matrices, MATH 1060 Linear Programming, MATH 1070 Combinatorics and Probability Theory, and MATH 1300 Analytic Geometry and Calculus I	
or Mathematics at or above the level of MATH 1300 (or APPM 1350) plus any one mathematics course above MATH 1300 .....	6-8
ECON 3070 Intermediate Microeconomic Theory and ECON 3080 Intermediate Macroeconomic Theory .....	6
ECON 3808 Introduction to Mathematical Economics .....	3
ECON 3818 Introduction to Statistics with Computer Applications .....	4
Electives in upper-division ECON courses ... 12 (15 credit hours of upper-division ECON courses if ECON 1000 is substituted for ECON 2010 and 2020)	

Note: Transfer students majoring in economics must complete at least 12 semester hours of upper-division economics courses at CU-Boulder.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in economics, students should meet the following requirements:

Declare economics as a major by the beginning of the second semester.

Complete ECON 2010 and 2020 or ECON 1000 and all mathematics requirements by the end of the fourth semester.

Complete ECON 3070, 3080, 3808, and 3818 by the end of the sixth semester.

Complete 12 or 15 credit hours (if ECON 1000 is substituted for ECON 2010 and 2020) of additional upper-division economics credit by the end of the eighth semester.

### Minor Program

The department also offers a minor in economics. Details are available in the departmental office.

### 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 credit hours in economics.

c. Submit Graduate Record Examination scores for aptitude (verbal, quantitative, and analytical). Foreign applicants must also submit a TOEFL score.

d. Arrange for the submission of four letters of recommendation.

Graduate study in economics is quantitative and analytical. Students should be comfortable with basic calculus (derivatives and integration), linear algebra, matrix algebra, and basic statistics.

Students who do not meet the requirements for admission as regular degree students may be recommended for provisional degree status. (See the Graduate School chapter of this catalog for more information.)

Application deadline for foreign students is March 1 for the following fall semester. Students desiring admission beginning with other terms will be considered but may be referred to the Economics Institute, 1030 13th St., Boulder, CO 80302.

2. Degree Requirements. There are three options open to students for fulfilling the requirements for the master of arts degree in economics.

a. *Plan I—Thesis*: This option requires a minimum of 24 semester hours of graduate course work plus a master's thesis (which entails registering for an additional four master's thesis semester hours) plus passage of a comprehensive final examination over all work presented for the degree.

b. *Plan II—Non-Thesis*: This option requires a minimum of 30 semester hours of graduate course work plus passage of a comprehensive final examination over all course work presented for the degree.

c. *Plan III*: This option, open only to students enrolled in the Ph.D. program in economics, requires a minimum of 30 semester hours of graduate course work in the Ph.D. program plus passage of all Ph.D. preliminary examinations, which shall count as the master's comprehensive examination.

3. Sequence of Study. The sequence of study for these degree options, including required and elective courses, is outlined below:

#### Plan I and II

##### First Year

##### Fall Semester

ECON 6070 Applied Microeconomic Theory  
ECON 6080 Applied Macroeconomic Theory  
ECON 6808 Intro/Quantitative Economics

##### Spring Semester

ECON 6xxx Field Elective  
ECON 6xxx Field Elective  
ECON 6818 Econometric Methods and Application

##### Second Year

##### Fall Semester

ECON 6209 Research Methods in Economics  
ECON 8xxx Ph.D. Field Elective

##### Spring Semester

ECON 6959 Master's Thesis—4 hours (Plan I only)  
ECON 8xxx Ph.D. Field Elective (Plan II only)  
ECON 8xxx Ph.D. Field Elective (Plan II only)

All students opting for Plan I or Plan II are required to take five core courses (ECON 6070, 6080, 6808, 6818, and 6209). The last of these courses, ECON 6209, is Research Methods in Economics. This 3-credit course trains students at the masters level in scientific methodology and research in economics. This course will culminate in a research project that normally will lead directly to thesis work. However, this course and its research project are required even if the student opts for the nonthesis plan.

The exact timing of course work is subject to the specific requirements of individual students. For instance, in some cases all

requirements for the degree might be fulfilled in three semesters. Up to 9 hours of transfer credit, including courses taken at the Economics Institute, can be substituted for required or elective courses with the approval of the director of Graduate Studies. When transfer credit is allowed for a required course, the director of Graduate Studies may require the student to pass the final examinations of required courses he or she omits because of transfer credit.

Before attempting course work at the 8000 level, students in Plan I or Plan II must meet specific prerequisites. Consult the course descriptions for the exact prerequisites in each field.

**Plan III** (M.A. degree for students in the Ph.D. program)

#### First year

##### Fall semester

ECON 7010 Microeconomic Theory 1  
ECON 7020 Macroeconomic Theory 1  
ECON 7808 Quantitative Analysis

##### Spring semester

ECON 7030 Microeconomic Theory 2  
ECON 7040 Macroeconomic Theory 2  
ECON 7818 Statistics and Econometrics

#### Second Year

12 hours of elective graduate course work. Consult the Ph.D. degree requirements for more details.

#### 4. Comprehensive Final Examination.

All students must pass a comprehensive final examination before earning the master of arts degree. Consult the Graduate School chapter for details.

A student opting for Plan I will take an oral examination covering his or her master's thesis and course work. The examining committee shall consist of three members including, if possible, the student's thesis advisor(s) and the student's instructor in ECON 6209. This examination will take place following the completion of the student's thesis work.

A student opting for Plan II will take a written comprehensive examination put together and graded by a committee consisting of faculty members who taught elective courses taken by the student. This examination will follow the completion of the fall or spring term in which the student completes his or her course work.

For a student earning the master of arts degree by following Plan III, the comprehensive examination will consist of passing all of the preliminary examinations required by the rules of the Ph.D. program.

The director of Graduate Studies will have final say on the composition of the comprehensive final examination committees. The evaluation of the final exam

committee will be final. If a student fails an initial comprehensive examination, he or she may attempt a second examination by the same examining committee (if at all possible) after a period of time of at least three months.

**5. Satisfactory Progress Toward a Degree.** In order to attain satisfactory progress toward the M.A. degree, students in plan I or plan II must complete all courses in the core with a grade of *B-* or better by the end of their second fall semester. Furthermore, a final comprehensive examination must ordinarily be passed within three years of entering the program (the maximum time allowed by the Graduate School is four years). Failure to make satisfactory progress is grounds for suspension from the graduate program.

Students in plan III must satisfy the requirements listed for satisfactory progress in the Ph.D. rules.

**6. Other Requirements.** Other requirements for the M.A. degree relating, for example, to transfer of credits, residence, time limitations, thesis, and admission to candidacy, are stated in this catalog.

#### 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 such a degree and equivalent to the degree given at 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 statistics.

c. Submit Graduate Record Examination (GRE) scores for aptitude (verbal, quantitative, and analytical). Foreign applicants must also submit a TOEFL score.

d. Arrange for the submission of four letters of recommendation.

Graduate study in economics is quantitative and analytical. Students should be comfortable with basic calculus (derivatives and integration), linear algebra, matrix algebra, and basic statistics.

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. See the list of M.A. requirements for more information.

Application deadlines for foreign students is February 1 for the following fall semester. There is no deadline for U.S. applicants; however, those students who wish to be considered for financial assistance should apply by February 1. Students must begin the program in the fall semester; those requiring prior remedial work may be referred to the Economics Institute, 1030 13th Street, Boulder, CO 80302.

**2. Degree Requirements.** Full-time students are ordinarily expected to complete all requirements for the Ph.D. degree within four years of entering the program (the maximum time allowed by the Graduate School is six years) and the schedule of required courses detailed below is centered on this expectation. However, it is recognized that some students may require five years to finish the degree; such students may deviate from the prescribed course of study in consultation with the Director of Graduate Studies (DGS). Failure to make timely and satisfactory progress toward the degree, as prescribed in a supplemental document on file in the graduate secretary's office, may result in loss of financial assistance or dismissal from the program.

#### 3. Course Requirements.

a. There are seven core courses in the Ph.D. program (ECON 7010, 7020, 7030, 7040, 7808, 7818, and 7828). Course requirements beyond the core courses include four courses taken in the student's two proposed fields of specialization at the 8000-level; two graduate elective courses with at least one of the courses at the 8000-level and at least one of the courses outside the two fields of specialization; 6 credit hours in a research colloquium; and at least 30 hours of dissertation credit after admission to candidacy.

b. At least four of the core courses must be taken on the Boulder campus. Courses transferred for credit must be approved by the DGS. After entry into the Ph.D. program, all remaining core requirements must be taken on the Boulder campus.

c. All courses for Ph.D. credit taken on the Boulder campus must be passed with a grade of *B-* or better. A student who receives a grade of *C+* or lower in a core course must retake that course in the following academic year.

d. Prior to beginning the program, students must demonstrate an acceptable degree of competence in integral and differential calculus and optimization techniques. Students with extensive mathematical preparation in prior studies would be judged by the DGS to have done so. Otherwise, such competence may be demonstrated in one of three ways:

1. Take ECON 7800, an intensive, two-week preparatory course offered immediately prior to each fall semester and pass its final examination with a grade of *B-* or better (no credit is offered for this course).

2. Pass the final examination in ECON 7800 without taking the course.

3. Pass a substantially equivalent course at the Economics Institute or other accredited graduate institution.

Students who fail the examination in ECON 7800 will be given a second opportunity to pass an equivalent examination two weeks later. Students who fail it on the second try will be required to take ECON 6808 in the fall semester and pass the course examination.

e. No more than 12 credit hours (exclusive of dissertation credit) from a single faculty member may be counted toward Ph.D. requirements. Independent study is allowed only to satisfy elective requirements. No more than 6 credit hours of independent study may be applied to the Ph.D. degree and no more than 3 credit hours of independent study may be taken from a single faculty member. Students who wish to take independent study must apply to the Graduate Curriculum and Review Committee (GCRC) in order to do so. In consultation with the DGS, students may choose to take up to two graduate offerings in other departments as elective courses.

f. Course requirements for the program include:

#### First Year

##### *Fall semester*

ECON 7010 Microeconomic Theory 1  
ECON 7020 Macroeconomic Theory 1  
ECON 7808 Quantitative Analysis

##### *Spring semester*

ECON 7030 Microeconomic Theory 2  
ECON 7040 Macroeconomic Theory 2  
ECON 7818 Econometrics 1

#### Second Year

##### *Fall semester*

ECON 7828 Econometrics 2  
Field or elective course  
Field or elective course

##### *Spring semester*

Field or elective course  
Field or elective course  
Elective course

Ordinarily students would be expected to complete course work in at least one field of specialization in the second year.

g. Course requirements in the third year include ECON 6209, which constitutes the third-year research colloquium; remaining elective course(s); and dissertation research, if practicable.

h. Course requirements in the fourth year consist of relevant dissertation credit hours.

**4. Preliminary Examinations.** Written preliminary examinations in microeconomic theory and macroeconomic theory must be taken in the August examination period following the successful completion of the core courses in these areas. Under most circumstances this period would be prior to the second year. A written preliminary examination in econometrics must be taken in the January examination period following successful completion of the core courses in this area. Under most circumstances this period would be in January of the second year. An examination attempted and failed must be taken again and passed in the next examination period. A second failure will result in dismissal from the program, subject to appeal under extraordinary circumstances to the GCRC. In no case will attempts beyond the third be granted.

Students who have failed any of these core courses are ineligible to take the preliminary examination in the area of failure. These students must retake the failed course(s) in the following year and attempt the relevant preliminary examination in the first scheduled examination period thereafter.

Students must pass all preliminary examinations within two-and-one-half years of beginning the Ph.D. program. Exceptions for part-time students may be allowed under extraordinary circumstances by the DGS.

**5. Fields of Specialization.** By the conclusion of the second year each student must declare to the graduate secretary his or her proposed two fields of specialization. With the approval of the DGS, one of the fields may be designed to include a course outside the economics department. Fields consist of at least two courses at the 8000-level as designated by faculty in particular areas. In lieu of one of the standard fields the student may offer a combination field when courses from different areas are complementary in meeting the specialization objectives of the student. In such a case, the student is responsible for obtaining the approval of the DGS and the written agreement of at least two faculty members who will be involved in evaluating his or her competence in the field.

**6. Comprehensive Examinations.** Students must pass a written comprehensive examination in two fields of specialization. These examinations must be taken in the examination period immediately following the successful completion of all required courses in the field. Comprehensive examinations are administered regularly in August and January.

Students who fail a comprehensive examination in one or more fields on the first attempt must retake the unsatisfactory

examination(s) in the next examination period. Students who fail such an examination a second time may appeal to the GCRC for a final third attempt under extraordinary circumstances. Subject to this appeal, students who fail a particular field's comprehensive examination twice are required to choose a different field of specialization and complete the course requirements and comprehensive examination in the following academic year. This procedure is available only for one field; students who fail the comprehensive examination twice in two fields will be dismissed from the program.

**7. Third-Year Research Colloquium.** By the end of October following the second academic year, students must submit to the graduate secretary a written proposal describing the topic, methodology, and objective of the third-year paper to be completed in the colloquium. The proposal must include the names and signatures of the student's main and secondary faculty advisors. All second-year students will be given a packet of lists of faculty research interests to facilitate this process.

Each third-year student is required to register for 3 credit hours per semester in the research colloquium, which will meet weekly under the direction of a faculty member. The purpose of the colloquium is to provide students the opportunity and guidance to complete the required third-year paper and to facilitate progress toward the dissertation stage. Meetings in the fall semester allow preliminary discussions of the research and lectures in research methodology, data sources, and the like. In the spring semester each student presents work in progress in the colloquium. In April or May of the third year each student must present a final version of the research paper in a departmental seminar series. Ordinarily, this seminar would also constitute the required dissertation proposal defense (see below).

Under some circumstances, students may delay taking this colloquium until the fourth year with the approval of the DGS.

**8. Admission to Candidacy and Dissertation Requirements.** Students are formally admitted to candidacy for the Ph.D. degree after completing all course requirements (other than the research colloquium) and all preliminary and comprehensive examinations and have earned four semesters of residency (see University of Colorado catalog for details). After admission to candidacy, students must register each fall and spring semester for dissertation credit (ECON 8999) until attaining the degree; the accumulated credit for the thesis must

total at least 30 semester credit hours to attain the degree. A student must prepare a written dissertation and successfully pass an oral examination before a dissertation committee and other interested persons on its content before receiving the degree. The minimum residence requirement for the Ph.D. degree is six semesters of scholarly work beyond the bachelor's degree.

#### 9. Administration.

a. *Examining Committees for Preliminary Examination.* Examining committees for preliminary examinations will consist of three members of the economics department who teach in the relevant area. Examining committees for comprehensive committees will consist of at least two members of the economics department who teach in the relevant area, with a third member appointed from another department in cases where the student has structured a field including a course from that department.

b. *Grading Preliminary and Comprehensive Examinations.*

1. Written examinations will be numbered so that insofar as possible the identity of the student will be unknown. Each faculty member will grade independently and write no comments in the examination booklet. A meeting of the graders shall be called by the chair person of the examination committee and the committee's grade shall be submitted to the graduate secretary. The possible grades include High Pass or Distinction (used sparingly), Pass, Fail, and Marginal-Fail (used sparingly).

2. Shortly after submission of grades a general faculty meeting will be held to discuss and report examination results. In cases where the committee's initial grade was marginal fail, if two of the members of the committee then vote affirmatively, a grade of pass will be recorded; if two of the members of the grading committee then vote negatively, a grade of fail will be recorded. If the vote of the grading committee is tied and the third member is absent (but will be available within seven days), the decision to pass or to fail is to be made by the reconvened grading committee. If fewer than two members of the grading committee are present and voting, or if the vote of the grading committee is tied and the third member will not be available within seven days, the decision to pass or fail will be made by the assembled faculty; in such circumstances the grade will be reported as pass if a majority votes affirmatively.

3. When examination results are reported, a student who failed should have an opportunity to discuss his performance with a member of the examining committee.

#### c. *Dissertation Guidelines.*

1. To facilitate progress on the dissertation, a "basic committee" consisting of a supervisor and two other members who are most interested in the proposed research is organized by the student, in conjunction with the DGS, during the third year. Any subsequent changes in this committee (or of the full committee later) must be approved by the supervisor and be recorded with the graduate secretary after all basic committee members have been consulted.

2. By September 1 of the academic year following the research colloquium, each student must submit a written dissertation proposal to his or her basic committee and the graduate secretary. The dissertation proposal form must be signed by each member of the basic committee and submitted to the graduate secretary as well by this date. An acceptable proposal must include a statement of purpose and a justification for the importance of the work; a full literature review and a statement of how this research will contribute to the literature; and a detailed description of the methodologies to be used and of the data bases, if appropriate.

3. By October 15 of the same academic year students must present the proposal in an open seminar. If the dissertation topic is related to the third-year paper, the proposal may be presented at the end of the paper presentation (see above). Otherwise a separate presentation must be scheduled. At the conclusion of the seminar, the basic committee and candidate must agree on necessary changes. If these are major, an additional proposal defense will be scheduled after they are made. A successful proposal defense will result in a letter from the basic committee to the candidate indicating that successful completion of the planned research will constitute an acceptable dissertation. Students who fail to present a proposal in a timely fashion will be denied a passing grade on dissertation credit for which they are registered.

4. Within three months of the dissertation proposal presentation, the DGS, in consultation with the dissertation supervisor, appoints remaining members of the full dissertation committee. A full dissertation committee consists of at least four faculty members from the economics department and one member from outside the department.

5. Normally students would be expected to complete their dissertations by the end of the fall of their fourth academic year (or fifth in exceptional cases). The graduate secretary will provide details on submission

of the dissertation and arrangements for the oral defense. After the defense, minor changes are agreed upon between candidate and supervisor. If major changes arise, the candidate and supervisor will consult with the DGS on a future course of action.

d. *Yearly review.* Each spring the graduate faculty of the Department of Economics will meet to review the progress of each student in the Ph.D. program. The regulations herein will serve as a standard of minimal acceptable progress, but additional rules on this issue are specified in a document available for the graduate secretary or the DGS.

## 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 literary 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 Programs

Expository writing courses (except ENGL 1001 and 3151) do not apply toward the major. English courses taken on a pass/fail basis do not fulfill major requirements. Independent study credit hours cannot fulfill a major requirement unless that requirement is not being offered or available within the year that the student graduates. A minimum of 12 hours of upper-division course work for the English major must be completed on the Boulder campus. English courses taken at other colleges must be evaluated by the Department of English. Courses taken in other departments (except approved cross-listed courses) normally do not count toward the English major. Normally no more than 6 credit hours of Continuing Education courses can be counted in the major.

Students must complete the general requirements of the College of Arts and Sciences and one of the two programs listed below.

### Literature

Students are subject to the major requirements in force when they enter the University of Colorado. A minimum of 36 credit hours must be earned in the Department of English, 21 of which must be upper division.

Note: Six hours must be taken in courses dealing with pre-1790 British or American literature (3 hours of which must be pre-1500 British literature), and 6 hours must be taken in courses dealing with post-1790 British or American literature. These requirements may be fulfilled by taking specific courses designated by the Department of English.

### Major Requirements Semester Hours

ENGL 1000 Critical Analysis 1: Poetry.....	3
ENGL 1010 Critical Analysis 2: Prose.....	3
ENGL 2010 Modern Critical Thought.....	3
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
ENGL 4030 Critical Thinking in English Studies.....	3
Three elective courses in English.....	9
In addition to the 36 hours required for the major, another 9 hours may be taken, for a maximum of 45 hours in English.	
The recommended sequence of courses to be taken during the initial year of the literature program is ENGL 1000 and an English elective for the first semester; ENGL 1010 and ENGL 2010 for the second semester.	

### Creative Writing

Students are subject to the major requirements in force when they enter the University of Colorado. A minimum of 36 credit hours must be earned in the Department

of English, 18 of which must be upper division.

ENGL 1000 Critical Analysis 1: Poetry. <i>or</i>	
ENGL 1010 Critical Analysis 2: Prose.....	3
ENGL 2010 Modern Critical Thought.....	3
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
ENGL 4030 Critical Thinking in English Studies.....	3
Six creative writing workshops, three of which must be upper division.....	18

In addition to the 36 hours required for the major, another 9 hours may be taken, for a maximum of 45 hours in English.

The recommended sequence of courses to be taken during the initial year of the creative writing program is ENGL 1000 or 1010 and ENGL 1191 for the first semester; ENGL 2010 and a 2000-level workshop for the second semester.

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 submit two copies of a manuscript (if poetry, 7 poems; if fiction, 20 pages) to the admissions committee for approval. Transfer students may apply after completing three hours of creative writing at CU-Boulder. Students should apply no later than the second semester of their junior year.

In order to take a workshop beyond the 2000-level, students must submit a manuscript to the Department of English prior to registration. Each workshop may be taken three times for credit. Students may not take two poetry or two fiction workshops in the same semester.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in English, students should meet the following requirements:

Declare the English major and begin course work in the major no later than the beginning of the second semester.

Successfully complete one-third of the hour requirements for the major by the end of the fourth semester. For literature track majors, this includes ENGL 1000, 1010, and 2010. For creative writing track majors, this includes ENGL 1000 or 1010, 1191, 2010, and 2021 or 2051, as well as formal admission to the program.

Successfully complete two-thirds of the hour requirements for the major by the end of the sixth semester.

Successfully complete the remaining major requirements by the end of the eighth semester.

### 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 license for secondary schools may be obtained in Education 151. 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 variable 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 variable 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 at CU-Boulder and should be submitted to the English department before April 15.

The Jovanovich Imaginative Writing Prize. The Jovanovich prize is an annual award for excellence in poetry, fiction, playwrighting, or nature writing. Information is available in the creative writing office.

### Graduate Degree Programs

#### Admission Requirements

Master's Degree in English. The M.A. program offers theory and literary history combined with a rigorous training in critical analysis. 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 section 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 chapter of this catalog and should write the department for a more complete description of the graduate programs in English.

## ENVIRONMENTAL, POPULATION, AND ORGANISMIC BIOLOGY

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 relations among theory, experiment, data, data analysis, and general knowledge;
- awareness of the relevance of mathematics, chemistry, 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, 1060, 1070, and 1080 fulfill the general biology requirement; MCDB 1150 and 1151 can replace EPOB 1210 and 1230. EPOB 1030, 1040, and 1050 Biology: A Human Approach 1, 2, and Laboratory, formerly NASC 1230 and 1240, fulfill the general biology requirement but cannot be applied toward the total of 38 hours required for the EPOB major.)	
EPOB 3200 Genetics.....	4
(MCDB 2150 Principles of Genetics can substitute; MCDB 3400 Molecular Genetics cannot.)	
EPOB 3020 Principles of Ecology.....	3
EPOB 3250 Principles of Evolution.....	3
(Required of students declaring the major beginning summer 1994 or after.)	

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
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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 Comparative Vertebrate Anatomy; EPOB 4650 Invertebrate Zoology; EPOB 4770 Vertebrate Zoology.....	3-5
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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 and CHEM 1131 General Chemistry 1 and 2 or CHEM 1111 General Chemistry 1 and CHEM 1071 Introduction to Organic and Biochemistry, or CHEM 1151 and CHEM 1171 Honors General Chemistry 1 and 2.....	9-12
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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
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One semester of college mathematics:

MATH 1310 Calculus 1 with Computer Applications or MATH 1300 Analytic Geometry and Calculus 1 or APPM 1350 Calculus 1 for Engineers.....	4-5
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**Note:** Up to 12 semester hours of courses taken in other departments may be counted toward the 38 hours required for the EPOB biology major. MCDB courses used to fulfill the general biology requirement are counted as part of this 12-hour limit. A listing of acceptable courses may be obtained from the EPOB office, Ramaley N122.

Transfer students must complete at least 12 upper-division hours in EPOB courses on the Boulder campus.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in environmental, population, and organismic biology, students must meet the following requirements:

Declare the EPO biology major and begin course work in the major in the first semester. Sign up during the first semester with the department's undergraduate services coordinator as a participant in the guarantee program. Complete additional requirements for the four-year guarantee that are described on a handout available in the department office.

### Minor Program

The department also offers a minor program. Details are available in the departmental office.

### 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, behavior, morphology, physiology, systematics, ecology, aquatic biology, population biology, genetics, neurobiology, and microbiology. Modern laboratory facilities for graduate study are in the Ramaley biology building. In addition, the department has strong ties with the University Museum, 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. 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 5 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 not accepted. 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 potential faculty advisors before January 5 to see whether application for the M.A. I or Ph.D. program is appropriate. Applications for the M.A. I program are considered on a competitive basis; the department only admits students for whom financial support is available. Twenty-four hours of course work, including 4 hours of thesis credit, are required for the degree. In addition to a thesis based on original research, each M.A. I student is required to take a comprehensive examination within the first three semesters of degree work. The thesis topic is presented to the thesis committee as a written research proposal. The M.A. I final examination consists of the thesis defense; it should be scheduled within two years for full-time students, and within five years or seven successive summers for part-time students.

### **The M.A. II Program**

A nonthesis master's degree program is offered for students who are interested in obtaining a greater knowledge of biology but who are 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. A faculty sponsor is required before admission can be granted; applicants

are encouraged to communicate with potential sponsors before January 5. Financial support is not guaranteed for M.A. II students. Thirty semester hours of course work are required for the degree, including 4 hours of independent research leading to a paper to be presented to the faculty sponsor. A M.A. II final examination should be taken by the end of the student's second year of degree work. Most requirements for the degree should be completed by this time, including the majority of course work and the paper based on independent research. The written exam is scheduled for three half-days. It covers three subject areas related to the student's scientific interests, chosen by the student and the Final Examination Committee. An additional oral exam may be required by the Final Examination Committee, following the written exam.

### **Doctoral Program**

The Ph.D. is a research degree, involving the production of a major piece of original research (the dissertation). 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. Because 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 usually made available. 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. The Ph.D. comprehensive exam is administered by the student's dissertation committee and must be taken within the first five semesters of degree work. It consists of a written research proposal on the dissertation topic, a formal presentation summarizing the student's research progress, and an oral examination centered on the student's research. Upon the student's completion of the dissertation, a final examination is administered by the dissertation committee.

The only specific courses required for the Ph.D. are 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, generally by serving as a departmental teaching assistant.

## **ENVIRONMENTAL STUDIES**

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

The environmental studies major is administered through the Office of Environmental Studies and draws from curricula in the earth and natural sciences as well as the social sciences. See the program office (Ketchum 223A) for details of the program requirements.

The program is composed of a required common curriculum that exposes all students to the basics of physical and social environmental sciences, as well as to a choice between two tracks. The environmental science track has specializations in water, biogeochemistry, and climate, and the social science track has specializations in environment and natural resources, environmental analysis, and decision-making, planning, and policy.

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

- an understanding of the causes, scale and relative importance of the major environmental problems in 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; and
- knowledge of the general principles of human-environmental interaction, global habitability and environmental change, and sustainable human societies.

Environmental studies is an interdisciplinary program, drawing on courses and expertise from over a dozen departments. Students who wish also to pursue a traditional, discipline-based education are encouraged to double major or complete a minor in one of the participating departments. An internship program is offered to provide the upper-level student with practical experience working in the field.

### **Bachelor's Degree Program**

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

### **Common Curriculum**

Students are expected to complete the following common curriculum:

<i>Major Requirements</i>	<i>Semester Hours</i>
Biology sequence (EPOB 1030 and 1040 Biology: A Human Approach 1 and 2, and EPOB 1050 Biology: A Human Approach Laboratory; or EPOB 1210 and 1220 General Biology 1	

and 2, and EPOB 1230 and 1240 General Biology Lab 1 and 2).....	7-8
Chemistry sequence (CHEM 1011 and 1031 Environmental Chemistry 1 and 2; or CHEM 1051 Introduction to Chemistry and 1071 Introduction to Organic and Biochemistry; or CHEM 1111 and 1131 General Chemistry 1 and 2; or CHEM 1151 and 1171 Honors General Chemistry 1 and 2).....	7-12
Economics sequence (ECON 1000 Introduction to Economics or ECON 2010 Principles of Microeconomics and ECON 3535 Natural Resource Economics or ECON 3545 Environmental Economics).....	7
Geography/Geology sequence (GEOG 1001 Environmental Systems 1—Climate and Vegetation and 1011 Environmental Systems 2—Landforms and Soils; or GEOL 1010 and 1020 Introduction to Geology 1 and 2, 1080, and 1090 Introductory to Geology Lab 1 and 2; or GEOL 1060, 1070, and 1110 Global Change 1 and 2 and Lab).....	8
Lab requirement (a total of three labs from any of the following: CHEM, EPOB, GEOL, or GEOG). Track B students are encouraged to take all labs.....	8
PHIL 3140 Environmental Ethics or GEOG 3422 Conservation Thought or ENVIS/ETHN 3003 Race, Class, and Pollution Politics.....	3
PSCI 3201 The Environment and Public Policy or PSCI 2101 Introduction to Public Policy Analysis.....	3
One calculus or statistics course.....	3-5

In addition, students are required to complete either Track A, Society and Policy, or Track B, Environmental Sciences. Each track has several choices of specializations. An internship may be used as one course in a specialized area.

### Track A, Society and Policy

Students must complete the three required courses and one of the four areas of specialization.

#### Required courses:

ANTH 4150 Human Ecology.....	3
ECON 3545 Environmental Economics.....	3
GEOG 3412 Conservation Practice.....	3

#### Environment and Natural Resources

Complete a minimum of 15 credit hours from the following courses:

ENVD 4023 Environmental Impact Assessment.....	3
GEOG 3351 Biogeography.....	3
GEOG 3662 Economic Geography.....	3
GEOG 4351 Landscape Ecology.....	3
GEOG 4371 Forest Geography.....	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 Environment and Peoples.....	3
GEOL 3070 Introduction to Oceanography.....	3
HIST 4417 Environmental History of North America.....	3
PHYS 3070 Energy in a Technical Society.....	3

#### International Environment and Development

Complete a minimum of 15 credit hours from the following courses:

ECON 3403 International Economics and Policy.....	3
GEOG 3682 Geography of International Development.....	3
GEOG 3812 Latin America.....	3
GEOG 3862 Geography of Africa.....	3
GEOG 4712 Political Geography.....	3
GEOG 4882 Russian Commonwealth.....	3
PHIL 2140 Environmental Justice.....	3
PSCI 3143 International Relations.....	3
PSCI 3193 International Behavior.....	3
PSCI 4012 Global Development.....	3
PSCI 4173 International Organization.....	3
PSCI 4183 International Law.....	3
PSCI 4782 Global Issues.....	3
SOCY 1002 Global Human Ecology.....	3
SOCY 3002 Population and Society.....	3
SOCY/WMST 3012 Women, Development and Fertility.....	3
SOCY/WMST 4012 Population Control and Family Planning.....	3
SOCY 4022 Population Studies: Fertility and Mortality.....	3

#### Decision-Making, Planning, and Public Policy

Complete a minimum of 15 credit hours from the following courses:

ENVD 4023 Environmental Impact Assessment.....	3
GEOG 3402 Natural Hazards.....	3
GEOG 4950 Natural Catastrophes and Geologic Hazards.....	3
PHIL 2140 Environmental Justice.....	3
PSCI 2101 Introduction to Public Policy Analysis.....	3
PSCI 3201 Environment and Public Policy.....	3
PSCI 4703 Alternative World Futures.....	3
PSYC 4136 Judgment and Decision Making.....	3
SOCY 3091 Environment and Society.....	3

#### Environmental Analysis

Complete a minimum of 15 credit hours from the following courses:

ECON 3808 Mathematical Economics.....	3
ENVD 4023 Environmental Impact Assessment.....	3
GEOG 2053 Maps and Mapping.....	4
GEOG 3053 Cartography 1.....	4
GEOG 3093 Geographic Interpretation of Aerial Photographs.....	3
GEOG 4083 Mapping from Remotely Sensed Imagery.....	4
GEOG 4093 Remote Sensing of the Environment.....	4
GEOG 4103 Geographic Information Systems.....	4

### Track B, Environmental Sciences

Students must complete the required courses and one of three areas of specialization.

#### Required Courses

Calculus.....	4-5
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EPOB 3020 Principles of Ecology.....	3
EPOB 3150 Tropical Conservation Biology.....	3
GEOG 3511 Introduction to Hydrology.....	4
GEOL 2700 Introduction to Field Geology.....	2
Plus one other 2 credit hour geology field course; or EPOB 4630 Field Techniques in Environmental Science; or any field course at the Mountain Research Station.....	3-4

#### Water

Complete a minimum of 12 credit hours from the following courses:

EPOB 3190 Tropical Marine Ecology; EPOB 4020 Stream Biology; EPOB 4030 Limnology; EPOB 4110 Advanced Ecology; GEOG 4321 Snow Hydrology; GEOG 4430 Seminar: Conservation Trends; GEOG 4501 Water Resources and Water Management of Western United States; GEOL 3030 Introduction to Hydrogeology; GEOL 4060 Oceanography; GEOL 4970 Environmental Fluid Mechanics; GEOL 4980 Hydrology 12	
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#### Biogeochemistry

Complete a minimum of 12 credit hours from the following courses:

CHEM 4191 Environmental Chemistry of the Biosphere; EPOB 4170 Ecosystem Ecology; EPOB 4360 Microbial Ecology; GEOG 4401 Soils Geography; GEOL 3040 Global Change: Recent Geological Record; GEOL 4060 Oceanography; GEOL 3320 Geochemistry; GEOL 3520 Environmental Issues in Geosciences; GEOL/GEOG 4241 Principles of Geomorphology.....	12
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#### Climate

Complete a minimum of 17 credit hours from the following courses:

Three of the following courses:

GEOG 3191 Atmospheric Science 1: Meteorology; GEOG 3201 Atmospheric Science 2: Climatology; GEOG 4211 Physical Climatology: Principles; GEOL 3040 Global Change: Recent Geological Record; GEOL 4060 Oceanography.....	9
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One of the following sequences:

PHYS 1110 and 1120 General Physics 1 and 2; PHYS 2010 and 2020 General Physics 1 and 2.....	8-10
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### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in environmental studies, students should meet the following requirements:

Begin the common curriculum in the freshman year.

Declare environmental studies as the major by the beginning of the second semester.

Students must consult with a major advisor to determine adequate progress toward completion of major requirements.

## ETHNIC STUDIES

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

The ethnic studies major was built on the strengths of the Center for Studies of Ethnicity and Race in America (now the Department of Ethnic Studies), which developed four ethnic-specific foci, with a multidisciplinary faculty. The goals for this major are to (1) enable students to think comparatively and cross-culturally about the relationships within and across racially defined communities, and to the dominant society; (2) allow students to gain substantive knowledge and expertise in one of the four specific racial/ethnic fields, and familiarity with at least a second racial/ethnic field; (3) reinforce students' acquisition of a critical approach to knowledge; (4) involve learning and thinking within interdisciplinary frameworks; (5) encourage participatory, experiential, diverse and student-centered learning; (6) develop skills in oral and written expression; (7) develop appropriate skills in research design, information retrieval, and use from an ethnic studies perspective; (8) empower students of color to move beyond being objects of study toward being subjects of their own social realities, with a voice of their own; (9) motivate majority and racial/ethnic students to examine and interrogate their inherited political/economic and social/cultural positions; and (10) prepare all students to live and contribute to an increasingly diverse America, in an ever interdependent world.

In short, the ethnic studies major provides a broad liberal arts education for the twenty-first century. It should impart fundamental skills in critical thinking, comparative analysis, social theory, data gathering and analysis, and oral and written expression. As a liberal arts degree with focus on American diversity, it is an especially appropriate training for those considering admission to graduate or professional schools and careers in education, law, medicine, public health, social work, journalism, business, urban planning, politics, counseling, international relations, creative writing, as well as university teaching and research.

The Department of Ethnic Studies promotes interdisciplinary research and teaching in Afroamerican studies, American Indian studies, Asian American studies, Chicano studies, and in cross-cultural and comparative race and ethnic studies.

The Department of Ethnic Studies seeks to provide a cohesive framework for the study of ethnic and racial groups 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 Americas, but the department 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.

The Department of Ethnic Studies 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 College of Architecture and Planning, the School of Education, the School of Journalism and Mass Communication, the School of Law, the College of Music, and the University Libraries.

### Bachelor's Degree Program

In addition to the general requirements of the College of Arts and Sciences, students must complete at least 33 semester hours of ethnic studies requirements: students must complete 12 hours of required ethnic studies core courses, 12 hours in a primary ethnic-specific concentration, 6 hours in a secondary ethnic-specific concentration,<sup>1</sup> and 3 hours in an ethnic studies course with a cross-cultural comparative focus. A comparative ethnic studies concentration option is also available upon consultation with and approval of the department chair.

A grade of C- or better must be received in all courses used to satisfy the major requirements, with an overall average of 2.00 in the major. At least 24 hours must be upper-division credit (3000 or 4000 level). No more than 6 semester hours may be taken in independent study. No pass/fail graded courses may satisfy the 33 semester hour minimum requirement. Required ethnic studies courses may be substituted by other appropriate courses on a case by case basis, if requested by the student in advance and in writing, and with the approval of the student's faculty advisor, as well as that of the department chair.

<i>Major Requirements</i>	<i>Semester Hours</i>
ETHN 2000 Introduction to Ethnic Studies	3
ETHN 3500 Research Methods in Ethnic Studies	3
ETHN 4510 Research Practicum in Ethnic Studies	3
ETHN 4950 Senior Seminar in Ethnic Studies	3
Primary ethnic-specific concentration	12
Secondary ethnic-specific concentration	6
Cross-cultural comparative focus	3

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only

refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in ethnic studies, students should meet the following requirements:

- Declare ethnic studies as the major no later than the beginning of the second semester of study.
- Complete at least 12 credit hours toward the ethnic studies major requirements by the fourth semester.
- Complete at least 24 credit hours toward the ethnic studies major requirements by the end of the sixth semester.
- Complete ETHN 3500 Research Methods in Ethnic Studies no later than the sixth semester.
- Complete ETHN 4510 Research Practicum in Ethnic Studies no later than the seventh semester.
- Complete ETHN 4950 Senior Seminar in Ethnic Studies no later than the eighth semester.

### Minor Program

The Department of Ethnic Studies also has a minor program. For details, contact the departmental office.

### Ethnic Studies Faculty Involvement in Graduate Studies

Faculty actively work to recruit Afroamerican, American Indian, Chicano/Latino, and Asian/Pacific students for graduate studies at the University of Colorado at Boulder, with special attention given to students who are interested in carrying out theses and/or dissertations that involve substantive and theoretical work revolving around the broad topic of "ethnicity and race in America." Faculty are further committed to the intellectual mentorship of such students, which might include instruction in graduate courses; directed reading courses; service on students' M.A. or Ph.D. committees, as well as helping to prepare graduate students for their qualifying examinations. An important dimension of this commitment includes attention to the step-by-step progress of these graduate students through their academic course work and research agenda.

Ethnic studies faculty will also recruit and employ whenever possible such students as graders and teaching assistants in large undergraduate courses, with the intention of providing experience in all aspects of classroom instruction, including syllabus design, design of assignments, grading, and issues of pedagogy vis-a-vis course content.

Ethnic studies faculty will mentor such graduate students in the area of writing for publication, and seek to facilitate publication opportunities in journals focusing on "ethnicity and race." After successful completion of graduate studies, faculty will assist graduates with their employment goals.

In sum, by making an active commitment in each of these areas, ethnic studies faculty assume a responsible, proactive, role in ensuring a greater diversity in the graduate programs at the University of Colorado.

### Study Abroad

The Department of Ethnic Studies encourages students to participate in the study abroad programs offered through the Office of International Education. These programs give students a deeper understanding of 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 Council on International Educational Exchange 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, Ghana, Tunisia, Spain, Taiwan, and Japan. Further information appears under International Education on page 30 of this catalog.

## 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 contemporary 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.

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;
- the ability to communicate such interpretations competently in essay form; and
- students completing the B.F.A. degree should have the ability to make a short 16-mm sound film.

### Admission to the Program

Students are encouraged to consult with an advisor in the appropriate area in order to obtain advice and current information.

The B.F.A. degree is competitive. In order to graduate with a B.F.A. degree, students must submit for review a film made in FILM 3500 Intermediate Filmmaking to a judicial committee of Film Studies faculty. Admission into FILM 4500 Advanced Filmmaking and completion of the B.F.A. degree are contingent upon approval of the film by this committee. New film projects may be submitted twice for reconsideration by this committee.

**Note:** Admission to any class after the third meeting of the class is contingent on professor permission. The department may drop a student from a class if the student misses the first three classes of the semester.

### Bachelor's Degree Programs

#### *Bachelor of Arts*

No more than 6 hours of independent study may be credited toward the major. All course work submitted for a film studies degree must have a grade of C or better. The arts and sciences 18-hour minimum of upper-division hours must be met with film studies courses.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below. The Film Studies Program requires a minimum of 53 hours in support of the B.A. requirements, including film courses and courses taken in other departments.

#### *Major Requirements*                      *Semester Hours*

##### Arts History Requirement

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 1309 and 1409 World Art 1 and 2.....6  
Two upper-division courses in fine arts history.....6

##### *Option 3: Literature*

Any four literature courses in the following departments: Classics, Comparative Literature, English, Humanities, or a literature course offered by a foreign language department. Six hours minimum must be upper-division.....12

##### *Option 4: Fine Arts History and British Literature*

FINE 1309 and 1409 World Art 1 and 2.....6  
Two upper-division literature courses.....6

##### Creative Arts/Performance Requirements

Completion of two to three creative arts/performance courses in the following departments: creative writing (English), fine arts (including photography), music, theatre, or dance ....6-9

### Required Critical Studies Courses

FILM 1502 Introduction to Film Studies .....3  
FILM 3051 and 3061 Film History 1 and 2  
(Note 1) .....8  
FILM 4004 Film Theory .....3

### Required Production Course

FILM 2000/2300 Beginning Filmmaking  
(Note 2) .....3

### Production Electives (not required)

FILM 3930 Internship.....1-3  
FILM 4005 Screenwriting .....1-3

### Critical Studies Elective Requirements

B.A. students must complete 18 hours from the following courses. At least 12 must be upper division.

FILM 2002 Recent International Cinema .....3  
FILM 2003 Film Topics (Note 3).....3  
FILM 2013 Quest for Truth.....3  
FILM 2400 Introduction to Video.....3  
FILM 3002 Major Film Movements  
(Note 3) .....3  
FILM 3003 Major Film Directors (Note 3) ...3  
FILM 3012 Documentary Film .....3  
FILM 3013 Women and Film .....3  
FILM 3015 Jung, Film, and Literature .....3  
FILM 3901 Independent Study (Note 4)....1-3  
FILM 3930 Internship.....1-6  
FILM 4003 Film and Fiction.....3  
FILM 4604 Colloquium in Film Aesthetics  
(Note 5) .....3  
Any FILM class crosslisted with another department (i.e. foreign language) that has been approved by the Film Studies Chair .....3

### Curriculum Notes

1. It is strongly recommended that students take FILM 3051 and 3061 in chronological order.
2. FILM 2300 may be taken instead of FILM 2000; however, only one of the two courses may be counted toward the B.A. degree. Students will not receive credit for both courses. FILM 2300 is offered summer session only.
3. Course may be taken for credit more than once, provided that the topics vary. If taken twice, this course may be used both as a required critical studies course and as an elective course.
4. Total number of independent study credit hours cannot exceed 6.
5. Occasionally crosslisted with FREN 4600.

### *Graduating in Four Years with a B.A.*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.A. in film studies, students should meet the following requirements:

Declare a film studies major by the beginning of the second semester.

Complete the lower-division arts history requirements (6 credit hours), FILM 2000 (3 credit hours), and FILM 1502 (3 credit hours) by the end of the fourth semester.

Complete the upper-division arts history requirements (6 credit hours) and the remaining 11 credit hours of the required critical studies courses by the end of the sixth semester.

Complete 6 additional upper-division critical studies elective credits by the end of the seventh semester (at least 3 of these credits must be upper-division credits). Also complete 6-9 credit hours of creative arts/performance courses.

Complete 6 credit hours of critical studies elective courses including at least two upper-division courses (6 credit hours) during the eighth semester.

### Bachelor of Fine Arts

No more than 6 hours of independent study may be credited toward the major. All course work submitted for a B.F.A. degree in film must have a grade of C or better.

Students must complete the general requirements of the College of Arts and Sciences as well as the major requirements listed below. The Film Studies Program required a minimum of 56 hours in support of the B.F.A. degree requirements.

#### Major Requirements Semester Hours

##### Arts History Requirement

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 1309 and 1409 World Art 1 and 2 .....6  
Two upper-division courses in fine arts history .....6

##### Option 3: Literature

Any four literature courses in the following departments: Classics, Comparative Literature, English, Humanities, or a literature course offered by a foreign language department. Six hours minimum must be upper-division .....12

##### Option 4: Fine Arts History and British Literature

FINE 1309 and 1409 World Art 1 and 2 .....6  
Two upper-division literature courses .....6

##### Creative Arts/Performance Requirements

Completion of two to four creative arts/performance courses in the following departments: creative writing (English), fine arts (including photography), music, or theatre and dance .....6-9

##### Required Critical Studies Courses

FILM 1502 Introduction to Film Studies .....3  
FILM 3051 and 3061 Film History 1 and 2 (Note 1) .....8

##### Required Production Courses

B.F.A. students must also complete 12 credit hours of the following courses:

FILM 2000 or 2300 Beginning Filmmaking (Note 2) .....3  
FILM 2400 Introduction to Video .....3  
FILM 3500 Intermediate Filmmaking, 16 mm .....3  
FILM 4500 Advanced Filmmaking .....3

##### Production Course Electives

B.F.A. students must take 3-6 hours of any combination of the following courses:  
FILM 3010 Special Topics in Production .....3  
FILM 3500 Intermediate Filmmaking (Note 3) .....3  
FILM 3900 Production Independent Study (Note 4) .....1-6  
FILM 3930 Internship .....1-2  
FILM 4005 Screenwriting .....1-3  
FILM 4500 Advanced Filmmaking (Note 5) .....3

##### Critical Studies Elective Requirements

B.F.A. students must complete 12 hours including 6 hours of upper-division classes.  
FILM 2002 Recent International Cinema .....3  
FILM 2003 Film Topics (Note 6) .....3  
FILM 2013 Quest for Truth .....3  
FILM 3002 Major Film Movements (Note 6) .....3  
FILM 3003 Major Film Directors (Note 6) .....3  
FILM 3010 Topics in Production .....3  
FILM 3012 Documentary Film .....3  
FILM 3013 Women and Film .....3  
FILM 3901 Independent Study in Critical Studies Area (Notes 4, 7) .....1-3  
FILM 4003 Film and Fiction .....3  
FILM 4004 Film Theory (Note 8) .....3  
FILM 4005 Screenwriting Workshop .....3  
FILM 4604 Colloquium in Film Aesthetics (Note 9) .....3  
FILM 3501 Film Production Management or FILM 3563 Production of the Feature .....3  
(Both usually offered through Continuing Education; only one may count towards Film Studies degree)

##### Curriculum Notes

1. It is strongly recommended that students take FILM 3051 and 3061 in chronological order.
2. Either FILM 2000 or 2300 may be taken for degree credit. Only one of the two courses may be counted toward the B.F.A. degree. FILM 2300 is offered summer session only.
3. Course may be taken for credit more than once.
4. Total number of independent study credit hours cannot exceed 6 and they cannot be used to duplicate regular course offerings.
5. May be repeated for completion of final thesis project.
6. Course may be taken for credit more than once, provided the topics vary.
7. Repeatable for credit within same term (maximum 6 hours total).
8. Satisfies college requirement for critical thinking course; required for B.A. majors and strongly recommended for B.F.A. majors.
9. Sometimes crosslisted with FREN 4600.

### Graduating in Four Years with a B.F.A.

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.F.A. in film studies, students should meet the following requirements:

Declare and start the film studies major the first semester freshman year.

Complete FILM 2000 (3 credit hours), FILM 1502 (3 credit hours), and one lower-division critical studies course (FILM 2002, 2003, 2013) for 3 credits by the end of the third semester.

Complete the arts history lower-division requirements (6 credit hours), FILM 2400 (3 credit hours), and 6-9 credit hours of creative arts/performance requirements by the end of the fourth semester.

Complete 6 credit hours of upper-division arts history requirements and 8 credit hours of film history by the end of the fifth semester.

Complete FILM 3500 (3 credit hours), and 3 credit hours of critical studies elective requirements by the end of the sixth semester. Note: Admission into FILM 4500 is subject to review of a student's creative film work in FILM 3500 by a faculty committee. FILM 3500 may have to be repeated if the work does not meet faculty standards. In order to graduate in four years, a student must be accepted into FILM 4500 on the first review.

Complete two upper-division courses of critical studies electives by the end of the seventh semester. All 6 credit hours must be upper-division critical studies courses.

Complete 3 credit hours of critical studies electives and 3-6 credit hours of FILM 4500 by the end of the eighth semester. Note: If students elect to take only 1 credit hour of internship they must take FILM 4500 twice to bring the total to the 56 credit hour minimum to graduate with a B.F.A. degree.

## FINE ARTS

Degrees ..... B.A., B.F.A., M.A., M.F.A.

The Department of Fine Arts offers the Bachelor of Arts in Art History and in Studio Art, and the Bachelor of Fine Arts in Creative Arts.

The following areas of knowledge are central to the undergraduate degree 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 Indian and Southeast Asian, 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 degree 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.

#### *Bachelor of Arts (Art History)*

(40-45 semester hours in the major)

##### *Major Requirements* Semester Hours

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 1309 World Art 1; FINE 1409 World 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

#### *Graduating in Four Years with a B.A. in Art History*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.A. in art history, students should meet the following requirements:

Declare the major by the beginning of the second semester.

By the end of the third semester, complete lower-division studio courses, lower-division art history courses, and two classes in either art history or a secondary area.

By the end of the sixth semester complete up to 32 credit hours in the major and secondary area.

Final semesters not to exceed 45 credits toward the major.

#### *Bachelor of Arts (Studio Arts)*

(33-45 semester hours in the major)

Required:

FINE 1002 or 1012 Basic Drawing .....2-3

Select two of the following:

FINE 1202 or 1212 Basic Painting.....2-3

FINE 1504 or 1514 Basic Sculpture.....2-3

FINE 1161 or 1171 Basic Photography.....2-3

Any three of the following:

FINE 1309 World Art 1; FINE 1409 World 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 or FINE 4202 Painting.

Ceramics majors must take FINE 4085 Ad-

vanced Ceramics and FINE 4095 Ceramics

Seminar

Electronic media majors must take FINE 1161

or FINE 1171 Basic Photography and FINE

4719 History of Media Arts.

#### *Graduating in Four Years with a B.A. in Studio Arts*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.A. in studio arts, students should meet the following requirements:

Declare major by the beginning of the second semester.

Complete lower-division studio courses and lower-division art history courses by the end of the third semester.

Complete up to 32 credit hours in the major by the end of the sixth semester.

Final semesters not to exceed 45 credits in the major.

#### *Bachelor of Fine Arts (Studio Arts)*

(65-67 credits toward the major)

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.

#### *Bachelor of Fine Arts (Divisional Studio Emphasis)*

Students must take any six upper-division studio courses that represent their interests in at least one studio area.

Students must complete five 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.

#### *Graduating in Four Years with a B.F.A. in Studio Arts or Divisional Studio Arts*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.F.A. in studio arts or divisional studio arts, students should meet the following requirements:

Declare the major by the beginning of the first semester, freshman year.

Complete lower-division studio courses, lower-division art history courses, and three additional courses that are lower-division or upper-division studio or art history courses by the end of the third semester.

Complete up to 48 credit hours in the major by the end of the sixth semester.

Final semesters not to exceed 67 credits toward the major.

Required:

FINE 1002 or FINE 1012 Basic Drawing

Select two of the following courses:  
 FINE 1202 or 1212 Basic Painting  
 FINE 1504 or 1514 Basic Sculpture  
 FINE 1161 or 1171 Basic Photo  
 FINE 1309 World Art 1  
 FINE 1409 World Art 2  
 FINE 2409 Introduction to Asian Art

### Honors

Students may graduate with departmental honors. Those interested in pursuing this program should contact the Honors Department and/or the Department of Fine Arts honors representative as early as possible. The GPA requirement is at least 3.30.

### Special Programs

**Art History in Italy.** Art history faculty annually conduct this program, which offers 6 semester hours of upper-division or graduate-level credit during a five-week summer term. Course offerings may vary, covering the late Medieval, Renaissance, and Baroque periods. The course divides its time between Florence and Rome, with up to a week spent in Venice.

Inquiries regarding this and other foreign studies programs should be directed to the Study Abroad Office in the Office of International Education.

**Colorado Collection.** The Colorado Collection is a wide-ranging teaching collection comprised primarily of works on paper ranging from expert old master prints and drawings to innovative contemporary art that speaks to the issues of our times. The collection includes a modest selection of nineteenth- and twentieth-century photographs, as well as ceramics, sculptures, and paintings. The collection is housed in the Department of Fine Arts, under the auspices of the CU Art Galleries. It is used for instruction, research, and special study sessions, and is exhibited periodically in the CU Art Galleries. Each summer exhibitions drawn from the collection travel to communities across Colorado as part of the statewide outreach program *CU This Summer*, sponsored by the University of Colorado at Boulder.

**Exhibitions Program.** The CU Art Galleries, located in the Sibell-Wolle Fine Arts Building, present an active program of exhibitions and related activities that reflect the interests, constituencies, and resources of the university community and of the greater metropolitan area. The galleries focus on contemporary art by artists of international, national, and regional significance, and address current concerns and developments in the visual arts. Bachelor of Fine Arts shows and Master of Fine Arts thesis shows are also held in the galleries,

which have a total of 5000 square feet of space. The galleries sponsor a number of related educational programs and a graduate curatorial internship program; graduate assistants and student guards help staff the galleries and receive practical training in the field.

**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

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.

#### 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 score of 500 or higher on the verbal section of the Graduate Record Examination.
3. A broad general background in history, literature, and philosophy.
4. An extensive background in art history.
5. Applicants to the master's program in art history are asked to write a 750 to 1,000 word essay in Part II, #6 on the application form.

**Examinations.** The comprehensive exams are given to measure graduate student knowledge of art history at the mas-

ter'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 30 credit hours) 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. Topics vary from semester to semester. Repeatable for different topics up to 6 credit hours.

b. FINE 5929 Visiting Scholars Program seminar, 3 credit hours. Students must take this during their second semester.

c. At least one course in four of the following areas of art history: Renaissance/Baroque, Modern, Asian/Tribal Arts, American, Critical Theory. Each course must be a 3-credit hour, 5000-level course.

d. At least two seminars in art history, which may also fulfill the course requirements in the above listed five areas of art history. Each seminar will be 3 credit hours and at the 5000 level.

e. At least one course in a department outside the Department of Fine Arts. The course must be 3 credit hours, at the 4000 level or above, and supplement the major and/or minor special areas of concentration.

f. FINE 6959 Master's Thesis (4-6 credit hours).

2. Thesis: See thesis requirements under Master of Arts and Master of Science in the Graduate School chapter 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. Students may petition to have this requirement waived.

**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; 12 credits in fine arts history is preferred.
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 electronic media committee for presentation to the full graduate faculty.

#### **Course Requirements.**

1. Minimum of four semesters (54 credit 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 credit 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 with advisor's approval.
  - 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. Fine Arts course work must be completed at the 5000 level.
3. Photography students must enroll in FINE 5161 (Graduate Photography Seminar) 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. 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 advisor. The IDA program encourages students to explore several disciplines, both within the fine arts department and outside of fine arts.

#### *IDA Program Requirements*                      *Hours*

<b>Studio</b>	
Fine Arts courses in accepted area.....	12
Fine Arts courses outside of accepted area, within Fine Arts (minimum) .....	12
Electives outside accepted area in Fine Arts, Theatre and Dance, Music, Film Studies, or any other relevant department.....	9
<b>Critical theory</b> (taken as studio or nonstudio hours).....	3

#### **Nonstudio**

Art history.....	6
FINE 5118 Visiting Artist Program .....	3
Hours within or outside fine arts.....	3
FINE 6957 M.F.A. Creative Thesis .....	6
Total Hours .....	54

#### *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 30 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) 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 to 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**

*Degrees in French*.....B.A., M.A., Ph.D.  
*Degree in Italian*.....<sup>1</sup>.....B.A.

### **Bachelor's Degree Programs**

#### *French*

Beyond providing mastery of the language skills (listening, speaking, reading, writing) of modern French needed for all purposes of daily life, the major introduces students to a central tradition of western and indeed world culture. Since the Middle Ages, French literature, thought, taste, and art have helped shape the essential experience and self-understanding of humanity at large. Survey courses and upper-division seminars offer a range of exposures to the French cultural past and the far-flung ethnic and national diversity of the French-speaking present, exploring such distinctively French contributions to world culture as: Arthurian romance, troubadour poetry, and Gothic architecture; the love sonnets of the Pléiade, the comic novels of Rabelais, and the essays of Montaigne; the neoclassical theatre of Corneille, Molière, and Racine and the critical philosophy of Descartes and Pascal; the Enlightenment philosophies of Voltaire, Diderot, and Rousseau; the psychological refinements of French fiction from Mme de La Fayette to Proust; artistic revolutions like impressionism and surrealism; the renewal of artistic conventions in the Theatre of the Absurd, the New Novel, and the cinema of the New Wave; the French-language literature of Africa, Canada, and the Caribbean; and the vital presence of French writers in major movements of twentieth-century thought like existentialism, structuralism, feminism, psychoanalysis, and contemporary cultural studies and multiculturalism.

In pursuing an undergraduate degree in French, majors are expected to acquire the following forms of knowledge:

- an awareness of the fundamental outlines of the history of French literature from the Middle Ages to the present;
- familiarity with significant works of French literature and awareness of the literary culture of the French-speaking world;
- awareness of the historical context in which particular works were written and of the relation between literature and other forms of cultural expression (e.g., art, philosophy, politics, religion);
- awareness of contemporary French culture, politics, and current events;
- awareness of a range of literary genres, their development and reception, as well as relevant critical methodologies; and
- understanding of the grammatical structure of modern standard French.

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 for successful literary or linguistic analysis of French texts;
- 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 communicate such analyses and interpretations simply in French or at a more sophisticated level in English, and to discuss a wide range of topics concerning French culture, civilization, and current events; and
- the ability to follow with reasonable comprehension French broadcasts or film.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below. Students wishing to pursue an Honors major should also consult the Honors requirements listed below.

**Note:** Students undertaking a major in French should expect to have regular conferences with the director of undergraduate studies 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.

A minimum of 30 upper-division hours in French must be completed (see below for specific courses). FREN 2120 or its equivalent is the prerequisite for admission to courses required for the major.

#### Major Requirements Semester Hours

FREN 3010-French Phonetics and Pronunciation .....	3
FREN 3050, 3060 French Composition 1 and 2 .....	6
FREN 3100 Critical Reading and Writing in French Literature.....	3
FREN 3110, 3120 Main Currents of French Literature 1 and 2.....	6
Four or more other courses at the 3000 or 4000 level, of which 9 hours <i>must</i> be at the 4100 level or above.....	12
FREN 4990 Senior Seminar (including a senior essay and oral presentation, except where a student elects to present a senior honors thesis).....	3
<b>Note:</b> The seminar runs concurrently with one of the three courses taken at the 4100 level or above. See departmental brochure for details.	

#### Honors Requirements Semester Hours

Honors candidates must meet all of the regular requirements for the major plus the following:

FREN 3200 Introduction to Literary Theory .....	3
One semester of independent study.....	3
<b>Note:</b> The semester of independent study is taken concurrently with FREN 4980, and is devoted to one-on-one work on the senior honors thesis with a faculty advisor. See departmental brochure for details.	

#### Graduating in Four Years with a B.A. in French

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in French, students should meet the following requirements:

- Declare French major by the beginning of the second semester of study.
- Complete FREN 3010, 3050, 3060, and 3100 by the end of the second (sophomore) year.
- Complete FREN 3110 and 3120 and two other 3000- or 4000-level courses (including one at the 4100 level or above) by the end of the third (junior) year.
- **Note:** Completion of French requirements includes the successful written and oral presentation of a senior essay or honors thesis by the end of the fourth (senior) year.

#### Italian

The major provides the language skills (listening, speaking, reading, writing) of modern Italian needed for all purposes of daily life. Moreover, by combining courses offered by the faculty of the Department of French and Italian with courses of Italian interest taught in other units, including film studies, fine arts, and history; the program promotes an understanding of the role of the Italian lit-

erary and cultural tradition within western civilization at large. Birthplace of Dante, Petrarca, and Boccaccio, Ariosto, Tasso, and Marino, and Michelangelo, Raphael, and Da Vinci, Italy is the cradle of the Renaissance. Through the work of nineteenth- and twentieth-century writers like Leopardi, Manzoni, Pirandello, Levy, and Calvino; operatic composers like Rossini, Puccini, and Verdi; philosophers and critics like Croce, d'Annunzio, Gramsci, and Ginzburg; and film-makers like Fellini, Passolini, and Bertolucci, Italy projects a powerful formative influence into our own day. Thus, in addition to supplying the necessary background for advanced professional study and specialization, the Italian major introduces students to a rich literary, artistic and intellectual history at the roots of the modern world.

Students wishing to major in Italian are required to have a thorough advising session with the Italian program advisor. In this session the student's program of study is outlined in detail. Students are required to see the 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 advisor.

For courses in other departments with an Italian emphasis (e.g., comparative literature, fine arts, history, honors, 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 significant works of Italian literature and awareness of the contribution to world literature of Italian letters;
- awareness of the historical context in which particular works were written;
- awareness of contemporary Italian culture, politics, and current events;
- awareness of a range of literary genres, their development and reception, as well as relevant critical methodologies; and
- understanding of the grammatical structure of modern standard Italian.

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 for successful literary or linguistic analysis of Italian texts;
- 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 communicate such analyses and interpretations simply in Italian or at a more sophisticated level in English, and to discuss a wide range of topics concerning Italian culture, civilization, and current events; and
- the ability to follow with reasonable comprehension authentic Italian broadcasts or film.

Students must complete the general requirements of the College of Arts and Sciences and the major requirements listed below. Thirty-six hours beyond the first year with a 2.00 (C) grade point average or better are required, as listed below.

<i>Major Requirements</i>	<i>Semester Hours</i>
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
Two 4000-level courses in the Italian department (one will be taught in Italian and another in English). One of these seminars must focus on literature or culture before 1800.....	6
Twelve hours in Italian studies, of which at least 9 credit hours must be upper-division and are to be chosen in consultation with the major advisor from suitable courses offered by the following departments: Classics, Fine Arts, History, and Political Science. Students may substitute one, but no more than one, additional 4000-level Italian course for one of the courses in Italian studies. It is recommended that students select courses in diverse disciplines and time periods.....	12
ITAL 4990 Senior Seminar (including a senior essay and oral presentation, except where a student elects to present a senior honors thesis).....	3
Note: The seminar runs concurrently with one of the two courses taken at the 4000 level. See departmental brochure for details.	

<i>Honors Requirements</i>	<i>Semester Hours</i>
Honors candidates must meet all of the regular requirements for the major plus the following:	
FREN 3200 Introduction to Literary Theory.....	3
Note: FREN 3200 is taught in English and presupposes no knowledge of French.	
One semester of independent study.....	3
Note: The semester of independent study is taken concurrently with ITAL 4980, and is devoted to one-on-one work on the senior honors thesis with a faculty advisor. See departmental brochure for details.	

### **Graduating in Four Years with a B.A. in Italian**

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept

of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in Italian, students should meet the following requirements:

- Declare the Italian major by the beginning of the second semester of study.
- Complete 12 credit hours of requirements (including ITAL 2110 and 2120) by the end of the second (sophomore) year.
- Complete 12 of the remaining 24 credit hours by the end of the third (junior) year.
- Complete the remainder of the major requirements in the fourth (senior) year.

### **Study Abroad**

French majors are strongly encouraged to spend a semester or a year at a French-speaking university. CU-Boulder patronizes study abroad programs in Annecy, Rennes, and Paris for which transfer credit is readily available.

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.

The Ayer Romance Language Scholarship is available for majors going on study abroad programs. The Lamont Scholarship is awarded alternately to French and Italian majors (in alternate years).

For further information, see International Education on page 30 of this catalog, or inquire at the Office of International Education.

### **Minor Programs**

The department now offers minors in both French and Italian. Interested students should contact the department office for further information.

### **Graduate Degree Programs in French**

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 chapter of this catalog. Graduate teaching exchanges at the Universities of Bordeaux and Valenciennes are available to students who have earned a master's degree. The Lamont Scholarship is available for 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. This last requirement

may be fulfilled either by taking at least 3 credit hours of a fourth semester undergraduate course in the language with a minimum grade of B- or by passing the Graduate Student Foreign Language Test. 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.** 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 must be shown by taking an undergraduate course in the language at the 4000 level. In some cases, when directly related to a student's research area, a reading knowledge of a *fourth* language can be substituted for the 4000-level course in the third language. Such reading knowledge must be certified by the student's 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). A dictionary is permitted. This language may be one of the following: German, Spanish, Italian, Latin, Greek, or Russian. Other languages are considered depending on the student's area of research.

## **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 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.

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:

- proficiency in one or more of the specific geographic skill areas of cartography, air photograph interpretation, remote sensing, and geographic information systems;
- proficiency in writing, quantitative methods, computer literacy, and in library and field methods of data collection; and
- proficiency in identifying the geographic dimensions of a problem and analyzing, synthesizing, and evaluating relevant data, and applying geographic principles offering 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. Students must complete at least 32 and no more than 45 credit hours in geography courses with grades of C (2.00) or better (18 hours must be upper division). No pass/fail grades are allowed in the major. These requirements apply to all geography majors who declare their major June 1, 1992, and thereafter. Majors who declared before that date have the option of completing their major under either the old or new rules. Transfer students majoring in geography must complete at least 12 credit hours of upper-division geography courses at CU-Boulder.

<i>Major Requirements</i>	<i>Semester Hours</i>
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.....	3
GEOG 1992 Introduction to Human Geography.....	3
GEOG 2002 World Geographic Problems....	3

One of the following:

GEOG 2053 Maps and Mapping.....	4
GEOG 3053 Cartography 1.....	4

One of the following:

GEOG 3002 Introduction to Research in Human Geography.....	4
GEOG 3023 Statistics for Earth Sciences.....	4
GEOG 3093 Geographical Interpretation of Aerial Photographs.....	3
GEOG 4023 Quantitative Methods in Human Geography.....	3
GEOG 4083 Mapping from Remotely Sensed Imagery.....	4
GEOG 4093 Remote Sensing of the Environment.....	3
GEOG 4103 Geographic Information Systems.....	4
GEOG 4173 Research Seminar.....	3
GEOG 4383 Methods of Vegetation Analysis.....	3
GEOG 4411 Methods of Soils Analysis.....	3
ANTH 4000 Quantitative Methods in Anthropology.....	3
ECON 3818 Economic Statistics with Computer Applications.....	4
EPOB 3030 Introduction to Biological Statistics.....	3
MATH 2510 Introduction to Statistics.....	3
PSCI 4074 Quantitative Research Methods....	3
PSYC 2101 Statistics and Research Methods in Psychology.....	4
SOCY 3061 Statistics.....	3
Additional electives.....	12

Students should consult the departmental office for further information and referral to departmental advisors.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in geography, students should meet the following requirements:

Declare a geography major by the beginning of the second semester.

Complete GEOG 1001, 1011, and one of the following courses: GEOG 1982, 1992, or 2002, by the end of the third semester.

Complete GEOG 1982, 1992, or 2002 (must be different than the course used to complete the previous requirement) and 9 credit hours of upper-division geography courses by the end of the sixth semester.

Complete the remaining upper-division credit hours by the eighth semester.

### 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 chapter 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.** It is recommended that students have approximately 20 semester hours of geography, including introductory courses in both human and physical geography. However, 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/or natural sciences. Graduate students are encouraged to have some background in college mathematics, statistics, and computer skills. Without the kind-of background described above, admission may be on a provisional basis, and/or the student will be asked to make up certain deficiencies in their first year.

**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. Students without a master's degree (or equivalent) will be initially admitted into the M.A. program, but they may petition to change to the Ph.D. program if all of the following conditions are met: the student has the support of a three-member committee of geography faculty, which will form the core of the dissertation committee; the student produces an extensive literature review paper and proposal with research ideas for a dissertation, and; the student passes an oral examination consisting of a discussion of the literature and defense of the research proposal. The oral examination must take place in or by the third semester of the student's graduate program. This procedure is only recommended if the student has had prior independent research experience.

**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 evalu-



are 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. Dissertation 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 options available in the undergraduate program in geology are tri-fold: geology, geophysics, or environmental geoscience. Each program leads to the B.A. degree. The environmental geoscience option offers flexibility and broad training; the geology and geophysics options offer more traditional paths of training. 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/or sedimentary rocks;

- awareness of interactions of the 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 also must demonstrate a basic ability to work interactively with computers. Information on how to satisfy the requirements for computer literacy is available in the departmental office.

<i>Major Requirements</i>	<i>Semester Hours</i>
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	6-7
GEOL 2700 Introduction to Field Geology	2
GEOL 3010 Introduction to Mineralogy	3
GEOL 4960 Writing in Geosciences	1
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 1 and 2 with Computer Applications or APPM 1350 and 1360 Calculus for Engineers 1 and 2.....8-10  
 PHYS 1110, 1120, and 1140 General Physics 1 and 2 and Experimental Physics 1.....9

Note: GEOL 1080 and 1090 Geology Laboratory 1 and 2 are also recommended, particularly for students taking GEOL 1010 and 1020. GEOL 1110 Global Change Laboratory is recommended for students taking GEOL 1070.

### Geology Option

Students electing the geology option are required to take the following additional courses:

GEOL 3020 Petrology	3
GEOL 3120 Structural Geology 1	4
GEOL 3430 Sedimentology and Stratigraphy	4
Two 2-credit hour advanced (4000-level) field geology modules	4

And any two of the following courses:

GEOL 3320 Introduction to Geochemistry	3
GEOL 3410 Paleobiology	3
GEOL 4130 Geophysics and Tectonics or GEOL 4530 Introduction to the Physics of the Solid Earth or GEOL 4940 Applied Geophysics	3-4

### Environmental Geoscience Option

Students electing the environmental geoscience option are required to take the following additional courses:

Two 2-credit hour advanced (4000-level) field geology modules	4
GEOL 3030 Introduction to Hydrogeology	3
GEOL 3320 Introduction to Geochemistry	3
GEOL 3430 Sedimentology and Stratigraphy	4

One course from Group A below, one course from Group B below, and a third course from either A or B:

<b>Group A</b>	
GEOL 3023 Statistics for Earth Sciences	3
GEOL 4093 Remote Sensing of the Environment	4
GEOL 4940 Applied Geophysics	4
<b>Group B</b>	
GEOL 3040 Global Change: The Recent Geological Record	3
GEOL 3120 Structural Geology	4
GEOL 3520 Environmental Issues in Geosciences	3
GEOL 4241 Principles of Geomorphology	4

### 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 28 hours. Any upper-division course is acceptable, with the exception that only one of the following may be counted toward the 28-hour minimum in the geology option:

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 3630 Great Geological Controversies.....	3
GEOL 3720 Evolution of Life: The Geologic Record.....	3
GEOL 4060 Introduction to Oceanography.....	3
GEOL 4080 Societal Problems and Earth Sciences.....	3
GEOL 4500 Critical Thinking in the Earth Sciences.....	3
GEOL 4950 Natural Catastrophes and Geologic Hazards.....	3

### Geophysics Option

Students electing the geophysics option are required to take the following additional courses:

GEOL 3020 Petrology.....	3
GEOL 3120 Structural Geology 1.....	4
GEOL 4530 Introduction to the Physics of the Solid Earth.....	3
One 2-credit hour advanced (4000-level) field geology module.....	2
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 CU-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.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in geology, students should meet all college requirements plus specific departmental requirements. These departmental requirements vary slightly between the three major options. Detailed information is available from the depart-

ment office, but in general these requirements include:

Declare a geology major and begin course work in the major during the first semester freshman year.

Meet with a departmental advisor prior to the second and fifth semesters and during the seventh semester.

Complete at least 33 credit hours (geology and environmental geoscience options; 44 credit hours for geophysics option) required for the major by the end of the fourth semester.

Complete at least 47 credit hours (geology and environmental geosciences options; 63 credit hours for geophysics option) required for the major by the end of the sixth semester.

Complete the remaining requirements for the major by the end of the eighth semester.

### Minor Program

The department also offers a minor in geology. Details are available in the departmental 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 carefully read 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.

The Department of Geological Sciences participates in the interdepartmental Ph.D. program in geophysics and hydrology. For more information about this program, consult the Graduate School chapter of this catalog.

## GERMANIC AND SLAVIC LANGUAGES AND LITERATURES

*Germanic Studies Degree*.....B.A., M.A.

*Russian Studies Degree*.....B.A.

Students may choose to major in either Germanic Studies or Russian Studies.

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.

The major in Russian Studies is an interdisciplinary program focusing on study of the current cultural and social context, and the literary, artistic, and historical aspects

of Russian culture in the past and present. The aim of the language 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 Studies should consider a double major in order to increase their career opportunities. Prospective teachers might combine Russian Studies with a major in another foreign language, while those preparing for a career in government service should benefit from a combination of Russian Studies and a social sciences major.

Students are required to structure their curriculum according to the departmental checklist for majors in close consultation with a departmental advisor.

## Bachelor's Degree Programs

### Germanic Studies

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

- 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 Germany as a manifestation of the particular cultural history of the region.

In addition, students completing the degree in Germanic Studies 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.

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 GRMN 1601 plus 39 hours beyond 2000-level language courses with grades of C or better (none may be taken pass/fail), distributed as follows:

*All students must take the following courses in residence here:*

GRMN 1601 Introduction to Modern German Culture and Civilization	3
GRMN 3110 German Literature from 1910 to Present or GRMN 3120 Modern German Literature	3
GRMN 4010 Advanced Composition, Conversation, and Stylistics 1	3
GRMN 4020 Advanced Composition, Conversation, and Stylistics 2	3
GRMN 4550 Senior Seminar: The Roles of Intellectuals and Academics in German Culture	3

### 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

Complete three courses, at least one each in PSCI and HIST:	
HIST 4413 German History to 1848	3
HIST 4423 German History since 1849	3
HIST 4433 Nazi Germany	3
PSCI 2012 Comparative Politics	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 European 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 Eastern Europe to 1914	3
HIST 4623 History of Eastern Europe since 1914	3
PHIL 4030 Studies in Nineteenth-Century Philosophy	3
PHIL 4040 Studies in Twentieth-Century Philosophy	3
PHIL 4250 Marxism	3
PSCI 4213 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.	

### 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 International Education on page 30 of this catalog.

### Russian Studies

The following areas are central to the undergraduate degree in Russian Studies:

- an awareness of the fundamental outlines of the history of Russian literature and culture from the Middle Ages to the present day;
- familiarity with the major Russian creative writers of the nineteenth and twentieth centuries;
- familiarity with the historical context of Russian literature and culture; and
- an awareness of basic critical methodologies as they relate to the study of Russian literature.

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 cultural texts;
- the ability to analyze Russian literary texts and give a reasoned response to them in literate English; and
- the ability to write and converse in Russian at their own intellectual level.

### Major Requirements Semester Hours

RUSS 1010, 1020 and 2010 do not count toward the 43 semester credit hours required for a B.A. degree in Russian Studies

### Russian Language Courses

RUSS 2020 Second-Year Russian 2	4
RUSS 3010 Third-Year Russian 1	3
RUSS 3020 Third-Year Russian 2	3
RUSS 4010 Advanced Conversation and Composition 1	3
RUSS 4020 Advanced Conversation and Composition 2	3

*Russian Literature and Culture Courses*

RUSS 2211 Russian Culture or RUSS 2221 Modern Russian Culture .....	3
RUSS 4811 Nineteenth-Century Russian Literature.....	3
RUSS 4821 Twentieth-Century Russian Literature.....	3
RUSS 4210 Open Topics: Russian Literature and Culture or RUSS 3301 Contemporary Issues in Russian Film .....	3

*Major Elective*

RUSS 3000 Advanced Conversation or RUSS 3301 Contemporary Issues in Russian Film any 4000-level literature/culture course (except RUSS 4811 and 4821) .....	3
(RUSS 3301 and 4210 may be counted in the <i>Russian Literature and Culture</i> or in the <i>Major Elective</i> category, but not in both.)	

*Russian Area Courses*

Complete two of the following courses, at least one from HIST:	
HIST 3010 Communist Societies in Historical Perspective .....	3
HIST 4713 History of Russia Through the Seventeenth Century .....	3
HIST 4723 Imperial Russia .....	3
HIST 4733 The Russian Revolution and the Soviet Regime.....	3
GEOG 4882 Russian Commonwealth.....	3
PSCI 4223 Soviet and Russian Diplomacy.....	3
SOCY.4105 Sociology of Modern Soviet Society.....	3

*General Electives*

Complete two of the following courses:	
ANTH 3800 Languages and People.....	3
CLAS 4071 History of the Byzantine Empire.....	3
ECON 4514 Economic History of Europe.....	3
FILM 3051 Film History 1 .....	4
FINE 4039 Byzantine Art .....	3
FINE 4329 Modern Art 1 .....	3
FINE 4339 Modern Art 2 .....	3
FINE 4349 Modern Architecture.....	3
GEOG 3662 Economic Geography .....	3
HIST 4414 European Intellectual History 1750-1870 .....	3
HIST 4424 European Intellectual History 1870-Present .....	3
JOUR 4201 International Mass Communications.....	3
LING 4800 Language and Culture .....	3
PHIL 3010 History of Modern Philosophy.....	3
PHIL 4030 Studies in Nineteenth-Century Philosophy .....	3
PHIL 4040 Studies in Twentieth-Century Philosophy .....	3
PSCI 3143 International Relations.....	3
RLST 3600 Islam.....	3
THTR 2021 Development of Theatre 2: Masters of Modern Drama .....	3
THTR 3031 Development of Theatre 3: European Theatre Practice, Nineteenth and Twentieth Centuries .....	3
Beginning or middle-level language courses can be met by transfer credit or by testing out of the course. Students who enter the program at the third-year level must complete at least 30 credit hours in courses numbered 3000 or	

above with grades of C- or better (none may  
be taken pass/fail).

*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. 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.

*Study Abroad*

The department strongly recommends that all majors take part in the University's summer language program in St. Petersburg. For further information, see International Education on page 30 of this catalog.

*Graduating in Four Years*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in Germanic Studies or Russian, students should meet the following requirements:

Begin to study the language in the freshman year, or have received advanced placement credit.

In consultation with the major program advisor before the end of the drop/add period in the first semester, plan a tentative schedule of courses to be taken over eight semesters.

Discuss progress toward the degree each semester with the major advisor.

**Note:** Although these requirements apply only in cases in which students are seeking to graduate under the terms of the four-year guarantee, they are good advice for all majors. Consult the program advisor about the major at any time.

*Minor Programs*

Minors in both German and Russian are available. See the department for requirements.

*Courses Taught in English*

The department 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.

*Scandinavian*

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 Uppsala University in Sweden. At least two semesters of Swedish are required for application to the program. No degree is offered in Scandinavian.

*Master's Degree in German*

Students wishing to pursue the interdisciplinary master's in German should read carefully Requirements for Advanced Degrees in the Graduate School chapter of this catalog. The following prerequisites and requirements apply: B.A. or equivalent in German or B.A.-level proficiency in German with a B.A. in a related field; general knowledge of the German-speaking countries' literature, history, and culture; 24 hours of approved course work and a master's thesis (6 hours), or 30 hours of course work without thesis; reading knowledge of one modern foreign language in addition to German and English to be demonstrated by approved course work or by examination. For specific requirements please contact the department.

**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 features in the political, social, cultural, and economic history of the United States, from its origins to the present;
- knowledge of the main features in the political, social, cultural, and economic history of western civilization, from its origins in antiquity to the present;
- knowledge of the main features 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 world areas—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 a coherent historical essay.

### 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

Complete either 36 or 39 hours in history courses with grades of C- (1.7) or better (21 or 24 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 1010 and 1040 Western Civilization 1 and Honors Western Civilization 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 1608 Introduction to Chinese History; HIST 1708 Introduction to Japanese History.....	3
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Complete a 12-hour concentration at the upper-division level (including a 3000-level seminar) in the history of one geographical area: the United States, Europe, or World Areas (Africa, Asia, Latin America, Middle East). Senior history majors may, with instructor consent, substitute a 6000-level course for the seminar.

Complete either two upper-division history courses outside the area of geographical concentration plus HIST 4020 Capstone: Comparative History (three courses for a total of 36 hours in the major); or two upper-division history courses in each of two regions outside the area of concentration (four courses for a total of 39 hours).

Note: All 1000- and 2000-level history courses meet College of Arts and Sciences core curriculum requirements (check individual course descriptions for the specific requirement met). Most 3000-level seminars intended for history majors complete the critical thinking requirement. Courses at the 4000-level do not normally fill core requirements. (A few courses cross-listed with other departments do not conform to these rules.)

#### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in history, students should meet the following requirements:

Declare the major no later than the second semester of the freshman year.

The recommended sequence of courses follows.

<i>Freshman year</i>	
Any two of the five required lower-division courses.....	6
<i>Sophomore year</i>	
Two more of the required lower-division courses.....	6
Optional: one upper-division course if students have completed an introductory course in that area.....	3
<i>Junior year</i>	
The one remaining required lower-division course.....	3
Two upper-division courses in area of geographical concentration.....	6
One upper-division course outside area of concentration (may have been taken in sophomore year).....	3
<i>Senior year</i>	
Two upper-division courses in area of geographical concentration, including 3000-level seminar.....	6
One upper-division course outside area of concentration.....	3
Either HIST 4020 Capstone: Comparative History, or two additional upper-division courses outside area of concentration.....	3 or 6

Note: No more than 45 semester hours in history apply to graduation requirements. Students must have a grade point average of at least 2.00 in the major in order to graduate. Students may receive credit for HIST 1020 and/or 1015-1025 by obtaining a score of 4 or better on the high school Advanced Placement history test(s). (CLEP tests are *not* accepted.) Many 1000-level courses, most 3000-level seminars, and all 4000-level courses count toward the 36-39 credit hour major requirements. The remaining 1000-level and all 2000-level courses count within the 45 credit hour maximum in history but do not meet requirements toward the 36-39 credit hour major. Transfer students majoring in history must complete at least 12 semester hours of upper-division history courses at the University of Colorado at Boulder.

#### Minor Program

The history department offers a minor in history requiring 21 credit hours. Information regarding specific requirements can be obtained from the Department of History.

#### 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 chapter 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, a broad liberal arts education is desired 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.** 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.

#### 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.

## HISTORY AND PHILOSOPHY OF SCIENCE

The College of Arts and Sciences offers the courses PHIL 3410 and 3430 in the history and philosophy of science. The two semesters cover two distinct time periods: ancients to Newton and Newton to Einstein. Of related interest are PHIL 4400 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.

## HUMANITIES

See Comparative Literature and Humanities.

## 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. The major must be approved by the dean of the College of Arts and Sciences, and, once approved, 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 B.A. 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 39 hours with a grade of C (2.00) or better

(none may be taken pass/fail), distributed as follows:

<i>Major Requirements</i>	<i>Semester Hours</i>
<b>Lower Division (11-15 hours)</b>	
ECON 1000 Introduction to Economics or ECON 2010 Principles of Microeconomics and ECON 2020 Principles of Macroeconomics .....	4-8
IAFS 1000 Global Issues and International Affairs.....	4
PSCI 2223 Introduction to International Relations.....	3
<b>Upper Division—One course from each of the following eight categories. No more than four courses from any one department will be allowed when completing the following 24-hour requirement.</b>	
<b>Development and Culture:</b>	
ANTH 4500 Cross-Cultural Aspects of Socio-economic Development or ANTH 4510 Applied Cultural Anthropology or ECON 3545 Environmental Economics or ECON 4606 Introduction to Economic Demography or ECON 4774 Economic Reform in Developing Countries or GEOG 3672 Gender and Global Economy or GEOG 3682 Geography of International Development or IAFS 4700 Global Perspectives and Political Philosophy or PSCI 4012 Global Development or PSCI 4732 Critical Thinking in Development.....	3
<b>International Economics/Business:</b>	
ECON 3403 International Economics and Policy or ECON 4413 International Trade or ECON 4423 International Finance or INBU 4200 International Financial Management .....	3
<b>Political Economy:</b>	
ECON 4433 Economics of the Pacific Area or ECON 4784 Economic Development or ECON 4999 Economics in Action—Defense Economics or FNCE 4410 International Business Seminar in Finance or INBU 4100 International Business and Marketing or PSCI 4272 Political Economy of Industrialized Society.....	3
<b>Political Geography:</b>	
GEOG 4712 Political Geography .....	3
<b>International Relations/Behavior:</b>	
ANTH 4580 Power: The Anthropology of Politics or PSCI 3121 War, Peace, and Strategic Defense or PSCI 3143 International Relations or PSCI 3193 International Behavior.....	3
<b>Foreign Policy:</b>	
HIST 4050 The World War II Era or HIST 4126 Diplomatic History of the U.S. Since 1940 or HIST 4166 The War in Vietnam and Its Legacy or PSCI 3191 National Security Organization and Policy Making or PSCI 3163 American Foreign Policy or RLST 4550 Religion, War, and Peace.....	3
<b>Regimes, Norms, and Institutions:</b>	
PHIL 3260 International Human Rights or PSCI 3064 Revolution and Political Violence or PSCI 4173 International Organization or PSCI 4183 International Law or PSCI 4213 Europe in the International System or PSCI 4703 Alternative World Futures or PSCI 4782 Global Issues: Political Repression and Human Rights.....	3



### Contemporary Issues in International Affairs: Senior Seminars:

IAFS 3000 Special Topics in International Affairs or IAFS 4500 Post-Cold War World or IAFS 4800 Honors in International Affairs.....3

**2. Area Requirement.** Completion of 12 credit hours of upper-division courses concentrating on the whole or part of a region outside the United States. While the area of concentration should be mainly in the social sciences and include one course in contemporary history, 3 credit hours of contemporary literature in a foreign language is also acceptable. 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.

#### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in international affairs, students should meet the following requirements:

Declare major by the beginning of the second semester.

Begin language study by the third semester. Complete the lower-division requirements by the end of the sophomore year.

Begin area of concentration courses in first semester of the junior year.

Begin upper-division general international affairs requirements in the junior year.

Successfully complete any remaining major requirements by the end of the eighth semester.

## 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 medicine.

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.

<i>Major Requirements</i>	<i>Semester Hours</i>
KINE 1010 Introduction to Kinesiology.....	3
KINE 2700 Introduction to Statistics and Research in Kinesiology.....	3
KINE 4540 Mechanical Kinesiology.....	5
KINE 4650 Physiological Kinesiology.....	5
KINE 4720 Neuromuscular Kinesiology.....	4
KINE 4750 Psychological Kinesiology.....	4
EPOB 1210-1240 General Biology 1 and 2 with labs or MCDB 1150 and 1151 Introduction to Molecular Biology with lab and MCDB 2150 and 2151 Principles of Genetics with lab.....	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 and 2020 General Physics 1 and 2.....	10
EPOB 3420 Introduction to Human Anatomy.....	5
EPOB 3430 Human Physiology.....	5
PSYC 1001 General Psychology.....	4
One of the following courses: PSYC 4406 Social Psychology, PSYC 4456 Psychology of Personality, or PSYC 4684 Developmental Psychology.....	3
One of the following courses: MATH 1300 Analytic Geometry and Calculus 1, MATH 1310 Calculus 1 with Computer Applications, or APPM 1350 Calculus 1 for Engineers...4-5	4-5
Six to 21 credit hours of electives, chosen from the following:	
KINE 1950 Introduction to Scientific Writing in Kinesiology.....	3
KINE 3420 Nutrition, Health, and Performance.....	3
KINE 3700 Scientific Writing in Kinesiology.....	3
KINE 4100 Colloquium in Kinesiology.....	2
KINE 4480 Perspectives on Aging.....	3
KINE 4660 Selected Topics in Exercise Physiology.....	3
KINE 4730 Motor Control.....	3
KINE 4760 Critical Thinking in Motor Behavior.....	3
KINE 4860 Independent Study.....	1-3
KINE 4870 Honors Thesis.....	1-3
KINE 4930 Internship.....	1-6

#### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibil-

ity for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in kinesiology, students should meet the following requirements:

Declare the major by the first semester.

Complete the biology and chemistry requirements before the beginning of the fifth semester.

Complete the anatomy and physiology requirements by the end of the sixth semester.

Students must consult with a major advisor to determine adequate progress toward completion of major requirements.

### Minor Program

The Department of Kinesiology also has a minor program. For details, contact the main departmental office.

### Graduate Degree Program

To obtain materials for application and for any additional information, address inquiries to the graduate staff assistant of the Department of Kinesiology.

### Departmental Requirements

Master's candidates entering the graduate program may select plan I (thesis—24 credit hours including 4-6 thesis hours) or plan II (nonthesis—30 credit hours including a 3-credit hour research project) for the degree program. All candidates are required to select an advisor who is willing to supervise the student's academic progress. The advisor will assist the student in deciding upon the thesis and nonthesis options based upon a careful examination of the candidate's academic record, his/her professional interests, and the availability of departmental resources. The comprehensive exam for thesis option candidates will consist of an oral defense of the candidate's thesis that integrates the course work completed for the degree as well as the research question under investigation. Nonthesis candidates will be required to complete a research project that has been designed in consultation with the student's advisor and complete a comprehensive exam. For these individuals, the comprehensive exam will consist of an evaluation of the results of the research project as well as course work completed for the degree.

### 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 departmental approval of their academic preparation for graduate study.

The following requirements have been established by the department as basic core requirements: all students must have an introductory statistics or research design course. In addition, students should have the knowledge base that would be obtained by completing the following courses: KINE 4540 Mechanical Kinesiology; KINE 4650 Physiological Kinesiology; KINE 4720 Neuromuscular Kinesiology; and KINE 4750 Psychological Kinesiology. 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 of a prospective graduate student is not adequate, 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. All entering graduate students with deficiencies must satisfy at least one deficiency per semester until all deficiencies are satisfied. Graduate courses taken before removing deficiencies may be accepted for graduate degree credit only if prior approval of the graduate coordinator has been granted.

**Basic Requirements.** The following are required of all students for the master of science degree: KINE 5100 Colloquium in current Kinesiology; KINE 5830 Applications of Statistics to Kinesiology; KINE 6830 Methods of Research in Kinesiology; a minimum cumulative grade point average of 3.00 in all graduate work undertaken; satisfactory performance on the comprehensive exam; and completion of the 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, KINE 6840 (Research Project) is required.

**Comprehensive Examination.** All candidates are required to complete an oral examination covering the thesis or research project, as well as 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 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.

## LINGUISTICS

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

The undergraduate major emphasizes 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; 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 analysis of data from 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 33 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.

<i>Major Requirements</i>	<i>Semester Hours</i>
Complete the following courses in general linguistics with grades of C or better:	
LING 2000 Introduction to Linguistics .....	3
LING 3430 Semantics .....	3
LING 4030 Linguistic Phonetics .....	3
LING 4410 Phonology .....	3
LING 4420 Morphology and Syntax .....	3

**Natural Language.** Students must complete with a grade of C (2.00) or better a minimum of 9 semester hours of study of a natural language other than English (including signed languages used by deaf communities). At least six semester hours offered in satisfaction of this requirement must be at the 3000 level or above. The natural language requirement may be satisfied by examination or waived for foreign students whose native language is not English; in these cases, students must still meet the college's minimum major requirement of 18 semester hours of upper-division course work and 30 semester hours overall in the major. Students who wish to have their language requirement waived must obtain the consent of the undergraduate advisor before registering for the fall term of the junior year.

**Electives.** A minimum of 9 elective hours must be completed with a grade of C (2.00) or better. Courses may be chosen from the following:

LING 1000 Language in U.S. Society  
 LING 2400 Language and Gender  
 LING 3220 American Indian Languages  
 LING 3500 Language/Public Interest  
 LING 4220 Language and Mind  
 LING 4560 Language Development  
 LING 4610 English Structure for TESOL  
 LING 4800 Language and Culture  
 Other upper-division linguistics courses may also be chosen if available.

The department recommends that prospective majors complete LING 2000 and at least two 1000-level foreign language courses (in the same language) by the end of the sophomore year, unless the student's foreign language proficiency is already advanced or the student is a native speaker/signer of a language other than English. (See the full statement of Natural Language requirements above.) The fall semester of the junior year should include two of the following: LING 3430, 4030, or 4420, plus a 2000-level foreign language course. It must also include LING 2000 if it was not taken earlier. The spring semester should include two linguistics courses, and a further 2000-level foreign language course if needed to prepare the student for the six required upper-division foreign language hours.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here refers only to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in linguistics, students should meet the following requirements:

- Declare linguistics as a major by the beginning of the second semester.
- Complete two semesters of study of a natural (spoken or signed) language other than English by the end of the sophomore year (fourth semester) at the latest, continue study at the 2000 level during the junior year at the latest, and take 6 credit hours at the 3000 level during the senior year (seventh and eighth semesters) at the latest. The language requirement is waived for native speakers of a language other than English, but if it is waived, two additional upper-division elective linguistics courses must be taken.
- Take LING 2000 (required) and LING 1000 or LING 2400 (electives) during the freshman or sophomore years and one or both of LING 3430 or 4420 during the fall of the junior year.
- Take LING 4030 and 4410 as a fall-spring sequence in the junior year to ensure graduation within four years.
- Take an upper-division elective during the spring of the junior year, and the remaining

courses as needed in the junior or senior year.

**Note:** A linguistics major who has been excluded from any upper-division linguistics course due to enrollment limitations will be given first preference for a seat in that course the following year if the exclusion is made known to the department staff within two weeks after it occurs. No declared linguistics major who still needs LING 2000 for fall of the junior year and attempts to register for it during the regular registration period for continuing students (spring of the sophomore year) will be excluded from the course.

### Minor Program

The Department of Linguistics also has a minor program. For details, contact the departmental office.

### 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 carefully read Requirements for Advanced Degrees in the Graduate School chapter of this catalog and the detailed degree requirements available from the department office. A brief summary of M.A. and Ph.D. requirements follow.

**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 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 four 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 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 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.

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

The department of mathematics offers two plans for earning a B.A. in mathematics. For each plan students must complete the general requirements of the College of Arts and Sciences as well as the major requirements listed below.

To earn an undergraduate degree in the mathematics plans 1 and 2, students must take Calculus 1, 2, and 3 plus 24 credit hours of courses numbered 3000 or above with 9 credit hours at the 4000-level or above, with a grade of C- or better and with 2.00 (C) average for all attempted work in mathematics. The 24 semester hours must be fulfilled by a minimum of eight courses.

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.

**Note:** Any APPM course that is cross-listed as a MATH course is considered by the Department of Mathematics to be a mathematics course.

MATH 3830 Communicating Mathematical Ideas cannot be used to fulfill the requirements for either plan.

### Mathematics Plan 1

<i>Major Requirements</i>	<i>Semester Hours</i>
Calculus 1, 2, and 3 .....	12-14
MATH 3000 Introduction to Abstract Mathematics or MATH 3200 Introduction to Topology.....	3
MATH 3130 Introduction to Linear Algebra .....	3
MATH 3140 Abstract Algebra 1 .....	3
MATH 4310 Introduction to Analysis.....	3
A two-semester upper-division sequence approved by the Department of Mathematics and upper-division math electives.....	12

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in mathematics plan 1, students should meet the following requirements:

Declare major by the beginning of the second semester.

Complete Calculus 1, 2, and 3, and either MATH 3000, 3200, or 3130 by the end of the fourth semester.

Complete either MATH 3000 or 3200 and MATH 3130, 3140, and at least two optional upper-division 3-credit mathematics courses by the end of the sixth semester.

Complete MATH 4310, at least three optional upper-division 3-credit mathematics courses, and have begun an approved two-semester upper-division sequence by the end of the seventh semester.

Complete a total of eight upper-division 3-credit mathematics courses including an approved two-semester upper-division sequence by the end of the eighth semester.

**Note:** At least three of the eight courses must be at the 4000 level.

### Mathematics Plan 2

<i>Major Requirements</i>	<i>Semester Hours</i>
Calculus 1, 2, and 3 .....	12-14
MATH 3130 Introduction to Linear Algebra .....	3
MATH 4430 Ordinary Differential Equations.....	3
MATH 4650 Intermediate Numerical Analysis .....	3
MATH 4510 Introduction to Probability or MATH 4470 Introduction to Partial Differential Equations or MATH 4450 Introduction to Complex Variables or MATH 4330 Fourier Analysis.....	3

A two-semester upper-division sequence approved by the Department of Mathematics and upper-division math electives.....12

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in mathematics, students should meet the following requirements:

Declare the major by the beginning of the second semester.

Complete Calculus 1, 2, and 3, and MATH 3130 by the end of the fourth semester.

Complete MATH 4430 and 4650; at least one of the following: MATH 4330, 4450, 4470, or 4510; and at least one additional 3-credit hour upper-division elective by the end of the sixth semester.

Complete at least three optional upper-division 3-credit mathematics courses and begin an approved two-semester upper-division sequence by the end of the seventh semester.

Complete a total of eight upper-division 3-credit mathematics courses, including an approved two-semester upper-division sequence by the end of the eighth semester.

### Secondary Licensure

The program for obtaining a secondary teaching license is handled by the School of Education and this program has requirements in addition to those needed for a mathematics degree. Teacher licensure candidates should talk to an advisor in the School of Education.

### Residency Requirement

For the B.A. degree in mathematics, all students must have completed at least 12 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 24-hour upper-division requirement must be approved by the Department of Mathematics. Courses accepted as mathematics credit but excluded from the minimum 24-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 3140, MATH 4310 and 4320, and should fulfill the College of Arts and Sciences language requirement with German, French, or Russian.

### Minor Program

The Department of Mathematics also offers a minor in mathematics. For further information, please contact the department.

### 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 chapter of this catalog.) Students interested in any of these programs should read carefully the material describing the University requirements in the Graduate School chapter 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, with a grade of B or better. GRE scores are required to be considered for financial support.

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 excluding MATH 5800. No language is required of master's students.

To earn an M.A. degree under the thesis plan, a student must complete 27 semester hours of graduate course work, including two courses that are approved full-year courses, and 4 to 6 semester hours of thesis work. For the nonthesis plan, 30 semester hours of course work are required. Two of those courses must be approved full-year courses. No more than 6 credit hours of seminars or independent study may be included in the 30-hour requirement.

For the M.S. degree in applied mathematics, 30 semester hours of graduate course work are required. Of these, 6 to 12 semester hours must be in an approved minor program outside the mathematics department.

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 and the student's advisor. The basic requirements for a Ph.D. degree in mathematics are as follows: demonstration

of reading knowledge of two languages, one of which must be French, German, or Russian (see departmental requirement sheet for language options); at least 30 semester hours of graduate course work and 30 semester hours of thesis; a written thesis that contains substantial original contributions to mathematics; and successful completion of a final examination.

## MEDIEVAL AND RENAISSANCE STUDIES

To the Middle Ages, the modern world owes the preservation and transmission of Latin and Greek; the development of a host of vernaculars; the evolution of Judaism and Christianity, and the rise of Islam; the renewed study of Roman law; the growth of a mercantile class; the creation of musical notation; the erection of ecclesiastical monuments; the foundations of constitutional government; and the institution of universities. The Renaissance inherited and elaborated all these institutions and inventions, adapting them to fit new conceptions of man—and woman—church and state. The Committee on Medieval and Renaissance Studies is founded on the convictions that the European Middle Ages and Renaissance are a dynamic cultural continuum and ever-evolving system; that study of both periods in tandem sheds new light on each; and that the unity and diversity of the pre-modern world can only be understood and appreciated from an interdisciplinary perspective. Medieval and Renaissance Studies therefore necessarily crosses boundaries of period, nation, language, and discipline, and the committee's prime function is to facilitate and encourage interdepartmental study and teaching.

The following courses are available to students whose area of specialization within a given department is the medieval and/or Renaissance period(s) and who wish to broaden their knowledge of medieval and Renaissance 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.

For further information, consult the University of Colorado at Boulder, Department of Comparative Literature and Humanities, Ketchum 233, Campus Box 331, Boulder, CO 80309-0331.

### Semester Hours

Medieval and Renaissance Culture  
MEDV 2020 Introduction to Medieval and Renaissance Studies .....3

MEDV 4020/5020 Medieval Studies:  
Texts and Contexts .....3  
MEDV 4030/5030 Medieval Studies:  
Special Topics .....3  
CLAS 1061 The Rise and Fall of Ancient Rome .....3  
CLAS 2610 From Paganism to Christianity .....3  
CLAS 4820 Latin Backgrounds  
to English Literature .....3  
ENGL 3226 Folklore 1 .....3  
ENGL 3312 The Bible as Literature .....3  
ENGL 3543 Chaucer: *Troilus* and  
the Early Poems .....3  
ENGL 3553 Chaucer: *The Canterbury Tales* .....3  
ENGL 3563 and 3573 Shakespeare 1 and 2 .....6  
ENGL 3583 Milton .....3  
ENGL 4192 Advanced Shakespeare .....3  
ENGL 4286 Folklore 2 .....3  
ENGL 4503 Medieval Literature 1 .....3  
ENGL 4513 Medieval Literature 2 .....3  
ENGL 4523 The Renaissance in England:  
1500-1600 .....3  
ENGL 4533 The Renaissance in England:  
1600-1700 .....3  
ENGL 5509 Medieval Literature .....3  
ENGL 5709 Chaucer .....3  
ENGL 5859 Tutorials in Medieval Studies .....1-3  
FINE 3209 Art, Culture and Gender  
Diversity: 1400-1600 .....3  
FINE 4029/5029 Art of Islam .....3  
FINE 4039/5039 Byzantine Art .....3  
FINE 4109/5109 Early Christian and  
Early Medieval Art .....3  
FINE 4129/5129 Gothic Art .....3  
FINE 4279/5279 Michelangelo  
(1475-1564) .....3  
FINE 4619/5619 Quattrocento Art  
in Florence and Central Italy .....3  
FREN 4250/5250 Medieval and Renaissance  
Readings .....3  
HIST 1061 The Rise and Fall of Ancient  
Rome .....3  
HIST 3112 Seminar in Renaissance and  
Reformation .....3  
HIST 3113 Selected Readings  
in Early English History .....3  
HIST 3511 Selected Readings in Medieval  
History .....3  
HIST 3841 Independent Study .....1-3  
HIST 4061 The Twilight of Antiquity .....3  
HIST 4071 History of the Byzantine  
Empire .....3  
HIST 4112 Venice and Florence  
in the Renaissance .....3  
HIST 4113 History and Culture of Medieval  
England .....3  
HIST 4123 Medieval England .....3  
HIST 4133 Tudor England .....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 4511 Social Foundations of European  
Civilization .....3  
HIST 4521 Intellectual History of Medieval  
Europe .....3  
HIST 4711 History of the Mediterranean  
World, 1099-1571 .....3  
HIST 6511 Readings in Medieval History .....3

HIST 7424 Research Methods on  
Medieval/Early Modern European History .....3  
HIST 7551 Seminar: Medieval History .....3  
HIST 7581 Latin Paleography .....3  
HUMN 4522 The Art of Courtly Love .....3  
ITAL 4130 Medieval Lyric Literature .....3  
ITAL 4140 The Age of Dante: Readings from  
*The Divine Comedy* .....3  
ITAL 4150 *The Decameron* and the Age of  
Realism .....3  
ITAL 4200 Italian Culture and Civilization  
from Origins through the Renaissance .....3  
PHIL 3000 History of Ancient Philosophy .....3  
PHIL 3410 History of Science: Ancients to  
Newton .....3  
PHIL 3610 From Paganism to Christianity .....3  
RLST 3000 The Christian Tradition .....3  
RLST 3100 Judaism .....3  
RLST 3600 Islam .....3  
SPAN 4150 Masterpieces of Spanish  
Literature to 1700 .....3  
SPAN 5140/7140 Seminar: Spanish Literature,  
Medieval Period .....2-4  
SPAN 5200/7200 Seminar: Spanish Literature,  
Renaissance and Baroque .....2-4  
THTR 6021 On-Stage Studies: Elizabethan  
and Jacobean Drama .....3  
Medieval Languages  
CLAS 5804 Accelerated Latin 1 .....3  
ENGL 4673/5679 Anglo-Saxon Literature and  
Language .....3  
ENGL 4682/5684 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 .....3  
SPAN 5420 or 7420 Seminar: History of the  
Spanish Language .....2-4

## MOLECULAR, CELLULAR, AND DEVELOPMENTAL BIOLOGY

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, and a detailed understanding of currently important aspects of cellular biology, molecular biology, biochemistry, genetics, and developmental biology; 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 need 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 who began the MCDB course sequence in the 1993-94 academic year or thereafter must complete the major requirements listed below. Alternatives for students starting before that time are listed as curriculum notes. All students must also complete the general requirements of the College of Arts and Sciences.

#### Major Requirements Semester Hours

MCDB 1150 Introduction to Molecular Biology and 1151 Introduction to Molecular Biology Laboratory (Note 1) .....	4
MCDB 2150 Principles of Genetics and MCDB 2151 Principles of Genetics Laboratory (Note 2) .....	4
MCDB 3120 Cell Biology and MCDB 3140 Cell Biology Laboratory .....	5
MCDB 3500 Molecular Biology (Note 3) .....	3
MCDB 4650 Developmental Biology and MCDB 4660 Developmental Biology Laboratory .....	5
Upper-division electives in MCDB. Must include at least two lecture courses. One non-MCDB course from the following list may be counted as an MCDB elective: CHEM 4731, 4761; EPOB 3400, 3700, 3720, 4190; PSYC 4052, 4072 .....	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, or PHYS 1110 and PHYS 2020 .....	9-10
MATH 1300 Analytic Geometry and Calculus 1 (Note 4) .....	5

It is strongly recommended that MCDB majors consult with a departmental advisor before applying AP or CLEP credit. Students majoring in MCDB who transfer bi-

ology credit from other institutions must also consult a departmental advisor.

#### Curriculum Notes

1. Previously MCDB 1050 and 1070. EPOB 1210 or 1610 and 1230 are acceptable but not recommended.
2. MCDB 2150 or a comparable genetics course is a strict prerequisite for MCDB 3500. MCDB 1060 and 1080 or EPOB 1220 and 1240 are acceptable alternatives for students who also completed MCDB 3400.
3. Replaces MCDB 3400, which did not have a genetics prerequisite. MCDB 2150 or transferred genetics credit is a strict prerequisite for MCDB 3500.
4. APPM 1350 or MATH 1310 are acceptable alternatives.

#### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in molecular, cellular and developmental biology, students should meet the following requirements:

The MCDB major must be started in the first semester for a student to be eligible for guaranteed four-year graduation. Adequate progress is defined as cumulative completion of at least one-fourth of the required course work for the major during each academic year, including the following specific requirements:

- a) either general chemistry or the introductory MCDB sequence must be completed during the first year;
- b) general chemistry and the introductory MCDB sequence must both be completed by the end of the second year;
- c) organic chemistry and the second level sequence in MCDB (cell biology and molecular genetics or molecular biology) must be completed by the end of the third year.

#### 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.** Includes gene regulation, virology, nucleic acid-protein interactions, chromosome structure and function, chromosome replication, control of bacterial replicons, human genome structure, RNA structure, and catalysis.

**Cell Biology.** Includes 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, defense responses in plants, and 3D high resolution reconstruction, biogenesis of mitochondria and chloroplasts, energy metabolism, assembly of membrane protein complexes, and signal transduction.

**Developmental Biology.** Covers mechanisms and regulation of morphogenesis and cell growth, genetic control of development, molecular genetics of embryogenesis, sex determination, *ras* proteins and vulval development in nematodes, molecular genetics of *Drosophila* neurobiology, developmental genetics of *Drosophila* and *Caenorhabditis*, neural development in mice, transgenic mice, and muscle development and function.

**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, biochemistry, chemical thermodynamics, differential and integral calculus, and general physics. 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. Students admitted generally have independent research experience.

**Areas of Study.** All students are expected to develop competence in five areas: biochemistry, genetics, cell structure and function, developmental systems and mechanisms, and current research techniques of experimental biology. Students are also expected to develop their abilities as independent investigators who identify important questions in biology and design experiments to address those questions.

### 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 during the second year, 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.** Generally, each candidate for the Ph.D. degree does two semesters of apprentice teaching. This obligation is usually 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, plus 30 hours of doctoral thesis, are 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.

### 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
- plant taxonomy, evolution, and phytogeography
- vertebrate paleontology and Cenozoic stratigraphy
- biology of mollusks
- 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 at Boulder, University of Colorado Museum, Campus Box 218, 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 4710/5710 Biology of Mollusks .....	3
EPOB 4840 or 4870 Independent Study/ Independent Research .....	1-6
EPOB 6950 Master's Thesis .....	1-6
GEOL 4470 or 5470 Paleontology of the Lower Vertebrates .....	4
GEOL 4480 or 5480 Paleontology of the Higher Vertebrates .....	4
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

### ORIENTAL LANGUAGES AND LITERATURES

See East Asian Languages and Literatures.

### PEACE AND CONFLICT STUDIES

Peace and Conflict Studies is an interdisciplinary field that students can approach from any discipline.

The certificate program in Peace and Conflict Studies (PACS) is designed for students who have an intellectual or moral commitment to issues of conflict and peace at any level, from intrapersonal to global, with varying emphases on action and theory. The certificate is issued by the dean of Arts and Sciences, and is awarded in addition to a bachelor's degree in another field.

The program is not a replacement for the core curriculum or the departmental major, but a way of enhancing students' interdisciplinary education. Students work with PACS faculty advisors to design individual certificate programs.

The certificate program involves 24 hours of credit, including two courses specific to and offered by the Peace and Conflict Studies Program. Additionally, students select 9 credit hours from relevant courses in their major, together with 9 credit hours of relevant courses outside the major.

Students from any major in the University, not just arts and sciences, are eligible for the program. The two required courses for the certificate are PACS 2500 Introduction to Peace and Conflict Studies and PACS 4500 Senior Seminar in Peace and Conflict Studies. Some of the topics covered in the required courses are: conflict resolution, nonviolence, human rights, ethnonationalism and current conflicts, ecological security, and imaging sustainable futures.

Interested students should check with the PACS program director at (303) 492-7718 for further information about the program and participating faculty.

#### International and National Voluntary Service Training (INVST)

Based on service learning principles, INVST is a two-year leadership training program in community service available through arts and sciences. It offers a unique educational experience to all majors in a 16-credit program of smaller innovative classes; in a one week mountain community-build-

ing experience; in two summer programs of community service in the U.S. and abroad; and in supervised community service positions in the Boulder-Denver area during the fall and spring semesters. The program combines academic and service perspectives on the issues of global development, non-violent social change, interpersonal conflict and conflict resolution, community development, and solving community problems, focusing especially on poverty, racism, and other manifestations of social inequality and injustice. The program is available to students during their junior and senior years. For further information, interested students should call the INVST office at (303) 492-7719.

## 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

For the undergraduate degree in philosophy, students must take 33 to 45 semester hours in philosophy, earning 33 hours with a grade of C- or better in philosophy and 2.00 (C) average for all work attempted in philosophy. Also, students must take 18 hours of upper-division work in philosophy with a grade of C- or better. No more than 8 credit hours of independent study may count toward the minimum requirements.

All students must complete a minimum of 12 credit hours of upper-division course work for the major on the CU-Boulder campus.

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.

Courses may be taken in any order providing prerequisites, if any, are met. However, the department strongly recommends completion of PHIL 2440, PHIL 3000, PHIL 3010, and PHIL 3480 in the first year of the major program.

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

### History (three courses):

PHIL 3000 History of Ancient Philosophy.....	3
PHIL 3010 History of Modern Philosophy.....	3
PHIL 4010 Single Philosopher.....	3

### Logic (one course):

One of the following courses:

PHIL 2440 Symbolic Logic.....	3
PHIL 4440 Mathematical Logic.....	3

### Philosophical Writing (one course):

PHIL 3480 Critical Thinking and Writing in Philosophy (prereq. or coreq., PHIL 2440 Symbolic Logic).....	3
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### Values:

1. The following required course:

PHIL 3100 Ethical Theory (prereq. or coreq., PHIL 3480 Critical Thinking and Writing in Philosophy).....	3
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2. One of the following additional courses:

PHIL 2140 Environmental Justice.....	3
PHIL 2200 Major Social Theories.....	3
PHIL 3110 Feminist Practical Ethics.....	3
PHIL 3140 Environmental Ethics.....	3
PHIL 3160 Bioethics.....	3
PHIL 3190 War and Morality.....	3
PHIL 3200 Social and Political Philosophy.....	3
PHIL 3260 International Human Rights.....	3
PHIL 4110 Contemporary Moral Theory.....	3
PHIL 4200 Contemporary Political Philosophy.....	3

### Metaphysics and Epistemology (two courses)

1. The following required course:

PHIL 3340 Epistemology (prereq. or coreq., PHIL 2440 Symbolic Logic).....	3
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2. One of the following additional courses (recommended prereq., PHIL 3340 Epistemology)

PHIL 3600 Philosophy of Religion.....	3
PHIL 4300 Philosophy of Mind.....	3
PHIL 4360 Metaphysics.....	3
PHIL 4400 Philosophy of Science.....	3
PHIL 4490 Philosophy of Language.....	3

Electives (two courses) (includes all courses which are at the 2000 level or above, and are not taken to satisfy any of the above requirements)

Note: The department offers a number of topically oriented majors that are interdisciplinary in nature, including law and society, dimensions of self, 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.

## Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in philosophy, students should meet the following requirements:

Declare major by the beginning of the second semester.

Complete an average of 6.7 credit hours of required philosophy courses in each of the next five semesters.

Meet with the undergraduate advisor at the time the major is declared.

Complete PHIL 2440, PHIL 3000, and PHIL 3010 by the end of the fifth semester of study.

## Minor Program

The department also offers a minor in philosophy. Details are available in the departmental office.

## 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 chapter of this catalog and should obtain a copy of the *Graduate Program in Philosophy* from the department.

In addition to its regular M.A. and

Ph.D. programs, the department offers an M.A. and Ph.D. in values and social policy in connection with the Center for 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: 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 (see Note 1). 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 credit 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 and Atomic Physics 1.....	3
PHYS 3310 and 3320 Principles of Electricity and Magnetism 1 and 2.....	6
PHYS 3330 Junior Laboratory.....	2
PHYS 4230 Thermodynamics and Statistical Mechanics.....	3
PHYS 4410 Quantum Mechanics and Atomic Physics 2.....	3
Electives in physics (chosen from the departmental list).....	minimum 9

In addition, the following nonphysics courses are required:

MATH 1300 Analytic Geometry and Calculus 1 or APPM 1350 Calculus 1 for Engineers.....	5
MATH 2300 Analytic Geometry and Calculus 2 or APPM 1360 Calculus 2 for Engineers.....	5
MATH 2400 Analytic Geometry and Calculus 3 or APPM 2350 Calculus 3 for Engineers.....	4
APPM 2360 Introduction to Linear Algebra and Differential Equations, or both MATH 3130 Introduction to Linear Algebra and MATH 4430 Ordinary Differential Equations.....	4-6
CHEM 1111 and 1131 General Chemistry 1 and 2 or CHEM 1151 and 1171 Honors General Chemistry 1 and 2.....	10-12

#### 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 credit 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 and Atomic Physics 1.....	3
PHYS 3310 and 3320 Principles of Electricity and Magnetism 1 and 2.....	6
PHYS 3330 Junior Laboratory.....	2
PHYS 4230 Thermodynamics and Statistical Mechanics.....	3
Electives in physics (chosen from the departmental list).....	minimum 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 or APPM 1350 Calculus 1 for Engineers.....	5
MATH 2300 Analytic Geometry and Calculus 2 or APPM 1360 Calculus 2 for Engineers.....	5
MATH 2400 Analytic Geometry and Calculus 3 or APPM 2350 Calculus 3 for Engineers.....	4
APPM 2360 Introduction to Linear Algebra and Differential Equations or both MATH 3130 Introduction to Linear Algebra and MATH 4430 Ordinary Differential Equations.....	4-6

#### Interdisciplinary Program

In addition to the above requirements, a student in plan 2 is required to complete 12 upper-division credit hours in a field other than physics with a demonstrable relation to physics. Courses in this program may include physics electives beyond the basic 36 hours listed above: Physics elective courses may not be double counted for both the interdisciplinary program and the 36 credit hours of required physics courses.

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.

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in physics plans 1 and 2, students should meet the following requirements:

Declare a major in physics in the first semester of the freshman year.

Complete PHYS 1110, 1120, 1140, MATH 1300 or APPM 1350, and MATH 2300 or APPM 1360 during the freshman year.

Complete PHYS 2140, 2150, 2170, CHEM 1111 or 1151, CHEM 1131 or 1171, MATH 2400 or APPM 2350, and APPM 2360 during the sophomore year. Either MATH 3130 or 4430 can substitute for APPM 2360.

Complete PHYS 3210, 3220, 3310, 3320 and 3330 during the junior year.

Students must meet with the physics major advisor before the beginning of the junior year and get the Fifth-Semester Approval for Completion Plan (FSACP). In addition to completing PHYS 4230 and 4410, plan 1 students must get approval to complete 9 credit hours in physics electives. In addition to completing PHYS 4230, plan 2 students must get approval to complete 15 credit hours with 3 credit hours in physics electives and 12 credit hours in a field other than physics with a demonstrable relation to physics. In both cases, the student must obtain the signature of the advisor and take courses accordingly.

**Note:** Early in the first semester of the senior year, the student must meet with the physics major advisor to have the Statement of Major Status form (a part of the graduation package provided by the College of Arts and Sciences) filled in. This includes a plan for completing the requirements of the major during the senior year and must be signed by the student and the advisor. Further details concerning the execution of the guarantee can be obtained from the department.

### Plan 3

For students intending to be secondary teachers; includes a minimum of 26 hours of physics and a minimum of 31 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 General Chemistry 1 and 2.....	10-12
MATH 1300 Analytic Geometry and Calculus 1 or APPM 1350 Calculus 1 for Engineers .....	5
MATH 2300 Analytic Geometry and Calculus 2 or APPM 1360 Calculus 2 for Engineers .....	5
MATH 2400 Analytic Geometry and Calculus 3 or APPM 2350 Calculus 3 for Engineers .....	4
APPM 2360 Introduction to Linear Algebra and Differential Equations or both MATH 3130 Introduction to Linear Algebra and MATH 4430 Ordinary Differential Equations .....	4-6

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 Education .....	1
EDUC 4232 Teaching Reading in the Content Area .....	3
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.
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.

### Minor Program

The department also offers a minor in physics. Details are available in the department office.

### 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 chapter 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 carefully read the requirements for advanced degrees in the Graduate School chapter 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, atomic physics, 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 credit hours), PHYS 5210 Theoretical Mechanics, 5250 Introduction to Quantum Mechanics 1, and 7310 and 7320 Electromagnetic Theory along with electives (5 credit hours) and mathematics (3 credit 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 credit hours) and electives (9 credit 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), Electromagnetic Theory 1 and 2 (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 credit hours) are required: PHYS 5210, 5250, 5260, 7230, 7310, 7320, and 6 credit hours of 5000- or 6000-level mathematics courses. In addition, 19 semester hours of courses in medical physics at the University of Colorado Health Science Center are required as follows:

Clinical Experience (RAD 6911-2, 6912-2, 6913-2, 6914-2)

Clinical Radiology (RAD 6608-1, 6609-1, 6610-1)

Basic Radiological Physics (RAD 6613-2, 6614-2, 6615-2)

Physics of Radiation Therapy (RAD 6645-2, 6646-2)

Physics of Radiological Imaging (RAD 6616-2, 6617-2, 6618-2)

Radiopharmacy, Anatomy, and Physiology (RAD 6623-2)

**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. Five 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, the Center for Public Policy Research, and the Keller-First Amendment Center.

The department participates in the distributed studies program. Programs leading to the M.A. and Ph.D. degree are offered.

At the most general level, the goal of the undergraduate curriculum in political science at the University of Colorado at Boulder is to offer students the opportunity to develop an appreciation of politics and government and of the students' roles within them. This implies:

- knowledge of the values and beliefs that constitute the Western political tradition, and of alternative ideologies and belief systems;
- knowledge of the institutions and processes of the American political system and its strengths and weaknesses in the last decade of the twentieth century;
- knowledge of other political systems, both Western and non-Western, which are members of the world community, our allies and competitors in international relations, and through comparative analysis a source of insight into American society and politics;
- knowledge of the patterns of interaction among members of the world community, the causes of war and peace, and the source of international conflict and cooperation;
- knowledge of the domestic and international policy issues facing the United States and the world community, and the ability to make reasoned judgments—integrating facts and values, means and ends—regarding policies to address those problems;
- the ability to evaluate conflicting arguments, to assemble and present empirical evidence, and to make reasoned conclusions from the evidence available; and
- skills in oral and written communication.

### 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 21 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. Twelve hours are required from the following lower-division fields:

American	
PSCI 1101 The American Political System .....	3
International	
PSCI 2223 Introduction to International Relations .....	3
Comparative	
PSCI 2012 Introduction to Comparative Politics .....	3
Theory	
PSCI 2004 Survey of Western Political Thought .....	3



Complete 15 hours of the required 21 upper-division hours from the following four primary fields:

American .....	6
Comparative .....	3
International .....	3
Theory .....	3

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 42 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.

### *Graduating in Four Years*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in political science, students should meet the following requirements:

Declare major by the beginning of the second semester.

Complete PSCI 1101 and two of the following required courses by the end of the third semester: PSCI 2012, 2223, or 2004.

Complete the remaining lower-division political science course and the two ancillary courses, ECON 2010 and 2020, by the end of the fourth semester.

Complete 12 upper-division credit hours of political science courses, including at least one course in three of the following fields by the end of the sixth semester: American, Comparative, International Relations, and Theory.

Complete 12 credit hours of political science courses, including at least 9 upper-division credit hours and all remaining upper-division field distribution requirements during the seventh and eighth semesters.

### **Minor Program**

The department also offers a minor program in political science. Details are available in the departmental office.

### **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 January 15. 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 chapter 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 15 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 (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. M.A. students on assistantship will be required to take PSCI 5008 and 5018 Teaching Political Science 1 and 2.

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 reader, 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.

Of the required 25 credit hours, students desiring an M.A. in political science (international affairs) must include, in addition to the required seminars, 12 credit hours of work in the international area and 9 of the 12 credit hours must be in the field of international relations. 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 GSELT 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 policy process. 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 in 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 four required seminars in 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 the law school. 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 thesis 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*

For the Ph.D., the Department of Political Science requires at least 42 hours of course work (with a grade of A or B) beyond the bachelor's degree. Except for 3 semester hours that may be taken at the senior undergraduate level in a cognate field at this University, all 42 hours must be at the 5000 level or above. Not to be included in the 42 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 competence. The first two, labeled 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. Competence 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 policy, and law and politics; international relations/comparative politics (comparative politics and international relations); and theory (political philosophy, empirical theory, and methodology).

Thirty-five hours must be taken in political science. Of this 35, 32 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 21 semester hours.

**First-Year Requirements.** All graduate students in the Ph.D. program are required to take Teaching Political Science 1 and 2 and three core seminars. At least two of the 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 must 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 32 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 Competence.** Each Ph.D. student must fulfill the research competence 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 competence 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 competence requires completion of at least two

advanced methods courses beyond PSCI 5085 or 7085.

Language competence is evidenced by completion of a fourth-semester college-level language course of 3 or more credit 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 competence is demonstrated by completion of at least a fifth-semester language course or other work deemed appropriate by the advisory committee.

The competence requirement may also be met by demonstrating basic competence 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 competence standards for the student than those outlined above.

The competence 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 competence 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 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 com-

parative, philosophical, historical, and methodological issues.

Comprehensive examinations are administered once each semester. In the fall semester, the written examinations are normally given during the first week of November, and in the spring semester they are normally given during the first 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 director of graduate studies 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.<sup>1</sup>, 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:

- 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 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;
- 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 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 assess the characteristics of social situations and measure the psychological attributes of individuals;
- 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 June 1, 1996. 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

In order to graduate with a degree in psychology, the department requires that students fulfill seven course requirements. These requirements are listed below, and additional explanatory notes are available in the department advising office, Muenzinger D243.

The department recommends taking PSYC 1001, 2101, and 2012 during the initial year of the major program.

PSYC 1001 General Psychology.....4

PSYC 2101 Statistics and Research Methods

in Psychology .....4

PSYC 2012 Biological Psychology 1.....3

At least one course from the following experi-

mental/quantitative laboratory courses:

PSYC 4145 Cognitive Psychology, PSYC 4165

Psychology of Perception, PSYC 4205 Psy-

chology of Learning, PSYC 4052 Physiologi-

cal Psychology, PSYC 4376 Research Meth-

ods in Social Psychology.....4

At least one course from the following

social/clinical courses:

PSYC 4303 Abnormal Psychology or PSYC

4313 Psychopathology, PSYC 4406 Social

Psychology, PSYC 4456 Psychology of Per-

sonality, PSYC 4733 Principles of Psycho-

logical Testing.....3-4

At least one course from the following

biopsychology courses:

PSYC 4072 Clinical Neuroscience, PSYC 4092

Hormones and Behavior, PSYC 4102 Behav-

ioral Genetics, PSYC 4385 Ethology and

Comparative Psychology, PSYC 4672 Princi-

ples of Psychobiology, PSYC 4132 Behavioral

Neuropharmacology, PSYC 4740 Biology of

Amphibians and Reptiles.....3

At least one course from the following

integrative psychology courses:

PSYC 4001 Honors Seminar, PSYC 4511

History of Psychology, PSYC 4521 Critical

Thinking, PSYC 3001 Honors Seminar,

PSYC 4911 Teaching of Psychology, PSYC

4684 Developmental Psychology.....3

Additional electives to bring total hours in psy-

chology to at least 30, of which at least 18

must be upper division. (Students are encour-

aged to use independent study to gain field or

laboratory experience. However, independent

study hours are pass/fail credit only and can-

not be used toward the 30 hours required for

graduation.)

In addition to the course requirements listed

above, and the minimum of 30 hours in psy-

chology, the student is required to pass one of

the following natural science sequences with a

grade of C- or better:

CHEM 1011 and 1031 Environmental Chem-

istry 1 and 2

CHEM 1051 and 1071 Introduction to Chem-

istry and Introduction to Organic and Bio-

chemistry

<sup>1</sup> Note that no terminal master's degree is offered.

CHEM 1111 and 1071 Introduction to Organic and Biochemistry and General Chemistry 1  
 CHEM 1111 and 1131 General Chemistry 1 and 2  
 EPOB 1210 and 1220 General Biology 1 and 2  
 MATH 1300 and 2300 Analytical Geometry and Calculus 1 and 2  
 MCDB 1150 and 2150 Introduction to MCD Biology 1 and Principles of Genetics  
 MCDB 1150 and EPOB 1220 Introduction to MCD Biology 1 and General Biology 2  
 PHYS 1110 and 1120 General Physics 1 and 2 (science and engineering majors only)  
 PHYS 2010 and 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. A minimum of 12 credit hours is required.

In order to graduate in psychology, all students are required to complete an assessment test.

### *Graduating in Four Years*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in psychology, students should meet the following requirements:

- Declare the major by the beginning of the second semester.
- Complete PSYC 1001, 2101, 2012 and the natural science sequence during the first two years of study.
- Complete the experimental/laboratory requirement, the social/clinical requirement, and the biopsychology requirement during the third (junior) year of study. (If students are unable to enroll in these courses due to oversubscription during the junior year, they will have top enrollment priority the senior year.)
- Complete the integrative psychology requirement during the senior year.

### *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, cognitive, and social psychology. Note that no terminal master's degree program is offered. 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 unravel-

ing 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 scientist-practitioner is stressed. The cognitive psychology program includes course work and research in the following areas of cognition: problem solving, thinking, human learning and memory, judgment and decision making, language, artificial intelligence, reading, attention and performance, perception, and information processing. The program in social psychology trains students to conduct research, either applied or basic, in the fields of social cognition, self-concept development, close relationships, and health. 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.

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 curriculum in religious studies includes the study of traditions such as Buddhism, Hinduism, Taoism, Confucianism, Judaism, Islam, Christianity, and Native American and other traditional religions, and topics such as ritual studies, peace studies, religion and literature, women and religion, and religion and psychology.

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/traditional 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 religious studies courses, including at least three of the lower-division offerings (9 credit hours, preferably completed before upper-division work) and at least one course (at either the upper- or lower-division level) in each of the following four areas: Western religions, Asian religions, Native American/ traditional religions, and thematic approaches to religion. At least 18 hours of upper-division work (including RLST 3830 and 4830) must be taken on the Boulder campus.

### *Graduating in Four Years*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in religious studies, stu-

dents should meet the following requirements:

Declare the major at the beginning of the second semester of study.

Complete two religious studies courses each semester.

The senior seminar must be taken the last spring semester in residence.

### Minor Requirements

Students must complete at least 18 hours of religious studies courses, including at least 6 credit hours of lower-division and 9 credit hours of upper-division work. At least 12 hours must be taken in the Department of Religious Studies.

### 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 at least a 3.30 overall grade point average and 3.50 in the major 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.

### Graduate Degree Program

#### Master's Degree

**Admission Requirements.** A student who has not completed at least 12 credit hours (or the equivalent) of undergraduate academic course work directly related to the study of religion will be required to do remedial work to make up the deficit before beginning graduate study.

A student who has not completed at least 3 credit hours of undergraduate course work in Western religion and 3 credit hours in Asian religion will be required to make up this deficit during the first year of graduate study by attaining a grade of *B* in course work at the 2000- or 3000-level or on an examination administered by the department before the semester in which course work begins. Remedial courses may not be counted toward the degree.

**Minimum Degree Requirements.** At least 24 credit hours of graduate-level course work plus a thesis of 4-6 credit hours must be completed. The course work must include RLST 6830 Approaches to the Study of Religion, at least two core seminars (RLST 6850) on topics in comparative religion, and at least one course in

three different traditions or culture areas (including Western and Asian). Up to 9 credit hours of course work may be taken outside the department or transferred from another accredited institution, consistent with the student's special needs and interests. The student's program of study must receive departmental approval.

The student must have a satisfactory reading knowledge of a language other than English, which will be employed in a significant way during the student's course of study.

An acceptable thesis must be written and, after approval of the final draft of the thesis, a comprehensive final examination must be passed.

## SOCIOLOGY

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

The Department of Sociology offers an undergraduate major in sociology with courses offered in the following areas: general sociology, population and health issues, health and medicine, criminology, social conflict, and sex and gender.

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. (A minimum of 36 semester hours in sociology is required for the degree. Of the 36 semester hours, 21 must be upper division with a minimum of 15 upper-division semester hours of course work in the major taken on the Boulder campus. All required major courses must be completed with a grade of *C-* or better.) The cumulative GPA required in sociology courses is 2.50.

<i>Major Requirements</i>	<i>Semester Hours</i>
SOCY 1001 Analyzing Society.....	3
SOCY 1011 History of Sociological Ideas <i>or</i>	3
SOCY 3001 History of Sociological Thought	1
<i>or</i> SOCY 3011 History of Sociological Thought 2.....	3
SOCY 2061 Introduction to Social Statistics <i>or</i>	3
SOCY 4061 Social Statistics.....	3
SOCY 4301 Research Methods 2: Survey Methods <i>or</i>	3
SOCY 4401 Research Methods 3: Field Experience.....	3
Electives.....	24

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in sociology, students should meet the following requirements:

Declare the major by the beginning of the second semester.

Complete SOCY 1001; 1011, *or* 3001, *or* 3011; and 6 credit hours of sociology electives by the end of the fourth semester.

Complete SOCY 2061 *or* 4061, and 15 credit hours, with a minimum of 9 upper-division credit hours, of sociology electives by the end of the sixth semester.

Complete SOCY 4301 *or* 4401, and 24 credit hours, with a minimum of 18 credit hours of sociology electives, by the end of the eighth semester.

### Graduate Degree Programs

Students wishing to pursue graduate work in sociology leading to candidacy for an advanced degree should carefully read the requirements for advanced degrees in the Graduate School chapter 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.

3. Proficiency in statistics or registration in SOCY 4061.

The deadline for applications is January 1 for the academic year.

**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. 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 hour minimum:

(a) 9 hours of sociological theory (including SOCY 5001 and SOCY 5011); (b) 6 hours of research methods and statistics (SOCY 5021 and SOCY 5031); and (c) two 1-hour proseminars, (SOCY 6821 and SOCY 6831).

3. A student must have passed all first-year work with a 3.50 GPA and no grade lower than a B to continue into the second year.

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 University of Colorado at Boulder, Graduate Secretary, Department of Sociology, Campus Box 327, 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. *All Spanish majors are required to consult with their designated departmental advisor before they can complete registration each semester.*

**Language and Literature Option**

<i>Major Requirements</i>	<i>Semester Hours</i>
SPAN 3000 Advanced Spanish Language Skills,	
SPAN 3100 Literary Analysis in Spanish, and	
SPAN 3120 Advanced Spanish Grammar...11	
Hispanic linguistic requirement. Of the total 32 credit hours required for the degree, at least 3 credit hours must be in Hispanic linguistics (SPAN 3050, 4430, or 4440).	
At least 9 credit hours in upper-division literature, culture, and/or language courses. (May include the Hispanic linguistics requirement.) .....	9
At least 12 credit hours in courses at the 4000 level or above, with at least 9 credit hours devoted to literature (3 credit hours must come from either SPAN 4150 or 4160, and 3 credit hours must come from either SPAN 4170 or 4180). (Twelve credit hours may include the Hispanic linguistics requirement.) .....	12
In addition to the 32 credit hours in the Department of Spanish and Portuguese, 6 credit 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 literature; 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 and are required to complete at least 12 upper-division credits at CU-Boulder, 6 of which must be from the masterpiece courses listed previously (SPAN 4150 or 4160, and SPAN 4170 or 4180). No more than 3 independent study credit hours may count toward the major. 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 their departmental 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.

**Graduating in Four Years**

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in Spanish, students should consult with the department's director of undergraduate studies to obtain detailed guidelines.

**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. Note: Prerequisites before admission to the program include sufficient Spanish to be admitted to 3000-level courses and ECON 2010 and 2020. SPAN 3030, 3040, 4060, and 4070 must be taken at CU-Boulder.

**Professional Spanish Courses (15 credit hours)**  
No substitutions permitted.

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
Any SPAN 4000-level course.....	3
Elective (recommended: SPAN 3001, 3310, 3340 or 4930).....	3

**Courses in the College of Business and Administration (15 credit hours)**  
No substitutions permitted.*Fall/Sophomore Year, or Junior Year*

BCOR 2000 Accounting and Financial Analysis 1 (Prereq., BCOR 1000).....	3
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*Fall or Spring, Junior Year*

BCOR 2050 Adding Value with Management and Marketing 1 (Prereq., BCOR 1000).....	3
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*Fall or Spring, Senior Year*

BCOR 3000 Business Law, Ethics, and Public Policy (formerly BLSW 3000).....	3
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ECON 3403 International Economics and Policy.....	3
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BCOR 2150 Adding Value with Management and Marketing 2 (Prereq., BCOR 2050).....	3
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**Note:** These courses must be taken in sequence during the sophomore/junior and senior years as indicated, unless taken in summer school, at another University of Colorado campus, another university, or study abroad.

Completion of the above sequence does not fulfill all requirements for a minor in the College of Business and Administration. Majors interested in this option must consult with their Spanish department advisor.

**Area Courses (12 credit hours)**

Six credit hours may be taken in lower-division courses. Note: Some courses are not offered every semester.

ANTH 3110 Ethnography of Mexico and Central America.....	3
ANTH 4220 Archaeology of Mexico and Central America.....	3
ANTH 4240 Archaeology of South America.....	3
BCOR 1000 Business Computing Skills (formerly INFS 2000).....	3
CHST 1015 Introduction to Chicano Studies.....	3
CHST 1031 Chicano Fine Arts and Humanities.....	3
CHST 1044 Introduction to Chicano Literature.....	3
CHST 1273 The Contemporary Mexican American.....	3
CHST 2213 Barrio Issues.....	3
CHST/HIST 2537 Chicano History.....	3
CHST 3023/SOCY 3022 Sociology of the Chicano and Mexican American.....	3
CHST/SOCY 3026 Women of Color—Chicanas in U.S. Society.....	3
CHST/WMST 3135 Study of Chicanas.....	3
CHST 3153 Folklore, Mysticism and Myth of the Hispanic Southwest.....	3
CHST 3824 Chicano Prose Fiction.....	3
CHST/SPAN 4000 Mexican American Culture of the Southwest.....	3
CHST/PSCI 4133 Latinos and the American Political System.....	3
CHST 4303 The Chicano and the United States Social System.....	3
CHST 4681 Special Topics.....	3
CSCI 1200 Introduction to Programming 1.....	3
CSCI 1210 Introduction to Programming 2.....	4
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
EMUS 4892 Latin American Music.....	3
ETHN/SOCY 1015 U.S. Race and Ethnic Relations.....	3
GEOG 2002 World Geographic Problems.....	3
GEOG 3812 Latin America.....	3
HIST 1038 Introduction to Latin American History.....	3
HIST 2537 Chicano History.....	3
HIST 3018 Selected Readings in Latin American History.....	3
HIST 3028 Lab in Selected Readings, Latin American History.....	3
HIST 4118 History of Mexico to 1821.....	3
HIST 4128 The Emergence of Modern Mexico.....	3
HIST 4327 The American Southwest.....	3
LAMS 1000 Introduction to Latin American Studies.....	3
LAMS 3804 Seminar in Latin American Studies.....	3
LAMS 4815 Senior Seminar in Latin American Studies.....	3
LING 3500 Language and the Public Interest.....	3
MATH 1050, 1060, 1070 math modules.....	3
MATH 1080, 1090, 1100 math modules.....	3
PSCI 3001 Government Regulation of Business.....	3
PSCI 3032 Latin American Political Systems.....	3
PSCI 3061 State Government and Politics.....	3
PSCI 3181 Public Administration.....	3
PSCI 3193 International Behavior.....	3
PSCI 3261 The Judicial System.....	3
PSCI 4112 Problems in Latin American Politics.....	3
PSCI 4122 The Military in Politics: Latin America and the United States.....	3
PSCI 4183 International Law.....	3
PSCI 4792 Issues on Latin American Politics.....	3

**Note:** The College of Arts and Sciences does not allow more than 45 credit hours in any one discipline to be counted toward the 120 credit hours required for a B.A. degree. This rule does not mean that a student may not take more than 45 credit hours in Spanish, but rather that one must have at least 75 credit hours in courses other than Spanish. PORT 2110 and 2120 or 2150 will be accepted as partially fulfilling upper-division courses in other foreign languages.

**Study Abroad**

The department strongly recommends that all majors include some study in a Spanish-speaking country in their major program. The department co-sponsors with the University of Kansas a program in Santiago de Compostela, Spain. The University cooperates with full-year and semester programs in Costa Rica, Dominican Republic, Chile, Argentina, and Spain. There is also a program in Brazil for Portuguese speakers. Credit earned normally counts toward satisfaction of the major

requirements, but the student should see the Associate Chair for Undergraduate Studies 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 International Education on page 30.

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 6 from the 4000-level masterpiece courses listed above, on the Boulder campus. As an exception, one of the masterpiece courses can be taken in the program at Santiago de Compostela, Spain.

### *Portuguêse*

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 chapter 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 three areas of concentration: one with an emphasis on literature, one with an emphasis on linguistics, and one with an emphasis on education applied to Spanish teaching. (Please contact the department for further information on these options.)

### *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 fame often participate in curricular and extracurricular activities. Recent guests have included Doug Varone, Meredith Monk, Wade Madsen, Ann Carlson, Dana Reitz, Douglas Nielsen, and Liz Lerman in dance; Celeste Holm, Jean-Claude van Itallie, Alexander Galin, Marvin Carlson, and Anatoly Smelyansky 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 in 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 a 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 44 credit 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.

<i>Major Requirements</i>	<i>Semester Hours</i>
THTR 1011 Development of Theatre 1	3
THTR 2003 Beginning Acting	3
THTR 2021 Development of Theatre 2	3
THTR 2005 Introduction to Technical Production 1 (Note 1)	3
THTR 2015 Introduction to Technical Production 1: Lab (Note 1)	1
THTR 2013 Performance of Literature	3
THTR 2021 Development of Theatre 2	3
THTR 2025 Introduction to Technical Production 2 or THTR 2035 Fundamentals of Design (Note 2)	3
THTR 2043 Vocal and Physical Preparation or THTR 2085 History of Fashion (Note 2)	3
(The courses listed above should be taken during the first two years of study.)	
THTR 3031 Development of Theatre 3	3
THTR 3035 Theatre Practicum (2 semesters)	4
THTR 3065 Theatre Management or THTR 3071 Directing or THTR 4051 Playwriting	3
THTR 4001 Development of Theatre 4	3
THTR 4081 Senior Seminar	3
Elective in theatre	3
Elective(s) in dance	3
Electives in dramatic literature, outside the Department of Theatre and Dance, including at least one course in Shakespeare (Note 3)	6

**Curriculum Notes:**

1. THTR 2005 and 2015 must be taken concurrently.
2. Choices must be advisor approved; B.F.A.s do not have the same options as B.A.s.
3. B.F.A. students must elect to take all 6 credits in Shakespeare (ENGL 3562 and 3572).

Recommended sequence of courses during the initial year of theatre major program, B.A. and B.F.A.:

THTR 1011 Development of Theatre 1	3
THTR 2021 Development of Theatre 2	3
THTR 2005 Introduction to Technical Production 1	3
THTR 2015 Introduction to Technical Production 1 Laboratory	1
THTR 2003 Beginning Acting	3
THTR 2013 Performance of Literature	3

A student wishing to qualify for teaching certification should check in the department office for the requirements of this option.

### *Graduating in Four Years with a B.A. in Theatre*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.A. in theatre, students should meet the following requirements:

- Declare a major in theatre by the beginning of the second semester of study.
- Complete THTR 1011, 2003, 2005, 2015, 2025, and 2043 by the end of the fourth semester.
- Complete 3 lower-division credit hours and 5 upper-division credit hours, including one of the theatre practicum course sections (THTR 3035), by the end of the fifth semester.
- Complete 8 additional upper-division credit hours, including practicum requirements (THTR 3035) by the end of the sixth semester.
- Complete 6 additional upper-division credit hours, plus all 3 elective credit hours in dance by the end of the seventh semester.
- Complete remaining 3 upper-division credit hours by the end of the eighth semester.

### *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 two possible areas of concentration: design and technical theatre, or performance. Total semester hours required in the B.F.A. concentrations:

Performance: B.A. requirements (44 semester hours in THTR), plus 31-34 additional hours (22 in THTR)

Design/technical: B.A. requirements (44 semester hours in THTR), plus 32 additional hours (23 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 both 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 a concentration in performance must achieve grades of *A* or *B* in their concentration to remain in the B.F.A. program (*B-* is not sufficient).

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*

<b>I. Concentration in Performance</b>	
29-30 semester hours are required: 22 in THTR courses, 7-8 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 3023 Studio 2: Acting Process— Scene Study	4
THTR 4013 Studio 3: Shakespeare	4
THTR 4033 Advanced Vocal and Physical Preparation	3
THTR 4083 Studio 4: Contemporary British and American Theatre	3
THTR 4093 Studio 5: Ibsen; Shaw, and Chekhov	4
Plus:	
DNCE 1100 Beginning Ballet	1
DNCE 1160 Dance Techniques: Recreational Dance Forms or DNCE 2400 Theatre Dance Forms	1-2
DNCE 2500 African American Dance	2
DNCE 4018 Performance Improvisation Techniques	2

### **II. Concentration in Design and Technical Theatre**

32 semester hours are required: 23 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 3055 Stage Lighting Design 1	3
THTR 4005 Costume Design 2 or THTR 4015 Scene Design 2	3
THTR 4035 Scene Painting or THTR 4025 Costume Construction or THTR 4095 Advanced Production Techniques	3
THTR 4065 Advanced Design Projects (6 credits maximum)	1-3
THTR 4075 Advanced Technical Projects (6 credits maximum)	1-3

Electives in design and technical theatre sufficient to total 23 THTR hours beyond the 44 required for the B.A. degree. As advised, courses in other departments in drawing, painting, drafting, sculpture, and/or environmental design

### *Graduating in Four Years with a B.F.A. in Theatre*

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.F.A. in theatre, students should meet the following requirements:

- All potential B.F.A. students must declare, in writing, at the beginning of their first semester the intention to audition for formal entrance into one of the B.F.A. concentrations (acting, design and technical theatre, or performance studies). Actual auditions and interviews must take place during the third semester of study. Students who are accepted to a major in a B.F.A. concentration must declare their major immediately upon acceptance in the third semester. In addition to the specific course requirements listed for completing a B.F.A. degree, students must also fulfill all requirements for the B.A. degree in theatre.
- As part of the first two years of study, all students who intend to enter the B.F.A. program must complete the following courses within theatre: THTR 1011, 2003, 2005, 2015, 2025, 2043, 2013, 3035 (2 credit hours).

### **Performance Concentration**

Upon acceptance to the performance concentration, students must meet immediately with a departmental advisor to confirm, in writing, specific courses to be completed within the remaining semesters of study. All B.F.A. performance majors must complete the following courses in the prescribed order: THTR 2043, 3013, 3023, 3043, 4013, 4083, 4093, DNCE 1100, 2400/1160, 4018, 4028, 2500. Students are also encouraged to complete EMUS 1154 (voice).

B.F.A. students in performance must achieve grades of *A* or *B* in all courses of their concentration in order to remain in the program (*B-* is not sufficient).

All students in this concentration must audition for all main stage departmental productions.

### Design and Technical Theatre Concentration

Upon acceptance to the design and technical theatre concentration, students must meet immediately with a departmental advisor to confirm, in writing, specific courses to be completed within the remaining semesters of study.

Students in this concentration must take THTR 2085, The History of Fashion option, as well as complete a design course in their chosen area by the end of the sophomore year.

### Minor Program

The Department of Theatre and Dance also offers a minor program in theatre. For further information, please contact the department.

### Bachelor's Degree Programs in 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 a 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 6 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.

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 2021 Beginning Modern Dance for Majors or DNCE 3041 Intermediate Modern Dance for Majors or DNCE 4061 Advanced Modern Dance for Majors (Note 1) .....	8
Dance technique elective(s) .....	2
DNCE 1005 Movement Awareness and Injury Prevention for the Performing Artist .....	3
DNCE 2012 and 2022 Production 1 and 2 .....	2
DNCE 2013 Dance Improvisation .....	2
DNCE 2033 Beginning Composition .....	3
DNCE 2014 Rhythmic Analysis and Accompaniment or DNCE 3024 Musical Resources for Dance .....	2
DNCE 4015 Movement Analysis .....	3
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 .....	4
THTR 2025 Introduction to Technical Production 2 or THTR 2035 Design Fundamentals .....	3
THTR 4081 Senior Seminar .....	3

### Curriculum Note:

1. Students are placed at the appropriate technique level in this series of courses. Modern dance courses listed as nonmajor technique courses do not normally count toward the major.

### Graduating in Four Years with a B.A. in Dance

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.A. in dance, students should meet the following requirements:

- Declare the major by the end of the second semester.
- Complete by the end of the sophomore year:
  - 4 credit hours of modern dance technique at the major level (based on placement audition);
  - 2 credit hours of ballet; 2 credit hours from DNCE 2240/2250, DNCE 1160, DNCE 2500, DNCE 2510, or DNCE 2400.
- Complete DNCE 1005, 2012, 2022, 1029, 2013, 2033.
- Complete 4 credit hours of electives at the appropriate time with the advice of the academic advisor.
- Complete during the junior and senior years:
  - 4 credit hours of modern dance technique at the major level (based on placement audition);
  - 2 credit hours of ballet; DNCE 2014 or 3024; DNCE 4015; DNCE 4016 or 4036, DNCE 4017; DNCE 4027; THTR 2025 or 2035; THTR 4081 during the spring of the senior year.

**Note:** To receive sufficient upper-division credit, students must be sure that 6 credit hours in addition to the upper-division courses specified above are at the upper-division level. These may include technique hours as well as elective hours. If a student takes DNCE 3024 instead of DNCE 2014, only 4 additional upper-division credit hours are necessary.

### 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 15 hours in theatre. Admission is limited by faculty consent to ensure the type of individual attention necessary for effective training. Students should be advised that 9 or 10 semesters are often 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 3160 Intermediate Ballet or DNCE 4180 Advanced Ballet (Note 1) .....	8
DNCE 2021 Beginning Modern Dance for Majors, DNCE 3041 Intermediate Modern Dance for Majors, or DNCE 4061 Advanced Modern Dance (Note 1) .....	8
DNCE 4061 Advanced Modern Dance for Majors (Note 1) .....	8
DNCE 2012 and 2022 Production 1 and 2 .....	2
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 3024 Musical Resources for Dance .....	2
DNCE 3043 Intermediate Dance Composition .....	3
DNCE 4015 Movement Analysis .....	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 .....	4
THTR 2003 Acting: Beginning .....	3
THTR 2025 Introduction to Technical Production 2 or THTR 2035 Design Fundamentals .....	3
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.

### Graduating in Four Years with a B.F.A. in Dance

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "ade-

quate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress toward a B.F.A. in dance, students should meet the following requirements:

- Declare the B.F.A. by the end of the first semester with consent of dance faculty.
- Complete 8 credit hours of modern dance technique at the major level, DNCE 1005, 1029, 2012, 2013, 2014, 2022, 2033, 2240 or 2250, and 4 credit hours of DNCE 3160 or 4180 (based on a placement audition) by the end of the sophomore year.
- Complete 4 credit hours of dance electives, THTR 2003, 2025 or 2035, and 4029 at the appropriate time with the advice of the academic advisor.
- Complete THTR 4081 in the spring of the senior year.
- Show choreographic work in the annual informal showcase in the freshman, sophomore, and junior years.
- Complete DNCE 3024, 3043, 4015, 4016 or 4036, 4027, 4038, 4053, 4 credit hours of DNCE 3160 or 4180 (based on placement audition), and 8 credit hours of DNCE 4061 (based on placement audition) during the junior and senior years.
- Complete DNCE 5052 Studio Concert, including presentation of choreography in a formal setting and submission of an evaluative paper during fall of the senior year.
- Maintain a 3.00 GPA overall and a 3.20 GPA in dance courses.
- Perform in at least one formal concert other than the B.F.A. concert.

### Minor Program

The Department of Theatre and Dance also offers a minor program in Dance. For further information, please contact the department.

### 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 carefully read both requirements for advanced degrees in the Graduate School chapter 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 signifi-

cant 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; auditions are usually held in February for admission the following fall.

**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 30 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. The program can be individualized to emphasize choreography/performance, teaching, or body therapies. Contact the department for information. 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 in dance and music, research strategies, methods of teaching, and a creative project or thesis.

**Project or Thesis.** One year before 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 to six 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, provided the course is taught by a member of the graduate faculty in that department.

Doctoral study in theatre is based on the following core of required advanced courses:

THTR 6009 Research Strategies and Techniques

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: Modern 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. Students who have passed an undergraduate language course at the fourth-semester level within a four-year period immediately prior to entering the doctoral program, or who have English as a second language, are not required to take the exam. Doctoral students should also consult the Graduate School description of dissertation hour requirements.

## UNIVERSITY WRITING PROGRAM

The University Writing Program (UWRP) trains students from all disciplines, schools, and colleges in the techniques of writing 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.

The UWRP offers both lower-division and upper-division seminars. Certain courses fulfill the College of Arts and Sciences core curriculum and some also fulfill graduation requirements in other colleges. Students should check with their advisor. 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*.

## WESTERN AMERICAN STUDIES

The Center of the American West offers an undergraduate certificate program for students who have an intellectual commitment to issues of the American West at any level, from flora and fauna, history and literature, to economic and environmental challenges facing Western communities. Courses involve students in an exploration of the past, an appreciation for traditional and contemporary stories and art in the region, and an understanding of Western landscapes, ecosystems, and the factors that affect them. Course work may be taken concurrently with undergraduate studies, or may be taken after an undergraduate degree has been completed. Students will complete 24 credit hours of C or better course work, a minimum of 15 being upper division and a minimum of 12 from outside the student's major. Contact the Center of the American West at (303) 492-4879 for further information about the program and participating faculty.

## WOMEN STUDIES

Students may concentrate in women studies through a special track within the American Studies major or may earn a women studies minor 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.

### Program Requirements

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

<i>Major Requirements</i>	<i>Semester Hours</i>
Students must complete a minimum of 36 credit hours with grades of C- or better in women studies courses, a minimum of 18 credits of which must be upper division. These 36 credit hours should be distributed as follows:	

#### *I. Required Courses (15 hours)*

WMST 2000 Introduction to Feminist Studies.....	3
WMST 2600 Gender, Race, and Class in Contemporary U.S. Society.....	3
WMST 2090 Feminist Theories.....	3
WMST 4800 Capstone Seminar.....	3

Choose one course from the following:

WMST 2400 History of Women and Social Activism.....	3
WMST 2500 History of the Feminist Movement in the United States.....	3

#### *II. Ethnic, Cultural, and Racial Diversity (6 hours)*

Two courses chosen from the following:

WMST 3135 Study of Chicanas.....	3
WMST 3505 Historical and Contemporary Issues of Black Women.....	3
WMST 3672 Gender and Global Economy	
WMST 3730 Women in International Development.....	3
WMST 3700 Topics in Women Studies.....	3

#### *III. WMST Upper Division Sponsored (9 hours)*

Choose three courses from the following:

WMST 3090 Critical Thinking in Feminist Theory.....	3
WMST 3110 Feminist Practical Ethics.....	3
WMST 3200 Religion and Feminist Thought.....	3
WMST 3300 Women and the Legal System.....	3
WMST 3400 Gender, Culture, and Personality.....	3
WMST 3656 History of Women in Progressive Social Movements.....	3
WMST 3930 Internship.....	1-6
WMST 4000 Senior Seminar.....	3
WMST 4636 Lesbian and Gay History: Culture, Politics, and Social Change in the United States.....	3

#### *IV. Electives (6 hours)*

Courses that are Women Studies sponsored and cross-listed may be used to satisfy the electives.....6

### Graduating in Four Years

Students should consult page 56 of this catalog for further information on eligibility for the four-year guarantee. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in women studies, students should meet the following requirements:

Declare major by the beginning of the second semester.

Complete WMST 2000 and 12 additional credit hours of major requirements by the end of the fourth semester.

Complete WMST 2090 and 27 total credit hours of major requirements by the end of the sixth semester.

Complete WMST 4800 and one additional 3-credit course of the major requirements by the end of the eighth semester.

## 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 term.*

For current information on times, days, and instructors of courses, students should consult each semester's *Registration Handbook and Schedule of Courses*.

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; those in the 3000s and 4000s are 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: 1600-1900.** 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 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.** Evolution of humanity and culture from beginnings through early metal ages. Covers human evolution, race, prehistory, and rise of early civilizations. Offered through Continuing Education only.

**ANTH 1040-3. Principles of Anthropology 2.** Surveys the world's major culture areas. Covers components of culture, such as subsistence, social organization, religion, and language. Offered through Continuing Education only.

**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. Same as BLST 1150. Approved for arts and sciences core curriculum: cultural and gender diversity.

**ANTH 1160-3. The Ancient Egyptian Civilization.** Emphasizes the origin of the Egyptian culture, its importance, and its impact on other cultures. In addition, the different points of view of various scholars will be discussed with a comparative study of the ancient Egyptian culture and modern culture of Egypt and the Middle East. 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, primate ecology, 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 2050-4. Honors—Human Origins 1.** Explores 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 2060-4. 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, as well as a general outline of world prehistory.

**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. Deals with practical exercises illustrating many of the theoretical principles covered in ANTH 2200. Coreq., ANTH 2200.

**ANTH 2260-3. Old World Archaeology.** Covers prehistory and protohistory of Eurasia and Africa, emphasizing growth of culture and spread of civilization. Prereq., ANTH 2200.

**ANTH 2300-3. Civilization of the Ancient Near East.** Discusses civilization of the Ancient Near East: Ancient Israel, Phoenicia, Syria, Jordan, Mesopotamia, Egypt and Nubia, Arabia, Asia Minor, and Persia. Origins of such cultures and their influences on other cultures are also discussed with comparative study between Ancient Middle East, Modern Middle East, and ancient and modern Western cultures. Scholarly points of view are mentioned in detail.

**ANTH 3000-3. Primate Behavior.** Surveys naturalistic primate behavior. Social behavior, behavioral ecology, and evolution are 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. Approved for arts and sciences core curriculum: natural science.

### *Cultures of the World, (ANTH 3100 through 3170):*

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 various culture areas. Same as AIST 3135.

**ANTH 3160-3. Peoples of the South Pacific.** Surveys traditional cultures and contemporary changes in Polynesia, Melanesia, and Micronesia.

**ANTH 3170-3. America: An Anthropological Perspective.** Historical and contemporary aspects of American life are considered from an anthropological perspective. Approved for arts and sciences core curriculum: United States context.

**ANTH 3300-3. Elements of Religion.** Explores universal components of religion, as inferred from religions of the world, primitive and civilized.

**ANTH 3800-3. Languages and People.** Investigates roles that languages play in building new nations, in the 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. Prereq., ANTH 2010 and 2020. Same as ANTH 5000.

**ANTH 4020-3. Explorations in Anthropology.** Special topics in cultural and physical anthropology, as well as archaeology. Prereq., 15 hours of anthropology course work. Repeatable for credit for a total of 6 credit hours; check with the department for semester offerings. Same as ANTH 5020.

**ANTH 4060-3. Nutrition and Anthropology.** Covers 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 EPOB 1030 or 1040. 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. Covers the 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 modern human diversity. 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 EPOB 1030 and 1040. Same as ANTH 5140.

**ANTH 4150-3. Human Ecology: Biological Aspects.** 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 1210. Same as ANTH 5170.

**ANTH 4180-3. Anthropological Perspectives: Contemporary Issues.** Students read, discuss,

and write critical evaluations of contemporary publications 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. Prereqs., background knowledge of general areas in anthropology, upper-division standing, and instructor consent. Approved for arts and sciences core curriculum: critical thinking.

**ANTH 4200-3. North American Archaeology.** Covers prehistoric and protohistoric cultures and areas of North America, excluding the American Southwest. Same as ANTH 5200.

**ANTH 4210-3. Southwestern Archaeology.** Discusses prehistoric cultures of the American Southwest, their origins, characteristics, and relationships. Prereq., ANTH 2200. Same as ANTH 5210.

**ANTH 4220-3. Archaeology of Mexico and Central America.** Studies prehistoric and protohistoric cultures and areas of Mexico and Central America, including the Aztecs and Mayas. Prereq., ANTH 2200. 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, community organization, architecture, and land use. Prereq., ANTH 2200. Same as ANTH 5230.

**ANTH 4250-3. Prehistoric Food Production.** Explores the history of plant/animal domestication in the Americas, Near East, Asia, and Africa. Focuses on specific biological changes in domesticates and associated social changes. Theoretical explanations for this major transformation in human economies are sought. Prereq., ANTH 2200.

**ANTH 4260-3. Archaeology of the Intermediate Area.** Covers prehistory of the western hemisphere from eastern Honduras to Ecuador. Focuses on technologies, settlement patterns, economy, subsistence, and the ethnohistory of the Spanish invasion period. Distinguishes prehistoric developments from those in Mesoamerica and Andean South America. Prereq., ANTH 2200. Same as ANTH 5260.

**ANTH 4270-3. Plains Archaeology.** Examines prehistoric and protohistoric cultures of the North American plains in five subregions. Origins, characteristics, and structural elements of these cultures are discussed in detail. Prereq., ANTH 2200 or 2270. Same as ANTH 5270.

**ANTH 4290-3. Ancient Semitic Languages and Their Inscriptions.** Studies the Ancient Semitic languages of the Middle East—Biblical Hebrew, Phoenician, Moabite, Aramaic, Palmyrene, and Nabataean—from their original sources, inscriptions and graffiti on the walls of the tombs, temples, potsherds, ostraca, terra cotta, columns, stelae, papyri, letters, seals, wood pieces, coffins, jars, vessels, statues, and figures. Prereq., upper-division standing.

**ANTH 4330-3. Environmental Archaeology.** Surveys the method of cultural ecology as it can be applied to archaeological investigations. Prereq., ANTH 2200. Same as ANTH 5330.

**ANTH 4340-3. Archaeological Method and Theory.** Reviews methods and cultural theories employed in investigating and explaining the archaeological record. May be repeated up to a maximum of 6 credits.

**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.** Uses diversity of approaches to the analysis of ancient stone tools, 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 4410-3. Archaeology of Ancient Near East.** Emphasizes similarity and differences between the archaeological material of nations of the Middle East and the archaeological influences that were exchanged between such nations. Same as ANTH 5410 and CLAS 4410.

**ANTH 4420-3. 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 5420 and CLAS 4420.

**ANTH 4430-3. 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 5430.

**ANTH 4440-3. 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 5440.

**ANTH 4500-3. Cross-Cultural Aspects of Socioeconomic Development.** Examines goals of international agencies that support development in underdeveloped countries. Anthropological perspective is provided for such issues as urban planning, health care and delivery, population control, rural development, and land reform. 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.** Explores 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. Prereq., ANTH 2100. Same as ANTH 5520. Approved for arts and sciences core curriculum: critical thinking.

**ANTH 4530-3. Theoretical Foundations of Sociocultural Anthropology.** Critically examines the pivotal schools of 20th-century social theory that have shaped modern sociocultural anthropology including the ideas of cultural evolutionism, Marxism, Durkheim, Weber, structuralism, postmodernism, and contemporary anthropological approaches. Includes primary

readings and seminar-style discussion. Prereq., ANTH 2100 or instructor consent. Same as ANTH 5530.

**ANTH 4550-3. Culture Dynamics.** Study of culture change emphasizing the role of individual motivation in promoting or inhibiting such change. Surveys literature and analyzes 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 selected aspects of power in modern society.

**ANTH 4590-3. Urban Anthropology.** Comparative study of urban life. Same as ANTH 5590. Approved for arts and sciences core curriculum: critical thinking.

**ANTH 4600-3. Human Ecology: Cultural Aspects.** 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.

**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, mortality and health care, and new socioeconomic consequences. Same as ANTH 5610.

**ANTH 4630-3. Nomadic Peoples of East Africa.** Examines the issues of current concern in the study of East African pastoral peoples. First half of the course is devoted to historical perspectives; second half explores the transition from subsistence to market-oriented economies. Prereq., must be an upper-division anthropology major, or anthropology graduate student. Same as ANTH 5630.

**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 4740-3. Peoples and Cultures of Brazil.** Thematically surveys theoretical and ethnographic issues that have been important in understanding Brazil. Students are expected to read and write critically about textual and visual representations of Brazil presented in the course. Prereq., ANTH 2100. Approved for arts and sciences core curriculum: critical thinking.

**ANTH 4750-3. Culture and Society in South Asia.** Intensive analysis of major issues in anthropological research on South Asia (India, Pakistan, Bangladesh, Nepal, and Sri Lanka), including kinship, gender, marriage, caste system, religion and ritual, ethnic conflict, and social change. Prereq., ANTH 2100. Same as ANTH 5750.

**ANTH 4760-3. Ethnography of Southeast Asia and Indonesia.** Same as ANTH 5760.

**ANTH 4840 (1-3). Independent Study.** For upper-division undergraduate students. May enroll for a maximum of 6 credit hours.

**ANTH 4850 (1-3). Independent Study.** For upper-division undergraduate students. May enroll for a maximum of 6 credit hours.

**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. May be repeated for credit, up to a maximum of 6 credit hours. 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 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: Biological Aspects.** Same as ANTH 4150.

**ANTH 5170-3. Primate Paleontology.** Same as ANTH 4170.

**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 5260-3. **Archaeology of the Intermediate Area.** Same as ANTH 4260.

ANTH 5270-3. **Plains Archaeology.** Same as ANTH 4270.

ANTH 5300-3. **Prehistoric Food Production.** Explores the history of plant/animal domestication in the Americas, Near East, Asia, and Africa. Focuses on specific biological changes in domesticates, and associated social changes. Theoretical explanations for this major transformation in human economies are sought. Prereq., ANTH 2200.

ANTH 5330-3. **Environmental Archaeology.** Same as ANTH 4330.

ANTH 5340-3. **Archaeological Method and Theory.**

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.** Discusses 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.** Focuses on the design of research, preparation of research proposals, scientific illustration and publication, editing, and research administration. Planned as a companion to ANTH 5390, a laboratory course in artifactual analysis.

ANTH 5410-3. **Archaeology of Ancient Near East.** Same as ANTH 4410 and CLAS 5410.

ANTH 5420-3. **Archaeology of Ancient Egypt.** Same as ANTH 4420 and CLAS 5420.

ANTH 5430-3. **Biblical Archaeology.** Same as ANTH 4430.

ANTH 5440-3. **Egyptian Hieroglyphics 1.** Same as ANTH 4440.

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. **Theoretical Foundations of Sociocultural 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 5590-3. **Urban Anthropology.** Same as ANTH 4590.

ANTH 5600-3. **Human Ecology: Cultural Aspects.**

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 century to the present day. Compares conventional ethnographic descriptions with more innovative forms of cross-cultural representation to bring out the underlying issues of ethnographic authority, allegory, voice, reflexivity, and accountability.

ANTH 5630-3. **Nomadic Peoples of East Africa.** Same as ANTH 4630.

ANTH 5640-3. **Race and Ethnicity in America: Sociocultural Perspectives.** Examines contemporary theoretical and methodological approaches to the study of race and ethnicity. Covers ethnic, gender, and cultural studies as well as post-modernism. Focuses on sociocultural perspectives and case studies in the United States. Prereq., graduate student status.

ANTH 5750-3. **Culture and Society in South Asia.** Same as ANTH 4750.

ANTH 5760-3. **Ethnography of Southeast Asia and Indonesia.** Same as ANTH 4760.

ANTH 5770-3. **Core Course: Archaeology.** Provides a graduate-level overview of analytic issues relevant to all phases of archaeological research and of the diversity of theoretical perspectives within the field as a whole. This course is required for all first-year graduate students in anthropology. Prereq., graduate status in anthropology.

ANTH 5780-3. **Core Course: Cultural Anthropology.** Provides an intense, graduate-level introduction to the discipline of cultural anthropology, with an emphasis upon critically assessing those methods, theories, and works that have shaped the field from the nineteenth century to the present time. Prereq., graduate status in anthropology.

ANTH 5790-3. **Core Course: Biological Anthropology.** Discusses how biological anthropologists use evidence and concepts from evolutionary theory, human biology, and ecology to understand the evolution, diversification, and adaptation of human populations. Required of all first-year graduate students in anthropology. Prereq., graduate status in anthropology.

ANTH 5840 (1-3). **Guided Study.** Directed individual research based on a specific area of specialization. May enroll for a maximum of 6 credit hours.

ANTH 6400-3. **Advanced Seminar in Human Ecology.** Challenges advanced graduate students to understand and utilize the methods, theory, and research results of human ecology in the three subfields of anthropology: biological, cultural, and archaeological. Focuses on a particular topic or geographic area. Prereq., completion of graduate core courses and EPOB 3020, or instructor permission.

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 enroll for a maximum of 6 credit hours.

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.

## 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, and one-half year of trigonometry or approval of faculty advisor. Note: GEEN 1350, a 2-credit lab, is available for students who would like more practice working calculus problems in a group learning environment. Students may not receive credit for APPM 1350 and MATH 1300 or MATH 1310. Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

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. Students may not receive credit for APPM 1360 and MATH 1320 or 2300 or 2310. Prereq., APPM 1350 or MATH 1300.

APPM 1400 (1-2). **Applied Mathematics: The Next Generation.** Provides undergraduate students the opportunity to learn, apply, and integrate their calculus knowledge with computational problems arising in a variety of settings. Prereq., APPM 1350; recommended coreq., APPM 1360.

APPM 2350-4. **Calculus 3 for Engineers.** Covers multivariable calculus, vector analysis, and theorems of Gauss, Green, and Stokes. Students may not receive credit for APPM 2350 and MATH 2400. Prereqs., APPM 1360 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 1360 or MATH 2300.

**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 include series solutions and boundary value problems. Studies numerical techniques with some laboratory experience. Prereq., APPM 2350 or MATH 2400. No credit given for students having credit in APPM 2360.

**APPM 2450-1. Calculus 3 for Engineers: Computer Lab.** Selected topics in analytic geometry and calculus with a focus on symbolic computation using Mathematica, Maple, or Matlab. Controlled enrollment through Applied Mathematics faculty. Coreq., APPM 2350; recommended prereqs., APPM 1360, 1380, or MATH 2300.

**APPM 3010-3. An Introduction to Nonlinear Systems: Chaos.** Aims at both majors and minors in the physical sciences. Provides students with an introduction to classes of tools that are useful in the analysis of nonlinear systems. Prereqs., APPM 1360 and 2360.

**APPM 3050-3. An Introduction to Mathematica and Maple and Numerical Computation.** Introduces symbolic and numerical computing at an elementary level. Designed to teach some principles of computational and applied mathematics using computational tools such as Mathematica, Maple, Reduce, or Derive. Prereq., APPM 1350 and 1360.

**APPM 3170-3. Discrete Applied Mathematics.** The major emphasis is on applications of graph theory to computer science, engineering, operations research, social sciences, and biology, depending on student interests. Topics include the basic properties of graphs and digraphs, and their matrix representations. Relates graph properties to their applications; for example, graph coloring problems are related to scheduling problems,  $n$ -cubes to logic circuits and the architecture of parallel processors, Hamilton circuits to gray codes and the traveling salesman problem, covering problems to assignment problems, etc. Prereq. or coreq., APPM 3310.

**APPM 3310-3. Matrix Methods and Applications.** Introduces linear algebra and matrices, with an emphasis on applications, including methods to solve systems of linear algebraic and linear ordinary differential equations. Discusses computational algorithms that 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 and 2360.

**APPM 3570-3. Applied Probability.** Axioms; counting formulas; conditional probability; independence; random variables; continuous and discrete distribution; expectation; moment generating functions; law of large numbers; central limit theorem; poisson process; multivariate Gaussian distribution. Students may not receive

credit for both APPM 3570 and ECEN 3810 or for both APPM 3570 and MATH 4510. Prereq., APPM 2350 or MATH 2400.

**APPM 4350-3. Methods in Applied Mathematics: Fourier Series and Boundary Value Problems.** Reviews ordinary differential equations, including solutions by Fourier 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. Same as APPM 5350.

**APPM 4360-3. Methods in Applied Mathematics: Complex Variable and Applications.** Introduces methods of complex variables. Contour integration and theory of residues. Application to solving partial differential equations by transform methods; Fourier and Laplace transforms; Riemann-Hilbert boundary-value problems. Conformal mapping with application to ideal fluid flow and/or electrostatics. Prereq., APPM 2350 and 2360 or APPM 3310 or instructor consent. Same as APPM 5360.

**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 and 3310.

**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. Prereq., MATH 4510 or APPM 3570 or 4560. Same as APPM 5520 and MATH 4520.

**APPM 4560-3. Introduction to Probability Models.** Tools will be developed and then applied to the analysis of probability models used in engineering, management science, the physical and social sciences, genetics, and operation research. Prereq., APPM 2350 or MATH 2400. 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 4580-3. Statistical Methods for Data Analysis.** Continuation of APPM 4570. Combines statistical methods with practical applications and computer software. Develops commonly used statistical models such as analysis of variance as well as linear and logistic regression. The statistical models are implemented and interpreted in the context of actual data sets using available statistical software. Same as APPM 5580. Prereq., any course in statistics.

**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. Prereqs., 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 4840 (1-3). Reading and Research in Applied Mathematics.** Introduces undergraduate students to the research foci of the Department of Applied Mathematics. Prereq., either APPM 3310 or MATH 3130. Recommended prereq., a course in ordinary or partial differential equations.

**APPM 4955-3. Seminar in Applied Mathematics.** Introduces undergraduate students to the research foci of the Department of Applied Mathematics and is a capstone experience for majors. Prereqs., either APPM 3310 or MATH 3130. Recommended prereq., a course in ordinary or partial differential equations.

**APPM 5350-3. Methods in Applied Mathematics.** Same as APPM 4350.

**APPM 5360-3. Methods in Applied Mathematics.** Same as APPM 4360.

**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: Partial Differential and Integral Equations.** Studies properties and solutions of partial differential 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: Approximation Methods.** Covers asymptotic evaluation of integrals (stationary phase and steepest descent), 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 Probability Models.** Same as APPM 4560.

**APPM 5570-3. Statistical Methods.** Same as APPM 4570.



**APPM 5580-3. Statistical Methods for Data Analysis.** Same as APPM 4580.

**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 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 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 APPM 4560 or instructor consent. Same as MATH 6540.

**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, birth and death processes and Brownian motion. Applications to physical and biological sciences. Prereqs., MATH 4310 and MATH 4510 or APPM 4560 or instructor consent. Same as MATH 6550.

**APPM 6620-3. Numerical Computation in Applied Mathematics 1.** Advanced topics in the numerical solution of ordinary and partial differential equations, initial and boundary value problems, and 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. Dynamical Systems.** Covers dynamical systems defined by mappings and differential equations. Also covers Hamiltonian mechanics, action-angle variables, results from KAM and bifurcation theory, phase plane analysis, Melnikov theory, strange attractors, chaos, etc. Prereqs., APPM 5440, PHYS 5210 or equivalent, or instructor consent.

**APPM 7300-3. 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 instructor consent.

**APPM 7400 (1-3). Topics in Applied Mathematics.** Provides a vehicle for the development

and presentation of new topics with the potential of being incorporated into the core courses in applied mathematics. May be repeated once for credit. Prereq., instructor consent.

**APPM 7500-3. Topics in Computational Fluid Dynamics.** Covers numerical methods and analysis relevant to problems in fluid dynamics. Discusses difference, spectral, multi-level and/or finite element methods as they apply to particular applications. Prereq., APPM 5610.

**APPM 7900 (1-3). Reading and Research in Applied Mathematics.** Introduces graduate students to the research focuses of the Department of Applied Mathematics. Prereq., instructor consent.

**APPM 8000-1. Colloquium in Applied Mathematics.** Introduces graduate students to the research focuses of the Department of Applied Mathematics. Prereq., instructor consent.

**APPM 8100-1. Seminar in Nonlinear Equations.** Introduces advanced topics and research in dynamical systems, nonlinear waves, and integrable systems.

**APPM 8200-1. Seminar in Computational Mathematics.** Introduces advanced topics and research in computational mathematics. Prereq., instructor consent.

**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. No more than 10 credit hours may be taken in any one semester.

## Arts and Sciences

### *Expository Writing*

**ARSC 1000-4. 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 Student Academic Services Center (formerly 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 Student Academic Services Center (formerly the University Learning Center). Prereq., ARSC 1000 or program coordinator consent. Approved for arts and sciences core curriculum: written communication.

**ARSC 1150-3. Writing in Arts and Sciences.** Emphasizes the development of effective writing skills with instruction provided in expository and analytical writing. Basic elements of grammar, syntax, and composition will be reviewed as needed. Approved for arts and sciences core curriculum: written communication.

### *Special Curricula*

**ARSC 1200-3. Topics in Arts and Sciences.**

**ARSC 1500-1. Environmental Sciences Seminar.**

**ARSC 1510-1. Environmental Sciences Seminar.**

**ARSC 1700-3. The Meaning of the University.** Develops major historical, psychological, philosophical, and personal perspectives on education in general and university education in particular. Participants are encouraged to consider how the issues developed in the seminar bear on the choices they face in planning their own educations. Approved for arts and sciences core curriculum: ideals and values.

**ARSC 2080-3. Introduction to Lesbian, Bisexual and Gay Studies.** Investigates the social and historical meanings of racial, gender, and sexual identities and their relationship to contemporary lesbian, bisexual, gay, and transgender communities.

**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.

**ARSC 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. Prereqs., one semester or year on a study abroad program and instructor consent.

**ARSC 3020-3. Advanced Writing in Arts and Sciences.** Approved for arts and sciences core curriculum: written communication.

**ARSC 3100-3. Multicultural Perspective and Academic Discourse.** Emphasizes advanced critical thinking/analytical skills in a process-oriented, portfolio-assessed format. How race, class, sexual orientation, and gender affect academic discourse is investigated through multicultural readings and research. Offered through the Student Academic Services Center (formerly the University Learning Center). Approved for arts and sciences core curriculum: written communication.

**ARSC 3935 (1-6). Internship.**

**ARSC 4030-4. Comparative Environmental Policies: Ethics, Law, and Social Science.** Taught by faculty from several different disciplines and continents, and taught in Italy, this course compares environmental policies in Europe, the United States and Australia from the perspective of ethics, law, and the social sciences. Same as ARSC 5030.

**ARSC 5030-4. Comparative Environmental Policies: Ethics, Law, and Social Science.** Same as ARSC 4030.

### *Theses*

**ARSC 4909 (2-6). Senior Thesis for Individually Structured Major.**

**ARSC 4949 (3-6). Senior Thesis.**

## Graduate Courses

**ARSC 5010-3. Environmental and Natural Resources Policy.** Focuses on the integration of disciplinary perspectives in the formation and appraisal of public policy dealing with the use and protection of natural resources and the environment. Research emphasis; specific topics vary. Required for the environmental policy certificate. Prereq., instructor consent. Same as ARSC 7010.

**ARSC 5020-3. Policy Responses to Global Change.** Focuses on the integration of disciplinary perspectives in the design and appraisal of policy responses to the cluster of issues involved in global change. Research emphasis; specific topics vary. Required for the environmental policy certificate. Prereq., instructor consent. Same as ARSC 7020.

**ARSC 5030-4. Comparative Environmental Policies: Ethics, Law, and Social Science.** Same as ARSC 4030.

**ARSC 5090-3. Graduate Seminar in Feminist Theory.** Begins with a reconsideration of contemporary Anglophone feminist theory, then focuses primarily on the debates of the last 25 years. Discusses how gender should be understood and how it interrelates with our understandings of class, race, embodiment, sexuality, and knowledge. Prereqs., graduate standing and instructor consent.

**ARSC 7010-3. Environmental and Natural Resources Policy.** Same as ARSC 5010.

**ARSC 7020-3. Policy Responses to Global Change.** Same as ARSC 5020.

## 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 representative in the student's disciplinary option.

## Astrophysical and Planetary Sciences

**ASTR 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 ASTR 1110, but with additional recitation and lab experience. There will be nighttime observing sessions at Sommers-Bausch Observatory. Some sessions will be at the Fiske Planetarium. Approved for arts and sciences core curriculum: natural science.

**ASTR 1020-3. Introductory Astronomy 2.** Introduces principles of modern astronomy for nonscience majors, summarizing our present knowledge about the Sun, stars, birth and death of stars, neutron stars, black holes, galaxies, quasars, and the organization and origins of the universe. Prereq., ASTR 1010. There will be

opportunities to attend nighttime observing sessions at Sommers-Bausch Observatory. Some sessions will be at the Fiske Planetarium. Approved for arts and sciences core curriculum: natural science.

**ASTR 1030-4. Accelerated Introductory Astronomy 1.** Covers principles of modern astronomy summarizing our present knowledge about the Earth, moon, planets, sun, and origin of life. Similar to ASTR 1010 but taught at a higher intellectual level including a significant amount of quantitative analysis. There will be nighttime observing sessions at Sommers-Bausch Observatory. Some sessions will be at the Fiske Planetarium. Prereq., algebra (MATH 1000, 1010, 1020, 1030, and 1040, or equivalent). Required in APAS minor. Approved for arts and sciences core curriculum: natural science.

**ASTR 1040-4. Accelerated Introductory Astronomy 2.** Covers principles of modern astronomy summarizing our present knowledge about the sun, stars, birth and death of stars, neutron stars, black holes, galaxies, quasars, and the organization and origins of the universe. Similar to ASTR 1020 but taught at a higher intellectual level including a significant amount of quantitative analysis. There will be opportunities to attend nighttime observing sessions at Sommers-Bausch Observatory. Some sessions will be at the Fiske Planetarium. Prereqs., algebra (MATH 1010 through 1040 or equivalent) and ASTR 1030. Required in ASTR minor. Approved for arts and sciences core curriculum: natural science.

**ASTR 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. ASTR 1110 and 1120 may be taken in either order. There will be opportunities to attend nighttime observing sessions at Sommers-Bausch Observatory. Some sessions will be at the Fiske Planetarium. Approved for arts and sciences core curriculum: natural science.

**ASTR 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. ASTR 1110 and 1120 can be taken in either order. There will be opportunities to attend nighttime observing sessions at Sommers-Bausch Observatory. Some sessions will be at the Fiske Planetarium. Approved for arts and sciences core curriculum: natural science.

**ASTR 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, calendars, cosmogony, and cosmology. Approved for arts and sciences core curriculum: natural science.

**ASTR 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; and the origin of the elements and of stars, galaxies, the

solar system, and life. Approved for arts and sciences core curriculum: natural science.

**ASTR 2020-3. Introduction to Space Astronomy.** Discusses reasons for making astronomical observations from space, scientific goals, practical requirements for placing instruments in space, politics of starting new programs, and selected missions. Prereq., ASTR 1010 or 1020 or 1110 or 1120. Approved for arts and sciences core curriculum: natural science.

**ASTR 2840 (1-3). Independent Study.** Prereq., instructor consent.

**ASTR 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.

**ASTR 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., ASTR 1110 or 1010. Approved for arts and sciences core curriculum: natural science.

**ASTR 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., ASTR 1120 or 1020. Approved for arts and sciences core curriculum: natural science.

**ASTR 3720-3. Planets and Their Atmospheres.** Physics and chemistry of the atmospheres 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. Elective for APS minor. Same as ATOC 3720.

**ASTR 3730-3. Astrophysics I—Stellar and Interstellar.** ASTR 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 astronomical applications of gravity, radiation processes, spectroscopy, gas dynamics, and plasma physics. Prereqs., PHYS 1110 and 1120 and either MATH 1300 and 2300 or APPM 1350 and 1360. Elective for APS minor.

**ASTR 3740-3. Cosmology and Relativity.** Special and general relativity as applied to astrophysics, cosmological models, observational cosmology, experimental relativity, and the early universe. Prereqs., PHYS 1110 and 1120, and

either MATH 1300 and 2300 or APPM 1350 and 1360. Elective for APS minor.

**ASTR 3750-3. Planets, Moons, and Rings.** Approach to the physics of planets that 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 ASTR 3720 and ASTR 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. Elective for APS minor.

**ASTR 3830-3. Astrophysics 2—Galactic and Extragalactic.** The course pair ASTR 3730 and 3830 provides a year-long introduction to physical processes, observations, and current research methods in stellar, interstellar, galactic, and extragalactic astrophysics, with astronomical applications of gravity, radiation processes, spectroscopy, gas dynamics, and plasma physics. Prereqs., PHYS 1110 and 1120, calculus (MATH 1300 and 2300 or APPM 1350 and 1360), and ASTR 3730. Elective for APS minor.

**ASTR 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.

**ASTR 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., ASTR 1110 and 1120 or ASTR 1010 and 1020 or PHYS 1120, or PHYS 2020. Approved for the arts and sciences core curriculum: critical thinking.

**ASTR 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., ASTR 1110 and 1120, or ASTR 1010 and 1020, or PHYS 1110 and 1120, or PHYS 2010 and 2020. Approved for arts and sciences core curriculum: critical thinking.

**ASTR 4840 (1-3). Independent Study.** Prereq., instructor consent.

**ASTR 5000-1. Seminar in Plasma Physics.** Same as PHYS 5000.

**ASTR 5110-3. Internal Processes 1.** Thermal, mechanical, quantum, and radiative processes in gases and plasmas, with emphasis on spectroscopy, atomic and molecular physics, statistical mechanics, and kinetic theory, with applications to astrophysics, planetary physics, and plasmas. Prereq., undergraduate physics.

**ASTR 5120-3. Internal Processes 2.** A second-semester continuation of ASTR 5110, this course introduces graduate students in astrophysics and planetary sciences to radiative transfer in continuum and lines, fluid dynamics of

compressible gases, flows in gravity, shock waves, and MHD, with application to stars, planets, and gas in space. Prereq., ASTR 5110.

**ASTR 5150-3. Introductory Plasma Physics.** Same as PHYS 5150.

**ASTR 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. Same as ATOC 5250.

**ASTR 5300-3. Introduction to Magnetospheres.** Introduces solar and stellar winds, and planetary and stellar magnetospheres. Guiding center theory for particle motion, magnetospheric topology, convection, radiation belts, magnetic storms and substorms, and auroras.

**ASTR 5400-3. Introduction to Fluid Dynamics.** Same as ATOC 5400.

**ASTR 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., ATOC 5060 or ASTR 5120. Same as ATOC 5410.

**ASTR 5540-3. Mathematical Methods.** Applied mathematics course designed to provide the necessary analytical and numerical 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. Same as ATOC 5540.

**ASTR 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. Same as ATOC 5560. Prereq., ASTR 5110 or instructor consent.

**ASTR 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.

**ASTR 5710-3. High-Energy Astrophysics.** Astrophysics of UV, x-ray, gamma-ray, and cos-

mic-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.

**ASTR 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, large-scale structure, physics of the early universe, chemical evolution of galaxies. Prereq., undergraduate physics.

**ASTR 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., ASTR 5110 and undergraduate physics.

**ASTR 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., ASTR 5110 or instructor consent.

**ASTR 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 wavelengths; 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.

**ASTR 5760-3. Astrophysical Instrumentation.** Covers the fundamentals underlying the design, construction, and use of instrumentation used for astrophysical research ranging from radio-wavelengths to gamma rays. Topics include: Fourier transforms and their applications; optical design concepts; incoherent and coherent signal detection; electronics and applications; and signal acquisition and processing.

**ASTR 5920 (1-6). Reading and Research in Astrophysical and Planetary Sciences.** Prereq., instructor consent.

**ASTR 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 for a maximum of 4 credit hours to meet candidacy requirements. Prereq., graduate standing or instructor consent.

**ASTR 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 ASTR 6000 for a maximum of 4 credit hours to meet candidacy requirements. Prereq., graduate standing or instructor consent.

**ASTR 6340-3. Remote Sensing of Planetary Surfaces.** Same as GEOL 6340.

**ASTR 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.

**ASTR 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.

**ASTR 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.

**ASTR 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.

**ASTR 6650 (1-3). Seminar in Geophysics.** Advanced seminar studies in geophysical subjects for graduate students. Same as GEOL 6650 and PHYS 6650.

**ASTR 6940 (1-3). Master's Degree Candidate.**

**ASTR 6950 (4-6). Master's Thesis.**

**ASTR 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). Prereq., ASTR 5150.

**ASTR 7160-3. Intermediate Plasma Physics.** Prereq., PHYS 5150 or instructor consent. Same as PHYS 7160.

**ASTR 7430-3. Fluid Turbulence and Nonlinear Processes.** Topics covered include deterministic models and transition to chaos in fluids; statistical descriptions of small- and large-scale turbulence in planetary and stellar atmospheres; dimensionality and intermittency; and mathematical and physical closure models. Prereq., ASTR 5410. Same as ATOC 7430.

**ASTR 7500 (1-3). Special Topics in Astrophysical and Planetary Sciences.** Acquaints students with current research in astrophysical and planetary sciences. (Topics vary each semester.) May be taken up to three times for credit.

**ASTR 7920 (1-6). Reading and Research in Astrophysical and Planetary Sciences.** Prereq., instructor consent.

**ASTR 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.

## Atmospheric and Oceanic Sciences

**ATOC 1050-3. Weather and the Atmosphere.** Introduces principles of modern meteorology for non-science majors, with emphasis on scientific and human issues associated with severe weather events. Includes description, prediction, economic safety impacts of blizzards, hurricanes, thunderstorms, tornadoes, lightning, floods, and firestorms. Approved for arts and sciences core curriculum: natural science.

**ATOC 1060-3. Atmosphere, Ocean, and Climate.** Climate of the Earth for non-science majors, focusing on the role of the atmosphere and oceans in the climate system. Descriptions of climate system energy flow, atmosphere and ocean global circulations, El-Niño, monsoons, and natural and human-caused climate change. Prereq., ATOC 1050. Approved for arts and sciences core curriculum: natural science.

**ATOC 1070-1. Weather and the Atmosphere Laboratory.** Optional laboratory for ATOC 1050. Laboratory experiments illustrating fundamentals of meteorology. Collection, analysis, and discussion of data related to current local weather. Use of computers for retrieval and interpretation of severe weather data from Colorado and across the U.S. Prereq. or coreq., ATOC 1050 or consent of instructor. Approved for arts and sciences core curriculum: natural science.

**ATOC 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., ATOC 1050/1060 or equivalent. Approved for arts and sciences core curriculum: natural science.

**ATOC 3300-3. Analysis of the Climate and Weather Observations.** The instruments, techniques, and statistical methods used in atmospheric observations. Issues of data accuracy and spatial representativeness. Applications to ozone changes, surface temperature trends, interannual variability of climate, droughts, floods, and hurricanes. Use of computers to access data sets and process data. Prereqs., ATOC 1050/1060 or ATOC 3600; statistics course. Approved for arts and sciences core curriculum: natural science.

**ATOC 3500-3. Air Chemistry and Pollution.** Composition of the atmosphere. Sources of gaseous and particulate pollutants; their chemistry, transport, and removal from the atmosphere. Application of general principles to acid rain, smog, and stratospheric ozone depletion. Prereqs., two semesters chemistry; two semesters physics; one semester calculus. Approved for arts and sciences core curriculum: natural science.

**ATOC 3600-3. Principles of Climate.** Description of the basic components of the climate sys-

tem: the atmosphere, ocean, cryosphere, and lithosphere. An investigation of the basic physical processes that determine climate and link the components of the climate system. The hydrological cycle and its role in climate, climate stability, and global change. Forecasting climate and its application and human dimensions. Prereqs., one semester calculus; physics. Approved for arts and sciences core curriculum: natural science.

**ATOC 3720-3. Planets and Their Atmospheres.** Prereqs., PHYS 1110 and 1120; either MATH 1300 and 2300 or APPM 1350 and 1360 (one year of physics and one year of calculus). Same as ASTR 3720.

**ATOC 4100-3. Modeling the Environment and Climate.** Examines modeling of the environment and climate, including climate change. Construction of simple climate and environmental models from first principles. These models are used to examine the interrelationships that exist within the climate and the environment and to test hypotheses and theories related to climate and environmental change. Prereqs., one year of calculus and physics, ATOC 1050/1060 or ATOC 3600, or equivalent. Same as ATOC 5100.

**ATOC 4710-3. Atmospheric Physics.** Structure and physical processes occurring in the Earth's atmosphere. Thermodynamics and stability of moist air; cloud physics and precipitation and thunderstorms; solar and thermal radiation; the global energy balance; and effects of clouds, aerosols, and greenhouse gases on the climate. Prereqs., PHYS 1110 and 1120; either MATH 1300 and 2300 or APPM 1350 and 1360 (one year physics and one year calculus).

**ATOC 4720-3. Atmospheric Dynamics.** Dynamics of the Earth's atmosphere. Basic properties and laws governing atmospheric motion. Geostrophic flow and vorticity. Sea breezes and mountain lee waves. Mid-latitude synoptic scale weather systems. Tropical cyclones. Prereqs., PHYS 1110 and 1120; either MATH 1300 and 2300 or APPM 1350 and 1360 (one year physics and one year calculus).

**ATOC 4900 (1-3). Independent Study.** Prereq., instructor consent.

**ATOC 5000-3. Critical Issues in Climate and the Environment.** Discussion of current issues such as ozone depletion, global warming, and air quality for graduate students in nonscientific fields. The course will provide the scientific background necessary to understand, follow scientific developments, and critically evaluate these issues.

**ATOC 5050-4. Physical Processes in Atmospheres and Oceans.** Atmospheric thermodynamics, hydrostatics; cloud and radioactive processes, and chemical cycles. Elementary dynamics with application to the earth and planetary atmosphere. PAOS graduate core course.

**ATOC 5060-3. Dynamics of the Atmosphere.** Large-scale motions in a stratified rotating atmosphere. Quasi-geostrophic flow, barotropic and baroclinic instabilities, cyclogenesis, global circulations, and transport processes. Ageostrophic motions, including Kelvin waves, internal gravity waves, and the theory of fronto-

genesis are also considered. Prereq., ATOC 5050. PAOS graduate core course.

**ATOC 5061-3. Dynamics of Oceans.** Theory of the large-scale wind-driven and thermohaline circulations in the oceans. Models of boundary currents, western intensification, ventilation, equatorial surface and undercurrents, ocean waves, and eddies. Prereq., ATOC 5400 or 5050 or 5060, or an equivalent course covering basic fluid dynamics. PAOS graduate core course.

**ATOC 5100-3. Modeling the Environment and Climate.** Examines modeling of the environment and climate, including climate change. Construction of simple climate and environmental models from first principles. These models are used to examine the interrelationships that exist within the climate and the environment and to test hypotheses and theories related to climate and environmental change. Prereq., instructor consent. Same as ATOC 4100.

**ATOC 5151-3. Atmospheric Chemistry.** Basic kinetics and photochemistry of atmospheric species. Stratospheric chemistry with emphasis on processes controlling ozone abundance. Tropospheric chemistry focusing on photochemical smog, acid deposition, oxidation capacity of the atmosphere, and global climate change. Prereq., graduate standing or instructor consent. PAOS graduate core course. Same as CHEM 5151.

**ATOC 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.

**ATOC 5225-3. Thermodynamics of Atmospheres and Oceans.** Examines the thermodynamics of water in the Earth's atmosphere including the formation of clouds and cloud physics and the impact on global climate. The thermodynamics of oceans and sea ice are also examined. Prereq., ASEN 2023, MCEN 2022, or instructor consent. Same as ASEN 5225. PAOS graduate core course.

**ATOC 5400-3. Introduction to Fluid Dynamics.** Governing equations of fluid motion relevant to terrestrial, planetary, and stellar atmospheres and gas-dynamical phenomena; scale analysis, and effects of rotation, buoyancy, viscosity, and compressibility. Topics include boundary layers, linear and nonlinear gravity waves, and shocks. PAOS graduate core course. Same as ASTR 5400.

**ATOC 5410-3. Fluid Instabilities and Waves.** Prereq., ATOC 5060 or ASTR 5120. Same as ASTR 5410.

**ATOC 5235-3. Remote Sensing of Atmospheres and Oceans.** Examines fundamentals of radiative transfer; extinction and scattering-based passive remote sensing; emission-based passive remote sensing; principles of active remote sensing; multi-sensor and multi-wavelength approaches to satellite remote sensing;

and future satellite systems and validation programs. PAOS graduate core course. Same as ASEN 5235.

**ATOC 5540-3. Mathematical Methods.** PAOS graduate core course. Same as ASTR 5540.

**ATOC 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., ASTR 5110 or ATOC 5050 or instructor consent. PAOS graduate core course. Same as ASTR 5560.

**ATOC 5920 (1-6). Reading and Research in Atmospheric and Oceanic Sciences.** Prereq., instructor consent.

**ATOC 5950-3. Seminar: Climatic Change.** Cross-disciplinary survey of evidence for and theories of climatic change. Prereq., instructor consent. Same as GEOG 5951 and GEOL 5951.

**ATOC 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.

**ATOC 6020-1. Seminar in Atmospheric and Oceanic Sciences.** Studies an area of current research in the atmospheric and oceanic sciences. Students read selected papers from the literature. Students and faculty give presentations and participate in discussions. Prereq., graduate standing or instructor consent.

**ATOC 6100-3. Predicting Weather and Climate.** The description of the background theory and the procedures used in weather and climate prediction on a variety of space and time scales. Issues discussed include the forecasting of weather on time scales of days; error growth in numerical models; prediction of El Niño and monsoon variability; prediction of the impact of anthropogenic influences on climate. The course consists of lectures and a weekly laboratory. Prereq., ATOC 5050 or 5060 or 5061, or instructor consent.

**ATOC 6940 (1-3). Master's Degree Candidate.**

**ATOC 6950. Master's Thesis (4-6).**

**ATOC 7430-3. Fluid Turbulence and Nonlinear Processes.** Prereq., ATOC 5410. Same as ASTR 7430.

**ATOC 7500 (1-3). Special Topics in Atmospheric and Oceanic Sciences.** Acquaints students with current research in atmospheres, oceans and climate. (Topics may vary each semester). May be taken three times for credit.

**ATOC 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 Electronic Library Research.** Exploration of the structure, organization, retrieval, and evaluation of electronic information sources through the formulation of search strategies useful for undergraduate research.

**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

See Environmental, Population, and Organismic Biology and Molecular, Cellular and Developmental Biology.

## Central and East European Studies

**CEES 1000-3. Introduction to Central and East European Studies.** Examines major themes in the history of Russia and East-Central Europe since the early modern era, introduces the literature and arts of the region, and presents current political, social, and economic issues. Same as HIST 1002. Approved for arts and sciences core curriculum: historical context.

## Chemistry and Biochemistry

**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 and 1071 meets the chemistry requirement for nursing and kinesiology students. 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 and 1071 or 1111 and 1071 completes the chemistry requirement for nursing 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 and 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 receive credit for only one of CHEM 1111, 1151, and 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. Students may receive credit for only one of CHEM 1131 and 1171. 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 and 1131. The laboratory experience is more extensive; therefore, the CHEM 1151 and 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. Students may receive credit for only one of CHEM 1111, 1151, and 1211. Approved for arts and sciences core curriculum: natural science.

**CHEM 1171-6. Honors General Chemistry 2.** Lect., rec., and lab. Continuation of CHEM 1151. Students may receive credit for only one of CHEM 1131 and 1171. 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 receive credit for only one of CHEM 1111, 1151, and 1211. Coreq., CHEM 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. Students may receive credit for only one of CHEM 3311 and 3351. 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 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. Students may receive credit for only one of CHEM 3321 and 3361.

**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. Students may receive credit for only one of CHEM 3331 and 3371. 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 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 and Biochemistry Majors.** Lect. Topics include structure and reactions of alkanes, alkenes, alkynes, alcohols, ethers, aldehydes, ketones, and alkyl halides; nomenclature of organic compounds; stereochemistry; reaction mechanisms. Students may receive credit for only one of CHEM 3311 and 3351. 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. Students may receive credit for only one of CHEM 3361 and 3321.

**CHEM 3371-3. Organic Chemistry 2 for Chemistry and Biochemistry Majors.** Lect. 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. Students may receive credit for only one of CHEM 3331 and 3371. 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 CHEM 3341 with grades of *C-* or higher; prereq. or coreq., CHEM 3371 or 3331.

**CHEM 4011-3. Modern Inorganic Chemistry.** Lect. Required course for chemistry majors. Introduces modern inorganic chemistry for undergraduates. Includes atomic structure, chemical periodicity, structure and bonding in molecules and crystals, reaction mechanisms, chemistry of selected main group and transition elements, and emphasis on catalyst, materials, bioinorganic, and organometallic systems. Prereq., CHEM 4411 or 4511.

**CHEM 4021-3. Inorganic Laboratory.** One lect. and two three-hour labs per week. Instruction in experimental techniques of modern inorganic chemistry. Includes syntheses and spectroscopic characterizations of transition metal and main group compounds, experience in manipulation of air sensitive compounds, and techniques involving unusual conditions of pressure or temperature. Prereq., CHEM 4011.

**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 4191-3. Chemistry and Biochemistry of the Biosphere.** Lect. Specific topics include soil and water chemistry, environmental fate of chemicals, biochemical toxicology, use of pesticides in agriculture, heavy metals in the environment, acid mine drainage, plastics, and remediation. Prereq., CHEM 3331 or CHEM 3371, or instructor consent. Biochemistry strongly recommended.

**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 and biology majors. 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. Students may receive credit for only one of CHEM 4411, 4511, and 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 and MATH 2400 or APPM 2350, and one year of physics. Students may receive credit for only one of CHEM 4431, 4531, and 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. Students may receive credit for only one of CHEM 4511, 4411, and 5411.

**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. Prereqs., CHEM 4511 or 4411 and PHYS 1120 or 2120. Students may receive credit for only one of CHEM 4531, 4431, and 5431.

**CHEM 4541-2. Physical Chemistry Laboratory.** One lect. and one three-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. Not open to chemistry majors.

**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 three-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, nucleic acids, carbohydrates, and membranes; enzyme mechanisms, kinetics, and regulation; intermediary metabolism; energetics and metabolic control; electron transport and oxidative phosphorylation. Prereq., CHEM 3331 or CHEM 3371.

**CHEM 4731-3. General Biochemistry 2.** Lect. Continuation of CHEM 4711. Metabolism of carbohydrates, 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 five-hour 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 3500 highly recommended. Approved for arts and sciences core curriculum: critical thinking.

**CHEM 4901 (1-6). Independent Study in Chemistry and Biochemistry.** For 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 5151-3. Atmospheric Chemistry.** Lect. Basic kinetics and photochemistry of atmospheric species. Stratospheric chemistry with emphasis on processes controlling ozone abundance. Tropospheric chemistry focusing on photochemical smog, acid deposition, oxidative capacity of the atmosphere, and global climate change. Prereq., graduate standing or instructor consent. Same as ATOC 5151.

**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 theory and practice of liquid and gas chromatography. Prereq., graduate standing or instructor consent.

**CHEM 5191-3. Chemistry and Biochemistry of the Biosphere.** Lect. Same lectures as CHEM 4191. Not open to undergraduates. Prereq., one year of organic chemistry, or instructor consent. Biochemistry strongly recommended.

**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 proton and carbon-13-NMR spectroscopy. Prereqs., 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. Students may receive credit for only one of CHEM 5411, 4411, and 4511.

**CHEM 5431-3. Physical Chemistry with Biochemistry Applications 2.** Lect. Principles of physical chemistry (second semester) for gradu-

ate 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. Students may receive credit for only one of CHEM 5431, 4431, and 4531.

**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. Discusses physical techniques used to determine the structure, function, and dynamics of macromolecules. Topics covered include Fourier analysis, optical spectroscopy, NMR and diffraction. Previous exposure to quantum mechanics is assumed. Prereqs., two semesters of physical chemistry and graduate standing, or instructor consent.

**CHEM 5571-3. Surface Science.** Lect. Principles of surface science with emphasis on fundamental surface phenomena, surface techniques, and surface chemistry. Basic description of surfaces, adsorbate-surface interactions, surface kinetics and methods of surface analysis. Surface science of interactions, surface kinetics, and methods of surface analysis. Surface science of heterogeneous catalysis, semiconductor processing, and environmental interfaces. Prereq., undergraduate 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. Pre-

reqs., 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 6001-1. Seminar: Inorganic Chemistry.** Student, faculty, and guest presentations and discussions of current research in inorganic chemistry and related topics (transition element and main group element compound properties, inorganic compound in biological, industrial, and materials applications). Required of all inorganic chemistry graduate students. Credit deferred until presentation of satisfactory seminar.

**CHEM 6021 (1-3). Special Topics in Inorganic Chemistry.** Lect. Subjects of current interest in inorganic chemistry. Primarily used for graduate-level presentations of special topics by visiting and resident faculty. Variable class schedule. 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 literature 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 methods and/or total synthesis of complex molecules. Prereqs., CHEM 5311 and graduate standing, or instructor consent.

**CHEM 6321 (1-3). Special Topics in Physical Organic Chemistry.** Selected topics in physical organic chemistry, which may include photochemistry, carbene chemistry, free 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 standing, 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 (1-6). 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 7051-1. Seminar: Chemistry of Materials.** Seminar in inorganic chemistry concerned with advanced materials design, synthesis, and study. Includes reviews in "current" research areas such as superconductivity in copper oxides and buckyballs. Prereq., graduate standing or 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. Seminar: Analytical Spectroscopy and Kinetic Measurements.** Student and faculty discussions and reports on research advances in analytical spectroscopy and reaction rate measurements. Prereqs., graduate standing and instructor consent.

**CHEM 7141-1. Seminar: Spectroscopy at Dielectric Interfaces.** Focuses on current research results and relevant literature in the areas of Raman spectroscopy, interfacial reactions/interactions, fluorescence spectroscopy, and photoacoustic spectroscopy. Prereq., graduate standing or instructor consent.

**CHEM 7151-1. Seminar: Bioorganic and Environmental Chemistry.** Discusses particularly the mechanism of enzymes involved in microbial degradation of pollutants. Prereq., graduate standing or instructor consent.

**CHEM 7161-1. Seminar: Heterogeneous Atmospheric Chemistry.** Topics in atmospheric chemistry emphasizing the structure and reactivity of atmospheric particulates. Presentations on current research and critical evaluations of recent literature. Prereq., graduate standing or instructor consent.

**CHEM 7201-1. Seminar: Synthetic and Bioorganic Chemistry.** The course is a seminar in organic and bioorganic chemistry, particularly the synthesis of complex organic molecules and their interactions with biopolymers. Included is the study of the synthesis and biological functions of complex carbohydrates and carbohydrate-containing organic molecules. Prereq., graduate standing or instructor consent.

**CHEM 7221-1. Seminar: Photochemistry and Free Radical Chemistry.** Current research in areas of organic free radical chemistry, photo-

chemistry, 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 modern 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 "tinker-toys" to the development of novel photochemical systems and their spectroscopies. Prereqs., graduate standing and instructor consent.

**CHEM 7301-1. Seminar: Synthetic and Mechanistic 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 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, van der 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 7511. Seminar: Reaction Dynamics in Condensed Phases.** Studies elementary steps in chemical reactions and their observation by ultrafast spectroscopy. Prereq., graduate standing or instructor consent.

**CHEM 7521-1. Seminar: 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 7531-1. Seminar: Surface Chemistry.** Topics in surface science with focus on materials processing and environmental interfaces. Emphasizes kinetic phenomena important in semiconductor fabrication and heterogeneous chemistry on environmental surfaces such as ice and silica. Prereq., graduate standing or instructor consent.

**CHEM 7541-1. Seminar: Atmospheric Trace Gases and Climate Change.** Measurements of the changing chemical composition of the Earth's atmosphere. Theories of biogeochemical cycles and climate change. Fate and interactions of trace gases in the atmosphere. Prereq., graduate standing or 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; and computations in molecular dynamics simulation, modeling, and geometry. 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; and occasional guest speakers. Prereqs., graduate standing and instructor consent.

**CHEM 7641-2. Seminar: RNA Structure and Function.** Topics include synthesis and character-

ization 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: Environmental Biochemistry.** Topics in various aspects of current biochemical and environmental research. Prereqs., graduate standing and instructor consent.

**CHEM 7681-1. Seminar: Molecular Genetics of Signaling in Yeast.** The course is a seminar in molecular and genetic analysis of signaling pathways and their interaction with proteolytic pathways in the yeast *saccharomyces cerevisiae*. Prereq., graduate standing or 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 7721-1. Seminar: 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 modeling. Prereq., graduate standing or instructor consent.

**CHEM 7731-1. Seminar: Structure and Function of Proteins and Nucleic Acids.** Covers protein and nucleic acid structure, emphasizing crystallization macromolecules and structure determination by x-ray crystallography. Prereq., graduate standing or instructor consent.

**CHEM 7741-1. Seminar: Signal Transduction and Protein Phosphorylation.** Devoted to experimental methods for understanding mechanisms of signal transduction in mammalian cells through pathways involving regulation of protein phosphorylation. Prereq., graduate standing or instructor consent.

**CHEM 7751-1. Seminar: Protein Structure and Folding.** Studies structure and folding of proteins and protein complexes using biophysical methods, including nuclear magnetic resonance (NMR), circular dichroism, and fluorescence spectroscopies. Prereq., graduate standing or instructor consent.

**CHEM 7761-1. Seminar: Eukaryotic Transcriptional Regulation.** The regulation of transcription by RNA Polymerase II from human promoters. Prereq., graduate standing or instructor consent.

**CHEM 8991-1-10. 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 2610-3. Paganism to Christianity.** Offers a cultural history of Greek and Roman religion. Students read ancient texts in translation and use evidence from archaeology to reconstruct the shift from paganism to Christianity in antiquity. Same as PHIL 2610.

Approved for arts and sciences core curriculum: ideals and values.

**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 4110-3. Greek and Roman Epic.** Students read in English translation the major epics of Greco-Roman antiquity such as the *Iliad*, *Odyssey*, *Argonautica*, *Aeneid*, and *Metamorphoses*. Topics discussed may include the nature of classical epic, its relation to the novel, and its legacy. Same as CLAS 5110. Approved for arts and sciences core curriculum: literature and the arts.

**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.** Studies Aristophanes, Plautus, and Terence in English translation. Same as CLAS 5130. Approved for arts and sciences core curriculum: literature and the arts.

**CLAS 4410-3. Archaeology of Ancient Near East.** Same as CLAS 5410 and ANTH 4410.

**CLAS 4420-3. Archaeology of Ancient Egypt.** Same as CLAS 5420 and ANTH 4420.

**CLAS 4600-3. Literary Criticism.** Studies the principles of literary criticism in Classical Greece, Rome, and the Italian Renaissance. Evaluates the standards used in judging the quality of literature.

**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. Greek and Roman Epic.** Same as CLAS 4110.

**CLAS 5120-3. Greek and Roman Tragedy.** Same as CLAS 4120.

**CLAS 5130-3. Greek and Roman Comedy.** Same as CLAS 4130.

**CLAS 5410-3. Archaeology of Ancient Near East.** Same as CLAS 4410 and ANTH 5410.

**CLAS 5420-3. Archaeology of Ancient Egypt.** Same as CLAS 4420 and ANTH 5420.

**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 (1-3). 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 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 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.

**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 Twilight of Antiquity.** Same as HIST 4061.

**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.

**CLAS 4091-3. The Roman Empire.** Intense survey of Imperial Rome from the Roman revolution to the passing of centralized political authority in the western Mediterranean. Emphasizes life, let-

ters, and personalities of the empire. Same as CLAS 5091 and HIST 4091.

**CLAS 4761-3. Roman Law.** 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 5081-3. The Roman Republic.** Same as CLAS 4081.

**CLAS 5091-3. The Roman Empire.** Same as CLAS 4091.

**CLAS 5761-3. Roman Law.** Same as CLAS 4761.

**CLAS 6011-3. Readings in Ancient History.** Prereq., graduate standing. Same as HIST 6011.

### *Classical Philology*

**CLAS 6012-3. Proseminar: Introduction to Research Methods in Classical Studies.**

**CLAS 6952 (1-6). Master's Thesis.**

**CLAS 7012-3. Graduate Seminar.** Topic to be specified in the *Registration Handbook and Schedule of Courses*. May be repeated up to 9 credit hours for different topics. Prereq., graduate standing (M.A. or Ph.D. students only).

**CLAS 8992 (2-10). 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.** For students with no previous knowledge of Greek. Introduces basic grammar and vocabulary.

**CLAS 1023-4. Beginning Classical Greek 2.** Completes the presentation of grammar and introduces reading of literature. Prereq., CLAS 1013 or equivalent.

**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. Incorporates review of grammar. Prereq., CLAS 1013 and 1023 or equivalent.

**CLAS 3123-3. Intermediate Classical Greek 2.** Reading of a Greek tragedy with attention to literary form and context as well as advanced grammar and syntax.

**CLAS 4013-3. Topics in Greek Prose.** Author or topic to be specified in *Registration Handbook and Schedule of Courses* (e.g., Thucydides, Herodotus, Plato, Aristotle, Attic Orators). May be repeated for up to 9 credit hours for different topics. Same as CLAS 5013.

**CLAS 4023-3. Topics in Greek Poetry.** Author or topic to be specified in *Registration Handbook*

*and Schedule of Courses* (e.g., Homer, Hesiod, Lyric Poetry, Tragedy, Comedy). May be repeated for up to 9 credit hours for different topics. Same as CLAS 5023.

**CLAS 4843 (1-3). Independent Study.**

**CLAS 5013-3. Topics in Greek Prose.** Same as CLAS 4013.

**CLAS 5023-3. Topics in Greek Poetry.** Same as CLAS 4023.

**CLAS 5033-3. Greek Prose Composition.**

**CLAS 5803-3. Accelerated Classical Greek 1.** Beginning course for graduate students. Grammar survey, intensive reading. No previous knowledge of Greek required.

**CLAS 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 6003-3. Graduate Reading.** Author or topic to be specified in *Registration Handbook and Schedule of Courses*. May be repeated for up to 9 credit hours for different topics. Prereq., graduate standing.

**CLAS 6843 (1-3). Graduate Independent Study.**

**CLAS 7013-3. Graduate Seminar in Greek Literature.**

### *Latin*

**CLAS 1014-4. Beginning Latin 1.** For students with no previous knowledge of Latin. Introduces basic grammar and vocabulary.

**CLAS 1024-4. Beginning Latin 2.** Completes the presentation of grammar and introduces reading of literature. For students with previous experience of Latin the course incorporates review of fundamentals. Prereq., CLAS 1014 or equivalent.

**CLAS 2114-4. Intermediate Latin 1.** Readings from Caesar and/or Cicero, with review of grammar. Prereq., CLAS 1024, or equivalent.

**CLAS 2124-4. Intermediate Latin 2.** Selections from Virgil's Aeneid with attention to literary form and context as well as advanced grammar and syntax.

**CLAS 3014-3. Introduction to Latin Prose.** Author or topic to be specified in *Registration Handbook and Schedule of Courses* (e.g., Cicero, Livy, Pliny). May be repeated for up to 9 credit hours for different topics.

**CLAS 3024-3. Introduction to Poetry.** Author or topic to be specified in *Registration Handbook and Schedule of Courses* (e.g., Virgil, Ovid, Catullus, Horace). May be repeated for up to 9 credit hours for different topics.

**CLAS 4014-3. Topics in Latin Prose.** Author or topic to be specified in *Registration Handbook and Schedule of Courses* (e.g., Roman Historians, Roman Epistolography, Cicero, Roman Novel). Prereq., CLAS 3014-3024 or equivalent. Same as CLAS 5014.

**CLAS 4024-3. Latin Prose Composition.** Reviews grammar and syntax. Introduces Latin prose style and composition. Prereq., CLAS 3014-3024 or equivalent. Same as CLAS 5024.

**CLAS 4044-3. Topics in Latin Poetry.** Author or topic to be specified in *Registration Handbook and Schedule of Courses* (e.g., Roman Elegy, Neronian Poetry, Lucretius, Roman Satire). Prereq., CLAS 3014-3024 or equivalent. Same as CLAS 5044.

**CLAS 4824-3. Latin Teaching Methods: Open Topics.** Covers specialized topics in Latin pedagogy to be specified in the *Registration Handbook and Schedule of Courses*. Prereq., proficiency test in the translation of Caesar, Cicero, Virgil, and Ovid. Same as CLAS 5824.

**CLAS 4844 (1-3). Independent Study.**

**CLAS 5014-3. Topics in Latin Prose.** Same as CLAS 4014.

**CLAS 5024-3. Latin Prose Composition.** Same as CLAS 4024.

**CLAS 5044-3. Topics in Latin Poetry.** Same as CLAS 4044.

**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 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 6004-3. Graduate Reading.** Author or topic to be specified in the *Registration Handbook and Schedule of Courses*. May be repeated for up to 9 credit hours for different topics.

**CLAS 6844 (1-3). Graduate Independent Study.**

**CLAS 7014-3. Graduate Seminar in Latin Literature.**

### Honors

**CLAS 1105-3. Honors—Greek Mythology.**

**CLAS 1115-3. Honors—Masterpieces of Greek Literature in Translation.**

### Art and Archaeology

**CLAS 1009-3. Introduction to Greek Art and Archaeology.** Discusses the major prehistoric and classical sites in Greece; presents the artifacts, such as frescoes, pottery, figurines, of each cultural period and discusses related theories and interpretations. Same as FINE 1009. Approved for arts and sciences core curriculum: literature and the arts.

**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. 306-337). Geographical scope includes far-flung imperial provinces as well as the Italian homeland. Same as CLAS 5079 and FINE 4079.

**CLAS 4799-2. Egyptian Hieroglyphics 2.** Same as CLAS 5799 and ANTH 4799.

**CLAS 4849 (1-3). Independent Study.**

**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 fourth Century B.C.) to the conquest of Greece by the Romans (middle second Century B.C.). Prereq., CLAS 4059 or 5059, or instructor consent. Same as FINE 5159.

**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 1300-3. 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 1600-3. 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. Interactions in both the oral and written modes are studied.

**COMM 2210-3. 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 2310-3. 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. Similar to COMM 3200. Recommended prereq., COMM 1300.

**COMM 2400-3. 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. Approved for arts and sciences core curriculum: contemporary societies.

**COMM 2500-3. 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 2600-3. 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 and empirical perspective.

**COMM 3100-3. 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. Recommended prereq., COMM 2310. Approved for arts and sciences core curriculum: critical thinking.

**COMM 3210-3. Human Communication Theory.** Acquaints students with general, thematic, and contextual theories of human communication. Gives attention to criteria for evaluating theories. Recommended prereq., COMM 2210.

**COMM 3250-3. 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. Recommended prereqs., COMM 2310 and 3210.

**COMM 3300-3. Rhetorical Foundations of Communication.** Introduces humanistic communication concepts from rhetorical theories of contemporary and earlier periods; discusses application of these concepts for communication analysis; and considers the implications of



rhetorical practice and analysis for social interaction. Recommended prereqs., COMM 1300 and 2310.

**COMM 3360-3. Rhetorical Criticism.** Applies key concepts from rhetorical theory to the analysis of specific speeches, written texts, and social situations within the humanistic tradition. Students read a variety of types of criticism and are encouraged to develop their own strategies for critical analysis. Recommended prereq., COMM 3300.

**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 twice for credit for different topics.

**COMM 4220-3. 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 twice for credit on different topics. Recommended prereq., COMM 3210 or 3300.

**COMM 4300-3. 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 twice for credit on different topics. Recommended prereq., COMM 3300.

**COMM 4400-3. 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 twice for credit on different topics. Recommended prereq., COMM 2400.

**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 twice for credit on different topics. Recommended prereq., COMM 2500.

**COMM 4600-3. 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 twice for credit on different topics. Recommended prereq., COMM 2600.

**COMM 4840 through 4900 (1-6). Undergraduate Independent Study.** Note: The 6-hour limit in the major applies to any combination of independent study and internship credit. This course does not count toward the 33 semester hours required for the major. Prereq., COMM 3250 or 3360.

**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. Typical internships are worth 3 hours of credit for a semester of work. This course does not count toward the 33 hours required for the major.

**COMM 4950 (1-6). Senior Thesis—Honors.** For communication students who wish to receive credit for writing an honors thesis and assistance from a faculty member.

**COMM 6010-3. Communication Research and Theory.** Provides an integrative overview of areas of study in the Ph.D. program, including rhetorical and communication theory, interpersonal, and organization communication. Required for graduate students in communication. Prereq., graduate standing.

**COMM 6020-3. Quantitative Research Methods.** Introduces students to the practice of empirical research: conceptualization and critique of research projects; coding, experimental and survey approaches; reliability and validity; and statistical reasoning and methods of analysis. Required for graduate students in communication. Prereq., graduate standing.

**COMM 6030-3. Interpretive Research Methods.** Introduces students to a range of interpretive and critical approaches to inquiry. Focuses on philosophical issues undergirding research as well as specifics of ethnographic observation, interviewing, and methods of textual analysis. Required for graduate students in communication. Prereq., graduate standing.

**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 twice for credit on different topics. Prereqs., graduate standing and instructor consent.

**COMM 6300-3. Advanced Readings in Organizational Communication.** Graduate-level survey of traditional and contemporary readings in organizational communication. Treats theory, research, and application from a variety of perspectives. Required for graduate students in communication. Prereq., graduate standing or instructor consent.

**COMM 6400-3. Advanced Readings in Interpersonal Communication.** Graduate-level survey course of advanced readings in interpersonal communication. Focuses on historical and contemporary works with emphasis on theory and research. Required for graduate students in communication. Prereq., graduate standing or instructor consent.

**COMM 6500-3. Advanced Readings in Rhetoric.** Graduate-level survey of classical and contemporary readings in rhetoric. Prereq., graduate standing or 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 1010-3. Disabilities in Contemporary American Society.** Fifty percent of all individuals will experience disability in their lifetime. Introduces students to the social, cultural, psychological, economic, political, legal, and health-care issues related to society and individuals with disabilities. Approved for arts and sciences core curriculum: contemporary societies ideals and values.

**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 3130-5. Speech and Hearing Science.** Examines the anatomical and physiological components of the human speech and hearing mechanism—respiration, phonation, articulation, and audition. Integrates acoustics of sound production, transmission, and auditory perception. Labs include making clinically relevant measurements, e.g., respiratory function, vocal pitch, intensity. Prereqs., EPOB 3420 or PSYC 2012 and 2022.

**CDSS 4000-3. Multicultural Aspects of Communication Differences and Disorders.** Examines perceptions and attitudes regarding differences in communication as a function of cultural-linguistic diversity. Implications of differing verbal and nonverbal communication styles of various cultural groups will be discussed in terms of professional responsibilities. Prereq upper-division standing. Approved for arts and sciences core curriculum: critical thinking.

**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 LIN 2000. Same as LING 4560 and PSYC 4560.

**CDSS 5000-3. Scientific Methods in CDSS.** 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 skill to utilize programs.

**CDSS 5110-3. Clinical Theory/Practice.** Models and theoretical perspectives regarding communication and disorders are reviewed with

application to the clinical processes of assessment, intervention, counseling, and efficacy of intervention. Prereq., graduate standing.

**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 7000-3. Research Designs in Human Communication Sciences and Disorders.** Advanced seminar in psychoacoustic/speech science research designs—efficacy, ethnographic, single-subject, quasi-experimental, and experimental designs. Designed to familiarize students with terminologies and research designs frequently used in speech-language-hearing areas. Prereq., basic statistics.

**CDSS 7100-3. Cognitive Bases of Human Communication and Its Disorders.** Explores major cognitive theories, including theories of Semantic Memory, Lexical Access, Information Processing, Connectionism, as well as theories of the Development of Cognition and their relationship to children and adults with communicative disorders.

**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 4502-2. Language Disorders: Child and Adult.** Language disorders can result from problems with cognitive, linguistic, and/or discourse processing. Addresses the theoretical framework of language dysfunction while drawing upon real clinical examples of language disorders that have been observed in children and adults. Prereq., CDSS 4560.

**CDSS 4512-3. Speech Disorders: Voice, Cleft Palate, Motor Disorders, Stuttering.** Primary emphasis on stuttering, clefting, voice disorders, and motor disorders. Research, evaluation, and treatment pertaining to each of these four disorder areas are discussed. Prereq., CDSS 3130.

**CDSS 4522-2. Clinical Phonetics and Phonological Disorders.** Provides an overview of the production and classification of speech sounds and development of skill in transcribing International Phonetic Alphabet. Emphasis on clinical application of phonetics in understanding and analyzing articulatory/phonological development and disorders. Prereq., sophomore standing.

**CDSS 5242-3. Language Disorders in School-Age Children.** Addresses the nature, assessment, and treatment of developmental language disorders in school-age children. Prereq., graduate standing and undergraduate background in CDSS.

**CDSS 5272-3. 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 sys-

tems. Presents various technological devices and systems. Addresses system selection, programming, development, and integration of use in environmental contexts.

**CDSS 5282-3. Acquired Cognitive Disorders.** Explores the theoretical and clinical management of two disorders related to speech language and communication: cognitive disorders and disorders of feeding and swallowing. Disorders in both areas will be discussed from both a development and acquired perspective. Prereq., graduate standing.

**CDSS 5292-3. Motor Speech Disorders and Dysphagia.** Presents the neural bases of normal and disordered speech motor control, teaches assessment and treatment of motor-speech disorders of children and adults, and applies motor control research to clinical problems. Prereq., graduate standing and undergraduate CDSS background.

**CDSS 5293-3. Acquired Language Disorders in Adults.** Introduces the neural bases and medical etiologies of acquired language disorders in adults, explores the ways in which normal language processing may become disordered, and studies current methods of evaluation and treatment design. Prereq., graduate standing.

**CDSS 5302-3. Phonological Disorders.** Provides overview of phonological development, perception, and production. Presents factors related to articulation and focuses on critical evaluation of traditional and phonological based assessment and intervention procedures. Includes coverage of phonological awareness, metaphonological skills as related to literacy.

**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 5602-3. 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 5612-3. Learning Disabilities.** Focuses on the nature, assessment, and treatment of learning disabilities and their relation to language disorders. Prereq., CDSS 5242 or 5293.

**CDSS 6362-3. Seminar: Research in Stuttering.** Issues related to research of child and adult stuttering are emphasized. Specifically, the neurophysiology, psychology, and phenomenology are discussed. In addition, students will be encouraged to explore other topics in stuttering that are of particular interest. Prereq., CDSS 5362.

**CDSS 7202-3. Motor Control and Speech Production.** Focuses on critical reading of literature on motor control, with particular relevance to theories of motor speech production. Prereq., doctoral student standing.

### *Didactic: Audiology*

**CDSS 2304-4. American Sign Language 1.** Introduces basic sign vocabulary, grammatical structures of ASL, and the culture of deaf people. Classes are taught using ASL without the use of spoken English.

**CDSS 2314-4. American Sign Language 2.** Develops more complex receptive and expressive grammatical structures and an understanding of deaf culture. Classes are taught using ASL without the use of spoken English. Prereq., CDSS 2304 or equivalent.

**CDSS 2324-4. American Sign Language 3.** Continuation of CDSS 2314. Covers ASL literature, advanced grammatical structures, idiomatic expressions, and deaf culture. Prereq., CDSS 2314 or equivalent.

**CDSS 2334-3. American Sign Language 4.** Studies linguistic structure of ASL, the development of ASL in children, and the sociolinguistics of the deaf community. Students perfect their expressive ASL skills through guided composition of oral expository text. Prereq., CDSS 2324 or equivalent.

**CDSS 4704-3. Audiological Evaluation.** Basic principles and techniques of hearing evaluation, including pure-tone, speech, immittance, and advanced audiometry; hearing conservation in hospital, school, and industrial settings; and identification and evaluation of auditory pathologies. Required projects in screening and pure-tone audiometry. Prereq., CDSS 3130.

**CDSS 4714-3. Audiological Rehabilitation.** Basic principles and techniques related to the habilitation and rehabilitation of individuals with hearing loss: speech, language, auditory, psychological, social and emotional, and educational issues. Prereq., CDSS 4704.

**CDSS 5524-3. 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.

**CDSS 5544-3. Seminar in Hearing 1: Adult.** Provides advanced study in the hearing assessment and management of adults across the age span. Emphasis is on the peripheral auditory system in adults.

**CDSS 5554-4. Seminar in Hearing 2: Pediatric.** Provides advanced study in hearing assessment and management of children across the age span. Topics include epidemiological, medical, audiological, developmental, and habilitative aspects of normal and impaired hearing in children. Prereqs., graduate standing and undergraduate audiology course.

**CDSS 5564-4. Seminar in Hearing 3: Neurodiagnostic.** Provides advanced study in the neurological assessment of the normal and impaired auditory/vestibular.

**CDSS 5614-3. Residual Hearing and Amplification.** Selection and evaluation of hearing aids based on behavioral, electroacoustic, and other

objective measures. Integration of technological aspects of the hearing aid with psychological and perception of the individual.

**CDSS 5644-3. Communication of the Hearing Impaired.** Theories and processes of the communication of individuals with hearing loss from infancy through geriatrics.

**CDSS 5674-3. Signals and Systems in Audiology.** Provides in-depth study of instrumentation used by audiologists for hearing aid evaluation and fitting, signal generation and modification, and signal measurement and calibration. Prereq., CDSS graduate standing.

**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. Prereq., graduate standing.

### *Didactic: Speech-Hearing Science*

**CDSS 6006-3. Advanced Hearing Science.** Provides advanced study in hearing science, including physical, physiological, and psychological acoustics of both normal and impaired auditory systems. Prereq., graduate standing in CDSS; undergraduate course work in biology or anatomy.

**CDSS 6106-3. Experimental Phonetics 1.** Advanced seminar in experimental phonetics for M.A. and Ph.D. students. Covers selected topics in language/speech/voice production and perception with emphasis on clinical applications.

**CDSS 8206-3. Perception/Production Theories in Human Communication Sciences and Disorders.** Advanced seminar in perception/production theories in human communication sciences and disorders. Designed to familiarize students with current perception theories related to the auditory/visual system and production theories related to the motor/auditory/visual system. Prereq., doctoral student standing or instructor consent.

### *Practica*

**CDSS 4918-2. Introduction to Clinical Practice.** Supervised observation with individuals exhibiting speech, language and/or hearing problems with a focus on key clinical issues and components of the clinical process.

**CDSS 4938 (1-6). Internship: Speech-Language Intervention.** Provides supervised clinical experience with children who have communication challenges enrolled in the Child Language Center Programs, individuals demonstrating communication disorders as a cotherapist in the Communication Disorders Clinic, or off-campus experience in an affiliated hospital or public school program. Prereq., CDSS 4918 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 man-

agement of speech-language-hearing disorders in children and adults.

**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 7918-3. Practicum 3: Clinical Supervision.**

**CDSS 7928-3. Practicum 3: Clinical Administration.**

**CDSS 8918-3. Practicum 3: Classroom Instruction.**

**CDSS 8928-3. 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 and Humanities**

### *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, 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.** From Baroque to contemporary styles in literature, music, and visual arts. Emphasizes the

cultural context in which art was created. Credit cannot be received for both HUMN 1010 and 1020 and ENGL 2600 and 2610. Approved for arts and sciences core curriculum: historical context, or literature and the arts.

**HUMN 2133-3. The Dramatic Arts in Great Britain.** Examines drama from an interdisciplinary point of view. The basis of the course will be six live performances, four in London and two in Stratford. These productions will be examined in comparison to versions of the same or a similar narrative in art, music, and literature and in reference to physical locations in and around London. Offered abroad only. Prereq., instructor consent.

**HUMN 2935 (1-3). Humanities Internship: Literature and Social Violence.** See HUMN 4835. Prereq., must be taken in conjunction with HUMN 4835.

**HUMN 3000-3. Images of the Twentieth Century.** Interdisciplinary study of twentieth-century themes in literature, film, and visual arts. Team taught.

**HUMN 3015-3. Jung, Film and Literature.** The basic themes of C.G. Jung's archetypal psychology (shadow, anima/animus, character typology, and individuation) will be studied and applied as tools of critical analysis to selected films and literary texts of the Modern period. Prereq., humanities major or Farrand student or instructor consent. Same as FILM 3015.

**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 3065-3. Feminist Theory/Women's Art.** Focuses on several key issues in feminist thought through the analysis of women's art (literature, film, visual art, performance) and theory. Approved for arts and sciences core curriculum: cultural and gender diversity or literature and the arts.

**HUMN 3145-3. African-America in the Arts.** Gives students the opportunity to explore interrelationships in the arts of African Americans, learning to recognize and appreciate the African-American contribution to our culture as a whole. Students also learn to think critically and avoid oversimplification when dealing with racism and stereotyping. Prereq., HUMN 1020. Approved for arts and sciences core curriculum: cultural and gender diversity or United States context.

**HUMN 3440-3. Literature and Medicine.** This course, taught by a physician from the CU School of Medicine, offers readings and discussion of the works of Anton Chekhov, William Carlos Williams, Oliver Sacks, and other physician-writers to explore the physician-patient relationship, ethical problems in medicine, death and dying, and other topics in medicine. Approved for arts and sciences core curriculum: literature and the arts, or ideals and values.

**HUMN 3505-3. The Enlightenment: Tolerance and Emancipation.** Examines the Enlightenment belief in reason and the common humanity of all individuals and cultures. Emphasizes arguments for and against freedom of religion, abolition of slavery, and emancipation of women in 18th-century European and American literature and thought. Same as GRMN 3505. Approved for arts and sciences core curriculum: ideals and values.

**HUMN 3552-3. Patrons, Artists and Politics: Fifteenth to Nineteenth Centuries.** Study of the relationship between political leadership and cultural patronage in Western Europe as seen at the courts of the dukes of Urbino (Renaissance Italy), Charles I of England (early seventeenth century), Louis XIV of France (late seventeenth century), Frederick the Great of Prussia (eighteenth century), and Napoleon. Prereq., HUMN 1010 or 1020 or equivalent.

**HUMN 3930 (1-6). Humanities Internship.** Students gain academic credit and professional experience working in museums, galleries, arts administration, and publishing. They work three to 18 hours per week with their professional supervisor and meet regularly with a faculty advisor who determines the reading and writing requirements.

**HUMN 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. Requires a working knowledge of silent film history. Same as FILM 4004. Approved for arts and sciences core curriculum: critical thinking.

**HUMN 4013-3. Narrative in the Arts.** Explores the nature of sacred and secular narrative in literature, film, and the visual arts. Prereq., HUMN 1010 or 1020.

**HUMN 4023-3. The Epic Tradition.** 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.** 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. Approved for arts and sciences core curriculum: cultural and gender diversity or literature and the arts.

**HUMN 4072-3. Seventeenth-Century Art and Poetry.** Examines English and continental dramatic and 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.** May be repeated for credit up to a maximum of 9 credit hours. Students should check with the department for specific semester offerings. Prereq., HUMN 1010 or 1020, or equivalent.

**HUMN 4093-3. Studies in Humanities.** May be repeated for credit up to a maximum of 9 credit hours. Students should check with the department for specific semester offerings. Prereqs., HUMN 1010 and 1020, or equivalent.

**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 (e.g., Flaubert, James, Kafka, Hoffman, and Hitchcock). Prereq., HUMN 1020.

**HUMN 4155-3. Philosophy, Art, and the Sublime.** Explores philosophies of art, theories of the sublime, and the relation between art and morality through philosophy, literature, and the visual arts. Includes works by Plato, Longinus, Burke, Rousseau, Kant, Mary Shelley, Melville, Friedrich, Turner, and Pollock. Prereqs., HUMN 1010 and 1020. Approved for arts and sciences core curriculum: critical thinking or ideals and values.

**HUMN 4160-3. Myth in the Arts.** Studies representative myths in the art, music, and literature of ancient and modern worlds. Prereq., HUMN 1010 and 1020, or CLAS 1100.

**HUMN 4333-3. Myth, Desire, and the Western Lyric Voice.** Introduces lyric as a genre giving voice to (private) desire through the (public) language of myth. By way of critical theory from Plato to Barthes, examines how lyric, from Sap-

pho to Ashbury, exploits myth to articulate desire and subjectivity. Prereq., HUMN 1010 or 1020.

**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 Quixote*, *Hard Times*, *Death of a Salesman*, and *Grapes of Wrath*. Prereq., HUMN 1010 or 1020.

**HUMN 4502-3. Nietzsche: Literature and Values.** Emphasis is placed on Nietzsche's major writings spanning the years 1872-1888, with particular attention to the critique of Western values. A systematic exploration of doctrines, concepts, and ideas leading to the values of creativity. Same as GRMN 4502. Approved for arts and sciences core curriculum: ideals and values.

**HUMN 4504-3. Goethe's Faust.** Systematic study of the Faust motif in Western literature, with major emphasis on Faust I and II by Goethe. Same as GRMN 4504. Approved for arts and sciences core curriculum: literature and the arts.

**HUMN 4522-3. The Art of Courtly Love: The Culture of the Medieval Troubadours.** Comparative, interdisciplinary study of the poetry, music, art, customs, beliefs, and practices of the culture surrounding the medieval Provençal troubadours. Draws from sources including literary texts, music, illuminated manuscripts, and films. Prereq., HUMN 1010 or 1020, or equivalent. Same as FREN 4130 and ITAL 4130.

**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. Approved for arts and sciences core curriculum: critical thinking.

**HUMN 4821-3. Twentieth Century Russian Literature and Art.** Interdisciplinary course emphasizing the influence of art in twentieth century Russian literature. Follows the changing cultural landscape from the time when Russia was in the vanguard of modern European literature to the gradual cultural relaxation that culminated in perestroika and glasnost. Same as RUSS 4821. Approved for arts and sciences core curriculum: literature and the arts.

**HUMN 4825-3. Law and Literature.** Explores law as theme and structure in literary texts from different periods, plus readings in legal materials.

**HUMN 4835-3. Literature and Social Violence.** Theoretical understanding of heightened awareness arising from literary and sociological investigations of contemporary sources of social violence (gang culture, racism, domestic violence) are combined with the concrete knowledge offered by an internship in a social service agency. Prereq., must be taken in conjunction with HUMN 2935. Approved for arts and sciences core curriculum: contemporary societies.

**HUMN 4840 (1-3). Independent Study.**

**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 (1-3). Proseminar.** Introduces basic issues in comparative literature and basic problems in literary history. Provides an overview of history and rationale of the discipline, traditional areas of research, and recent developments. Prereq., graduate standing or instructor consent. With director's approval, may be repeated for credit to a maximum of 7 hours.

**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.** Explores topics and problems in rhetoric and poetic practice from antiquity to the present day. Prereq., graduate standing or instructor consent.

**COML 5410-3. Theory and Practice of Literary Translation.** After reviewing theories and practices of literary translation in their historical, linguistic, and cultural dimensions, students will translate a substantial piece from a significant literary work in their chosen foreign language, and provide a detailed commentary on the process. Prereq., graduate standing or instructor consent and advanced knowledge of one ancient or modern language.

**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.** Selection of Renaissance Enlightenment, and post-Enlightenment works of literary criticism and theory. Prereq., graduate standing or instructor consent.

**COML 5660-3. Themes, Motifs, and Characters.** Prereq., graduate standing or instructor consent.

**COML 5830-3. Topics in Literature and History.**

**COML 5840 (1-3). Independent Study.**

**COML 6040 (1-3). Seminar: A Selected Topic.** May be repeated for credit to maximum of 7 hours.

**COML 6840 through 6890 (1-3). Independent Study.**

**COML 6940 (1-3). Candidate for Degree.**

**COML 6950-4. Master's Thesis.**

**COML 6970-3. Colloquium in Comparative Literature.**

**COML 8990-10. Doctoral Dissertation.**

**East Asian 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 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 (zhuyin fu-hao). Prereq., CHIN 1020.

**CHIN 2120-5. Intermediate Chinese 2.** Continuation of CHIN 2110. Prereq., CHIN 2110.

**CHIN 3110-3. Advanced Chinese 1.** Surveys a variety of authentic-language materials, including films, plays, newspaper articles, essays, and short stories. Extensive use of videotapes made from actual television programs, news broadcasts, commercials, and documentaries. Emphasizes proficiency-oriented approach to reading, writing, and oral communication. Prereq., CHIN 2120.

**CHIN 3120-3. Advanced Chinese 2.** Continuation of CHIN 3110. Prereq., CHIN 3110.

**CHIN 3210-4. Introduction to Classical Chinese.** Systematic introduction to the classical language based on texts from the pre-Han and Han periods. Stresses precise knowledge of grammatical principles and exactitude in translation—the basis for all further work in classical Chinese. Prereq., CHIN 2120.

**CHIN 3220-4. Readings in Classical Chinese.** Close reading of selected texts of ancient and medieval literature. Readings are mainly in prose; some poetry is introduced. 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 Hsiün, Lao She, Ting Ling, Chang Aijung, and Su T'ung. 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 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 5040-3. Diachronic Aspects of Chinese Language.** Focuses on the changes in Chinese in the last two thousand years. Examines what type of language Chinese was and what type of language it is now. Prereq., CHIN 3210.

**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. Prereq., 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-yüan, 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 Yuan 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, Yuan, 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.**

**CHIN 6900 (1-6). Independent Study.**

### *Chinese Courses in English*

The following courses require no knowledge of Chinese.

**CHIN 1011-4. Introduction to Traditional East Asian Civilizations.** An interdisciplinary introduction to the cultures of traditional China and Japan, which shaped the East Asian world, from early times to ca. 1650, the eve of sustained contact with the west. Focuses on significant cultural themes characterizing the premodern culture of the two. Same as JPNS 1011. Approved for arts and sciences core curriculum: cultural and gender diversity.

**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 2441-3. Film and the Dynamics of Chinese Culture.** Through studying a group of Chinese films in light of modern Chinese history and literature, students will examine a series of cultural dilemmas and issues in twentieth-century China and develop skills in analyzing literary and filmic texts.

**CHIN 3441-3. Chinese Language and Society.** Deals with major linguistic characteristics of Chinese as a medium of communication. Discusses complex linguistic processing of social status and empathy relationships, for example, with reference to the structure of Chinese society and political system. Prereq., CHIN 2120.

**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. Reality and Dream in Traditional Chinese Fiction.** Explores how early Chinese fiction offers a means of synthesizing societal values, culture, and intellectual developments in premodern China. Special attention is given to *The Story of the Stone* (also known as *Dream of the Red Chamber*), the masterpiece novel of the Ch'ing dynasty (1644-1911), as

well as classical Chinese tales from the third to the tenth century and selected vernacular stories written in the Ming (1368-1644). Considers various approaches to literary analysis and interpretation. Taught in English. Prereq., junior standing or instructor consent.

**CHIN 4831-3. Chinese Drama in Translation.** Lectures and discussion. Surveys the major works of Chinese drama, emphasizing historical background, social milieu, structure, theme, and language. Special attention given to dramas of the Yuan dynasty (1279-1368), especially the works of Kuan Han-ch'ing. 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 or instructor consent.

**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 or instructor consent.

### *Japanese*

**JPNS 1010-5. Beginning Japanese 1.** Thorough introduction to modern Japanese, emphasizing speaking, listening, reading, and writing in a cultural context.

**JPNS 1020-5. Beginning Japanese 2.** Continuation of JPNS 1010. Prereq., JPNS 1010.

**JPNS 2110-5. Intermediate Japanese 1.** Continued study of oral and written modern Japanese in a cultural context. Prereq., JPNS 1020.

**JPNS 2120-5. Intermediate Japanese 2.** Continuation of JPNS 2110. Prereq., JPNS 2110.

**JPNS 3110-3. Advanced Japanese 1.** Develops competence in reading and interpreting a wide variety of materials by contemporary Japanese writers. Reviews structure and grammar. Prereq., JPNS 2120.

**JPNS 3120-3. Advanced Japanese 2.** Continuation of JPNS 3110. Prereq., JPNS 3110.

**JPNS 3210-2. Advanced Japanese Conversation and Composition 1.** An upper-division course designed primarily for students who have spent fewer than six months in a Japanese-speaking environment. Concentrates on productive skills in spoken and written Japanese. Can be taken concurrently with JPNS 3110. Prereq., JPNS 2120.

**JPNS 3220-2. Advanced Japanese Conversation and Composition 2.** Continuation of JPNS 3210. Can be taken concurrently with JPNS 3120. Prereq., JPNS 3210.



**JPNS 4030-3. Japanese Syntax.** Deals with syntactic phenomena from five areas of Japanese grammar that cause the most difficulty for learners. Their characteristics are explored in forms and discursive function which go beyond the explanations in basic, prescriptive grammars of Japanese. Prereq., JPNS 3120 or instructor consent.

**JPNS 4110-3. Advanced Readings in Modern Japanese 1.** Surveys a wide variety of material written in modern Japanese, including texts from literature, the social sciences, religion, and cultural history. Emphasizes content and style. Prereq., JPNS 3120.

**JPNS 4120-3. Advanced Readings in Modern Japanese 2.** Continuation of JPNS 4110. Prereq., JPNS 4110.

**JPNS 4300-3. Open Topics: Readings in Japanese 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.

**JPNS 4310-3. Classical Japanese 1.** Introduces reference tools for reading classical Japanese, and grammar, vocabulary, and use of scripts in pre-modern Japanese, focusing on the tenth century *Taketori Monogatari* and the thirteenth century *Hojoki*. Prereqs., JPNS 3110; JPNS 3120, 4811, and 4821 recommended.

**JPNS 4320-3. Classical Japanese 2.** Continuation of JPNS 4310. Survey of changes in Japanese literary language from the Nara (eighth century) to Meiji (late nineteenth century) periods. Attention to changes in grammar, vocabulary, and use of scripts in premodern Japanese. Introduction to representative works of classical Japanese literature of all periods. Prereq., JPNS 4310.

**JPNS 4900 (1-3). Independent Study.**

**JPNS 4950-3. Honors Thesis.**

### *Japanese Courses in English*

The following courses require no knowledge of Japanese.

**JPNS 1011-4. Introduction to Traditional East Asian Civilization.** An interdisciplinary introduction to the cultures of traditional China and Japan, which shaped the East Asian world, from early times to ca. 1650, the eve of sustained contact with the west. Focuses on significant cultural themes characterizing the premodern cultures of the two. Same as CHIN 1011. Approved for arts and sciences core curriculum; cultural and gender diversity.

**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 present. 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.** Surveys the major works and authors of classical Japanese literature, both poetry and prose, from the earliest historical records and literary anthologies through the Heian period (784 to 1185). Taught in English. Prereq., junior standing.

**JPNS 4821-3. Medieval Japanese Literature in Translation.** Surveys the major works and authors of medieval Japanese—poetry, prose, and drama—from the Kamakura and Muromachi periods (1185 to 1600). Taught in English. Prereq., junior standing.

**JPNS 4831-3. Early Modern Japanese Literature in Translation.** Surveys the major works, authors, and genres of literature from the Tokugawa through Meiji periods in their historical and cultural contexts. Attention is given to various approaches of literary analysis and interpretation. Taught in English. Prereq., junior standing.

**JPNS 4841-3. Modern Japanese Literature in Translation.** Surveys the major works, authors, and genres of literature from the late Meiji period and twentieth century in their historical and cultural contexts. Attention is given to various approaches of literary analysis and interpretation. Taught in English. Prereq., junior standing.

## Economics

### *Theory and History of Economic Thought*

**ECON 1000-4. Introduction to Economics.** Introduces the economic way of thinking. Economic thinking is critically important in cases where we want to make ourselves as well off as possible, but can't have everything we want: that is, economic thought affects all choices. Topics included are scarcity, decision-making, and markets. Students may not receive credit for ECON 1000 and 1001 or 2010 or 2020, or ECON 1000 and ECON 2011 or 2021. Approved for arts and sciences core curriculum; contemporary societies.

**ECON 1001-3. Introduction to Economics: Kittredge Honors.** Introduces the economic way of thinking (economic thought affects all choices). Topics include scarcity, decision-making, and markets. Students may not receive credit for ECON 1001 and 1000 or 2010 or 2020. Approved for arts and sciences core curriculum; contemporary societies.

**ECON 2010 (3-4). Principles of Microeconomics.** Examines basic concepts of microeconomics, or the behavior 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. Students may not receive credit for ECON 2010 and 2011 or 1000 or 1001. Approved for arts and sciences core curriculum; contemporary societies.

**ECON 2011-3. Principles of Microeconomics.** Same as ECON 2010. For Kittredge Honor students only. Students may not receive credit

for ECON 2011 and 2010 or 1000 or 1001. Approved for arts and sciences core curriculum; contemporary societies.

**ECON 2020 (3-4). Principles of Macroeconomics.** An overview of the economy, examining the flows of resources and outputs and the factors determining the levels of income and prices. Policy problems of inflation, unemployment, and economic growth are explored. May be taken before ECON 2010. Students may not receive credit for ECON 2020 and 2021 or 1000 or 1001. Approved for arts and sciences core curriculum; contemporary societies.

**ECON 2021-3. Principles of Macroeconomics.** Same as ECON 2020. For Kittredge Honor students only. Students may not receive credit for ECON 2021 and 2020 or 1000. Approved for arts and sciences core curriculum; contemporary societies.

**ECON 3070-3. Intermediate Microeconomic Theory.** Explores theory and application of models of consumer choice, firm and market organization, and general equilibrium. Extensions include intertemporal decisions, decisions under uncertainty, externalities, and strategic interaction. Prereqs., ECON 1000 or 2010 and ECON 1078 and 1088 or equivalent.

**ECON 3080-3. Intermediate Macroeconomic Theory.** Theories of aggregate economic activity including the determination of income, employment, and prices; economic growth and fluctuations. Macroeconomic policies are explored in both closed and open economy models. ECON 3070 and 3080 may be taken in any order; there is no recommended sequence. Prereqs., ECON 1000 or 2020 and ECON 1078 and 1088, or equivalent.

**ECON 6070-3. Applied Microeconomic Theory.** Develops competence in techniques of applied micro theory for those going into policy and problem-solving jobs. Also useful to undergraduates considering graduate study in economics. 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 3808.

**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 3808.

**ECON 7010-3. Microeconomic Theory 1.** Analyzes recent and contemporary literature on fundamentals of economic theory. Considers value theory with particular emphasis on methodology, theory of demand, theory of the firm, game theory, theory of distribution, general equilibrium theory, and welfare economics. Prereqs., ECON 3070, 3080, and ECON 6808 or MATH 1300.

**ECON 7020-3. Macroeconomic Theory 1.** Discusses behavior of consumption, investment, employment, production, and interest rates in the context of dynamic optimization models. Also considered are government; economic

growth, and business cycles. Prereqs., ECON 3070 and 3080.

**ECON 7030-3. Microeconomic Theory 2.** Continuation of ECON 7010. Prereq., ECON 7010.

**ECON 7040-3. Macroeconomic Theory 2.** Presents the theoretical and empirical application of dynamic macro programming models. Topics include consumption, investment, labor, money, and credit theories. The theory of economic fluctuations and business cycles are covered employing dynamic general equilibrium models. Prereq., ECON 7020.

### *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 1000 or 2010, and 2020.

**ECON 4211-3. Economics of the Public Sector.** 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.

**ECON 6111-3. Survey in Monetary Economics.** Surveys the U.S. experience and international monetary relations. Attention is given to interest rates, international debt, history of U.S. monetary/debt crises, bank reform, and the evolution of monetary institutions. Prereq., ECON 4111 or equivalent.

**ECON 6211-3. Public Economics.** General topics covered are principles of taxation and public expenditures. Specific topics include the incidence of taxes, the allocative effect of taxes, public goods, externalities, voting, bureaucratic behavior, and cost-benefit analysis. Prereqs., ECON 6070 and 6080.

**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: Public Economics Taxation.** Part of a year-long graduate seminar in public economics. Focuses upon taxation, and examines the effects of taxation on economic incentives, the distribution of income, and the allocation of resources. May be taken independently for credit. Prereq., ECON 6070 or 7010.

**ECON 8221-3. Seminar: Public Economics Expenditures.** Part of a year-long graduate seminar in public economics. Focuses upon public sector externalities. Topics include public goods, expenditures, voting, public sector bureau behavior, fiscal federalism, and cost-benefit analysis. May be taken independently for credit. Prereqs., ECON 6070 or 7010.

### *Urban and 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.

**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. Prereq., instructor consent. Same as GEOG 4292.

**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.

**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 1000 or 2010 and 2020. Approved for arts and sciences core curriculum: contemporary societies.

**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. Economics of the Pacific Area.** Analyzes economic interrelationships in the Pacific Area, emphasizing the United States, Japan, China, and ASEAN nations. Considers aspects of economic conflict, growth, and commercial policy. Prereq., ECON 3403, 4413, or 4423.

**ECON 6413-3. 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. Prereqs., ECON 6070 and 6080.

**ECON 6423-3. 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 8323-3. Continuities and Changes in Modern World Economy.** Introduces the topics of globalization and democratization from an interdisciplinary perspective. Examines major changes to the global political economy and explores implications for local, national, regional, and international political and economic processes. Prereq., graduate standing. Same as PSCI 7223.

**ECON 8333-3. Globalization and Democratization: An Introduction.** Introduces research on globalization and democratization from an interdisciplinary perspective. Examines ongoing interdisciplinary research on the global political economy. Students learn about ongoing research, critique current efforts, and design their own research project. Prereq., graduate standing. Same as PSCI 7333.

**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. Examines the role of international financial markets for the behavior of consumption, investment, saving, and production. Also considers international transmission of business cycles. Prereq., ECON 6080 or 7020.

**ECON 8433-3. Seminar: Topics in Money and International Economics.** Explores advanced work in various aspects of international economics, such as empirical trade analysis, public choice, and interactions between real and monetary phenomena in the world economy. Prereq., ECON 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 1000 or 2010 and 2020.*

**ECON 4514-3. Economic History of Europe.** Evolution of modern economic growth and development in Europe, emphasizing institutional change. Prereqs., ECON 1000 or 2010 and 2020. Approved for arts and sciences core curriculum: historical context.

**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 1000 or 2020, and 3070. Approved for arts and sciences core curriculum: United States context.

**ECON 4774-3. Economic Reform in the Developing Countries.** Competing paradigms of economic development are explored with

emphasis on the confrontation between the structuralist/dirigiste paradigm and the neoclassical public choice paradigm. Economic reforms underway in developing countries are analyzed, including stabilization policy and structural adjustment. Political reforms are explored, including the pluralist revolution and the design of a constitutional framework in developing societies. Prereqs., ECON 1000 or 2010 and 2020.

**ECON 4784-3. Economic Development.** Empirical, theoretical, and policy issues in economic development are explored. The following topics are examined with reference to the developing countries: income distribution and poverty, demographic change, labor force employment and migration, human capital, physical capital, natural resources and the environment, industrial structure, international trade, and finance. Prereqs., ECON 1000 or 2010 and 2020.

**ECON 6774-3. Economic Reform in Developing Countries.** General topics covered are stabilization policy and structural adjustment. Specific topics include Orthodox stabilization policies (fiscal, monetary, and exchange rate policies); heterodox stabilization policies (price, wage, and interest controls); trade liberalization; financial liberalization; privatization and deregulation. Prereqs., ECON 6070 and 6080.

**ECON 8534-3. Economic History of North America.** Examines North America's past from the perspective of economics. Topics include growth and welfare in the colonial period; staple products, agricultural development, and the emerging industrialism in the antebellum period; transformation of the North American economy to 1914; the interwar years and the Great Depression; and economic integration since 1945. Prereqs., ECON 3070 and 3080.

**ECON 8764-3. History of Economic Development.** Covers in historical perspective the causes of economic development including 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 8784-3. Economic Development.** Explores empirical, theoretical, and policy issues in economic development. Topics examined are political economy, income distribution and poverty, demographic change, labor force employment and migration, human capital, physical capital, natural resources and the environment, industrial structure, international trade and finance, stabilization policy, and structural adjustment. 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, fish-

eries, mineral, and water systems. For nonmajors. Students may not receive credit for both ECON 3535 and 4535. Prereq., ECON 1000 or 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 1000 or 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 3808.

**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 3808.

**ECON 6535-3. Resources and Environment.** The economics of resource and environmental problems. Benefit-cost analysis, microeconomic foundations of optimal static and intertemporal usage of both renewable and nonrenewable natural resources, and philosophical issues are covered. Prereqs., ECON 6070 and 6080.

**ECON 6555-3. Water Resources Development and Management: Technology, Economics, Institutions.** Multidisciplinary exploration of the engineering, economic, and institutional principles involved in water system development and management. Provides a background in basic hydrology, economics, water law, and institutions. Cross listed course, CVEN 5393. Prereqs., ECON 3070 or equivalent.

**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 6808.

**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 6808, and 6070 or 7010.

**ECON 8555-3. Water Resources Development and Management.** Research seminar in joint hydrologic-economic modeling and systems analysis. Problems addressed include joint water quantity-water quality management and joint surface-ground water management. Prereq., ECON 6555.

### *Labor and Human Resources*

**ECON 4606-3. Introduction to Demography.** Covers issues relating to the causes and consequences of population growth and decline and examines the determinants of an individual's decisions about child bearing, marriage, divorce, migration, labor supply, and investments in education and health. Analyzes how these decisions affect an individual's economic well-being and studies the family as the institution within which many of these decisions are made. 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. Prereq., ECON 3070.

**ECON 4626-3. The Economics of Inequality and Discrimination.** Examines the unique insights available through economic analysis regarding the causes, mechanisms, and consequences of inequality and discrimination. Examines the extent of inequality, the varieties and extents of discrimination, and explores the economic models that suggest explanations. Prereq., ECON 3070. Approved for arts and sciences core curriculum: cultural and gender diversity.

**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.** Focus is on demand side of labor markets. Topics include standard static and dynamic models of labor demand, labor market discrimination, composition of compensation, labor hierarchies within enterprises, unionization, efficient contracts and macroeconomics of labor markets. 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. Industrial Organization and Regulation.** Explores neoclassical theory of the firm, the determinants of industrial structure, and the purposes and institutions of public policy to control or maintain a competitive environment. Recommended preparation, ECON 3070 or 3808. Prereqs., ECON 1000 or 2010 and 2020. Approved for arts and sciences core curriculum: United States context.

**ECON 6697-3. Industrial Organization and Regulation.** Explores theory and application of economic models of industrial organization. Neo-

classical and game theoretic models of markets range from competitive to collusive. Also examines the laws and regulations that affect business in the U.S. Prereq., ECON 6070 and 6080.

**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 1078-3. Mathematical Tools for Economists—1.** Teaches mathematical skills and logical thinking for use in economics. Topics include algebra, graphs, functions, and probability. Includes many "real-world" examples and some illustrative computer assignments.

Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

**ECON 1088-3. Mathematical Tools for Economists—2.** Continuation of ECON 1078. Teaches mathematical skills for use in economics. Topics include derivatives, optimization, and integration. These skills will be illustrated with computer assignments and used on "real world" problems. Prereq., ECON 1078.

**ECON 3808-3. 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 1000 or 2010 and 2020, and ECON 1078 and 1088 or equivalent.

**ECON 3818-4. Introduction to Statistics with Computer Applications.** Introduces statistical methods and their applications in quantitative economic analysis. Prereqs., ECON 1000 or 2010 and 2020, and ECON 1078 and 1088 or equivalent.

**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 3808 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 3808 or MATH 1300, and ECON 3070.

**ECON 6808-3. Introduction to Quantitative Economics.** Topics include multivariable optimization problems with and without constraints; simple difference and differential equations, stability, introduction to linear and nonlinear programming, and calculus of variations. Prereq., ECON 3808.

**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 autoregressive integrated moving average models, nonstationarity and cointegration, vector autoregressions, and the evaluation of forecasts from such models. Emphasizes applied computer assignments. Prereq., ECON 3808.

**ECON 7808-3. Quantitative Analysis.** Teaches quantitative and mathematical tools to prepare for modern economic theory and econometrics. Topics include matrix algebra, static optimization, dynamic optimization, and basic topological concepts for functional analysis. Prereq., ECON 6808.

**ECON 7818-3. Seminar: Foundations of Statistics and Econometrics.** Application of statistical inference to economic research. Principle topics are probability and mathematical statistics, classical regression and least squares estimation, problems of regression, and extensions to models of qualitative choice, dynamic models, and systems of equations. Prereq., ECON 7808.

**ECON 7828-3. Econometrics 2.** Continuation of ECON 7818. Topics include maximum likelihood estimation, problems of regression, extensions of the linear regression model, and simultaneous equations estimation. Prereq., ECON 7818.

**ECON 8808-3. Seminar: Mathematical Economics—Statics.** Theory of decision making under uncertainty; game theory. Prereq., ECON 6808.

**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 6808.

**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. Asymptotic (large sample) theory of inference. Some topics in the estimation of microdata. Prereq., ECON 7818.

**ECON 8838-3. Seminar: Econometrics 2.** Teaches advanced econometric theory. Topics include asymptotic theory, maximum likelihood estimation, limited dependent variables analysis, and other frontier areas of econometrics such as the method of moment estimation and semi-

parametric and nonparametric estimation procedures. Prereq., ECON 8828.

### Independent Study and Other Courses

**ECON 4309-3. Economics Honors Seminar 1.** Open only to qualified seniors. For information consult the department's director of honors. Approved for arts and sciences core curriculum: critical thinking.

**ECON 4339-3. Economics Honors Seminar 2.** Open only to qualified seniors. For information consult the department's director of honors. Prereq., ECON 4309.

**ECON 4909 (1-3). Independent Study.** Offered only to students with a GPA of 3.00 or better. Prereqs., ECON 1000 or 2010 and 2020; instructor and department consent required.

**ECON 4939 (2-6). Internship/Seminar.** Offers students the opportunity to integrate theoretical concepts of economics with practical experience in economics-related institutions. The theoretical portion arises from seminars and readings, the practical from activities in organizations related to the economics field. Prereqs., ECON 3070 and 3080; junior or senior major standing; and instructor consent.

**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 1000 or 2010 and 2020, and junior or senior standing. May not be taken more than once for credit. Approved for arts and sciences core curriculum: critical thinking.

**ECON 6209-3. Research Methods in Economics.** Trains graduate students in scientific methodology and research in economics. The course will culminate in a research project that normally leads directly to thesis work. Prereqs., ECON 6070, 6080, 6808, and 6818.

**ECON 6339 (1-3). Teaching Economics.** Explores a variety of topics applicable to the study and teaching of economics. Main emphasis 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

The CU-Boulder Department of English has restructured the course numbering system used for all English courses to conform more effectively with the undergraduate English major. The new course numbers are now grouped by the last digit under a subheading that relates to a specific field of study. Questions regarding the courses should be directed to the English Undergraduate Studies Office in Hellem 111.

### *General Literature and Language*

**ENGL 1000-3. Critical Analysis 1: Poetry.** A basic skills course designed to equip the student to handle the English major. Emphasizes critical writing and the acquisition of basic techniques and vocabulary of literary criticism through close attention to poetic language. Required for the English major beginning in the fall of 1992. Limited to English majors only.

**ENGL 1010-3. Critical Analysis 2: Prose.** A basic skills course designed to equip the student to handle the English major. Emphasizes critical writing and the acquisition of basic techniques and vocabulary of literary criticism through close attention to varieties of prose language. Required for the English major beginning in the fall of 1994. Limited to English majors only.

**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, African American and Chicano traditions. Same as ETHN 1800. Approved for arts and sciences core curriculum: cultural and gender diversity.

**ENGL 1840 (1-3). Independent Study, Lower Division.** Creative writing.

**ENGL 1850 (1-3). Independent Study, Lower Division.** Literature/language.

**ENGL 2010-3. Modern Critical Thought.** Introduces students to a wide range of critical theories that English majors need to know. Organized as a survey. Covers major movements in modern literary/critical theory from Matthew Arnold through new criticism to contemporary post-modern frameworks. Required for the English major beginning in the fall of 1992. Limited to English majors only.

**ENGL 3000-3. Shakespeare for Nonmajors.** Introduces students to Shakespeare's major works—the histories, comedies, and tragedies. May include the nondramatic poetry as well. Approved for arts and sciences core curriculum: literature and the arts. Prereq., sophomore standing.

**ENGL 3060-3. 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. Prereq., sophomore standing.

**ENGL 3930 (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 4030-3. Critical Thinking in English Studies.** Concerned with developments in the study of literature that have significantly influenced our conception of the theoretical bases for study and expanded our understanding of appropriate subject matter. Approved for arts and sciences core curriculum: critical thinking. May not be repeated. Prereq., senior standing. Limited to English and humanities majors only.

**ENGL 4100-3. 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. Assumes elementary knowledge of English grammar. Prereq., senior standing.

**ENGL 4250-3. Modern Novel.** Close study of masterpieces by such novelists as Proust, Joyce, Woolf, Lawrence, Mann, Kafka, and Faulkner. Prereq., senior standing.

**ENGL 4260-3. Contemporary Novel.** Studies major novelists and developments in the genre, emphasizing novels written since 1945. Prereq., senior standing.

**ENGL 4360-3. Modern Drama.** Continental, British, and American drama since Ibsen. Prereq., senior standing.

**ENGL 4460-3. Modern Poetry.** Selection of the works of British and American poets from 1900 to the present. Prereq., senior standing.

**ENGL 4720-3. Seminar: Topics in English.** Studies such topics as heroism in eighteenth century literature, eros and violence, South African women writers, politics and religion in nineteenth century literature, and American

humor. Specially designed for senior English majors. May not be repeated. Prereq., senior standing. Limited to English and humanities majors only.

**ENGL 4830-3. Honors Thesis.**

**ENGL 4840 (1-3). Independent Study, Upper Division.** Creative writing.

**ENGL 4850 (1-3). Independent Study, Upper Division.** Literature/language.

### *Undergraduate Writing*

**ENGL 1001-3. Freshman Writing Seminar.** Provides training and practice in writing. Focuses on the writing process, the fundamentals of composition, and the structure of argument. Provides numerous and varied assignments with opportunity for revision. Approved for arts and sciences core curriculum: lower division written communication.

**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. May not be repeated.

**ENGL 2021-3. Introductory Poetry Workshop.** Introductory course in poetry writing. Prereq., ENGL 1191 or transfer equivalent. May be taken up to three times for credit.

**ENGL 2051-3. Introductory Fiction Workshop.** Introductory course in fiction writing. Prereq., ENGL 1191 or transfer equivalent. 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 3061-3. Literary Publishing: Why and How.** Surveys the recent history and purposes of literary publishing and teaches its methods and practices, from editing to the art of nonfiction prose. In addition to lectures and class discussion, offers optimal hands-on experience with university-affiliated publications.

**ENGL 3071-3. The Practice of Publishing.** Surveys the history and technical evolution of book and journal publishing and equips students with a working knowledge of contemporary publishing practices. In addition to lectures and class discussion, offers optimal hands-on experience with university publications.

**ENGL 3081-3. Intermediate Nonfiction Workshop.** Discussion and practical criticism of student work and discussion of relevant works of literary nonfiction. Prereq., instructor consent based on submission of manuscript.

**ENGL 3151-3. Advanced Composition: Style.** Same as UWWRP 3150.

**ENGL 3161-3. Report Writing.** Instruction and practice in various forms of reports, papers, and articles. Style and editing are emphasized. Prereq., sophomore standing.

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 4071-3. Scriptwriting Workshop. Designed to give students practical criticism of their script writing and technical format requirements. Either stage plays or screenplays will be studied, as announced. Admission by submission of manuscript and permission of instructor. Same as ENGL 5289.

ENGL 4081-3. Playwriting. Prereq., instructor consent. May be taken up to three times for credit.

### Backgrounds of British and American Literature

ENGL 2602-3. Introduction to Western European 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 and 1020.

ENGL 2612-3. Introduction to Western European 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 and 1020.

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. Prereq., sophomore standing. Limited to English and humanities majors only.

ENGL 3312-3. The Bible as Literature. Surveys literary achievements of the Judeo-Christian tradition as represented by the Bible. Prereq., sophomore standing.

### British Literature

ENGL 3163-3. History and Literature of Georgian England. Provides an 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. Prereq., sophomore standing.

ENGL 3503-3. Survey of British Literature 1. Chronological study of greater figures and forces in English literature from Beowulf to 1660. Prereq., sophomore standing. Limited to English, humanities, and film studies majors only.

ENGL 3513-3. Survey of British Literature 2. Continuation of ENGL 3503. Prereq., sophomore standing. Limited to English, humanities, and film studies majors only.

ENGL 3543-3. 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. Prereq., sophomore standing.

ENGL 3553-3. Chaucer: *The Canterbury Tales*. Short introduction to Middle English precedes study of the poetry. Prereq., sophomore standing. Limited to English and humanities majors only.

ENGL 3563-3. Shakespeare 1. Shakespeare's works through 1600. Prereq., sophomore standing. Limited to English, humanities, and theatre majors only.

ENGL 3573-3. Shakespeare 2. Shakespeare's works after 1600. Prereq., sophomore standing. Limited to English, humanities, and theatre majors only.

ENGL 3583-3. Milton. Milton's poetry and selected prose. Prereq., sophomore standing. Limited to English and humanities majors only.

ENGL 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. Same as HIST 4113. Approved for arts and sciences core curriculum: historical context. Prereq., senior standing.

ENGL 4203-3. Development of the English Novel 1. From the beginnings to 1830. Prereq., senior standing.

ENGL 4213-3. Development of the English Novel 2. Continuation of ENGL 4203. Prereq., senior standing.

ENGL 4223-3. Modern British and Irish Novel. Studies major figures and trends in the twentieth century. Prereq., senior standing.

ENGL 4503-3. Medieval Literature 1. Intensive study of the major literary works of the Middle Ages in Europe. Prereq., senior standing.

ENGL 4513-3. Medieval Literature 2. Intensive study of the major literary works of the Middle Ages in Britain. Prereq., senior standing.

ENGL 4523-3. The Renaissance in England: 1500-1600. Selected prose and nondramatic poetry from Skelton and More through Shakespeare and his contemporaries. Prereq., senior standing.

ENGL 4533-3. The Renaissance in England: 1600-1700. Selected prose and poetry by Donne, Jonson, Bacon, and their successors. Prereq., senior standing.

ENGL 4543-3. The Age of Satire: 1660-1740. Dryden, Defoe, Swift, Pope, Addison, and Steele, and their contemporaries. Prereq., senior standing. Limited to English and humanities majors only.

ENGL 4553-3. The Age of Sense and Sensibility: 1740-1800. Gray, Johnson, Goldsmith, Boswell, Cowper, Burns, Blake, and their contemporaries. Prereq., senior standing.

ENGL 4563-3. The Early Romantics. Major emphasis on Blake, Coleridge, and Wordsworth. Prereq., senior standing. Limited to English and humanities majors only.

ENGL 4573-3. The Later Romantics. Major emphasis on Keats, Shelley, and Byron. Prereq., senior standing. Limited to English and humanities majors only.

ENGL 4603-3. The Early Victorians. Main currents of Victorian thought in prose and poetry, 1830-1860. Prereq., senior standing. Limited to English and humanities majors only.

ENGL 4613-3. The Later Victorians. Continuation of ENGL 4603, covering 1860-1900. Prereq., senior standing. Limited to English and humanities majors only.

ENGL 4673-3. 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 5679. Prereq., senior standing.

ENGL 4683-3. *Beowulf*. Students read and analyze *Beowulf* in the original language, with some attention to additional background readings. Prereq., senior standing.

### American Literature

ENGL 3654-3. Survey of American Literature 1. Chronological survey of the literature from Bradford to Whitman. Prereq., sophomore standing. Limited to English, humanities, and film studies majors only.

ENGL 3664-3. Survey of American Literature 2. Chronological survey of the literature from Whitman to Faulkner. Continuation of ENGL 3654. Prereq., sophomore standing. Limited to English, humanities, and film studies majors only.

ENGL 4234-3. American Novel 1. From the beginnings to 1900. Prereq., senior standing.

ENGL 4244-3. American Novel 2. From 1900 to the present. Prereq., senior standing.

ENGL 4654-3. Studies in American Literature to 1900. Extensive study of particular periods and movements in American literature. Prereq., senior standing. Limited to English and humanities majors only.

ENGL 4664-3. Studies in American Literature after 1900. Extensive study of particular periods and movements in American literature. Prereq., senior standing. Limited to English and humanities majors only.

### Theory

ENGL 3115-3. Topics in Theory. Studies special topics in theory, specially designed for English majors. Topics vary each semester. Students may receive credit for this course up to two times for different topics. Prereq., sophomore standing.

ENGL 3795-3. Queer Theory. Surveys theoretical, critical, and historical writings in the context of lesbian, bisexual, and gay literature. Examines relationships among aesthetic, cultural, and political agendas, and literary and visual texts of the twentieth century. Prereq., sophomore standing.

ENGL 4005-3. Literature and Psychology. Critical application of basic concepts of psychology to world literature. Prereq., senior standing.

ENGL 4125-3. Topics in Theory. Studies special topics in theory; specially designed for English majors. Topics vary each semester. Students may receive credit for this course up to two times for different topics. Prereq., senior standing.



**Popular Culture**

ENGL 3226-3. 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. Prereq., sophomore standing.

ENGL 3246-3. Topics in Popular Culture. Studies special topics in popular culture; specially designed for English majors. Topics vary each semester. Students may receive credit for this course up to two times for different topics. Prereq., sophomore standing.

ENGL 4016-3. 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 contemporary views of etiology. Prereq., senior standing.

ENGL 4256-3. Topics in Popular Culture. Studies special topics in popular culture; specially designed for English majors. Topics vary each semester. Students may receive credit for this course up to two times for different topics. Prereq., senior standing.

ENGL 4286-3. 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 3226 and senior standing.

**Multicultural Literature**

ENGL 2717-3. 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. Same as AIST 2712.

ENGL 2727-3. Survey of African-American Literature 1. Chronological study of African-American literature from the seventeenth century to the Harlem Renaissance. Same as BLST 2722.

ENGL 2737-3. Survey of African-American Literature 2. Chronological study of African-American literature from the Depression writers to the present. Same as BLST 2732.

ENGL 2747-3. Survey of Chicano Literature. Introduces Chicano literary studies, focusing on narrative works by major Chicano/a writers. Examines a diverse range of Chicano/a writing as it addresses recurring issues and themes, including language, race and class oppression, questions of identity, and gender relations. Same as CHST 2742.

ENGL 2757-3. Survey of Asian-American Literature. Surveys the narrative literature of major Asian-American writers of Chinese, Japanese, Korean, Filipino, Asian Indian, and Southeast Asian descent. Explores such themes as: immigration, generational and cultural difference, stereotypes, and cultural identity, emphasizing a critical analysis framed by socio-historical contexts. Same as AAST 2752.

ENGL 2767-3. Survey of Post-Colonial Literature. Surveys the development of literatures in

English in former British colonies. Topics include the spread and adaptation of English language literary forms in Asia; Africa, the Caribbean, and the "Far New World" (Australia and New Zealand). Students will learn the causes of the dispersion and the motivations for the clearly different uses of English literary forms in the ex-colonies. Same as ETHN 2762.

ENGL 3377-3. Topics in Multicultural Literature. Studies special topics in multicultural literature; specially designed for English majors. Topics vary each semester. Students may receive credit for this course up to two times for different topics. Prereq., sophomore standing.

ENGL 3677-3. 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. Prereq., sophomore standing.

ENGL 4387-3. Topics in Multicultural Literature. Studies special topics in multicultural literature; specially designed for English majors. Topics vary each semester. Students may receive credit for this course up to two times for different topics. Prereq., senior standing.

ENGL 4697-3. Contemporary African-American Literature 1. Advanced in-depth study of the works of prominent African-American novelists and poets. Same as BLST 4692. Prereq., senior standing.

**Gender Studies**

ENGL 2708-3. Introduction to Lesbian, Bisexual, and Gay Literature. Offers students at sophomore and junior levels an introduction to some of the forms, concerns, and genres of contemporary lesbian, bisexual, and gay writing in English. Prereq., sophomore standing.

ENGL 3218-3. Topics in Gender Studies. Studies special topics in gender studies; specially designed for English majors. Topics vary each semester. Students may receive credit for this course up to two times for different topics. Prereq., sophomore standing.

ENGL 3268-3. Women Writers. Introduces literature by British and American women. Same as WMST 3262. Prereq., sophomore standing.

ENGL 4228-3. Topics in Gender Studies. Studies special topics in gender studies; specially designed for English majors. Topics vary each semester. Students may receive credit for this course up to two times for different topics. Prereq., senior standing.

ENGL 4278-3. 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. Prereq., senior standing.

ENGL 4288-3. Studies in Lesbian, Gay, Bisexual, and Transgender Literature. Examines selected British, American, and French literary representations of lesbian and gay identity from

the early 16th century to the present. Discusses the changing status of homosexuality as a literary and cultural topos—how same-sex desire is defined, and the rhetorical and ideological difficulties involved in its representation. Specific topic will vary. Prereq. senior standing.

**Graduate Courses**

ENGL 5009, 5019, 5029-3. 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 5109 through 5199-3. Studies in Special Topics. Special topics in British and American language and literature.

ENGL 5309. Playwriting. Admission by submission of manuscript and/or instructor consent.

ENGL 5209-3. Studies in the Novel. In-depth analyses of novels that are significant in mainstream traditions or that display major departures.

ENGL 5219, 5229-3. 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 5239, 5249-3. 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 5259-3. 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 5269-3. Publishing Workshop. Provides practical experience in the editorial, design, and business procedures of the publishing industry.

ENGL 5279-3. Studies in Poetry. Covers poetry, mainly American, written since World War II.

ENGL 5289-3. Scriptwriting Workshop. Designed to give students practical criticism of their script writing and technical format requirements. Either stage plays or screenplays are studied, as announced. Admission by submission of manuscript and permission of instructor. Same as ENGL 4071.

ENGL 5299-3. Studies in Fiction. Covers fiction, mainly American, written since World War II.

ENGL 5509-3. Medieval Literature. Selections representative of life and thought of the Middle Ages up to 1500.

ENGL 5529-3. Renaissance and Seventeenth-Century Literature.

ENGL 5549-3. Restoration and Eighteenth-Century Literature. Explores poetry, novel, and nonfiction prose of the period, with rotating emphases on genres and topics.

ENGL 5559-3. Studies in the Nineteenth Century. Covers principal movements and developments.

**ENGL 5659-3. 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 5669-3. Twentieth-Century American Literature.**

**ENGL 5679-3. Anglo-Saxon Language and Literature.** Same as ENGL 4673.

**ENGL 5709-3. Chaucer.** Intensive study of *The Canterbury Tales* and other works by Chaucer.

**ENGL 5849 (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 5859 (1-3). Tutorials in Medieval Studies.**

**ENGL 5869 (1-3). Tutorials in Renaissance Studies.**

**ENGL 5879 (1-3). Tutorials in Restoration and Eighteenth Century Studies.**

**ENGL 5889 (1-3). Tutorials in Romantic Studies.**

**ENGL 5899 (1-3). Tutorials in Victorian Studies.**

**ENGL 5909 (1-3). Tutorials in Modern Studies.**

**ENGL 6849 (1-3). Tutorials in American Studies.**

**ENGL 6859 (1-3). Tutorials in Author Studies.**

**ENGL 6869 (1-3). Tutorials in Creative Writing.**

**ENGL 6949-3. Master's Degree Candidate.**

**ENGL 6959 (3-6). Master's Thesis.**

**ENGL 7009-3. 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 7109-3. 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 7119-3. History of English Studies.** Surveys the intellectual, institutional, and pedagogic origins and development of the study of English and American literature and language in universities from the eighteenth through the twentieth centuries.

**ENGL 7489-3. Problems in Literary Theory.**

**ENGL 7849 (1-3). Independent Study, Graduate Level 2.**

**ENGL 7889-1. 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.

**ENGL 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.

## Environmental, Population, and Organismic Biology

The Department of Environmental, Population, and Organismic (EPO) Biology offers three sequences: (1) EPOB 1210 and 1220 are lecture-only courses intended for science majors. The accompanying labs (EPOB 1230 and 1240) are designed for and required of EPOB majors; they also are suitable for other science majors. (2) EPOB 1610 and 1620 are lecture-only honors courses designed for biology majors and others with at least one year each of high school biology and chemistry. (3) EPOB 1030, 1040 and 1050 are designed 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. Credit for EPOB 1210 and 1230 can be used as credit for MCDB 1150 and 1151, but not MCDB 2150 and 2151. Students majoring in biology who transfer biology credit from other institutions must also consult their departmental advisor.

**EPOB 1030-3. Biology: A Human Approach 1.** Lect., rec. 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. For nonscience majors. Approved for arts and sciences core curriculum: natural science. Similar to EPOB 1010.

**EPOB 1040-3. Biology: A Human Approach 2.** Continuation of EPOB 1030, focusing on the function of the human body, and maintenance of dynamic equilibrium in the internal environment in the face of a continually changing external environment. Factors influencing these homeostatic conditions and how and why they change are discussed. Approved for arts and sciences core curriculum: natural science. Prereq., EPOB 1030. Similar to EPOB 1020.

**EPOB 1050-1. Biology: A Human Approach Laboratory.** One two-hour lab per week. Experiments and exercises relating to concepts presented in EPOB 1030 and 1040 Biology: A Human Approach 1 and 2. Recommended for nonscience majors. This course uses animals and/or animal tissues. Approved for arts and sciences core curriculum: natural science laboratory.

**EPOB 1210-3. General Biology 1.** Lect. Concentrated introduction to molecular, cellular, genetic, and evolutionary biology. Emphasizes fundamental principles, concepts, facts, and questions that receive more detailed consideration later in the EPO biology 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 that receive more detailed consideration later in the EPO biology curriculum. Prereq., EPOB 1210 or equivalent. Recommended for science majors. Similar to EPOB 1620.

Approved for arts and sciences core curriculum: natural science.

### EPOB 1230-1. General Biology Laboratory

1. One three-hour lab per week. 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 or equivalent. Recommended for science majors. This course uses animals and/or animal tissues. Equivalent course is MCDB 1151. Approved for arts and sciences core curriculum: natural science.

### EPOB 1240-1. General Biology Laboratory

2. One three-hour lab per week. Diversity, physiology, and ecology of whole organisms. Provides direct experience with experimental procedures, identification of organisms, and report preparation. Prereq. or coreq., EPOB 1220 or equivalent. Recommended for science 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 permission from the Honors Program. Approved for arts and sciences core curriculum: natural science.

**EPOB 1840 (1-6). Independent Study (Freshman).** May be repeated for a total of 6 credit hours.

**EPOB 1870 (1-6). Independent Research (Freshman).** May be repeated for a total of 6 credit hours.

**EPOB 1950-3. Introduction to Scientific Writing.** Lect. Review of writing skills with emphasis on those most important to scientific writing. Focus is on analysis and argument with attention to organization, data presentation, and style; essay and research paper writing; and reading comprehension. No biology credit for EPOB majors. Approved for arts and sciences core curriculum: written communication.

**EPOB 2010 (1-3). Environmental Issues and Biology.** Lect. 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. Prereq., EPOB 1210 or equivalent.

### EPOB 2500-4. Introduction to Horticulture.

Lect. and lab. 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. Prereqs., EPOB 1210 and 1220 or equivalent.

**EPOB 2840 (1-6). Independent Study** (Sophomore). May be repeated for a total of 6 credit hours.

**EPOB 2870 (1-6). Independent Research** (Sophomore). May be repeated for a total of 6 credit hours.

**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 equivalent. Open to nonmajors.

**EPOB 3150-3. Introduction to Tropical Conservation Biology.** This intensive five-week course (first summer session) is held partly on the Boulder campus (two weeks) and partly in Puerto Rico (three weeks). Emphasizes practical aspects of conservation biology, especially as they pertain to the tropical regions of the world. Prereqs., one year of introductory biology (EPOB 1030, 1040, 1050, or EPOB 1210, 1220, 1230, and 1240). Approved for arts and sciences core curriculum: natural science.

**EPOB 3160-3. Paleocology.** Lect. and field trips. 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; ecological instability in North America; extinction of large mammals; why environmental planning ignores historical perspective. Prereqs., EPOB 1210 and 1220 or equivalent.

**EPOB 3170-3. Arctic and Alpine Ecology.** Lect., field trips. 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. Prereqs., EPOB 1210 and 1220, or equivalent, or GEOL 1010, or GEOG 1992.

**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, global change, and environmental ethics. Prereqs., EPOB 1210 and 1220 or equivalent. Open to nonmajors. Approved for arts and sciences core curriculum: natural science.

**EPOB 3190-3. Tropical Marine Ecology.** 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 environment. For non-biology majors. Prereqs., EPOB 1210 and 1220 or equivalent. Approved for arts and sciences core curriculum: natural science. Formerly NASC 3510.

**EPOB 3200-4. 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. Similar to MCDB 2150. Prereqs., EPOB 1210 and 1220 or equivalent.

**EPOB 3240-4. Animal Behavior.** Lect. Topics include basic concepts and history, methods of study, ethical issues, neurobiology and behavior, the development of behavior, predator-prey relationships, communication, aggression and dominance, mating systems, cognitive ethology, and parental care. Where possible, life-history strategies, the evolution of behavior, and behavioral ecology are stressed. Prereqs., EPOB 1210 and 1220, or equivalent, or PSYC 1001, or ANTH 2020.

**EPOB 3250-3. Principles of Evolution.** Introduces evolutionary biology, including the patterns of evolutionary history and the processes that give rise to them, history of evolutionary ideas, phylogeny, diversification of life, microevolutionary processes, population variation, speciation, molecular evolution, and human evolution. Prereqs., EPOB 1210 and 1220 or equivalent.

**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 or equivalent. 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 equivalent. 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. Students may not receive credit for both EPOB 3430 and PHED 2800. Prereqs., EPOB 1210-1240 or equivalent, and CHEM 1071, 1131, or 1171; EPOB 3420 strongly recommended. This course uses animals and/or animal tissues.

**EPOB 3450-3. Biology of Human Reproduction.** Lect. Anatomy and physiology of human reproduction, including sex determination, embryology, puberty, menstrual cycle, pregnancy, lactation, menopause, sexual behavior, sexual abnormalities, and contraception. Prereqs., EPOB 1210 and 1220 or equivalent. Open to nonmajors.

**EPOB 3470-3. History of Biology.** Surveys major themes in biological theory development from ancient times to present, emphasizing complimentary roles of observation, experiment, and technical innovation, and influence of general cultural environment on scientific advance. Readings in primary and secondary sources, lectures, discussion. Prereqs., EPOB 1210 and 1220 or equivalent.

**EPOB 3500-4. Plant Kingdom.** Lect. and lab. Surveys plant types emphasizing diagnostic features of plants in general and major taxa in particular. Emphasizes identity, morphology, anatomy, reproduction, ecology, geography, evolution, fossil record, and economic use of taxa. Prereqs., EPOB 1210 and 1220 or equivalent.

**EPOB 3510-4. Plant Anatomy and Development.** Lect. and lab. Introduction to 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 equivalent.

**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. Prereq., EPOB 3200.

**EPOB 3530-5. Essentials of Plant Physiology.** Mechanisms of plant functioning and how such functioning relates to the performance of the plant under different environmental conditions. Phenomena include water relations, growth and development, and metabolic processes including photosynthesis, respiration, and responses to stress. Prereqs., EPOB 1210 and 1220 or equivalent, and CHEM 1071, 1131, or 1171.

**EPOB 3630-3. Parasitology.** Lect. and lab. Surveys animal parasites, including life histories; emphasizes parasites of humans. Prereqs., EPOB 1210 and 1220 or equivalent. This course uses animals and/or animal tissues.

**EPOB 3650-3. Embryology.** Lect. 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 equivalent, and EPOB 3200 or MCDB 2150; coreq., EPOB 3660.

**EPOB 3660-2. Developmental Biology Laboratory.** Lab for EPOB 3650 and MCDB 4650. Studies live and prepared embryos from a variety of organisms, including amphibia, chickens, nematodes, and fruit flies. Topics include descriptive and experimental embryology, developmental genetics, and molecular biology methods applied to developing systems. Prereq., EPOB 3200 or MCDB 2150; 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. Introduction to principles of animal physiology and responses to environmental change. Prereqs., EPOB 1210 and 1220 or equivalent and CHEM 1071, 1131, or 1171. This course uses animals and/or animal tissues.

**EPOB 3720-5. 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 equivalent. This course uses animals and/or animal tissues.

**EPOB 3840 (1-6). Independent Study (Junior).** May be repeated for a total of 6 credit hours.

**EPOB 3870 (1-6). Independent Research (Junior).** May be repeated for a total of 6 credit hours.

**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. May be repeated for a total of 6 credit hours.

**EPOB 3940-3. Argument in Scientific Writing.** Lect. Argumentative strategies used in scientific writing. Reviews essential writing skills to prepare students for academic and professional communication. Limited to juniors and seniors. No biology credit for EPOB majors. Approved for arts and sciences core curriculum: written communication.

**EPOB 4000-3. Teaching 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 equivalent, and junior standing. Same as EPOB 5000.

**EPOB 4010 (1-2). Teaching Biology.** Opportunity to assist in teaching of specific laboratory section in EPO Biology under direct faculty supervision. Students must make arrangements with the faculty member responsible for the course in which they plan to assist. No student can receive independent study credit through this program. May repeat once in a different course.

**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, 4170 or 5150, 5170). Prereq., EPOB 3020. 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. Same as EPOB 5030.

**EPOB 4040-3. Conservation Biology.** Lect. 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. Prereq., EPOB 3020. Same as EPOB 5040.

**EPOB 4045-3. Medical Ecology and Environmental Health.** Lect. 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 environmen-

tal factors in chronic diseases. Prereqs., EPOB 1210 and 1220 or equivalent. Same as EPOB 5045.

**EPOB 4070-3. Geographical Ecology.** Lect. 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. Same as EPOB 5070.

**EPOB 4090-2. 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., EPOB 3020 and SCUBA certification. Formerly NASC 4250.

**EPOB 4100, 4110, 4120, 4130, 4140 (2-4). Advanced Ecology.** Specific aspects of ecology, emphasizing faculty specialties. One or more courses are offered most semesters. Topics may include dynamics of mountain ecosystems, tundra ecology, population dynamics, landscape ecology, tropical and insular biology, ecology of fishes, quantitative plant ecology, and arctic and alpine environments. Courses may use animals and/or animal tissues. Prereqs., EPOB 1210 and 1220 or equivalent and EPOB 3020. Same as EPOB 5100, 5110, 5120, 5130, 5140.

**EPOB 4150 (1-2). Techniques in Ecology.** Emphasizes application of modern ecological techniques, such as stream biology, aquatic biology, environmental measurement and control, and techniques in geoecology. Same as EPOB 5150.

**EPOB 4165-3. Landscape Ecology.** Distribution patterns of communities and ecosystems, and ecological processes that affect those patterns over time. Consideration of spatial and temporal scales in ecological analyses is required to understand and predict response to broad-scale environmental change. Prereqs., EPOB 1210, 1220, and 3020, or equivalent. Same as EPOB 5165.

**EPOB 4170-3. Ecosystem Ecology.** 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.** Lect. 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 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. Action potential generation, synaptic transmission and neuronal integration in terms of the neurophysiology and biophysics of single nerve cells. These topics lead to an introduction

to information processing by neural circuits and neuronal changes underlying selected behavioral modifications. Restricted to EPOB majors with 87-180 predicted cumulative hours. 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 4190, or MCDB 3120. 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 EPO biology. Approved for arts and sciences core curriculum: critical thinking.

**EPOB 4240-3. Advanced Topics in Animal Behavior.** Lect. Special areas of ethology such as sociobiology, animal communication, cognitive ethology, human ethology, moral and ethical issues. Prereq., EPOB 3240. Same as EPOB 5240. Approved for arts and sciences core curriculum: critical thinking.

**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. Same as EPOB 5270. Approved for arts and sciences core curriculum: critical thinking.

**EPOB 4350 (1-4). Biological Field Studies.** Stresses broad areas of biology and employs field approaches. This course uses animals and/or animal tissues. May be repeated for a total of 4 credit hours. Prereqs., EPOB 1210 and 1220 or equivalent. Same as EPOB 5350.

**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 biodegradation 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 equivalent. 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 tech-

niques appropriate to realistic biological problems. Includes data file management using interactive computing techniques. Prereqs., EPOB 1210 and 1220 or equivalent, 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. Same as EPOB 5420. Approved for arts and sciences core curriculum: critical thinking.

**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. Prereq., EPOB 3430 or 3700.

**EPOB 4460 (1-4). Special Topics.** Specialized areas of physiology including invertebrate physiology, cell physiology, vertebrate reproduction, and others. Prereq., EPOB 3430 or 3700. Same as EPOB 5460. May be repeated for a total of 7 credit hours.

**EPOB 4470 (1-4). Special Topics Lab.** Special topics in biology laboratory. Prereq., EPOB 3430 or 3700. Same as EPOB 5470. May be repeated for a total of 7 credit hours.

**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 equivalent. 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, plant ecology, plants of Colorado, developmental plant anatomy, and Cenozoic paleobotany. Prereq., EPOB 3020. Same as EPOB 5550. May be repeated for a total of 4 credit hours.

**EPOB 4570-3. Advanced Plant Physiology.** Critical evaluation of various concepts underlying the functioning of plants, including current controversial topics. Emphasizes the responses of plants to various environmental factors. Prereq., EPOB 3530 or EPOB 4080. Same as EPOB 5570. Approved for arts and sciences core curriculum: critical thinking.

**EPOB 4580 (2-4). Advanced Topics in Plant Physiology.** Studies special areas of plant physiological processes such as growth, development, photosynthesis, respiration, water relations, etc. Topics vary from year to year. Prereqs., EPOB 1210 and 1220 or equivalent, and one of the following: EPOB 3500, 3510, 3520, or 3530. Same as EPOB 5580. May be repeated for a total of 7 credit hours.

**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 or equivalent; EPOB 3400, 3510, or 3520; and

EPOB 3200 or 3700. Approved for arts and sciences core curriculum: critical thinking.

**EPOB 4630 (2-6). 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. Prereq., EPOB 3020. Same as EPOB 5630.

**EPOB 4640 (2-4). Plant Field Studies.** Field-oriented course offered at irregular intervals during the academic year or during summer sessions. May include field botany and plants of Colorado.

**EPOB 4650-4. Invertebrate Zoology.** Lect. and lab. Broad study of the biology of the most diverse group of organisms on earth. Areas include ecology, physiology, evolution, and morphology of aquatic and terrestrial forms. Prereqs., EPOB 1210 and 1220 or equivalent. Same as EPOB 5650. Students are encouraged to enroll simultaneously in EPOB 4690/5690. 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 equivalent. Same as EPOB 5660. This course uses animals and/or animal tissues.

**EPOB 4670 (2-4). Advanced Invertebrate Biology.** 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 equivalent. Same as EPOB 5670, 5680. This course uses animals and/or animal tissues.

**EPOB 4690 (1-6). Invertebrate Zoology Field Course.** Intensive week-long course held during spring break at the CEDO marine biological station on the Sea of Cortez, Puerto Penasco, Mexico. Emphasis on natural history, collection, identification and morphology of marine intertidal invertebrates; and on quantitative techniques using transects to assess local species distributions. Prereq. or coreq., EPOB 4650. Same as EPOB 5690.

**EPOB 4710-3. Biology of Mollusks.** Lect. and lab. Lectures deal with eight molluscan classes and their basic functional morphology, development, physiology, ecology, distribution, phylogeny, and evolution. Four labs for dissection and classification of snails and clams. Prereq., EPOB 4650; or EPOB 1210 and 1220 or equivalent. Same as EPOB 5710.

**EPOB 4740-3. Biology of Amphibians and Reptiles.** Comparative morphology, taxonomy, ecology, behavior, and geographic distribution of amphibians and reptiles. Prereqs., PSYC 1001 and 2012, or EPOB 1210 and 1220 or equivalent. This course uses animals and/or animal tissues. 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. Same as EPOB 5750. This course uses animals and/or animal tissues.

**EPOB 4760-4. Mammalogy.** Lect., lab, and field studies. Origin, evolution, diversity, ecology, and zoogeography of mammals; field and laboratory emphasis on Coloradan species. Prereq., EPOB 3020. Same as EPOB 5760. This course uses animals and/or animal tissues.

**EPOB 4770-4. Vertebrate Zoology.** Lect., lab., and field trips. Natural history of the major groups of living vertebrates, including their origin and evolution, behavior, ecology, anatomy, and physiology. Same as EPOB 5770. This course uses animals and/or animal tissues.

**EPOB 4800-3. Critical Thinking in Biology.** Different sections of this course fulfill the arts and sciences core curriculum requirement in critical thinking. Consult the EPOB department office for current listings. Different course sections may be repeated for a maximum of 6 credit hours on different topics. Prereq., minimum of 14 hours EPOB course work. Same as EPOB 5800. Restricted to students with 87-180 predicted cumulative hours.

**EPOB 4840 (1-6). Independent Study (Senior).** May be repeated for a total of 6 credit hours.

**EPOB 4870 (1-6). Independent Research (Senior).** May be repeated for a total of 6 credit hours.

**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 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 5165-3. Landscape Ecology.** Same as EPOB 4165.

**EPOB 5170-3. Ecosystem Ecology.** Same as EPOB 4170.

**EPOB 5190-3. Introduction to Neurobiology.** Same as EPOB 4190 and MCDB 5190.

**EPOB 5200-3. Developmental Neurobiology.** Same as EPOB 4200.

**EPOB 5240-3. Advanced Topics in Animal Behavior.** Same as EPOB 4240.

**EPOB 5270-3. Population Genetics and Evolution.** Same as EPOB 4270.

EPOB 5280 (2-4). **Advanced Topics in Evolution.** Same as EPOB 4280.

EPOB 5350 (1-4). **Biological Field Studies.** Same as EPOB 4350.

EPOB 5360-3. **Microbial Ecology.** 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 5440-3. **Vertebrate Endocrinology.** Lect. Evolutionary analysis of chemical control and integration of physiology and behavior. Instructor consent required.

EPOB 5460 (1-4). **Special Topics.** Same as EPOB 4460.

EPOB 5470 (1-4). **Special Topics Lab.** Same as EPOB 4470.

EPOB 5550 (2-4). **Advanced Botany.** Same as EPOB 4550.

EPOB 5570-3. **Advanced Plant Physiology.** Same as EPOB 4570.

EPOB 5580 (2-4). **Advanced Topics in Plant Physiology.** Same as EPOB 4580.

EPOB 5630 (2-6). **Field Techniques in Environmental Science.** Same as EPOB 4630.

EPOB 5650-4. **Invertebrate Zoology.** Same as EPOB 4650. Students are encouraged to enroll simultaneously in EPOB 4690/5690.

EPOB 5660-4. **Insect Biology.** Same as EPOB 4660.

EPOB 5670 (2-4). **Advanced Invertebrate Biology.** Same as EPOB 4670, 4680.

EPOB 5690-1. **Invertebrate Zoology Field Course.** Same as EPOB 4690.

EPOB 5740-3. **Biology of Amphibians and Reptiles.** Same as EPOB 4740 and PSYC 5740.

EPOB 5750-3. **Ornithology.** Same as EPOB 4750.

EPOB 5760-4. **Mammalogy.** Same as EPOB 4760.

EPOB 5770-4. **Vertebrate Zoology.** Same as EPOB 4770.

EPOB 5800-3. **Critical Thinking in Biology.** Same as EPOB 4800.

EPOB 5820-2. **Graduate Writing Seminar.** Enhances writing proficiency, using graduate writing projects to implement the course concepts. Offers understanding of conventions and strategies used in scientific writing to prepare students for academic and professional communication. Prereqs., graduate standing and basic proficiency in English as a written language.

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. Same as MCDB 5800, PSYC 5800, ASEN 5080.

EPOB 5840 (1-3). **Independent Study (Graduate).** Instructor consent required. May be repeated for a total of 6 credit hours. Same as EPOB 7840.

EPOB 6000 (1-2). **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 6100 through 6130 (1-3). **Seminar in Environmental Biology.** Open only to graduate students. Instructor consent required. Same as EPOB 7100, 7110, 7120, and 7130.

EPOB 6200-6230 (1-3). **Seminar in Population Biology.** Same as EPOB 7200-7230.

EPOB 6300-6330-2. **Seminar in Organismic Biology.** Same as EPOB 7300-7330.

EPOB 6410-3. **Readings in Environmental History.** Offers historical perspective on the complex and interdependent relationship between human social and cultural institutions and the natural world. Considers interdisciplinary methodologies incorporating history, biology, geography, law, and other disciplines. Same as HIST 6417.

EPOB 6840 (1-3). **Independent Research in Environmental Biology.** Instructor consent required. Same as EPOB 8840.

EPOB 6860 (1-6). **Independent Research in Population Biology.** Instructor consent required. Same as EPOB 8860.

EPOB 6880 (1-6). **Independent Research in Organismic Biology.** Instructor consent required. Same as EPOB 8880.

EPOB 6940 (1-3). **Master's Degree Candidate—Plan II.** Instructor consent required.

EPOB 6950 (1-6). **Master's Thesis.** Instructor consent required.

EPOB 7100-7130 (1-3). **Seminar in Environmental Biology.** Same as EPOB 6100-6130.

EPOB 7200-7230-2. **Seminar in Population Biology.** Same as EPOB 6200-6230.

EPOB 7300-7330-2. **Seminar in Organismic Biology.** Same as EPOB 6300-6330.

EPOB 7840 (1-3). **Independent Study Graduate.** Instructor consent required. Same as EPOB 5840.

EPOB 8840 (1-3). **Independent Research in Environmental Biology.** Instructor consent required. Same as EPOB 6840.

EPOB 8860 (1-3). **Independent Research in Population Biology.** Instructor consent required. Same as EPOB 6860.

EPOB 8880 (1-3). **Independent Research in Organismic Biology.** Instructor consent required. Same as EPOB 6880.

EPOB 8990 (1-10). **Doctoral Dissertation.** Instructor consent required.

## Environmental Studies

ENVS 1000-3. **Introduction to Environmental Studies.** A survey of environmental studies examining ecological, socioeconomic, political, aesthetic, and technological factors that influence the quality of life on Earth.

ENVS 3003-3. **Race, Class, and Pollution Politics.** Examines communities affected by major toxic contamination threats in the U.S., evaluating race and class factors in levels of governmental and private sector responses and actions. Investigative research methods utilized at case study sites provide skills necessary for assessment of any environmental threat for protective action. Same as ETHN 3003.

ENVS 3930-3. **Internship.** Provides academically supervised opportunities for environmental studies majors to work in public and private organizations on projects related to students' career goals; relates classroom theory to practice.

ENVS 4100, 4110-3. **Special Topics in Environmental Studies.** Covers a variety of topics not currently offered in the curriculum; offered depending on instructor availability and student demand. May be repeatable for a maximum of 6 credit hours, provided the topics vary.

ENVS 4990-3. **Senior Thesis.** Supervised project involving original research. Open only to environmental studies majors with a 3.00 GPA or better. Thesis proposal must be accepted by honors chairman. Prereq., 3.00 GPA.

## Ethnic Studies

ETHN 1013-3. **Ethnic Notions.** Introduces first year students to the study of contemporary issues in American society through the eyes of culturally diverse groups (Latinos, African Americans, Asians, and Native Americans) as expressed in film, the ethnic press, music, TV programming, and other cultural representations produced by members of these groups.

ETHN 1015-3. **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.

ETHN 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. Emphasizes materials from Native American, Afro-American and Chicano traditions. Same as ENGL 1800. Approved for arts and sciences core curriculum: cultural and gender diversity.

ETHN 2000-3. **Introduction to Ethnic Studies.** A comprehensive, comparative introduction to ethnic studies. Applies analytic perspectives, especially racial formation theory, to the experiences of the four principle peoples of color in the United States: American Indian, Afroamerican, Chicano/Latino, and Asian American.

ETHN 2762-3. **Survey of Post-Colonial Literature.** Surveys the development of literatures in English in former British colonies. Topics include the spread and adaptation of English language literary forms in Asia, Africa, the Caribbean, and the "Far New World" (Australia and New Zealand). Students learn the causes of the dispersion and the motivations for the clearly different uses of English literary forms in the ex-colonies. Same as ENGL 2767.



**ETHN 3000-3. Race, Class, and Gender.**

Examines the uses of race, sex and class as instruments of domination in Western society.

**ETHN 3003-3. Race, Class, and Pollution Politics.**

Examines communities affected by major toxic contamination threats in the United States, evaluating race and class factors in levels of governmental and private sector responses and actions. Investigative research methods utilized at case study sites provide skills necessary for assessment of any environmental threat for protective action. Same as ENVS 3003.

**ETHN 3013-3. Racist Ideology in American Life.**

Explores the origins and evolution of racism as a political and religious force in American life, beginning with Puritan ideology in colonial New England, proceeding through the era of Manifest Destiny, and ending in the present day. Special attention is paid to the history of organizations such as the Ku Klux Klan, and emergence of "Christian Identity" doctrine.

**ETHN 3100-3. Selected Topics in Ethnic Studies.**

Intensive examination of a particular topic, theme, issue, or problem in ethnic studies as chosen by the instructor. May be repeated up to 6 credit hours on different topics.

**ETHN 3500-3. Research Methods in Ethnic Studies.**

Preparation for empirical inquiry in ethnic 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 ethnic studies. Prereqs., ETHN 2000, junior or senior standing, and ETHN major.

**ETHN 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.

**ETHN 3840 (1-3). Undergraduate Independent Study.**

Please consult the Department of Ethnic Studies for further information.

**ETHN 4510-3. Research Practicum in Ethnic Studies.**

Research apprenticeship with emphasis on skill development. Students execute in library, field, or laboratory the research design developed in ETHN 3500. Prereq., ETHN 3500.

**ETHN 4950-3. Senior Seminar in Ethnic Studies.**

Independent project summarizing the work done in ethnic studies. A public presentation of the work executed is a requirement. Prereqs., ETHN 2000, 3500, 4510, and ETHN major.

**Afro-American Studies****BLST 1150-3. 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. Same as ANTH 1150. Approved for arts and sciences core curriculum: cultural and gender diversity.

**BLST 2000-3. Introduction to Afro-American Studies.** Overview of Afro-American 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 Afro-Americans, 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. Approved for arts and sciences core curriculum: cultural and gender diversity, or contemporary societies.

**BLST 2400-2. African American Dance 1.**

Explores the technique, rhythm, and movement style of African/African American dance. History, anthropology, ritual, games, and songs are included in the total cultural experience. Same as DNCE 2500.

**BLST 2410-2. African American Dance 2.**

A continuation of BLST 2400. Technique and rhythms explore various Caribbean, African, and dance forms of the Americas not taught in BLST 2400. Music, history, and folklore help to enhance the dance and provide a total cultural experience. Same as DNCE 2510.

**BLST 2722-3. Survey of African-American Literature 1.**

Chronological study of African-American literature from the seventeenth century to the Harlem Renaissance. Same as ENGL 2727.

**BLST 2732-3. Survey of African-American Literature 2.**

Chronological study of African-American literature from the Depression writers to the present. Same as ENGL 2737.

**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 3020-3. Selected Topics in Afro-American 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 Mar-

tin Luther King, Jr. May be repeated for up to 6 credit hours on different topics.

**BLST 3023-3. African-American Family in U.S. Society.**

Systematically examines and analyzes patterns of family life for African-Americans as sociocultural phenomenon within the context of U.S. society. Same as SOC 3023. Approved for arts and science core curriculum: cultural and gender diversity or United States context.

**BLST 3101-3. 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 3101. Approved for arts and sciences core curriculum: contemporary societies, or cultural and gender diversity.

**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 education. 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. Same as RLST 3125. Approved for arts and sciences core curriculum: contemporary society or ideals and values.

**BLST 3203-3. Afro-American Psychology.**

Describes the philosophy, theories, and research findings associated with the psychology of African Americans. Analyzes issues of identity and personality development of African 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 3840 (1-3). Undergraduate Independent Study.****BLST 4650-3. Contemporary Issues in Afro-American Studies.**

Variable topic that allows intensive coverage of a subject, theme, or issue in Afro-American studies. May be repeated for up to 6 credit hours on different topics.

**BLST 4670-3. The Sixties: Critical Black Views.**

Reviews the ideas, events, persons, and organizations oriented to the quest for Black social justice in the decade of the Sixties. Approved for arts and sciences core curriculum: critical thinking.

**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 4697.

**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.

### *American Indian Studies*

**AIST 1023-3. History of American Indian Tribal Governments.** Designed for the Tribal Resource Institute in Business, Engineering, and Science. Introduces students to the history and the continuing development of American Indian tribal governments. Examines several early pre-invasion tribal governments to study their function, sources of power, and governing structure; explores the changes that took place in the tribal governments during the early contact years; examines the Indian Reorganization Act and subsequent legislation; and reviews the status of contemporary tribal governments.

**AIST 1125-3. 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 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 2015-3. Topical Issues in Native North America.** Explores a series of issues including disposition of population; land and resource holdings, water rights, education, religious freedom, military obligations, the sociopolitical role of women, self-governance, and legal standing as these pertain to modern American Indian life. Approved for arts and sciences core curriculum: cultural and gender diversity or United States context.

**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 2700-3. American Indian Religious Traditions.** Introduces religions of the peoples indigenous to the Americas. Concerns include ritual, mythology, and symbolism occurring throughout these cultures in such areas as art, architecture, cosmology, shamanism, sustenance modes, trade, and history. Same as RLST 2700. Approved for arts and sciences core curriculum: ideals and values, or cultural and gender diversity.

**AIST 2712-3. Native American Literature.** Surveys traditional and contemporary North American Native American literature, from traditional oral forms to contemporary genre literature to novel, short story, and poetry. Same as ENGL 2717.

**AIST 3010-3. Marxism and Native Americans.** Contrasts and compares the major tenets of Marxist 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. May be repeated up to 6 credit hours on different topics.

**AIST 3023-3. Native Americans and Environmental Ethics.** Articulates the nature of indigenous environmental relations in this hemisphere, both conceptually and practically. The resulting native system of environmental ethics will be the dominant culture that has supplanted American Indian societies since 1492. Approved for arts and sciences core curriculum: cultural and gender diversity or United States context.

**AIST 3135-3. 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 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 the Department of Ethnic Studies for further information.

**AIST 4025-3. U.S. Indian Relations.** The 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. Same as HIST 4026.

**AIST 4565-3. North American Indian Acculturation.** Comprehensive survey of changes in the native cultures of America north of Mexico caused by occupation of the continent of 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 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.** 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 HIST 4627.

### *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 1717-3. Introduction to Asian-American History.** Introductory-level survey of social history of Asians in America from nineteenth century to the present. Focuses 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 HIST 1717. Approved for arts and sciences core curriculum: United States context.

**AAST 2752-3. Survey of Asian American Literature.** Surveys the narrative literature of major Asian American writers of Chinese, Japanese, Korean, Filipino, Asian Indian, and Southeast Asian descent. Explores such themes as: immigration, generational and cultural difference, stereotypes, and cultural identity, emphasizing a critical analysis framed by socio-historical contexts. Same as ENGL 2757.

**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 Department of Ethnic Studies for further information.

**AAST 4717-3. Chinese-American History.** Examines Chinese-American history from 1848 to the present day within the context of socio-economic and political developments in China and the United States. Covers the Chinese diaspora, immigration to the United States; participation in the economy, the exclusion movement, community development, women and family. Same as HIST 4717. Restricted to junior and senior history or ethnic studies majors, or instructor consent.

**AAST 4727-3. Japanese-American History.** An overview of the Japanese-American experience in the U.S. Highlights pre-WWII processes of immigration, community and family formation, and exclusion, as well as mass incarceration during the 1940s. Same as HIST 4727. Restricted to junior and senior history or ethnic studies majors, or instructor consent.

### *Chicano Studies*

**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 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 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 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 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, or cultural and gender diversity.

**CHST 2742-3. Survey of Chicano Literature.** Introduces Chicano literary studies, focusing on narrative works by major Chicano/a writers. Examines a diverse range of Chicano/a writing as it addresses recurring issues and themes, including language, race and class oppression, questions of identity, and gender relations. Same as ENGL 2747.

**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 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 an examination of controversies surrounding culture and gender through an analysis of feminism. Same as SOCY 3026.

**CHST 3100-3. Selected Topics in Chicano Studies.** Intensive examination of a particular topic, theme, issue, or problem in Chicano studies as chosen by the instructor. May be repeated up to 6 credit hours on different topics.

**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 3153-3. Folklore and Mythology of the Hispanic Southwest.** Concerned with the indigenous and Christian syncretic 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 3905 (1-3). Independent Study.** Instructor consent required.

**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.

**CHST 4015-3. Field Experience in Sociology.** Emphasizes ethnographic techniques including intensive interviewing, direct observation, coding participant observation, interpreting data, theory construction, and report writing. Students conceive and execute a field research project with data collection and analysis, then design and execute a project and prepare a research paper on the basis of the collected data. Same as SOCY 4011.

**CHST 4128-3. The Emergence of Modern Mexico.** The study of Mexican history continues with the establishment of independence in 1821. Examines the upheavals of the Mexican Revolution and culminates with recent events in Mexico. Same as HIST 4128.

**CHST 4133-3. Latinos and the U.S. 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. Prereq., PSCI 1101. 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.

**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.

**CHST 4905 (1-3). Independent Study.** Instructor consent required.

### *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 making narrative sound films, according to instructor. Students will need to purchase materials and rent the necessary equipment. The Film Studies program maintains an equipment pool with modest rental fees for students needing equipment.

**FILM 2300-3. Beginning/Intermediate Filmmaking.** Covers basic camera, editing, and splicing techniques for Super-8 film. Equipment is available at the Film Studies office for a modest rental fee.

**FILM 2400-3. Intermediate Small-Format Production.** Provides instruction in shooting and editing some Super-8 sound film but with an emphasis on small format video. Students complete several short projects involving image and sound, editing, using found footage, documentary or other genres and styles. Prereq., FILM 2000 or instructor's consent.

**FILM 3010 (1-3). 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. Covers 16mm camera operation, splicing, editing, sound transfer and recording, and lab work. 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. 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 2400 with concurrent registration in FILM 3500 and 6 hours of elective Film Studies courses, and instructor consent. A concurrent course is offered for critical studies students who are interested in job experiences when available in critical studies areas.

#### **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 taken twice for credit to fulfill required course work and major requirements. Prereqs., FILM 2000, FILM 2400, 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. 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. Approved for arts and sciences core curriculum: literature and the arts.

**FILM 3301-3. Contemporary Issues in Russian Film.** Examines the relationship between politics, economics, aesthetics, and the way moral and social issues are treated in noteworthy Russian films from the last twenty years. Same as RUSS 3301.

**FILM 3901 (1-3). Independent Study (Critical Study).**

### *Genre and Movements*

**FILM 1502-3. Introduction to Film Studies.** Introduces the critical study of film, exploring basic theoretical concerns while presenting a survey of important film genres, both narrative and non-narrative. Lectures may be 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 screened in class and/or 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, taught in conjunction with the appropriate language department. Typical offerings are the French film, the German film, the Russian film, and so on. Also offers a more detailed approach to a more restricted subject, i.e., film comedy, women filmmakers, German expressionist cinema, Italian neorealism. Course may be repeated for credit within the same term (up to 9 hours total) with department consent. Course may be repeated for credit with department consent, but may be used for partial fulfillment of a college requirements only once.

**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 3015-3. Jung, Film, and Literature.** The basic themes of C.G. Jung's archetypal psychology (shadow, anima/animus, character typology, and individuation) will be studied and applied as tools of critical analysis to selected films and literary texts of the modern period. Prereq., instructor consent. Same as HUMN 3015.

### *Topics*

**FILM 2003-3. Film Topics.** Varying topics on important individuals, historical developments, groupings of films, film directors, critical and theoretical issues in film. May be repeated for a maximum of 9 credit hours, provided the topics are different.

**FILM 2013-3. Film and the Quest for Truth.** Concerns the subjectivity and relativity of truth, focusing on how and why we pursue (or fail to pursue) the truths about ourselves and about the people and events around us, and how and why such truths are often elusive, fragmentary, and impermanent. Normally taught through Farrand Hall. Approved for the arts and sciences core curriculum: ideals and values.

**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, but may be used for partial fulfillment of a college requirements only once. 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 Von 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 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 3501 or 3563 may be used for partial fulfillment of major requirements.

**FILM 3513-3. German Film and Society 2.** History and theory of German cinema with sociocultural emphasis. Emphasis is on post-war film. Taught in English. Same as GRMN 3513.

**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 3501 or 3563 may be used for partial fulfillment of major requirements.

**FILM 3902 (1-3). Independent Study (Reading).**

**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.

### *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 4005 (1-3). Screenwriting Workshop.** A creative workshop in which students write and rewrite several short screenplays as well as a treatment for a feature-length script. Examples from produced scripts are closely analyzed, with careful attention to aesthetics, mechanics, and business practices. A sample of the student's writing must be submitted before acceptance to the 3-hour class.

**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 skills for description of film.

### *Fine Arts*

#### *Photography and Media Arts*

**FINE 1130-2. Multiples.** An introduction to all "multiples" media; including but not limited to photocopying, artist's books, silkscreen, linoleum cut, and intaglio prints.

**FINE 3120-3. Computer Imaging.** Studio course utilizing the personal-computer in generating and processing images in the visual arts. Prereqs., any 2000-level fine arts studio course

and familiarity with computer basics. Restricted to fine arts majors only. May not be repeated. Same as FINE 5120.

**FINE 3230-3. Electronic Arts Survey.** Explores the development of video as an art form through tape screenings, readings, lectures, and discussions. Prerequisite for further studies in video production.

**FINE 3900 (1-3). Undergraduate Independent Study—Video.**

**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 4220-3. Advanced Computer Imaging.** Explores advanced techniques and concepts of digital image-making. Emphasizes the creative application of computer imaging in the production of visual art through individual projects. May be repeated once, for a maximum of 6 credit hours. Prereq., FINE 3120. Restricted to fine arts majors only. Same as FINE 5220.

**FINE 4230-3. Intermediate Electronic Arts Survey.** Continuation of Electronic Arts Survey. Explores the development of video as an art form. Prerequisite for further studies in video production. Same as FINE 5230.

**FINE 4240-3. Beginning Video Production.** Studio course on basic single-camera video production strategies and concepts. Through class screenings, projects, demonstrations, discussions, and readings, students gain an introductory familiarity with camera, lighting, sound, editing, and the organization and planning involved in a video project. Explores a basic theoretical understanding of video as an art form and its relationship to television, film, art, history, and culture. Same as FINE 5240.

**FINE 4340-3. Intermediate Video Production.** Continuation of Beginning Video Production. Extends the knowledge of single-camera video production strategies and concepts. Expands the concept of montage (editing) and strategies to develop a video project through class screenings, projects, discussions, and readings. Further theoretical understanding of video as an art form. Prereq., FINE 4240 or review of work. Same as FINE 5340.

**FINE 4440-3. Advanced Video Production.** Continuation of Intermediate Video Production. Explores advanced technical skills to control the quality of the video image in production, post-production, and distribution. Emphasis on self-motivated independent projects and conceptual realization of advanced student work. Basic working knowledge of distribution and life as a media artist. Further theoretical understanding of video as an art form. Prereq., FINE 4340 or review of work. Same as FINE 5440.

**FINE 4710 (1-3). Studio/Art History Critique.** Consists of consultations with faculty on individual studio problems and projects and/or art history papers and projects. May be repeated for a maximum of 6 credit hours. Prereqs., junior standing and instructor consent.

**FINE 5120-3. Computer Imaging.** Same as FINE 3120.

**FINE 5130-3. Multiples.**

**FINE 5150-3. Performance/Installation.** Same as FINE 4150.

**FINE 5220-3. Advanced Computer Imaging.** Same as FINE 4220. May be repeated for a maximum of 6 credit hours.

**FINE 5230-3. Intermediate Electronic Arts Survey.** Same as FINE 4230.

**FINE 5240-3. Beginning Video Production Image Processing—Computer Animation.** Same as FINE 4240.

**FINE 5340-3. Intermediate Video Production Image Processing—Computer Animation.** Prereq., FINE 4240 or 5240. Same as FINE 4340.

**FINE 5440-3. Advanced Video Production Image Processing—Computer Animation.** Prereq., FINE 4340 or 5240. 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. May not be repeated.

**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. May not be repeated.

**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 are encouraged to discover and develop a personal position in relation to the medium. May be repeated once. Prereq., FINE 2191 or equivalent.

**FINE 3841 (1-3). Undergraduate Independent Study—Photography.**

**FINE 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 for a maximum of 9 credit hours. Prereq., FINE 2191 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, photoinstalla-

tions, electronic media, performance, filmmaking, electrostatic art (copy machine), photo-books, photocollage, and audio/visual art. May be repeated for a maximum of 9 credit hours. Course content changes each semester. Prereq., FINE 2191 or equivalent.

**FINE 4181-3. Advanced Photography.** See FINE 4171. May be repeated for a maximum of 9 credit hours. Prereq., FINE 3191 or equivalent.

**FINE 5161-3. Graduate Photography Seminar.** May be repeated for a maximum of 18 credit hours.

**FINE 5171-3. Graduate New Directions in Photography.** May be repeated for a maximum of 9 credit hours.

**FINE 5181-3. Graduate Photography Seminar.** May be repeated for a maximum of 18 credit hours.

**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. Restricted to Freshmen, Sophomores, Fine Arts Junior/Senior majors; see department. 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. Restricted to Freshmen, Sophomores, Fine Arts Junior/Senior majors; see department. May not be repeated.

**FINE 1202-2. Basic Painting.** General introduction to painting. Color, pictorial space, still life, landscape, figure, and abstract painting. Restricted to Freshmen, Sophomores, Fine Arts Junior/Senior majors; see department. 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. Restricted to Freshmen, Sophomores, Fine Arts Junior/Senior majors; see department. 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 for a maximum of 6 credit hours. Prereq., FINE 1002 or 1012.

**FINE 2202-3. Intermediate Painting.** Emphasizes composition, color, and use of materials in expressing the student's ideas. Prereq., FINE 1202 or FINE 1212. May be repeated once.

**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 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. May not be repeated. Prereq., FINE 2002.

**FINE 3202-3. Advanced Painting 1.** 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. May not be repeated.

**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 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 for a maximum of 12 credit hours. Prereq., FINE 2002.

**FINE 4202-3. Advanced Painting 2.** Expressive pictorial problems involving varied subject matter and painting media emphasizing individual development. May be repeated for a maximum of 12 credit hours. 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.** May be repeated for a maximum of 6 credit hours.

**FINE 5202-3. Graduate Painting.** May be repeated for a maximum of 12 credit hours.

**FINE 5842 (1-3). Graduate Independent Study—Drawing.**

**FINE 5852 (1-3). Graduate Independent Study—Painting.**

### *Printmaking*

**FINE 1003-2. Basic Printmaking.** Emphasizes processes involved with both nonmultiple and multiple methods, including but not limited to metal plate etching (intaglio), lithography, collagraph, woodcut, linoleum cut, xerox transfer, and monotype. Equal emphases placed on developing drawing skills and understanding design principles. Recommended for fine art majors and for nonart majors. May not be repeated.

**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 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.

**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.

**FINE 3423-3. Intermediate Screen Printing.** Refinement of basic techniques emphasizing individual development. May be repeated once.

**FINE 3843 (1-3). Undergraduate Independent Study—Printmaking.**

**FINE 4403-3. Advanced Intaglio and Relief.** May be repeated for a maximum of 6 credit hours. Prereq., FINE 3403.

**FINE 4413-3. Advanced Lithography.** May be repeated for a maximum of 6 credit hours. 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 for a maximum of 6 credit hours. Prereq., FINE 3423.

**FINE 4443-3. Advanced Papermaking.** Papermaking is the study of plant fibers and cellulose structure relating to the making of paper pulp as an art medium. Emphasizes creative use of the paper pulp as related to two- and three-dimensional form. May be repeated for a maximum of 6 credit hours.

**FINE 5403-3. Graduate Intaglio and Relief.** May be repeated for a maximum of 18 credit hours.

**FINE 5413-3. Graduate Lithography.** May be repeated for a maximum of 18 credit hours.

**FINE 5423-3. Graduate Screen Printing.** May be repeated for a maximum of 18 credit hours.

**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. May not be repeated. 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. Prereqs., FINE 2504 or 2514, and 2524.

**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 for a maximum of 6 credit hours. Prereq., FINE 3504 and 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, hand building, and primitive clay forming methods. Investigates utility, function, and ceramics in the fine arts context. Slide presentations explore historical and contemporary attitudes involving ceramics. May not be repeated.

**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.

**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 for a maximum of 12 credit hours.



**FINE 4095-3. Ceramics Seminar.** Designed for students majoring in ceramics. May be repeated for a maximum of 9 credit hours.

**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 Education*

Students entering the University prior to fall semester 1996 may seek art teacher certification. See an art advisor.

**FINE 3626-2. Teaching Art in the Elementary Classroom.** For non-art majors who are enrolled in the elementary teacher certification program. Prereq., junior standing

**FINE 3636-3. Art for the Elementary Teacher.** For persons planning to teach at the elementary level. Theoretical and practical elementary level art methods for the non-art major are covered. Through Continuing Education only.

**FINE 3646-2. Art in the Elementary Schools.** Deals with theoretical and practical problems of teaching art in the elementary school. Prereq., art majors seeking teacher certification. See *Art Education* above.

**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. For art majors seeking certification. Prereqs., FINE 1002, 1202, 1504, and junior standing. See *Art Education* above.

**FINE 3686-2. Art in the Secondary Schools.** Deals with the theoretical and practical problems of teaching art in the secondary school. Prereq., art majors seeking teacher certification. See *Art Education* above.

### *Seminars/Special Topics*

**FINE 2097 (2-3), 3097 (2-3), 4097 (2-3), 5097 (1-3). 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 for a maximum of 18 credit hours provided the topics are different.

**FINE 3007-3. Writing in the Visual Arts.** Enables artists and art historians to improve their writing skills through organization, presentation, critique, and revision. Writing assignments include formal writing (analysis and argument), informal writing, and grant proposals. Approved for arts and sciences core curriculum: upper-division written communication. May not be repeated.

**FINE 3227-3. Critical Thinking: Women's Art—Issues and Controversies.** A reading, writing, and discussion class that investigates important questions about women artists and the art they create. Course material includes exploring persistent critical and cultural attitudes toward women in a critical thinking format. Prereq., junior status; lower-division art history requirements. Approved for arts and sci-

ences core curriculum: critical thinking. May not be repeated.

**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. May be repeated once.

**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., 20 hours of fine arts courses. Same as FINE 5087. Approved for arts and sciences core curriculum: critical thinking.

**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. May be repeated for a maximum of 12 credit hours. Same as FINE 5137.

**FINE 5087-3. Selected Topics in Contemporary Art.** Same as FINE 4087.

**FINE 4137-3. Gallery Operations.** Same as FINE 4137.

**FINE 5117-2. Graduate Art Seminar.**

**FINE 5847 (1-3). Graduate Independent Study—Nonstudio.**

**FINE 5857, 5867 (1-3). Graduate Independent Study.**

**FINE 6947 (1-3). 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 1009-3. Introduction to Greek Art and Archaeology.** Same as CLAS 1009. Approved for arts and sciences core curriculum: literature and the arts.

**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. Students may not receive credit for both FINE 1109 and FINE 1309. 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. Students may not receive credit for both FINE 1209 and FINE 1409. Approved for arts and sciences core curriculum: literature and the arts.

**FINE 1309-3. History of World Art 1, A.** A basic survey of major art styles from the Paleolithic period through the Renaissance, including European, Asian, and the Pre-Columbian/ Islamic World. Emphasizes comparison of Western and non-Western visual expressions as evidence of differing cultural orientations. Students may not receive credit for both FINE 1309 and FINE 1109. Approved for arts and sciences core curriculum: literature and the arts.

**FINE 1409-3. History of World Art 2.** A basic survey of major art styles from 1600 to the present including European, Asian, Islamic, the American, and tribal arts. Emphasizes comparison of Western and non-Western visual expressions as evidence of differing cultural orientations. Students may not receive credit for both FINE 1409 and FINE 1209. 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 appreciating 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 2029-3. Introduction to Medieval and Renaissance Studies.** Introduces students to the literature, history, culture, and art of Europe and the Mediterranean basin from late antiquity through the Renaissance. The course is interdisciplinary and focuses on topics revealing the dynamism and diversity of pre-modern culture. Same as HIST 2020 and MEDV 2020.

**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 3109-3. Critical Thinking: Art in Society.** An examination of writings by philosophers

and art critics as they address the question: What is art for? Readings focus on the nineteenth and twentieth centuries, including current theories and some non-Western theories. Students are encouraged to develop their own responses to the question. Prereq., 6 credit hours in art history. Approved for arts and sciences core curriculum: critical thinking.

**FINE 3209-3. Art, Culture, and Gender Diversity, 1400-1600: Renaissance Art Out of the Canon.** Studies the 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 3409-3. 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"? Approved for arts and sciences core curriculum: critical thinking.

**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 States context.

**FINE 4019-3. Art of Ancient Egypt.** Surveys the 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 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 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. Prereq., 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 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 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, Filippo Lippi, and others, ending in the late Quattrocento. Offered abroad only. Same as FINE 5619. Approved for arts and sciences core curriculum: literature and the arts.

**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. Class-

room and on-site lectures as well as techniques appropriate to writing about the visual arts are emphasized. Offered abroad only. Same as FINE 5659. Approved for arts and sciences core curriculum: literature and the arts.

**FINE 4709-3. Perspectives on Art and Criticism.** Examines some traditional and current ideas that have shaped, defined, or influenced the goals, practices, and evaluation of the visual arts. Lectures, readings, discussion. Open to fine arts majors or students with 9 or more credit 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. Approved for arts and sciences core curriculum: critical thinking.

**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 4749-3. Italian Renaissance Art: Studies in the Exchange between Theory and Practice.** Addresses how artists developed new compositional procedures, graphic techniques, and audiences, and how these procedures were theorized in an age when artists' intellectual and social status rose dramatically. Explores reception of new graphic technology. Studies specific commissions and primary texts in depth. Prereqs., FINE 2209 and one other art history course. Same as FINE 5749.

**FINE 4759-3. Seventeenth Century Art and the Concept of the Baroque.** Surveys seventeenth century European painting, sculpture, and architecture, along with a critical study of artistic theory, artistic institutions (such as the *Accademia di San Luca* and the *Académie Royale*), and the concept of the term "baroque." Prereqs., HUMN 1010 or 1020 or FINE 1109 or 1209. Approved for arts and sciences core curriculum: literature and the arts.

**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.** May be repeated for a maximum of 18 credit hours when topic varies. Same as FINE 5929.

**FINE 5019-3. Art of the Ancient Near East.** Same as FINE 4009 and CLAS 5009.

**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 5129-3. Gothic Art.** Same as FINE 4129.

**FINE 5159-3. Hellenistic Art and Archaeology.** Same as CLAS 5159.

**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 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 5619-3. Quattrocento Art in Florence and Central Italy.** Same as FINE 4619.

**FINE 5659-3. The Roman Baroque.** Same as FINE 4659.

**FINE 5709-3. Perspectives on Art and Criticism.** Same as FINE 4709.

**FINE 5749-3. Italian Renaissance Art: Studies in the Exchange between Theory and Practice.** Same as FINE 4749.

**FINE 5759-3. Seventeenth Century Art and the Concept of the Baroque.** Same as FINE 4759.

**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. May be repeated for a maximum of 18 credit hours when topic varies. Same as FINE 4929.

**FINE 5969 (1-3). Graduate Project.**

**FINE 6909 (1-3). Graduate Independent Study—Art History.**

**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. Topics vary from semester to semester. Repeatable for different topics up to 6 credit hours.

**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. Presents basic grammar, most commonly used vocabulary of French, and introduces students to Francophone culture. Students may not receive credit if they have completed FREN 1050.

**FREN 1020-5. Beginning French 2.** Completion of presentation of most basic structures and vocabulary of French. Prereq., successful completion of one semester of college-level French or one year of high school French. Students may not receive credit if they have completed FREN 1050.

**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., three to five semesters 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 1200-3. Medieval Epic and Romance.** Covers the most important works of medieval literature, in English translation. Among the texts studied are the *Nibelungenlied*, the *Song of Roland*, and Arthurian romances, including the stories of Lancelot and Guinevere and Tristan and Isolde. Offers a general introduction for nonmajors to medieval literature and society. Approved for arts and sciences core curriculum: literature and the arts.

**FREN 1600-3. 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 1700-3. Francophone Literature in Translation.** Studies the literary expression of French-speaking peoples of Africa, the Caribbean, and Canada. Gives special attention to oral tradition, identity, question, and cultural conflict. Taught in English. Approved for arts and sciences core curriculum: cultural and gender diversity.

**FREN 1800-3. Contemporary French Literature in Translation.** Reviews the major philosophical, political, and aesthetic issues in the twentieth-century French novel and drama. Beginning with existentialist literature, discussion focuses subsequently on the Theatre of the Absurd, the New Novel, World War II and the Holocaust, and recent women writers. Taught in English. Approved for arts and sciences core curriculum: literature and the arts.

**FREN 2110-3. Second-Year French Grammar Review and Reading 1.** Intensive review of important grammar structures. Introduces cultural readings (track A) and literary readings (track B) as well as writing compositions in French. Prereq., successful 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 2110. Continued reading in French literature and culture, considerable practice in writing and speaking French. Prereq., three semesters of college-level French or equivalent.

**FREN 2500-3. Conversation in French.** This lower-division course is for students who have spent no time in a French-speaking environment. Sessions include a variety of discussion formats including presentations, debates, and occasional video-taping. All work is in French. Prereq., FREN 2120 or equivalent.

**FREN 3010-3. French Phonetics and Pronunciation.** Training in correct pronunciation of standard French through understanding of the function of speech organs. International pho-

netic alphabet learned and used throughout the course; intensive practice in class and language laboratory. Required of all majors. 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. Should be taken before 3100, 3110, or 3120. May be taken concurrently. Required for majors. Prereq., FREN 3050 or equivalent.

**FREN 3100-3. Introduction to Critical Reading and Writing in French Literature.** Introduces students to the analysis and interpretation of French literature through close readings of representative examples of major literary forms (poetry, fiction, drama, essay) and through the composition of critical writings in French. Required for French majors. Prereq., FREN 3050 or concurrent enrollment in FREN 3060.

**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. Prereq., FREN 3100 (may be taken concurrently). 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., FREN 3100 (may be taken concurrently). Approved for arts and sciences core curriculum: literature and the arts.

**FREN 3200-3. Introduction to Literary Theory and Advanced Critical Analysis.** Introduces students to important aspects of both classical and modern literary theory as an aid to reading and understanding literary texts. Covers theoretical works by figures ranging from Plato and Aristotle to modern French critics such as Barthes, Foucault, and Derrida in conjunction with selected literary works. Offers students more sophisticated means of understanding issues like gender, ethnicity, the roles of both author and reader in constructing meaning, the nature and functions of signs, and the relation between literature and the larger society. Required for students taking Honors in French or Italian. Conducted in English, though French majors are required to read the texts in the original language. Prereq., FREN 3100 or instructor's consent. Approved for arts and sciences core curriculum: literature and the arts, or critical thinking.

**FREN 3500-3. French Conversation and Current Events.** This upper-division course is for students who have spent less than four months in a French-speaking environment. Discussion, readings, and written work focus on presentation, debates, and occasional video-taping.

**FREN 3600-3. Business French 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 4050. Concentrates on composing business letters and conducting business in French. Prereq., FREN 3060 or equivalent.

*Note: Courses at the 4000 level or above are normally not open to freshmen or sophomores. Exceptions may be made with consent of instructor.*

**FREN 4010-3. Advanced Composition.** Systematic review of French grammar, vocabulary, and style. Prereq., FREN 3060 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 3500 and/or 3060 or equivalent. May be repeated once for credit.

**FREN 4050-3. Business French 2.** Prereq., FREN 3600 or instructor consent.

**FREN 4100-3. Translation.** Concentrates on the problems of written and oral translation, both into and out of French. Prereq., FREN 4010 or instructor consent.

*Note: Prereqs. for all of the following courses are FREN 3100, 3110, and 3120 or instructor consent.*

**FREN 4110-3, 4120-3. French Special Topics.** Topics vary each semester. Students should consult the *Registration Handbook and Schedule of Courses* for specific topics. Each course may be repeated for different topics up to a maximum of 6 credits.

**FREN 4130-3. Medieval Lyric Literature.** Examines the medieval concept of courtly love as both a cultural and literary phenomenon and its theoretical and stylistic evolution from the Provençal and Old French, with comparative reference to Italian lyric. Same as HUMN 4522 and ITAL 4130.

**FREN 4140-3. 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 is helpful, but not required. No previous knowledge of linguistics is required.

**FREN 4170-3. Francophone Literature.** Studies the literary expression of French-speaking peoples of Africa, the Caribbean, and French Canada. Gives special attention to oral tradition, identity question, and cultural conflict.

**FREN 4200-3. Studies in Contemporary French Culture.** Through a wide variety of text and audio-visual documents, students learn the structures of contemporary French society and study the cultural phenomena of that society.

**FREN 4210-3. French Cultural History.** Studies the main currents of French culture from Louis XIV to the end of the First World War showing how they have evolved in response to changes in society rather than as a series of discrete historical events.

**FREN 4250-3. Medieval and Renaissance Readings.** Explores the complex and evolving cultural and historical contexts of medieval and

Renaissance French, and introduces the masterpieces of French medieval and Renaissance literature, including the *Chanson de Roland*, Arthurian romance, and the work of Marie de France, Guillaume de Lorris, and Jean de Meun, Christine de Pisan, Machaut, Villon, Louise Labé, the poets of the Pléiade, Rabelais, and Montaigne.

**FREN 4300-3. Theatre and Modernity in Seventeenth-Century France.** Readings of plays by Corneille, Molière, and Racine introduce students to theatre's role as a mirror of the multifarious tensions shaping modern Western experience. Taught in English with English translations. Approved for arts and sciences core curriculum: literature and the arts.

**FREN 4310-3. Seventeenth-Century French Tragedy and Poetry.** Close readings of tragedies by Corneille and Racine placed in the evolving context of baroque and neoclassical political and artistic culture as illustrated by lyric poetry, the Fables of La Fontaine, moral philosophy, painting, and architecture. Examines the role of heroic drama as at once a symptom and agent of early modern French social history.

**FREN 4320-3. Seventeenth-Century French Prose.** Close readings of selected works of Descartes, Pascal, Mme. de La Fayette, La Rochefoucauld, La Bruyère, and Perrault. Themes include seventeenth-century theories of self, notions of *honnêteté* and the critical analysis of human motives and behavior, the role of literary prose in the critique of heroic idealism and in demystifying the monarchic absolutism of the Sun King, Louis XIV.

**FREN 4330-3. Molière and Seventeenth-Century French Comedy.** Close readings of farces and comedies of Molière in context with selected comedies by Corneille, Rotrou, and Cyrano de Bergerac and selected satires by Boileau and La Fontaine. Themes include comedy as a form of social criticism and the socio-cultural significance of such episodes of Molière's career as the scandalous "quarrels" of *L'École des Femmes* and *Tartuffe*.

**FREN 4350-3. French Enlightenment.** Fiction, essays, theatre, and philosophical tales. A study of the Enlightenment in France through the texts of its major representatives: Montesquieu, Voltaire, Marivaux, Diderot, and Rousseau.

**FREN 4360-3. Survey of Eighteenth-Century French Literature.** Close readings of texts by Voltaire, Rousseau, Diderot, Marivaux, and Beaumarchais. Focuses on the evolution of literary genres and the influence of philosophy, politics, and social change on "belles lettres."

**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.** Close readings of plays from the turn of the century to the contemporary period introduce the principal themes and techniques of modernist and postmodernist French theatre. Students are encouraged to consider problems commonly evoked by these texts,

and to compare the positions that each text takes on such problems as the status and uses of language, the function and limits of the theatre, and the dialectic of appearance and reality.

**FREN 4480-3. Twentieth-Century French Novel.** Close readings of novels from the 1930s to the contemporary period introduce the principal themes and techniques of the modernist and postmodernist French novel. Students are encouraged to analyze a variety of questions commonly evoked in these texts, such as the problem of representation, the uses and abuses of writing, the relation of fiction and history, and the status of the subject in the world.

**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 4500-3. Reading the Orient: French Literature and Exoticism.** Examines representations of the non-Western world in French literature from the 16th century to the present. Issues include imperialism, sexuality, the relation between literature and the visual arts, and the place of post-colonial literature in the canon. Works include texts by Montaigne, Flaubert, Baudelaire, Lévi-Strauss, Aimé Césaire, and Edward Said, and paintings by Delacroix, Moreau, and Rodon. Taught in English for non-majors, but may be used as a senior seminar (senior essay course) with consent of the Undergraduate Director. Approved for arts and sciences core curriculum: literature and the arts, or cultural and gender diversity.

**FREN 4510-3. French Dramatic Theories.** Studies French dramatic theories since the sixteenth century, using representative plays as illustration of theoretical works.

**FREN 4600-3. Topics in French Film.** Covers various topics in the French and some other Francophone cinemas (Belgian, Swiss, Québécois) from 1895 to the present. Periods, schools, themes, and directors from Méliès to Duras, and the critical approaches by which they are studied. Varies from year to year. Course may be repeated for different topics up to a maximum of 6 credits. Prereqs., junior standing and 6 hours in French literature or other literature or film studies. Same as FILM 4604.

**FREN 4750-3. Methods of Teaching French and Professional Orientation.** To be taken one semester prior to or concurrently with student teaching.

**FREN 4840 (1-3). Independent Study: Language.** Upon consultation only. Undergraduate level.

**FREN 4850 (1-3). Independent Study: Literature.** Upon consultation only. Undergraduate level.

**FREN 4960-6. High School French Teaching.** Part of the supervised student teaching in a secondary school required for state certification to teach French. These hours do not count toward student hours in the major nor in the maximum departmental hours allowed. The credit is pass/fail only. Prereq., FREN 4750; must be

admitted to the secondary teaching education program and currently in EDUC 4712.

**FREN 4980-3. French Senior Honors Thesis.** The senior honor thesis is a 40 to 45 page original research paper, written in French, and constitutes a requirement for graduating with departmental honors. Prereq., all third-year course requirements including FREN 3200. Recommended prereq., at least one course numbered FREN 4100 or above.

**FREN 4990-3. Senior Seminar.** Preparation of a 15-page research paper in French presented to two members of the department faculty and defended orally in class. Prereq., all third-year requirements and advisor consent; recommended prereq., at least one course numbered FREN 4100 or above.

*Note: Prereq. for all of the following courses is graduate standing or instructor consent.*

**FREN 5080-3. Introduction to Old French.**

**FREN 5110, 5120-3. French Special Topics.** Different topics are offered and, in a number of cases, cross-listed with other departments. May be repeated up to 6 credit hours on different topics.

**FREN 5130-3. Medieval Lyric Literature.**

**FREN 5160-3. Modern Canadian Fiction.** Introduces the most significant works of a representative and broad selection of both Anglophone and Francophone Canadian fiction writers of the twentieth century—modern and postmodern, traditional and experimental.

**FREN 5170-3. Francophone African Literature.**

**FREN 5250-3. Medieval and Renaissance Readings.** Through close readings of masterpieces of French medieval and Renaissance literature (e.g., the *Chanson de Roland*, and Arthurian romance, and the work of Marie de France, Guillaume de Lorris and Jean de Meun, Christine de Pisan, Machaut, Villon, Louise Labé, the poets of the Pléiade, Rabelais, Montaigne) in conjunction with contemporary criticism and theory, explores the complex and evolving cultural and historical contexts of medieval and Renaissance France. Readings in French. May be taught in English to accommodate students in other programs.

**FREN 5310-3. Seventeenth-Century French Tragedy and Poetry.** Close readings of tragedies by (among others) Corneille, Racine and Rotrou placed in the evolving context of baroque and neoclassical political and artistic culture as illustrated by lyric poetry, the Fables of La Fontaine, moral philosophy, painting, and architecture. With the help of recent critical and theoretical scholarship, explores the role of heroic drama as at once a symptom and agent of early modern French social and cultural history. Readings in French. May be taught in English to accommodate students in other programs.

**FREN 5320-3. Seventeenth-Century French Prose.** Close readings of major works by such writers as Descartes, Pascal, Sorel, Mme. de La Fayette, La Rochefoucauld, La Bruyère, Mme. de Sévigné, Scarron, Cyrano de Bergerac, Bossuet, and Perrault. Themes include seventeenth-century theories of self, early modern

epistemology, notions of *honnêteté* and the critical analysis of human motives and behavior, the emerging French novel, the role of literary prose in the critique of heroic idealism and in demystifying the monarchic absolutism of the Sun King, Louis XIV. Readings in French. May be taught in English to accommodate students in other programs.

**FREN 5330-3. Molière and Seventeenth-Century French Comedy.** Close readings of the farces and comedies of Molière in context with the comic works of such writers as Corneille, Rotrou, Cyrano de Bergerac, Desmarests de Saint-Sorlin, Georges de Scudéry, and the satires of Boileau and La Fontaine. Themes include Molière's contribution to the institution of literary authorship, comedy as a form of social criticism and its role in the "deconstruction" of the early modern subject, and the sociocultural significance of such episodes of Molière's career as the scandalous "quarrels" of *L'École des femmes* and *Tartuffe*. Readings in French. May be taught in English to accommodate students in other programs.

**FREN 5350-3. French Enlightenment.** Focuses on the uses of literature to address the revolutionary philosophical, scientific, religious, and/or socio-political questions of the day. Texts explored will include Diderot and d'Alembert's *Encyclopédie*, Voltaire and Diderot's philosophical tales and dialogues, and Rousseau's *Discours* and other writings. Discusses the development of specific literary forms to promote the ideas and goals of the *philosophes* to reach a changing and diverse readership and to fight censorship.

**FREN 5360-3. Eighteenth-Century French Literature.** Each course focuses on the study of a specific literary genre (e.g., theatre, the novel) or on the global production of a major author (e.g., Voltaire, Diderot, Rousseau). Discussion stresses both the uniqueness of the genre/writer and their significance as representatives of the century's changing society and culture. The course may be repeated for different topics up to a maximum of 6 credits during a student's graduate career.

**FREN 5420-3. Nineteenth-Century French Literature.** A survey of principal works and movements, intended as an introductory course.

**FREN 5430-3. Topics in Nineteenth-Century French Prose, Poetry, and Theatre.** Topics vary. May be repeated for different topics up to a maximum of 6 credits during a student's graduate career.

**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.

**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 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 6840, 6850 (1-3). Independent Study.**

**FREN 6940 (1-6). Master's Degree Candidate.**

**FREN 6950 (1-6). Master's Thesis.**

**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.** Through a selected reading of major texts, prose, and poetry of nineteenth-century literature, students are introduced to this period of literary history. Emphasis on critical reading and analysis of Italian literature in its literary and historical context. Students should have passed ITAL 2120 or have instructor consent. Taught in Italian.

**ITAL 3130-3. Readings in Italian Literature 2.** A selected reading of major texts, prose, and poetry of twentieth-century literature. Emphasis on critical reading and analysis of modern and contemporary Italian literature in its literary and historical context. Students should have passed ITAL 2120 or have instructor consent. Taught in Italian.

**ITAL 3210-3. Advanced Conversation and Composition 1.** Course designed to build vocabulary and fluency in spoken Italian, and to build competence and confidence in correct and ever more sophisticated written Italian. Exercises and themes will be drawn primarily from current events and politics (e.g. print and broadcast news) and contemporary culture (e.g. magazines, films, and video). Students should have passed ITAL 2120 or have instructor consent.

**ITAL 3220-3. Advanced Conversation and Composition 2.** Course designed to improve vocabulary and fluency in spoken Italian, and competence and confidence in correct and ever more sophisticated written Italian. Exercises and themes will be drawn primarily from Italian cultural history. Students should have passed ITAL 2120 or have instructor consent.

**ITAL 3600-3. Workshop in Italian Theatre.** Consult instructor.

**ITAL 4010-3. 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 4020-3. Problems in Translation, Advanced Grammar, and Stylistics 2.** Consult instructor.

**ITAL 4130-3. Medieval Lyric Literature.** Examines the medieval concept of courtly love as both a cultural and literary phenomenon; its theoretical and stylistic evolution from the Provençal and Old French to Italian lyric. No knowledge of Italian is necessary. Consult instructor. Same as FREN 4130 and HUMN 4522.

**ITAL 4140-3. The Age of Dante: Readings from the Divine Comedy.** Focuses on close reading of Dante's poetry with emphasis on the intellectual, religious, political, and scientific background of the medieval world. Taught in English. Prereq., junior standing or instructor consent. Approved for arts and sciences core curriculum: literature and the arts. Same as FREN 4130 and HUMN 4522.

**ITAL 4150-3. The Decameron and the Age of Realism.** Analyzes the rise of realism in the thirteenth and fourteenth century Italian literature and parallel manifestations in the visual arts. Discussion will focus on Boccaccio's *Decameron* and contemporary realistic prose and poetry with emphasis on gender issues and medieval cultural diversity. Taught in English. Approved for arts and sciences core curriculum: literature and the arts, or cultural and gender diversity.

**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 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 4730-3. Italian Feminisms: Culture, Theory, and Narratives of Difference.** Studies Italian women writers, artists, and film-makers of this century. Literary and visual texts are analyzed in dialogue with readings of leading Italian gender theorists. Italian history and culture is reread by following the development of a discourse about women. Taught in English, readings in Italian for Italian majors. Approved for arts and sciences core curriculum: cultural and gender diversity, or literature and the arts.

**ITAL 4840 (1-3). Independent Study.**

**ITAL 4980-3. Italian Senior Honors Thesis.** The senior honors thesis is a 40 to 45 page original research paper, written in Italian, and constitutes a requirement for graduating with departmental honors. Prereq., all third-year course requirements including FREN 3200. Recommended prereq., at least one course numbered ITAL 4100 or above.

**ITAL 4990-3. Senior Seminar.** Preparation of a 15-page research paper in Italian presented to two members of the faculty and defended orally in class. Prereq., advisor consent; recommended prereq., at least one course numbered ITAL 4100 or above.

## Geography

**GEOG 3840 (1-3). Undergraduate Independent Study.** By special arrangement with faculty. Only for students presenting strong geography preparation. May be repeated for a maximum of 8 credit hours.

**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 4100, 4110, and 4120 (1-3). Special Topics in Geography.** Various topics not normally covered in the curriculum; offered intermittently depending on student demand and availability of instructors. May be repeated twice as the topics vary.

**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 geography and environmental studies 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 and environmental conservation 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 (1-3). 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. 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. Prereq., GEOG 1001 or

instructor consent. 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. Prereq., GEOG 1001 or instructor consent. 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 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 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. Approved for arts and sciences core curriculum: natural science.

**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 4231-4. Physical Climatology/Field Methods.** Theory and field measurements in boundary layer climatology with major emphasis on radioactive and turbulent fluxes near the ground. Field calibration of flux equipment and measurements of radioactive, sensible, latent, and ground heat fluxes over different terrain types. Prereq., GEOG 4211 or 5211. Same as GEOG 5231.

**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 any 1000-level sequence in geological sciences. Same as GEOL 4241. Approved for arts and sciences core curriculum: natural science.

**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. Prereq., a college course in physical geology or geography and instructor consent. Offered during the summer at the Mountain Research Station. Call for schedule. Same as GEOG 5291, GEOL 4291, and GEOL 5291.

**GEOG 4321-3. Snow Hydrology.** Multidisciplinary and quantitative analysis of physico-chemical processes that operate in seasonally snow-covered areas, from the micro- to global-scale: snow accumulation, metamorphism, ablation, chemical properties, biological aspects, electromagnetic properties, remote sensing, GIS, and quantitative methods. Prereqs., GEOG 1001 or GEOG 1011 and any statistics course. Same as GEOG 5231.

**GEOG 4331 (3-4). Mountain Climatology.** Survey and analysis of climatic characteristics of mountain environments worldwide. Prereq., GEOG 1001 or ASTR 1150.

**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 4401-3. Soils Geography.** 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 4411-3. Methods of Soil Analysis.** Methods of soil sampling and laboratory analysis are applied toward an understanding of the relationships between soils, the environment, and landscape impacts. Field trips explore field observation and sampling techniques. Laboratory analyses determine soil physical and chemical properties. Prereq., GEOG 1001 or GEOG 1011; prereq./coreq., GEOG 4401/5401. Same as GEOG 5411.

**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. Research Design in Geography. (Human section)** Readings and discussion of contemporary research philosophies and methodologies in human geography. Practice in the development of research proposals and presentation of research ideas and results. (Physical section) Readings and discussion of contemporary research philosophies and methodologies in physical geography (climatology, geomorphology, biogeography, and soils geography). Practice in the development of research proposals and presentation of research ideas.

**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. Prereq., GEOG 3201 or equivalent and instructor consent.

**GEOG 5231-4. Physical Climatology/Field Methods.** Prereq., GEOG 4211 or 5211. Same as GEOG 4231.

**GEOG 5241 (1-3). 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 5321-3. Snow Hydrology.** Same as GEOG 4321.

**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 5401-3. Soils Geography.** Same as GEOG 4401.

**GEOG 5411-3. Methods of Soil Analysis.** Same as GEOG 4411.

**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. Prereq., instructor consent. Same as ASTR 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 ASTR 5960.

**GEOG 6181-3. Special Topics.** Current problems in geography, particularly physical and environmental geography. Topics and instructors vary. May be taken twice.

**GEOG 6211-3. Readings in Climatology.** Selected topics in current climatological literature discussed in seminars. Specific themes vary.

**GEOG 6241 (1-3). Seminar in Hydrology and Geomorphology.** Emphasizes process-oriented research in hydrology and geomorphology. Sample topics include river mechanics, snow hydrology, and periglacial processes. See the *Registration Handbook and Schedule of Courses* for specific title. May be taken twice. Same as GEOL 6241.

### *Human and Cultural Geography*

**GEOG 1982-3. World Regional Geography.** An intellectual journey around the globe, stopping at major regions to study the people, their environments, and how they interact. Topics include the political/economic tensions in changing Europe, conflicts in Brazilian rain forests, transitions facing African peoples, and rapid changes in China.

**GEOG 1992-3. Human Geographies.** Examines social, political, economic, and cultural processes creating the geographical worlds in which we live, and how these spatial relationships shape our everyday lives. Studies urban

growth, geopolitics, agricultural development and change, economic growth and decline, population dynamics, and migration exploring both how these processes work at global scale as well as shape geographies of particular places.

**GEOG 2002-3. Geographies of Global Change.** Spatial and ecological perspectives on economic, political, social, cultural, and environmental changes. Examines roles of transnational corporations, global media, world cities, food security, labor, migration, human rights, ethnicity, nationalism, resources, environmental degradation, and sustainable development in global 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 3612-3. 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.

**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 3672-3. Gender and Global Economy.** Examines the role of gender in global economy. Explores the impacts of colonialism and modern global economy on gender relations, with particular emphasis on Third World societies. Also focuses on related issues of population politics, environmental crisis, women's sexual exploitation, and women's social movements worldwide. Prereq., one of GEOG 1982, 1992, 2002, WMST 2000, or 2050. Same as WMST 3672. Approved for arts and sciences core curriculum: cultural and gender diversity.

**GEOG 3682-3. 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.

**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 4622-3. City Life.** 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: Agroecosystems.** Surveys global agricultural systems followed by a more detailed analysis of the social and ecological elements of agricultural systems in the United States. Emphasizes pastoralism and annual cropping systems in the Western arid and semi-arid regions. Stresses systems analytical approaches and interdisciplinary analysis.

**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, geopolitics, international political economy, and strategic concepts. Same as GEOG 5712.

**GEOG 4722-3. Field Methods in Human Geography.** Examines research methods associated with field work in human geography. Prepares students for fieldwork by focusing on geographic and interdisciplinary field work techniques; interpretation of field data; and discussion of the politics, ethics and gender, race, class and cross-cultural issues related to field work. Prereqs., graduate status or 15 credit hours in human geography. Same as GEOG 5722.

**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. May be taken twice as the topics vary. Approved for arts and sciences core curriculum: critical thinking.

**GEOG 4882-3. Russian Commonwealth.** Systematic and regional survey of features that characterize the physical, economic, and social geography of the Russian Commonwealth.

**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 Theory of Geography.** History of ideas and institutions that have shaped contemporary geographic inquiry. Examines the evolving relations among human geography, physical geography, environment-society relations, and geographic information processing. Designed to situate graduate student research within major subfields and intellectual currents of geography. Limited to geography graduate students.

**GEOG 5222-3. Continuities and Changes in the Modern World Economy.** Introduces the topics of globalization and democratization from an interdisciplinary perspective. Examines major changes to the global political economy and explores their implications for local, national, regional, and international political and economic processes. Prereq., graduate standing. Same as PSCI 5223 and SOCY 5223.

**GEOG 5292-3. Migration, Urbanization, and Development.** Same as GEOG 4292.

**GEOG 5622-3. City Life.** 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: Agroecosystems.** Same as GEOG 4672.

**GEOG 5712-3. Political Geography.** Same as GEOG 4712.

**GEOG 5722-3. Field Methods in Human Geography.** Same as GEOG 4722.

**GEOG 5732-3. Population Geography.** Same as GEOG 4732.

**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.

**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 bound-

aries, international rivers, conflicting claims to territory, and electoral geography.

**GEOG 6722-3. Seminar: Historical Geography.** Discusses 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 2053-4. 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 GEOG 3023.

**GEOG 3053-4. Cartography 1.** Introduces the fundamentals of cartography—the science and art of map design. Emphasizes map projections, symbolization, and the design of maps with computers. Students produce a series of thematic maps with modern computer-assisted techniques. Prereq., a basic familiarity with computers is strongly recommended.

**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 4043-4. Cartography 2—Computer Mapping.** Advanced cartography, with a focus on map compilation and reproduction, including digitizing and scanning as well as the use of existing digital data files. Surveys commercially available mapping packages. Students work on independent projects and design and produce a

final map to be printed in color. Prereq., GEOG 3053. Same as GEOG 5043.

**GEOG 4083-4. Mapping from Remotely Sensed Imagery.** Mapping of spatial information from remotely sensed imagery, specifically high spatial resolution imagery (e.g., photography) in digital form. Emphasizes correction of 2- and 3-D geometric distortions, topographic influences, planimetric, topographic, and thematic mapping concepts. Prereq., GEOG 3093, 4093, or equivalent. Same as GEOG 5083.

**GEOG 4093-4. 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 4103-4. Geographic Information Systems.** Construction and use of an information system and its data specifically designed for representing and manipulating geographical data. Modern geographical information systems include computer hardware/software with a collection of methods/procedures for recording, transforming, storing/retrieving, analyzing, and mapping geographic data. Prereq., GEOG 2053, 3053 or 3093. Same as GEOG 5103.

**GEOG 4173-3. Research Seminar.** Examines the nature of research and develops pre-graduate skills for geographic research, emphasizing problem definition, methods, sources, data interpretation, and 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. Prereq. or coreq., GEOG 4371. 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 5043-4. Cartography 2—Computer Mapping.** Same as GEOG 4043.

**GEOG 5083-4. Mapping from Remotely Sensed Imagery.** Same as GEOG 4083.

**GEOG 5093-4. Remote Sensing of the Environment.** Same as GEOG 4093.

**GEOG 5103-4. 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 5095-3. Advanced Political Data Analysis.** Same as GEOG 7095 and PSCI 5095.

**GEOG 5983 (1-6). Field Problems.** Same as GEOG 4983.

**GEOG 7095-3. Advanced Political Data Analysis.** Provides advanced training in empirical and analytic methods of political analysis. Covers general multivariate linear (regression) model as employed in political science. Also covers variety of dynamic approaches to empirical analysis (stochastic models, time series, and simulation). Prereq., instructor consent. Same as GEOG 5094 and PSCI 7095.

## 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 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 1080-1. Introduction to 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. Introduction to 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. Prereq., GEOL 1010 or equivalent. 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. Prereq., GEOL 1060; coreq., GEOL 1070. 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. 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 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 Academic Access and Student Academic Services Center (formerly 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 Academic Access and the Student Academic Services 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 1600-4. Order, Chaos, and Complexity.** Develops the foundations for understanding new ideas in science, focusing on fractals, and chaos in complex interacting systems. Topics include the historical perspective, fractal geometry, complex nonlinear systems, and the nature of uncertainty. Approved for arts and sciences core curriculum: natural science, or quantitative reasoning and mathematical skills.

**GEOL 2700-2. Introduction to Field Geology.** Introduces basic field techniques necessary to collect geologic data and samples, and necessary to map geologic units. Prereqs., GEOL 1010 and 1020; or GEOL 1060 and 1070; or GEOL 1130 and 1140; or GEOG 1001 and 1011.

**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 3023-3. Statistics for Earth Sciences.** Introduces parametric and distribution-free statistics, emphasizing applications to earth science problems. Same as GEOG 3023.

**GEOL 3030-3. Introduction to Hydrogeology.** Introduces groundwater flow concepts, hydrologic cycle, physical and chemical properties, flow net, hydraulic potential, geologic controls on heterogeneity and anisotropy, aquifers and aquitards in a geologic system, saturated and unsaturated flow, flow to a well, pumping tests, and role of groundwater in geologic processes. Prereqs., GEOL 1010, 1060 or 1130 and MATH 1300; or instructor consent.

**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. Prereq., any two-course sequence of natural science core courses. Approved for arts and sciences core curriculum: natural science.

**GEOL 3050-2. Computer-Assisted Geologic Techniques.** Methods for computing, analyzing, and graphic geologic data using microcomputers. Prereq., two semesters of 1000-level geology.

**GEOL 3060-2. Sedimentary Petrology.** Petrography, petrology, chemistry, and diagenesis of sedimentary rocks are studied by means of lectures, readings, and lab experience. Applications to porosity, permeability, and fluid flow are included. Prereq., GEOL 3010, 3020, and 3430.

**GEOL 3070-3. Introduction to Oceanography.** Surveys ocean features and processes including ocean water, circulation, sediments, structure, faunas, floras, and history of the ocean basins. Prereqs., any two-course sequence of natural science courses. Approved for arts and sciences core curriculum: natural science.

**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., any 1000-level sequence in geological science or

environmental, population and organismic biology; or ANTH 2010 and 2020.

**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., any 1000-level sequence in geological science or environmental, population and organismic biology 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 temporal 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. Approved for arts and sciences core curriculum: natural science.

**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., a two-course sequence in any natural science. 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., a two-course sequence in any natural science. 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 of the 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 4020-3. Marine Geology.** Studies the geology and geophysics of the ocean basins and marginal seas, including discussions of plate tectonics and history of the ocean basins, the formation of ocean crust, the development of active and passive continental margins, and interpretation of the distribution of ocean sediments. Prereq., GEOL 1010, 1060, or 1130. Same as GEOL 5020.

**GEOL 4030-3. Coastal Processes.** Covers the physical processes that shape the sedimentary deposits in various coastal environments: estuaries, deltas, fjords, barrier islands, beaches and lagoons, glacier coastal settings, paraglacial coasts, tidal flats, and mangroves. Prereqs., GEOL 1010 and 3430 or instructor consent. Same as GEOL 5030.

**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. Prereqs., one year of natural science and MATH 1300 or instructor consent. Same as GEOL 5050.

**GEOL 4060-4. Oceanography.** Studies the ocean as a system influencing the earth's surficial processes and climate. Composition and properties of seawater, ocean circulation, waves, tides, coastal-, shallow-, and deep-sea sediments. Laboratory emphasizes the use of oceanographic data. Prereq., one semester of chemistry, physics, or geology, or instructor consent. Same as GEOL 5060.

**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. Approved for arts and sciences core curriculum: critical thinking.

**GEOL 4093-4. 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 and GEOG 5093.

**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 phe-

nomena. 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 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., MATH 1300 and PHYS 1110 and any 1000-level sequence in geological sciences; GEOL 3120 recommended.

**GEOL 4150-3. Geological Processes on Planetary Surfaces.** Covers geological processes that occur on solid planets in the solar system. Topics include impact cratering, volcanism, aeolian, glacial and fluvial processes, and surface-atmosphere interactions. Applications are made to terrestrial planets and outer-solar-system satellites. Recent spacecraft observations emphasized. Prereq., GEOL 1010 and PHYS 1110 and 1120. Same as GEOL 5150.

**GEOL 4160-3. Interpretation of Geological Phase Diagrams.** Explores phase diagrams of mineral systems in terms of temperature, pressure, composition, redox state, pH, and activities of volatile components. Emphasizes what these phase diagrams can tell us about the origins of igneous and metamorphic rocks and hydrothermal ore deposits. Prereq., GEOL 3020 and 3320, or equivalent. Same as GEOL 5160.

**GEOL 4180-3. Fractals and Complexity.** Develops foundations to understand nonlinear complex interacting systems. Topics include self similarity in geometry, power laws, fractals and multifractals, statistical-mechanical ensembles, phase transitions, renormalization, cellular automata, thermodynamics of chaos, and scaling in systems with randomness. Prereqs., APPM 2360 or equivalent, APPM 3570 or equivalent, and PHYS 3210 or equivalent; or instructor consent. Same as GEOL 5180.

**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 4241-4. Principles of Geomorphology.** Systematic study of weathering, mass-wasting, fluvial, and marine processes and the landforms resulting therefrom. Prereqs., any 1000-level sequence in geological sciences or GEOG 1001 and 1011. Same as GEOG 4241. Approved for arts and sciences core curriculum: natural science.

**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 4440-3. Morphology and Genesis of Soils.** Effects of climate, vegetation, parent material, topographic position, and time on development, classification, and chemistry of soils and paleosols. Geomorphic and Quaternary history used to interpret soils. Lab is field trips to study soils in plains to mountains transect. Prereqs., GEOG/GEOL 4241 or equivalent, CHEM 1111 or equivalent or instructor consent. Same as GEOL 5440.

**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 4500-3. Critical Thinking in the Earth Sciences.** Deals with controversies within the broad realm of geological sciences, including either planetary geology, evolution, paleobiology, global change, environmental issues, plate tectonics, resources, other societal problems, or geologic thought in general. Students will be provided the opportunity to analyze and debate scientific issues in the earth sciences. Prereq., any 1000-level sequence in geological sciences. Approved for arts and sciences core curriculum: critical thinking.

**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 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. Prereq., MATH 1300. Same as GEOL 5640.

**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 (1-4). 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 4710-2. Igneous and Metamorphic Field Geology.** Applies field techniques to interpretation of igneous and metamorphic rocks. Field exercises and lectures focus on collecting data required to map igneous and metamorphic rock units. Prereqs., GEOL 2700 and 3020.

**GEOL 4720-2. Structural Field Geology.** Methods of field study of structure of rocks, including observations, data collection, and interpretation to understand geometry of deformation and causative processes and kinematics. Field projects are mapped using different scales, air photos, topographic maps, and compass and tape. Prereqs., GEOL 2700 and 3120.

**GEOL 4730-2. Field Techniques in Stratigraphic Sciences.** Methods of field study of sedimentary rocks and fossils, including observation of lateral and vertical variations, data collection, and interpretation. Field projects include description of stratigraphic sections, mapping at a variety of scales, and data synthesis into cohesive two- and three-dimensional interpretations. Prereqs., GEOL 2700 and 3430.

**GEOL 4740-2. Field Geophysics.** Applies geophysical field techniques and data interpretation to studying geological and engineering problems. Fieldwork includes seismic, gravity, magnetic, and electrical measurements. Prereqs., GEOL 2700, MATH 1300, PHYS 1110, or instructor consent.

**GEOL 4750-2. Field Techniques in Surficial Geology and Geohydrology.** Field mapping and description of a variety of surficial deposits and soils in various environments (moraines and terraces) and estimating their age relations. Also techniques for surface and ground water field measurements: mapping water tables, measuring stream flows; conducting pump tests, and collecting water samples. Prereqs., GEOL 2700, 3030, or GEOG 3511, and GEOL/GEOG 4241 or GEOL 3430.

**GEOL 4760-2. Environmental Field Geochemistry.** Develops basic field skills in the most commonly performed tasks required for the environmental characterization of solid and aqueous wastes. Media of study include soils, stream sediments, surface waters, ground waters, and atmospheric particulates. Prereqs., GEOL 2700 and CHEM 1011/1031, or CHEM 1051/1071, or CHEM 1111/1131, or CHEM 1151/1171.

**GEOL 4780-2. Paleoenvironmental Field Techniques.** Provides experience in field techniques used to reconstruct paleoenvironments, including sediment coring and cataloging. Emphasis on glacial, lacustrine, bog, soil, and cave environments. Prereqs., one year introductory geology or other environmental science and GEOL 2700.



**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. Applied Geophysics.** 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. Writing in Geosciences.** Emphasizes strategies of literature research and scientific writing in the geosciences. Includes small writing assignments and a larger library research paper. Prereq., 15 hours of upper-division course work in geological sciences.

**GEOL 4970-3. Environmental Fluid Mechanics.** Provides a solid foundation in environmental fluid mechanics and its application to problems in hydrology, geomorphology, and geology for students in natural and earth sciences with a minimal background in mathematics and physics. Prereq., one year college-level calculus and one year college-level physics. Same as GEOL 5970.

**GEOL 4980-3. River Basin 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; one year college physics; GEOG 3511 recommended. Same as GEOL 5980.

**GEOL 4990 (1-3). 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.

### *Graduate Courses*

**GEOL 5020-3. Marine Geology.** Same as GEOL 4020.

**GEOL 5030-3. Coastal Processes.** Same as GEOL 4030.

**GEOL 5050-3. Earthquakes.** Same as GEOL 4050.

**GEOL 5060-4. Oceanography.** Same as GEOL 4060.

**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 5080-3. Advanced Hydrogeology and Modeling Concepts.** Introduces advanced groundwater flow and modeling concepts, equations for steady state and transient flow, saturated and unsaturated flow, finite difference method, application of modeling in geologic processes, radial flow and aquifer parameters, infiltration and groundwater recharge, model calibration, verification, and prediction. Prereqs., MATH 2300, FORTRAN, or instructor consent.

**GEOL 5093-4. Remote Sensing of the Environment.** Same as GEOL 4093 and GEOG 5093.

**GEOL 5100-3. X-Ray Crystal Chemistry.** Same as GEOL 4100.

**GEOL 5150-3. Geological Processes on Planetary Surfaces.** Same as GEOL 4150.

**GEOL 5160-3. Interpretation of Geological Phase Diagrams.** Same as GEOL 4160.

**GEOL 5180-3. Fractals and Complexity.** Same as GEOL 4180.

**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 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 5210-3. Advanced Igneous Petrology.** Systematic analysis of petrology of igneous rocks. Emphasizes integrating knowledge obtained from theory, experiment, and field studies. Prereq., optical mineralogy or instructor consent.

**GEOL 5240-4. 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 4093 or 5093, GEOL 4093 or 5093. Knowledge of multivariate statistics recommended.

**GEOL 5250-4. Introduction to Ore Deposits.** Same as GEOL 4250.

**GEOL 5260-3. Field 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 or equivalent, or instructor consent.

**GEOL 5270-4. Thermodynamics for Petrologists.** Offered alternate years. 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., one year of college chemistry.

**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 Petrography.** Studies ores and associated rocks by reflected and transmitted light microscopy, x-ray diffraction, and fluid inclusion microscopy. Emphasizes phase relations, chemical conditions or ore deposition. This is a laboratory course, intended to provide laboratory training in ore deposits for graduate students. Prereqs., GEOL 4250 or 5250 or equivalent, or instructor consent.

**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 Dynamic Stratigraphy.** Evaluates simple to complex approaches (dimensional analysis, transport equations; finite element vs. finite difference schemes) to understand how stratigraphic sequences are formed. Excellent introductory course on simulation modeling. Examples include research from placer mining, pollution and hazards studies, military applications, and reservoir characterization. Prereqs., calculus, intro to statistics, sedimentology, and stratigraphy, or instructor consent.

**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, or instructor consent.

**GEOL 5410-3. Ancient Sedimentary Environments.** Analysis of sedimentary rock sequences, biostratigraphy, sedimentary environments, and stratigraphic synthesis. Prereq., GEOL 3430 or equivalent.

**GEOL 5420-3. Quaternary Dating Methods.** In-depth survey of standard and experimental dating methods that provide absolute ages for events of the last two 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.

**GEOL 5440-3. Morphology and Genesis of Soils.** Same as GEOL 4440.

**GEOL 5450-4. Micropaleontology 1.** Classification, occurrence, and interpretation of 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 4250/5250 or equivalent, or instructor consent.

**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., one year of biology or instructor consent.

**GEOL 5520-3. Marine Paleocology.** 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 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.** Examines postdepositional alteration of carbonate rocks, emphasizing diagenetic environments and process-response models. Stresses petrographic and geochemical evidence. Prereqs., GEOL 3010, 3020, and 3430.

**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 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.** 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.

**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., graduate standing or instructor consent.

**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 5840 through 5851 (1-3). Graduate Independent Study.**

**GEOL 5940-4. Applied Geophysics.** Same as GEOL 4940.

**GEOL 5951-3. Seminar: Climatic Change.** Cross-disciplinary survey of the evidence for and theories of climatic change. Prereq., instructor consent. Same as ASTR 5950 and GEOG 5951.

**GEOL 5970-3. Environmental Fluid Mechanics.** Same as GEOL 4970.

**GEOL 5980-3. River Basin Hydrology.** Same as GEOL 4980.

**GEOL 6020-3. Topics in Petroleum Geology.** Covers current advanced topics of research and interest in petroleum geology. Content varies each time course is offered. May be repeated for credit every other year. Sample topics include source rock geochemistry, reservoir geology, seismic expression structural styles, and 3-D seismic interpretation. Prereq., GEOL 5500, 5350, or 6330.

**GEOL 6060-4. Petroleum Geology of Turbidite Systems.** Covers the exploration and production aspects of petroleum submarine fans and turbidite systems. A one-week field trip to California is included. Students are responsible for part of the trip expenses. Prereq., GEOL 6330 or instructor consent.

**GEOL 6241 (1-3). Seminar in Hydrology and Geomorphology.** Emphasizes process-oriented research in hydrology and geomorphology. Sample topics include river mechanics, snow hydrology, and periglacial processes. Same as GEOG 6241.

**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. Applied Sequence 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., graduate standing and introductory undergraduate physics.

**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 ASTR 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 ASTR 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 ASTR 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 ASTR 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 ASTR 6640.

**GEOL 6650 (1-3). Seminar in Geophysics.** Advanced seminar studies in geophysical subjects for graduate students. Same as ASTR 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 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. Prereq., GEOL 6680. 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.

## Germanic and Slavic 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 1028-3. Special Topics in German.** Students should inquire at the department since topics will vary. May be repeated for a maximum of 6 credit hours when topic varies.

**GRMN 1900 (1-6). Independent Study.**

**GRMN 2010-4. Intermediate German 1.** 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 2.**

**GRMN 2050-2-4. Intermediate German: Conversation.** For students who wish supplementary conversational practice at the third semester level. Students may take this course concurrently with GRMN 2010. May be repeated for a maximum of 8 credit hours. 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 (1-6). 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 business persons 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. May be repeated for a maximum of 6 credit hours when topic varies.

**GRMN 3900 (1-6). Independent Study.**

**GRMN 4010-3. Advanced Composition, Conversation, and Stylistics 1.** Designed to improve written expression in German. Detailed study of difficult grammatical 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. May be repeated for a maximum of 6 credit hours when topic varies.

**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 (1-6). Independent Study.**

### *German 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. Approved for arts and sciences core curriculum: contemporary societies.

**GRMN 1602-3. Metropolis and Modernity.** An interdisciplinary introduction to the modern industrial city in Europe and the U.S.A., with particular attention to the representation of urbanism in the visual arts. Approved for arts and sciences core curriculum: literature and the arts.

**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. Approved for arts and sciences core curriculum: literature and the arts.

**GRMN 2502-3. Representing the Holocaust.** Examines how the memory of the Holocaust in Nazi Germany is increasingly determined by the means of its representation, e.g. in film, autobiography, poetry, architecture, etc. Approved for arts and sciences core curriculum: ideals and values.

**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 3502-3. Literature in the Age of Goethe.** Features the writings of Germany's major literary figures from 1749 to 1832. Special attention is paid to the formation of literary periods, genres, aesthetic, and socio-historical developments contributing to the birth of modernism in German intellectual history and literature. Approved for arts and sciences core curriculum: literature and the arts.

**GRMN 3503-3. German Film and Society 1.** History and theory of Weimar and Nazi film with sociocultural emphasis. Taught in English. Same as FILM 3503.

**GRMN 3504-3. Topics in German Film: Technology and Film.** A comparative analysis of key issues in German culture as they are represented in film and other media, e.g. technology, architecture, women, Holocaust. Same as FILM 3504. No prereqs., taught in English. May be repeated for a maximum of 6 credit hours when topic varies.

**GRMN 3505-3. The Enlightenment: Tolerance and Emancipation.** Examines the enlightenment belief in reason and the common humanity of all individuals and cultures. Emphasizes arguments for and against freedom of religion, abolition of slavery, and emancipation of women in 18th-century European and American literature and thought. Same as HUMN 3505. Approved for arts and sciences core curriculum: ideals and values.

**GRMN 3513-3. German Film and Society 2.** History and theory of postwar German cinema with sociocultural emphasis. Taught in English. Same as FILM 3513.

**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. May be repeated for a maximum of 6 credit hours when topic varies.

**GRMN 4502-3. Nietzsche: Literature and Values.** Emphasizes Nietzsche's major writings spanning the years 1872 to 1888 with particular attention to the critique of Western values. Includes a systematic exploration of doctrines, concepts, and ideas leading to the values of creativity. Same as HUMN 4502. Approved for arts and sciences core curriculum: ideals and values.

**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. May be repeated for a maximum of 6 credit hours when topic varies.

**GRMN 4504-3. Goethe's Faust.** Systematic study of the Faust motif in Western literature, with major emphasis on Faust I and II by Goethe. Approved for arts and sciences core curriculum: literature and the arts.

### German Graduate Courses

**GRMN 5010-3. Bibliography and Methods of Research.** Training in the use of reference works for conducting research in the humanities and social sciences. Analysis of, and hands-on practice with, bibliographic tools specific to German, as well as reference tools inclusive of German-area materials but broader in their scope. Students will learn proper procedure for manuscript preparation and submission. Prereq., graduate standing or instructor consent.

**GRMN 5020-3. Applied Linguistics and Foreign Language Teaching Methodology.** Required of all graduate teaching assistants, this course provides a knowledge of the aspects of German linguistics that are important for teaching German and a survey of foreign language teaching methods and second language acquisition research. Prereq., graduate standing or instructor consent.

**GRMN 5110-3. Seminar: Germanic Literature and Society from the Beginning to the Renaissance.** Treats cultural, intellectual, linguistic, and literary developments, with emphasis on the medieval period. Readings will include Gottfried's *Tristan und Isolde*, *Das Nibelungenlied*, courtly lyric poetry, Wolfram's *Parzival*, and other Arthurian romances. Prereq., graduate standing or instructor consent.

**GRMN 5120-3. Seminar: Germanic Literature and Society from the Renaissance through the Baroque.** Intellectual, cultural, and literary developments from about 1450 through the early eighteenth century, with emphasis on Baroque literature. Prereq., graduate standing or instructor consent.

**GRMN 5210-3. Seminar: The Age of Enlightenment.** Examines the influence of the emerging middle class on the transformation of aesthetic and societal values. Major works of theory, philosophy, literature, and criticism by Lessing, Herder, Kant, J.E. Schlegel, and others. Examines major literary and cultural influences from France and Great Britain. Prereq., graduate standing or instructor consent.

**GRMN 5220-3. Seminar: Topics in the Age of Goethe.** Examines various aspects of German-speaking society from the 1770s to 1830s. Topics may include *Sturm und Drang* as social commentary; romantic theory in the wake of the French Revolution; Romantic nationalism; the Faust theme; Weimar as a cultural center; and others. May be repeated for a maximum of 6 credit hours when topic varies. Prereq., graduate standing or instructor consent.

**GRMN 5230-3. Seminar: Concepts of the Self from Schlegel to Freud and Jung.** Profound contributions to the discourses of modernity begin with Romanticism and lead to the depth-psychology of Freud and Jung. The course examines the major stages in this process: the symbolism of the self in Romanticism (Schlegel, E.T.A. Hoffman, Chamisso), the seminal role of Schopenhauer and Nietzsche, and finally the emergence of the self as the hidden god in the thought of Freud, Jung, Hesse, and others. Prereq., graduate standing or instructor consent.

**GRMN 5310-3. Seminar: Topics in the Nineteenth Century.** Examines the transformation of realism from Büchner to Gerhart Hauptmann. Topics may include literary responses to

the Restoration; intellectuals and the Revolution of 1848; philosophy and literature; theatrical representations of woman, family, and gender; and others. May be repeated for a maximum of 6 credit hours when topic varies. Prereq., graduate standing or instructor consent.

**GRMN 5320-3. Seminar: The German Novel from 1901-1956.** Beginning with T. Mann's *Buddenbrooks*, this course charts the rise of the German novel in the early twentieth century and examines such topics as Wilhelminian society; intellectuals and World War I; dehumanization and alienation; national socialism and literary exile; and others. Authors include T. Mann, H. Hesse, R. Rilke, F. Kafka, A. Seghers, and A. Zweig. Prereq., graduate standing or instructor consent.

**GRMN 5330-3. Seminar: German Intellectuals and Society Between the Wars.** Examines the period of social crisis and the intellectual responses to the collapse of the prewar order. Attention will be given to the antidemocratic thought of Spengler, Jünger, Stefan George and his circle, to the emergence of existentialism with Scheler and Heidegger, and to the search for a new political humanism as evidenced by the work of Thomas Mann. Prereq., graduate standing or instructor consent.

**GRMN 5410-3. Seminar: Topics in Early Twentieth Century German Society.** Focuses on major issues, events, movements, and figures prior to World War II. Topics may include the ontology of lyric poetry; Berlin in the 1920s; exiles, their communities, and their writings; women writers from Andreas-Salomé to Anna Seghers; topics in German film; and others. May be repeated for a maximum of 6 credit hours when topic varies. Prereq., graduate standing or instructor consent.

**GRMN 5420-3. Seminar: Topics in Later Twentieth Century German Society.** Analyzes major currents and events such as the Holocaust, coming to terms with the past (*Vergangenheitsbewältigung*), German Democratic Republic (GDR) literature, and responses to the reunification. Topics may include the Austrians from *Anschluss* to Waldheim; Paul Celan; East German writers between Wolf Biermann and Christa Wolf; topics in German film; and others. May be repeated for a maximum of 6 credit hours when topic varies. Prereq., graduate standing or instructor consent.

**GRMN 5510-3. Seminar: Open Topics in German Civilization.** Focuses on cultural issues that cross lines of literary periodization. Topics may include the theater as social criticism from Lessing to Handke; forms of German protest from Luther to Thomas Mann; nihilism from Bonaventura to Thomas Bernhard; topics in German film; and others. May be repeated for a maximum of 6 credit hours when topic varies. Prereq., graduate standing or instructor consent.

**GRMN 5520-3. Seminar: Current Issues in German Literature and Media.** Examines issues pervading contemporary German literature and media, such as concerns of youth, xenophobia, stereotyping as it affects women and men in their relations, work experience, feminism, problems connected with the reunification, and other issues. Prereq., graduate standing or instructor consent.

**GRMN 5900 (1-3). Independent Study.** Prereq., graduate standing or instructor consent.

**GRMN 6900 (1-3). Master's Thesis.** Repeatable up to 6 credit hours. Prereq., graduate standing or instructor consent.

**GRMN 6940-0. Master's Degree Candidate.**

### *Polish*

**PLSH 1010-4. 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 1020-4. Beginning Polish 2.** Continuation of PLSH 1010. Prereq., PLSH 1010.

### *Russian*

**RUSS 1010-4. Beginning Russian 1.** For students with no previous training in Russian.

**RUSS 1020-4. Beginning Russian 2.** Continuation of RUSS 1010. Prereq., RUSS 1010.

**RUSS 1030-3. Russian for Reading Knowledge.** Provides the requisite structure and vocabulary of Russian in an intensive format, such that students are able to read and translate Russian in their field of study with the help of a dictionary.

**RUSS 1900 (1-6). Independent Study.** May be repeated for a maximum of 6 credit hours.

**RUSS 2010-4. Second-Year Russian 1.** Review and continuation of basic skills learned in the first year: reading, writing, speaking and oral comprehension. Satisfies arts and sciences language requirement. Prereq., RUSS 1020.

**RUSS 2020-4. Second-Year Russian 2.** Continuation of RUSS 2010. Prereq., RUSS 2010.

**RUSS 2900 (1-6). Independent Study.** May be repeated for a maximum of 6 credit hours.

**RUSS 3000-3. Advanced Conversation.** Enables students to speak and understand contemporary Russian. Discussion topics and source materials will vary. May be repeated for a maximum of 6 credit hours. Prereq., RUSS 2020.

**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 Russian literature. Prereq., RUSS 2020.

**RUSS 3020-3. Third-Year Russian 2.** Continuation of RUSS 3010. Prereq., RUSS 3010.

**RUSS 3900 (1-6). Independent Study.**

**RUSS 3930 (1-6). Russian Internship.** Provides an academically supervised opportunity for upper-division students to earn credit while working for public or private organizations. Students apply skills and knowledge earned in the major, and supplement their work experience through directed readings and assignments. Prereqs., junior standing and major in Russian.

**RUSS 4010-3. Advanced Conversation and Composition 1.** Prereq., RUSS 3020.

**RUSS 4020-3. Advanced Conversation and Composition 2.** Prereq., RUSS 4010.

**RUSS 4210-3. Open Topics: Russian Literature and Culture.** Selected topics in Russian literature, film, art, and music. Prereq., RUSS 3020. May be repeated for a maximum of 9 credit hours when topic varies.

**RUSS 4900 (1-6). Independent Study.** May be repeated for a maximum of 6 credit hours.

### *Russian Courses Taught in English*

**RUSS 1601-3. Russian Culture Past and Present.** Introduction to Russian culture from the ninth century to the present. Focuses on interdisciplinary exploration of literature, folklore, art, architecture, and music through study in St. Petersburg.

**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 Modern Russian Culture.** Forces shaping twentieth century Russian culture. Evolution of Russian literature, art, film, music, and ballet. Approved for arts and sciences core curriculum: contemporary societies.

**RUSS 3301-3. Contemporary Issues in Russian Film.** Examines the relationship between politics, economics, aesthetics, and the way moral and social issues are treated in noteworthy Russian films from the last 20 years. Same as FILM 3301.

**RUSS 3502-3. Ideals and Values in Modern Russia.** Covers sources and evolution of contemporary Russian ideals and values in the spheres of religion, education, law, business, family life, ethnicity, gender, and sexuality. Approved for arts and sciences core curriculum: ideals and values.

**RUSS 4421-3. Gogol.** Noteworthy short stories and his novel, *Dead Souls*.

**RUSS 4431-3. Dostoevsky.** Selected novels.

**RUSS 4441-3. Tolstoy.** Selected short stories and novels.

**RUSS 4451-3. Chekhov.** Major plays and short stories.

**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 for arts and sciences core curriculum: literature and the arts.

**RUSS 4821-3. Twentieth-Century Russian Literature and Art.** Interdisciplinary course emphasizing the influence of art in 20th century Russian literature. Follows the changing cultural landscape from the time when Russia was in the vanguard of modern European literature to the gradual cultural relaxation that culminated in perestroika and glasnost. Same as HUMN 4821. Approved for arts and sciences core curriculum: literature and the arts.

### *Scandinavian*

**NORW 1010-4. Beginning Norwegian 1.**

**NORW 1020-4. Beginning Norwegian 2.** Prereq., NORW 1010 with a grade of C- or better.

**NORW 1900 (1-3). Independent Study.**

**NORW 2110-4. 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.**

### *Scandinavian Courses Taught in English*

**SCAN 2201-3. Introduction to Modern Scandinavian Culture and Society.** Provides a comprehensive introduction to modern Scandinavian culture and society. Surveys the history of Scandinavian countries and examines their culture using art, architecture, literature, and film. Studies social issues, environmental concerns, and political patterns. In profiling aspects of culture and society unique to Scandinavian countries, students arrive at a conception of a collective Scandinavian identity. Approved for arts and sciences core curriculum: contemporary societies.

**SCAN 2202-3. The Vikings.** Examines the social, cultural, technological, and artistic backgrounds of the Viking experience, charting the history of the period both within Scandinavia and Europe as well as North America. Additionally, looks at some of the lasting influences of the Vikings on western civilization. Approved for arts and sciences core curriculum: historical context.

**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.

**SCAN 2510-3. Introduction to Norwegian and Swedish Literature in Translation.** Comprehensive overview of Norwegian and Swedish literature, emphasizing the twentieth century.

### *Slavic*

**SLAV 1900 (1-3). Independent Study.**

**SLAV 2900 (1-3). Independent Study.**

**SLAV 3900 (1-3). Independent Study.**

**SLAV 4900 (1-3). Independent Study.**

### *Slavic Courses Taught in English*

**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 Ukraine. Problems and ideas of dissident literature. Prereq., junior standing.

### Swedish

**SWED 1010-4. Beginning Swedish 1.**

**SWED 1020-4. Beginning Swedish 2.** Prereq., SWED 1010 with a grade of C- or better.

**SWED 1900 (1-3). Independent Study.**

**SWED 2110-4. Second-Year Swedish Reading and Conversation 1.** Fulfills the arts and sciences language requirement for the B.A. and B.F.A. degrees.

**SWED 2120-4. Second-Year Swedish Reading and Conversation 2.** Prereq., SWED 2110 with a grade of C- or better.

**SWED 2900 (1-3). Independent Study.**

**SWED 3900 (1-3). Independent Study.**

**SWED 4900 (1-3). Independent Study.**

### History

Many 1000-level courses, most 3000-level seminars, and all 4000-level courses count toward the 36-39 credit hour major requirements. The remaining 1000-level and all 2000-level courses count within the 45 credit hour maximum in history but do not fill requirements toward the 36-39 credit hour major. 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. HIST 4020 is limited to history majors and minors.

### Methodological, Comparative, and General

**HIST 1010-3. Western Civilization 1: From Antiquity to the 16th Century.** Survey course on the development of Western civilization from its beginnings in the ancient Near East through the Reformation of the sixteenth century. Also available through correspondence study. Approved for arts and sciences core curriculum: historical context.

**HIST 1020-3. Western Civilization 2: 16th Century to the Present.** Survey course dealing with political, economic, social, and intellectual developments in European history from the sixteenth century to the present. Similarities and contrasts between European states are underscored, as is Europe's changing role in world history. Also available through correspondence study. 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 the sixteenth century 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 1180-3. History of Christianity: 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. Approved for arts and sciences core curriculum: historical context.

**HIST 2020-3. Introduction to Medieval and Renaissance Studies.** Introduces students to the literature, history, culture, and art of Europe and the Mediterranean basin from late antiquity through the Renaissance. The course is interdisciplinary and focuses on topics which reveal the dynamism and diversity of pre-modern culture. Same as FINE 2029 and MEDV 2020.

**HIST 2100-3. Revolution in History.** Examines the causes, character, and significance of political revolution in world history. Concentrating on one of the major revolutions of modern history, it examines why revolutions occur, who participates in revolution, and to what effect. Specific course focus will vary. Approved for arts and sciences core curriculum: historical context.

**HIST 3000-3. Seminar 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 3010-3. Communist Societies in Historical Perspective.** Examines communist societies in Asia and Europe, 1917 to the present, using primary sources to compare how different social groups experienced such regimes, the social bases of revolutions which created and ended communism, and why some communist regimes have survived. Approved for arts and sciences core curriculum: critical thinking.

**HIST 3100-3. History Seminar in Honors.** Approaches to the historian's craft. Gives honors students (both history and non-history majors) an opportunity to engage significant issues in historical interpretation chosen from the field of the instructor. Primary sources typically form the basis for reading, writing, and discussion. Prereq., honors standing.

**HIST 3110-3. 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 3120-3. Honors Thesis.**

**HIST 3840 (1-3). Independent Study.** Methodological, comparative, and general history.

**HIST 4020-3. Capstone: Comparative History.** Explores historical themes from a comparative perspective. As a culmination of the major, it encourages students to think more analytically about historical change. Consult the *Registration Handbook and Schedule of Courses* to determine the course's focus each semester. Team-taught by several faculty. Prereq., 12 hours of upper-division history. Enrollment limited to history majors and minors.

**HIST 4050-3. The World War II Era.** The World War II era witnessed transformations in the social, political, and economic orders across the globe. Traces the domestic and international developments, including military issues, that

shaped the period in Europe, Asia, and the United States and assesses the war's legacy. Prereq., sophomore standing.

**HIST 4750-3. Topics in Canadian History.** Introduces students to Canadian history. Topics may include economic development; aboriginal peoples; the environment; women; comparisons of the American and Canadian west. Same as HIST 5750.

**HIST 4930 (1-3). History Internship.** Matches selected students with supervised internships in professional archives, research libraries, historical associations, and special projects. Internships have a work and academic (reading and writing) component.

**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. Social Scientific Thinking in History.** Subjects include the meaning of objectivity, elements of scientific thinking, limits of scientific thinking, strategies for research design, formulation of testable hypotheses, definition of variables, problems of measurement, investigation of relationships between variables, and interpretation. Assignments include students projects, using SPSS.

**HIST 5750-3. Topics in Canadian History.** Same as HIST 4750.

**HIST 5840 (1-3). Independent Study.** Methodological, comparative and general history.

**HIST 6500-3. Comparative Labor History.** Examines major issues in labor history through comparative study of Europe, the United States, and Latin America. Issues to be studied include working-class formation, the development of worker identities, and workers and the state.

**HIST 6940 (1-3). Master's Degree Candidate.**

**HIST 6950 (1-6). Master's Thesis.**

**HIST 7840 (1-3). Independent Study.** Methodological, comparative 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 GLAS 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 3011-3. Seminar in Ancient History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3511-3. Seminar in Medieval History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3841 (1-3). Independent Study.** Europe: ancient and medieval.

**HIST 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 4021.

**HIST 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 Anthony by Octavian in 31 B.C. Same as CLAS 4031.

**HIST 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 4041, PHIL 4210, and PSCI 4094.

**HIST 4061-3. The Twilight of Antiquity.** 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.

**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.

**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 4761-3. Roman Law.** Same as CLAS 4761.

**HIST 5761-3. Roman Law.** Same as CLAS 5761.

**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 1002-3. Introduction to Central and East European Studies.** Examines major themes in the history of Russia and East-Central Europe since the early modern era, introduces the literature and arts of the region, and presents current political, social and economic issues. Same as CEES 1000-3. Approved for arts and sciences core curriculum: historical context.

**HIST 2222-3. War and Society in the Modern World.** Focuses on war in European and/or American history. Explores the character, origins, and social, political, and intellectual impact of war in contexts ranging from several centuries of international conflict to the experience of individual nations in specific wars. Specific course focus may vary. Approved for arts and sciences core curriculum: historical context.

**HIST 3012-3. Seminar in Modern European History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3112-3. Seminar in Renaissance and Reformation.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3212-3. Seminar in Early Modern Europe.** Approved for arts and sciences core curriculum: critical thinking.

**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). Same as HIST 5222.

**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.** Examines the major political, economic, and social developments in twentieth-century Europe, from the origins of the First World War to the disintegration of communism in Eastern Europe. Particular attention is paid to the political and social consequences of the two world wars, and the division, reconstruction, and transformation of Europe after 1945. Prereq., junior or senior standing.

**HIST 4422-3. World War I. The Brutalization of Europe.** Examines the causes of World War I, the nature of the war itself, and its political, psychological, cultural, and social impacts. Considers the link between World War I and the rise of modern totalitarian movements and ideologies. Prereq., HIST 1020 or 1040.

**HIST 5012-3. Graduate Colloquium in Modern European History: 1789-1970.** Acquaints students with historical literature covering the central issues in modern European history, starting with the French Revolution. Includes the French Revolution, the Industrial Revolution, the revolutions of 1848, nationalism and the emergence of nation-states, World War I, and the Russian Revolution.

**HIST 5222-3. War and the European State, 1618-1793.** Prereqs., HIST 1010 and HIST 1020 or equivalent; and at least two of either HIST 4033, 4133, 4143, 4223, 4232, 4613, or equivalent upper-division graduate courses. Same as HIST 4222.

**HIST 5232-3. The Age of Reason, from Montaigne to Voltaire.** Studies major European intellectual trends from the late sixteenth century through the Enlightenment. Prereq., equivalent to HIST 1010 and 1020; at least two upper-division or graduate equivalents to courses such as HIST 4122, 4222, 4314, 4414, 4521.

**HIST 5842 (1-3). Independent Study.** Europe: modern.

**HIST 6012-3. Readings in Modern European History.**

**HIST 6122-3. Readings in Sixteenth-Century Europe.**

**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 Roman, medieval, and early modern periods. Covers the demographic, economic, and social patterns, political and religious developments, and cultural changes that contributed to the formation 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 2113. Early Modern England (1450-1700).** Examines major themes in the history of England during the period of transition between the medieval and modern eras. The kinds of issues to be explored include the Reformation, the Renaissance, popular culture, the roles of women, and the English Civil War. Specific course focus may vary. Approved for arts and sciences core curriculum: historical context.

**HIST 2543-3. Medieval Nations.** Examines major themes in European national histories during the medieval period: the origins and development of states, social and economic life, religion, and popular culture. Specific course focus may vary. Approved for arts and sciences core curriculum: historical context.

**HIST 3113-3. Seminar in Medieval and Early Modern English History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3133-3. Seminar in Britain Since 1688.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3163-3. 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 ENGL 3163. Approved for arts and sciences core curriculum: historical context.

**HIST 3713-3. Seminar in Russian History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3843 (1-3). Independent Study. Europe: specific countries.**

**HIST 4053-3. Britain and the World, 1688-1964.** Examines the external policy of Great Britain from 1688 to 1964 in Europe, the East, Africa, 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 4113. 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 century. Emphasizes late medieval English society during the thirteenth and fourteenth centuries. Prereq.: junior or senior standing.

**HIST 4133-3. Tudor England.** Deals with the history of England from 1485 to 1603. Examines patterns of daily life, the impact of the Reformation and the Renaissance, and the development of Parliament and the monarchy under the Tudor rulers, especially Henry VIII and Elizabeth. Prereq.: HIST 1010 or 1113.

**HIST 4143-3. Stuart England.** Covers the history of England from 1603 to 1714, the era of the English Civil War and the Glorious Revolution. Traces economic and social relationships, cultural change, and religious and political conflict under the Stuart monarchs. Prereq.: HIST 1010 or 1113.

**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. Revolutionary France.** Examines the two questions most fundamental to any scholarly understanding of the French Revolution: What were the political, social, and cultural causes of revolution in 1789? Why did the French Revolution become increasingly radical after 1789?

**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. Prereq.: senior standing.

**HIST 4613-3. History of Eastern Europe to 1914.** Examines the conquering of the kingdoms of Eastern Europe by the Russian, Prussian, Habsburg, and Ottoman Empires, and the formation of national consciousness among the subject peoples of the region before World War I.

**HIST 4623-3. History of Eastern Europe Since 1914.** Examines the struggle of nations of eastern Europe to assert their independence, from break-up of the imperial system at the end of World War I, through the Soviet bloc which emerged after World War II, to the establishment of democratic governments after the 1989 revolutions.

**HIST 4723-3. Imperial Russia.** Surveys major cultural, social, and economic changes from the reign of Peter the Great through World War I.

**HIST 4733-3. The Russian Revolution and the Soviet Regime.** Covers in detail the significant social, economic, and political events of Soviet Russia from the February Revolution of 1917 to the present. Prereq.: junior or senior standing.

**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*. May be repeated for credit to a maximum of 6 hours.

**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 7153-3. Seminar: English History, 800-1688.**

**HIST 7163-3. Seminar: English History, 1688-Present.**

**HIST 7183-3. Interdisciplinary Seminar in British Studies.** Introduces students to the methodologies and texts/sources of current work in English literature, history, theatre, art history, and certain of the social sciences. Students write a paper based upon the University of Colorado's distinctive research collections in British studies. Same as ENGL 7889.

**HIST 7843 (1-3). Independent Study. Europe: specific countries.**

### *Europe: Topical*

**HIST 3414-3. Seminar in European Intellectual History.** Approved for arts and sciences core curriculum: critical thinking.

**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. Same as HIST 5314.

**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-WW II European thought.

**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.

**HIST 5314-3. History of Science from the Ancients to Sir Isaac Newton.** Same as HIST 4314.

**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 in 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.** Surveys American history from first settlement until end of the Civil War. Also available through correspondence study. Approved for arts and sciences core curriculum: United States context.

**HIST 1025-3. History of the United States Since 1865.** Surveys social, economic, political, and cultural development of the United States from the close of the American Civil War to the present. Also available through correspondence

study. 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 primary sources and interpretations of significant topics of this time period. Students explore critical thinking skills of analysis, evaluation, and interpretation from the historian's perspective. 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 primary sources and interpretations of significant topics of this time period. Students learn critical thinking skills of analysis, evaluation, and interpretation from the historian's perspective. 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 2215-3. The Era of the American Revolution.** Explores the foundation of the American republic and promotes an understanding of the social, cultural, and political circumstances that define the era of the American Revolution. Specific course focus may vary. Approved for arts and sciences core curriculum: United States context.

**HIST 3115-3. Seminar in Early American History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3415-3. Seminar in Recent American History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3845 (1-3). Independent Study.** United States: chronological periods.

**HIST 4115-3. Natives and Newcomers: Encounters in the New World.** Focuses on the first generations of interaction between natives and newcomers in the northern and middle regions of the Americas during the sixteenth and seventeenth centuries. Areas include New England, the Chesapeake, Canada, Spanish Borderlands, and the West Indies.

**HIST 4125-3. British Colonial America, 1580-1756.** Studies settlement and evolution of British Colonial America until the Seven Years' War.

**HIST 4205-3. The Colonial Wars and the Coming of American Independence, 1739-1776.** Investigates imperial warfare and its effects during the late colonial period, concentrating on the French and Indian War (1754-1763), the disruption of Anglo-American relations, and the origins of the War of American Independence (1775-1783). Same as HIST 5205.

**HIST 4215-3. The American Revolution.** Examines the events leading to the War of Independence and the creation of the United States.

**HIST 4225-3. The Revolutionary War and the Making of the American Republic, 1775-1801.** Investigates the Revolutionary War and

its impact on the creation of American political institutions, as well as its cultural, social, and economic effects, from the Battles of Lexington and Concord through the inauguration of Thomas Jefferson. Same as HIST 5225.

**HIST 4235-3. Jacksonian America.** Focuses on the social and cultural history of the Jacksonian Era. Issues include the transformation of the market economy, slavery, moral reform, Indian removal, changes in ideas about men's and women's natures and roles, western expansion, and political culture.

**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. Prereq., HIST 1015. Approved for arts and sciences core curriculum: United States context.

**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, WW II, 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. Prereq., junior or senior standing.

**HIST 5205-3. The Colonial Wars and the Coming of American Independence, 1739-1776.** Same as HIST 4205.

**HIST 5225-3. The Revolutionary War and the Making of the American Republic, 1775-1801.** Same as HIST 4225.

**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, 1880-1920.**

**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 2126-3. Modern U.S. Politics and Diplomacy.** Traces the development of contemporary U.S. politics and foreign relations. Analyzes subjects such as the Cold War, the relationship between foreign and domestic politics, the developing meaning of conservatism, liberalism,

and radicalism. Explains the impact of race, gender, class, and immigration. Specific course focus may vary. Approved for arts and sciences core curriculum: United States context or contemporary societies.

**HIST 2166-3. The Vietnam Wars.** Traces the causes, course, and outcome of the wars in Vietnam from 1940 until 1975. Explains the successes of the revolutionaries and the failures of the French and Americans. Analyzes the development of Vietnamese nationalism, French colonialism, and U.S. intervention. Approved for arts and sciences core curriculum: contemporary societies or United States context.

**HIST 2616-3. Women's History.** Examines the history of women in culture and society over time. Particular emphasis on the roles of women in family, economy, society, and politics. Specific course focus may vary. Approved for arts and sciences core curriculum: cultural and gender diversity.

**HIST 2626-3. Gender and Culture.** Examines the construction of gender in a specific culture and society over time. Particular emphasis on the production, maintenance and critique of sex roles and gender ideologies. Specific course focus may vary. Approved for arts and sciences core curriculum: cultural and gender diversity.

**HIST 3116-3. Seminar in American Diplomatic History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3416-3. Seminar in American Society and Thought.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3436-3. Seminar 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. Seminar in Women's History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3646-3. Seminar: Women, Politics, and the State in the U.S. Since 1890.** Explores the twentieth-century political history of American women with an emphasis on their activism and their relationship to the U.S. government. Themes will include women's role in twentieth-century social movements, government policies and their impact on women, and the politics of sexuality and reproduction.

**HIST 3656-3. History of Women in Progressive Social Movements.** The first goal is to explore women's involvement in the United States and international peace, including feminist and civil rights movements of the nineteenth and twentieth centuries. Secondly, students will learn research methods by using a variety of primary and secondary sources and writing an original research paper. Prereq., WMST 2000 or HIST 1015 or 1025. Same as WMST 3656. Approved for arts and sciences core curriculum: critical thinking.

**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. Same as HIST 4025.

**HIST 4116-3. U.S. Diplomatic History, 1865-1939.** Traces the rise of the United States to world power. Explores the interactions of expansionist and isolationist impulses with politics, ideology, culture, and economics.

**HIST 4126-3. U.S. Diplomatic History Since 1940.** Traces the development of the United States as a superpower. Special attention paid to the way in which foreign policy was created and the relationship between foreign and domestic affairs.

**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, and the impact of military activities on American society.

**HIST 4166-3. The War in Vietnam and Its Legacy.** Traces diplomatic, military, cultural, social, and political history of the war in Vietnam from the beginning of U.S. involvement in 1950 to its aftermath in the 1980s. Prereq., junior or senior standing.

**HIST 4316-3. The Origins of American Culture, 1600-1830.** Traces the development of 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.** Addresses the impacts of political, social, and economic developments on ideas about democracy, science, race, gender, faith, the supposed mission of America, and the role of intellectuals in society.

**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. Prereq., HIST 1025. Approved for arts and sciences core curriculum: United States context.

**HIST 4566-3. Twentieth-Century United States Labor History.** 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 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.

**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.

**HIST 4636-3. Lesbian and Gay History: Culture, Politics, and Social Change in the United States.** Considers current theoretical approaches to the history of sexuality and traces the changing meaning of same-sex sexuality in the United States through investigation of lesbian/gay identity formation, community development, politics, and "queer" cultural resistance. Prereqs., WMST 2000 and junior or senior standing. Same as WMST 4636.

**HIST 5106-3. Graduate Colloquium in United States History.** Students gain an acquaintance with major works in the field and discuss current issues of interpretation and methodology.

**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 Twentieth-Century U.S. Labor History.**

**HIST 6546-3. Readings in Cultural History and Theory.** Introduces standard works and recent developments in cultural history. Structuralism and post-structuralism, semiotics, social construction, relativism, hegemony, and the idea of "postmodernity" will be explored in considering the uses of "culture" as an historical category.

**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 7566-3. Research Seminar in Labor History.** Explores various issues in U.S. labor history through readings and research projects. Most of the readings are taken from writings on U.S. labor history. Special attention given to women, immigration, and regional patterns. Research skills emphasized. Prereq., HIST 6536 or instructor consent.

**HIST 7656-3. Seminar: Women's History.**

**HIST 7846 (1-3). Independent Study.** United States: Topical Courses 1.

### *United States: Topical Courses 2*

**HIST 1717-3. Introduction to Asian-American History.** Introductory-level survey of social history of Asians in America from the nineteenth century to the present. Primary focus is on delineating and explaining changes that Asian Americans have undergone since their arrival in the United States. Same as AAST 1717. Approved for arts and sciences core curriculum: United States context.

**HIST 2117-3. History of Colorado.** 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. Also available through correspondence study. Approved for arts and sciences core curriculum: United States context.

**HIST 2227-3. Topics in American Southwest History.** Covers major observations and criticisms central in shaping the history of the southwest.

**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 or cultural and gender diversity.

**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 or cultural and gender diversity.

**HIST 3317-3. Seminar in the American West.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3417-3. Seminar in African-American History.**

**HIST 3847 (1-3). Independent Study.** United States: Topical Courses 2.

**HIST 4217-3. The American West in the Nineteenth Century.** Explores cultural, social, and political interaction in the American west during the nineteenth century. Themes include

environmental change, conflict and syncretism across race, class, and gender lines, and mythic images, and their relationship to the "real" west.

**HIST 4227-3. The American West in the Twentieth Century.** Explores cultural, social, and political interaction in the American west during the twentieth century. Themes include popular culture, state-federal relationships, environmental change, urbanization, immigration, and cultural formation.

**HIST 4267-3. U.S. Mining West.** Integrates social, economic, technological, and environmental aspects of industrial mining in the U.S. west. Course explores urban development and economic adaptations, mining and reclamation technology, and federal mining law and policies that accompanied the evolution of the industry.

**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.

**HIST 4417-3. Environmental History of North America.** Examines how people of North America, from pre-colonial times to the present, organized their lives within the ecological systems of the area, how they conceived of their natural world, and how they reshaped their environment according to their human needs. Prereq., HIST 1015 and 1025.

**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.

**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.

**HIST 4717-3. Chinese-American History.** Examines Chinese-American history from 1848 to the present day within context of socioeconomic and political developments in China and the United States. Topics include the Chinese diaspora, immigration to the United States, participation in the economy, the exclusion movement, community development, women, and family. Same as AAST 4717. Prereq., AAST 1015, HIST/AAST 1717, or instructor consent.

**HIST 4727. Japanese-American History.** An overview of the Japanese-American experience in the United States, highlighting pre-WWII processes of immigration, community and family formation, and exclusion, as well as mass incarceration during the 1940s. Same as AAST 4727. Prereq., HIST or ETHN major, junior or senior standing, or instructor consent.

**HIST 5847 (1-3). Independent Study.** United States: topical courses 2.

**HIST 6317-3. Readings in the American West.**

**HIST 6417-3. Readings in Environmental History.** Offers historical perspective on the complex and interdependent relationship between human social and cultural institutions and the natural world. Considers interdisciplinary methodologies incorporating history, biology, geography, law, and other disciplines. Same as EPOB 6410.

**HIST 7257-3. Seminar: History of the American Frontier.**

**HIST 7847 (1-3). Independent Study.** United States: Topical Courses 2.

### *World Areas: 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. Approved for arts and sciences core curriculum: historical context.

**HIST 1208-3. Sub-Saharan Africa to 1800.** An introduction to the peoples of Africa south of the Sahara and some major developments in the region up to 1800 A.D. Approved for arts and sciences core curriculum: historical context.

**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. Approved for arts and sciences core curriculum: historical context.

**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. Approved for arts and sciences core curriculum: historical context.

**HIST 1708-3. Introduction to Japanese History.** A broad interdisciplinary survey of the history of Japan from earliest times to the twentieth century. Explores the development of political institutions, social structures, cultural and religious life, economic development, and foreign relations in an historical perspective. Approved for arts and sciences core curriculum: historical context.

**HIST 3018-3. Seminar in Latin American History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3028-1. Lab 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 3218-3. Seminar in African History.** Deals with particular themes in African history. Check with department for details.

**HIST 3328-3. Seminar 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. Approved for arts and sciences core curriculum: critical thinking.

**HIST 3628-3. Seminar in Recent Chinese History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3718-3. Seminar in Japanese History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3848 (1-3). Independent Study. World Areas:** 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 events 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.** The study of Mexican history continues with the establishment of independence in 1821, examines the upheavals of the Mexican Revolution, and culminates with recent events in Mexico. Same as CHST 4128.

**HIST 4218-3. States and Societies of West Africa to 1900.** Examines the history of West Africa from the earliest times to the nineteenth century.

**HIST 4248-3. Africa in the 19th Century.** Juxtaposes an increasing process of indigenous state-building with increasing European presence.

**HIST 4258-3. Africa Under European Colonial Rule.** Focuses on the political, economic, and social dimensions of colonialism, as well as African nationalism and decolonization.

**HIST 4318-3. The Medieval Middle East, A.D. 500-1600.** Examines the history of the Middle East from 600 to the early modern period. Attention divided equally between 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-Palestinian 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 4348-3. Topics in Jewish History.** Explores different aspects of Jewish history in different semesters. Surveys Jewish history from biblical beginnings through the early middle ages. Examines the Torah, prophecy and wisdom, and the origins of Christianity and Rabbinic Judaism.

**HIST 4538-3. History of Modern India.** Examines the history of India from the British conquest of India in the late 18th century to independence in 1947. Emphasizes the impact of British rule on the political, economic, and social development of modern India.

**HIST 4618-3. Traditional China.** Examines major traditions in philosophy, art, politics, society, and economy of China during the premodern period.

**HIST 4628-3. Modern China.** Examines China from 1750 to 1949. Focuses on such issues as the influence of imperialism, the emergence of nationalism, and the meaning of revolution.

**HIST 4638-3. Contemporary China.** Examines the history of the People's Republic of China from 1949 to the present. Focuses on such issues as the nature of Maoism; foreign policy; political campaigns such as the Cultural Revolution and the Democracy movement; and recent economic developmental efforts.

**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, Classical, and Medieval Japanese History.** Begins with the prehistoric and protohistoric periods. Explores the development of Japan's classical age and traces the rise and attenuation of elite warrior government.

**HIST 4728-3. Modern Japanese History.** Begins with early modern Japan; proceeds through the era of rapid modernization after the Meiji Restoration in the mid-nineteenth century, and concludes with Japan's gradual descent into prolonged war, first with China and then in the Pacific.

**HIST 5848 (1-3). Independent Study. World Areas:** Specific Regions.

**HIST 6128-3. Readings in Modern Mexican History.**

**HIST 6618-3. Readings in Chinese History.**

**HIST 6718-3. Readings in Modern Japanese History.**

**HIST 7848 (1-3). Independent Study. World Areas:** Specific Regions.

### *World Areas: Comprehensive and General*

**HIST 3019-3. Seminar in Asian and African History.** Approved for arts and sciences core curriculum: critical thinking.

**HIST 3849 (1-3). Independent Study. World Areas:** comprehensive and general.

**HIST 4619-3. Women in Asian History.** Considers major issues in the history of Asian women in the eighteenth, nineteenth, and twen-

tieth centuries. Focuses on gender roles in Asian family, state, and religious systems. Same as WMST 4619.

**HIST 5849 (1-3). Independent Study. World Areas:** Comprehensive and General.

**HIST 6019-3. Readings in Third-World History.**

**HIST 6329-3. Readings in Comparative Ethnohistory.**

**HIST 6339-3. Natives and Newcomers: New World Encounters, 1500-1775.** A comparative analysis of Native American encounters with Europeans and Africans in the period 1500 to 1775. Makes use of archaeological and ethnographic studies of Native Americans and West African societies prior to contact while employing more traditional historical sources for the European cultures from which these explorers and colonists derived. Analyzes the forms and direction of interaction between hosts and intruders.

**HIST 7849 (1-3). Independent Study. World Areas:** Comprehensive and General.

## Humanities

See Comparative Literature and Humanities.

## International Affairs

**IAFS 1000-4. Global Issues and International Affairs.** Introduces students to the international affairs program. Examines political and economic development in several countries in many different world regions; historical trends and development; and current political and economic issues. Approved for arts and sciences core curriculum: contemporary societies.

**IAFS 3000-3. Special Topics in International Affairs.** Senior level "umbrella" seminar spanning a variety of topics relevant to the study of international affairs. Subjects addressed vary according to student interest and faculty availability. Repeatable for credit for a maximum of 6 hours. Prereq., junior or senior standing.

**IAFS 4500-3. The Post-Cold War World.** A capstone course for international affairs majors. Students will have the maximum opportunity for discussion, oral reports, critical book reviews, and research papers. The course examines the ways in which the end of the Cold War affected world politics. As issues of military confrontation and the danger of nuclear war between the superpowers faded, how did peoples, governments, and non-governmental organizations face new challenges? Approved for arts and sciences core curriculum: critical thinking.

**IAFS 4700-3. Global Perspectives and Political Philosophy.** Preparation and discussion of selected political philosophies from various regions around the world including Islamic fundamentalism, Confucianism, traditional African ideologies, and Enlightenment. A critical review of these approaches will form the basis for a comparison of the corresponding political systems.

**IAFS 4800-3. Honors Seminar in International Affairs.** This is a "directed research" course tailored to the particular research interests of the



students enrolled. Devoted to research methodology and the development of students' research. Prereq., 3.50 GPA. Approved for arts and sciences core curriculum: critical thinking.

**I.A.F.S. 4930 (3-6). Internship in International Affairs.** Working individually under the guidance of a public or private organization, students will be assigned to projects selected for their academic suitability. Written assignments will occur throughout the semester. Prior approval is required before registering for this course.

## Kinesiology

**KINE 1010-3. 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 1950-3. Introduction to Scientific Writing in Kinesiology.** Overview of writing skills and strategies, emphasizing those most important to the sciences, especially kinesiology. Focuses on fundamental skills, objective analysis, and scientific persuasion, with attention to clear organization and style, academic and scientific mechanics, and distinctions between audiences. Approved for arts and sciences core curriculum: written communication.

**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 3230-3. Health and Physiological of Exercise.** Physiological adaptations to exercise with consideration of the biophysical values of exercise in maintaining fitness and health throughout an individual's life span.

**KINE 3420-3. Nutrition, Health, and Performance.** Basic principles of nutrition and their relationship to health. Students may not receive credit for both KINE 3420 and PSYC 2062. Prereq., junior standing (pre-nursing students are exempt). Approved for arts and sciences core curriculum: natural science.

**KINE 3700-3. Scientific Writing in Kinesiology.** Presentation of guidelines for language, style, and format in scientific writing. Practice in writing preparation techniques including library searches, outlining, and computer use. Critique of research articles on issues of kinesiology. Experience in writing, editing, and revising review and research papers. Prereq. or coreq., at least one upper-division kinesiology core course. Restricted to KINE majors. Approved for arts and sciences core curriculum: written communication.

**KINE 4010 (1-3). Seminar in Kinesiology.** The purpose of this course is to introduce a small group of students to current research topics in kinesiology. Evaluation of current research and discussion of critical issues will be the primary focus of the course. May be repeated for different topics up to a maximum of 6 credit hours. Prereq., junior or senior standing.

**KINE 4100-2. Colloquium in Current Kinesiology.** A general research seminar experience for upper-division kinesiology majors. Emphasis on integrating research topics from all areas of kinesiology and promoting faculty-student research interaction. Emphasis also on developing fundamental research skills and science-based critical thinking. Prereqs., KINE 1010, 2700, and junior standing. Same as KINE 5100.

**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 4540-5. Mechanical Kinesiology.** 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 1010 and 2700, and PHYS 2010.

**KINE 4650-5. Physiological Kinesiology.** 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 1010 and 2700. Same as KINE 5600.

**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. Approved for arts and sciences core curriculum: critical thinking.

**KINE 4710-3. Advanced Laboratory Techniques in Motor Behavior.** Focuses on acquisition and analysis of biokinetic signals associated with human movement, including kinetic and kinematic data. Also, psychological measurement techniques are discussed. Laboratory and individual research projects are required. Prereq., KINE 4720.

**KINE 4720-4. Neuromuscular Kinesiology.** Focuses on the neurological and muscular factors involved in the control movement and the factors that effect the learning of motor skills. Same as KINE 5720.

**KINE 4730-3. Motor Control.** Examines the central and peripheral neural structures responsible for the control and coordination of human movement. Theories of motor control are also investigated from a behavioral and biomechanical view. Concepts in reflexive and voluntary movement control are emphasized. Prereqs., KINE 2700, 4720, or instructor consent.

**KINE 4750-4. Psychological Kinesiology.** 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 1010 and 2700. Same as KINE 5750.

**KINE 4760-3. Critical Thinking in Motor Behavior.** Focuses on critical analysis of research in the area of motor behavior (motor control/learning and sport and exercise psychology). Students participate in group discussions, individual presentations, and written arguments. Prereq., KINE 4720 or 4750. Approved for arts and sciences core curriculum: critical thinking.

**KINE 4860 (1-3). Independent Study: Undergraduate.**

**KINE 4870 (1-3). Honors Thesis.** Prereqs., KINE 2700, 3700, 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 5100-2. Colloquium in Current Kinesiology.** Prereq., graduate standing. Same as KINE 4100.

**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 5600-5. Physiological Kinesiology.** Same as KINE 4650.

**KINE 5610-3. Neuromuscular Physiology.** Deals with neurophysiological mechanisms of body movement and integration of physiological, biomechanical, and biochemical mechanisms of human muscle fatigue. Prereq., EPOB 3430 and KINE 4650.

**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 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 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 indi-

vidual research projects required. Prereq., KINE 4720 or instructor consent.

**KINE 5720-4. Neuromuscular Kinesiology.** Same as KINE 4720.

**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 4720 or instructor consent.

**KINE 5740-3. Theory of Motor Skill Learning.** Critical analysis of motor learning theories. Adam's closed loop theory, Schmidt's schema theory, and the influence of contextual interference on learning and performance are evaluated. Feedback and practice organization are also covered. Projects and presentations required. Prereq., KINE 4720 or equivalent.

**KINE 5750-4. Psychological Kinesiology.** Same as KINE 4750.

**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 4750 or 4720, and KINE 5750.

**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 Physiology.** Presentation and evaluation of relevant issues in the field of exercise physiology; 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. Explores consistent themes in history, geography, literature and music. Approved for arts and sciences core curriculum: cultural and gender diversity.

**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 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 3220-3. American Indian Languages in their Social and Cultural Context.** A sampling of the many languages and cultures found in America before Columbus. Emphasizes those living in what eventually became the United States, but also gives attention to the languages and higher civilizations of Latin America. Approved for arts and sciences core curriculum: cultural and gender diversity.

**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 audi-

tory 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. Language and Mind.** 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 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. Same as LING 5610.

**LING 4800-3. Language and Culture.** Principles of language structure and how language and culture interrelate; how language and language use are affected by culture; and how culture may be affected by use of, or contact with, particular languages.

**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 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. Same as PSYC 5300.

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., graduate status.

LING 5570-3. **Introduction to Diachronic Linguistics.** Familiarizes students with terminology, methods, and theories dealing with phenomena of language change through time. Prereqs., LING 4410 and 4420.

LING 5610-3. **English Structure for Teachers of English to Speakers of Other Languages.** Prereq., graduate status. Same as LING 4610.

LING 5900 (1-3.) **Independent Study.**

LING 6000-3. **Linguistics for Cognitive Science.** Surveys linguistics for doctoral students, especially those in the cognitive science disciplines. Covers the phenomena studied by linguists (sound systems, grammar, meaning and function, language use, and language change) and the theoretical approaches linguists take to these phenomena. Not open to graduate students in linguistics. Prereqs., graduate status or instructor consent.

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 perspective. No special prior knowledge of the subject language is

required. Prereqs., LING 5410, 5420, and 5570.

LING 6940 (1-3.) **Master's Degree Candidate.**

LING 6950 (1-6.) **Master's Thesis.**

LING 7000-2. **Methods of Typological Research Ia.** 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 preliminary sketch of results under close faculty supervision. Prereqs., LING 5410, 5420, and 5570 or equivalent. Must be followed by LING 7001 to receive credit.

LING 7001-1. **Methods of Typological Research Ib.** Continuation of LING 7000. Research practicum providing experience in discovering generalizations about language from observations over a sample of individual languages. Students practice the steps in such research from preliminary sketch of results to presentation of results under close faculty supervision. Prereq., LING 7000. Must be taken in the semester immediately after LING 7000 in order to receive credit.

LING 7100-2. **Field Methods Ia.** 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. Must be followed by or taken concurrently with LING 7101 in order to receive credit.

LING 7101-1. **Field Methods Ib.** Continuation of LING 7100. Introduces the process of discovering structure of a language from data obtained directly from its speakers. Emphasizes formulation using computational tools. Prereq. or coreq., LING 7100. Must be taken concurrently with or in the semester immediately after LING 7100 in order to receive credit.

LING 7110-3. **Field Methods 2.** Continuation of LING 7101. Students continue field investigation of the same language, further applying the techniques introduced in LING 7100, but they are expected to undertake a deeper analysis of one aspect of the language structure. Prereq., LING 7100 and 7101.

LING 7200-3. **Computational Methods in Linguistics.** Computational speech and text corpora analysis (search tools, statistics, script writing), foundations of linguistics theory (regular and context-free grammars, the Chomsky hierarchy), and an overview of common algorithms (transduction, parsing, connectionism). Prereq., CSCI 1200 or basic computer programming ability.

LING 7410-3. **Phonological Theory.** Phonetic and morphophonological representations: distinctive features, segments, prosodic structures, morphological structures. Phonological processes and their interaction. Naturalness conditions. Prereqs., 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 change, 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 7800-3. **Open Topics in Linguistics.**

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.** In-depth exploration of current issues in language acquisition, 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 this 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 Applied English Structure for Foreign Students.** Instruction and practice at the non-beginning 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 Applied English Structure 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. Summer offerings vary; check the summer schedule.

**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. The combination MATH 1110 and 1120 is approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

**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. The combination MATH 1110 and 1120 is approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

**MATH 1300-5. Analytic Geometry and Calculus 1.** Topics include 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 credit hours in MATH 1300. Students with credit in MATH 1310 or APPM 1350. Prereqs., two years of high school algebra, one year of geometry, and 1/2 year of trigonometry or MATH 1000-1040. Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

**MATH 1310-5. Calculus 1 with Computer Applications.** The topics, prerequisites, and credit restrictions are the same as for MATH 1300, but a greater emphasis is placed on synthesizing the geometric, numerical, and algebraic aspects of each concept and on exploring "real world" applications of calculus. Especially recommended for biology majors. Students with credit in MATH 1310 may not receive credit in MATH 1300 or APPM 1350. Prereq., three years of high school math, including trigonometry. Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

**MATH 1320-5. Calculus 2 with Computer Applications.** Continuation of MATH 1310. Students with credit in MATH 1320 may not receive credit in MATH 2300 or APPM 1360. Prereq., MATH 1310.

**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. 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 various fundamental concepts in 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.** A continuation of Calculus 2. Topics include 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. 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 APPM 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. Offered each spring. 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. Students may not receive credit for both MATH 3130 and APPM 3310. Prereq., Calculus 3.

**MATH 3140-3. Abstract Algebra 1.** Careful study of the elementary theory of groups, rings, fields, polynomials, group and ring homomorphisms, and isomorphisms. Prereq., MATH 3000, 3110, 3130, or 3200.

**MATH 3170-3. Combinatorics 1.** Basic methods and results in combinatorial theory. Enumeration methods, elementary properties of functions and relations, graph theory. Emphasizes applications. Prereq., Calculus 2.

**MATH 3200-3. Introduction to Topology.** An introduction to proof writing, this course helps prepare students for MATH 4310 through the study of the underlying structure of a space, with particular attention to open and closed sets and continuous functions. Topics include basic set theory, metric spaces, Hausdorff spaces, general topological spaces, continuity, limits, homeomorphisms, connectedness, and compactness. Prereq., Calculus 3.

**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. Cannot be applied toward the mathematics major. Prereqs., two semesters of calculus and permission of the director of the mathematics module program.

**MATH 4000-3. Foundations of Mathematics.** A complete deductive framework for mathematics is given and applied to various areas. Presents Godel's famous incompleteness theorem about the inherent limitations of mathematical systems. Uses idealized computers to investigate the capabilities and limitations of human and machine computation. Prereq., one upper-division mathematics course.

**MATH 4140-3. Abstract Algebra 2.** A continuation of MATH 3140, this course covers group actions, Sylow theory, field theory, and some Galois theory. Prereq., MATH 3140.

**MATH 4180-3. Combinatorics 2.** More advanced techniques in enumeration theory and graph theory. Finite groups, Polya's theory of counting, diagraphs, finite rings and fields are discussed, as are applications in computer science, switching theory, and coding theory. Prereq., MATH 3170.

**MATH 4230-3. Geometry of Curves and Surfaces.** Introduces the modern differential geometry of plane curves, space curves, and surfaces in space. Computers will be used, but no prior knowledge of computer programming is required. Prereqs., MATH 2400 and 3140.

**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. Introduction to Analysis.** Calculus of one variable. Topics include the real number system, continuity, differentiation, sequences and series, convergence, uniform convergence, Taylor's theorem, integration. Prereqs., Calculus 3 and MATH 3000 or MATH 3200. MATH 3130 highly recommended.

**MATH 4320-3. Multivariable Analysis.** Calculus of several variables. Topics include continuity, differentiation and integration, implicit function theorem, inverse function theorem, Fourier series if time permits. Prereqs., MATH 4310, and either MATH 3130 or APPM 2360.

**MATH 4330-3. Fourier Analysis.** The notion of Fourier analysis, via series and integrals, of periodic and nonperiodic phenomena is central to many areas of mathematics. This course develops the Fourier theory in depth, and considers such special topics and applications as wavelets, Fast Fourier Transforms, seismology,

digital filtering, NMRI, probability, and number theory. Prereq., MATH 3130.

**MATH 4370-3. Honors Advanced Calculus and Related Subjects 1.** Topics include completeness of the number system; concepts and theorems that underlie the calculus of functions of one and several variables; and other topics including trans-finite 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 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.

**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.** Topics include 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.** Numerical analysis of partial differential equations. Finite difference methods, finite element methods, finite spectral methods. The mathematical settings and analyses of these methods. Model problems such as heat equation, convection/diffusion equations, first order hyperbolic systems. Prereq., MATH 4470 or equivalent. Same as MATH 5480.

**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. Credit may not be received for both MATH 4510 and APPM 3570 or for both MATH 4510 and ECEN 3810.

**MATH 4520-3. Introduction to Mathematical Statistics.** Topics include 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.** Topics include 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 3310. Prereq. for MATH 4660 is MATH 4650. Same as APPM 4650 and 4660.

**MATH 4710-3. Introduction to Mathematical Logic.** Topics include 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 4890 (1-3). Honors Independent Study.** For students doing a thesis for departmental honors.

**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 5000-3. Foundations of Mathematics.** Foundations used in other graduate courses and for specialization in foundations. Topics covered include: equivalence relations, orderings, ordinal and cardinal numbers and arithmetic, axiom of choice; first order logic, models, truth, compactness and completeness theorems, nonstandard analysis, and infinitesimals; and formulation of Godel's incompleteness theorem. Prereqs., MATH 3130, 3140, and 4310.

**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.** 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. Same as APPM 5470.

**MATH 5480-3. Partial Differential Equations 2.** Same as MATH 4480. Prereq., MATH 5470 or MATH 4470 or equivalent.

**MATH 5520-3. Introduction to Mathematical Statistics.** Same as MATH 4520 and APPM 4520/5520.

**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. This course does not count toward a graduate degree in mathematics.

**MATH 6110-3. Introduction to Number Theory.** Divisibility properties of integers, congruences, diophantine equations, arithmetic functions, quadratic residues, distribution of primes, and algebraic number fields. Prereq., MATH 3140.

**MATH 6130-3, 6140-3. Modern Algebra 1 and 2.** Groups, rings and ideals, fields, polynomials, Galois theory. Prereq., MATH 3140.

**MATH 6150-3. Commutative Algebra.** Serves as an introduction to topics that are used in number theory and algebraic geometry, including radicals of ideals, exact sequences of modules, tensor products, Ext, Tor, localization, primary decomposition of ideals, and Noetherian rings. Prereq., MATH 6140.

**MATH 6170-3. Algebraic Geometry.** Serves as an introduction to algebraic geometry, including affine and projective varieties, rational maps and morphisms, and differentials and divisors. Additional topics might include Bezout's Theorem, the Riemann-Roch Theorem, elliptic curves, and sheaves and schemes. Prereq., MATH 6140.

**MATH 6180-3. Algebraic Number Theory.** Serves as an introduction to topics that include number fields and completions, norms, discriminants and differentials, finiteness of the ideal class group, Dirichlet's unit theorem, decomposition of prime ideals in exten-

sion fields, decomposition, and ramification groups. Prereq., MATH 6110 and 6140.

**MATH 6190-3. Analytic Number Theory.** Serves as an introduction to topics that include the Riemann Zeta-function and its meromorphic continuation, characters and Dirichlet series, Dirichlet's theorem on primes in arithmetic progression, zero-free regions of the zeta function, and the prime number theory. Prereq., MATH 6110 and 6350.

**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.** Metric spaces, measure theory, general theory of integration and differentiation, and continuous and Lebesgue function spaces. Prereqs., MATH 4310 and 4320.

**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 with emphasis on the simplest problems; the problem of Lagrange; Hamiltonian and Lagrangian mechanics. The problem of optimal control; the maximum principle of Pontryagin; controllability, applications. Prereq., instructor consent.

**MATH 6520-3. Mathematical Statistics.** Mathematical theory of statistics covering distribution theory, estimation and testing of hypotheses, multivariate analysis, and nonparametric inference, all with emphasis on theory. Prereq., MATH 5520 or APPM 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. Same as APPM 6540.

**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, queuing 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 6710-3, 6720-3. Mathematical Logic 1 and 2.** First-order logic, completeness theo-

rem, 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. 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, L<sub>2</sub>-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 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. Differential Topology.** 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 L<sub>1</sub> and L<sub>2</sub> 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 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. Topics in Applied Mathematics.** 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.** Selected topics in probability such as: sums of independent random variables, notions of convergence, characteristic functions, Central Limit Theorem, random walk, conditioning and martingales, Markov chains, and Brownian motion. Prereq., MATH 6310 or equivalent.

**MATH 8104-3. Modular Forms.** Serves as an introduction to topics that include the upper-half plane and its geometry, modular forms, congruence subgroups, cusps, Fourier expansions, Theta series, Poincaré series, Hecke operators, and relations to Dirichlet series. Prereq., MATH 6130 and 6350.

**MATH 8114-3. Topics in Number Theory.** May include the theory of automorphic forms, elliptic curves, or any of a variety of advanced topics in analytic and algebraic number theory. Prereq., MATH 6120.

**MATH 8134-3. Diophantine Approximation.** Serves as an introduction to topics that include heights, Thue-Siegel-Roth Theorem; S-unit equations, and applications to Diophantine equations.

**MATH 8144-3. Transcendental Number Theory.** Serves as an introduction to topics that include Liouville's Theorem, methods of Gel'fond-Schneider and Schneider-Lang, linear forms in logarithms, and transcendence measures. Prereq., MATH 6115 and 6350.

**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. Topics in Analysis 1.** 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 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. Topics in Logic.** 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 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. ULAM 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.

**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.

**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.

**MATH 1025-1. Fundamentals of Statistics.** Covers general statistics with an emphasis on what statistics is and how it is used. Topics include qualitative description of distributions, normal distributions and calculations, descriptions of relationships, growth models, correla-

tion and regression, probability and random variables. Prereq., one year high school algebra or placement by exam; MATH 1000 is recommended. Approved for arts and sciences core curriculum: quantitative reasoning and mathematical skills.

**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 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.

**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 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 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 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 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.

### *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 various fundamental concepts in 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 and Renaissance Studies

**MEDV 2020-3. Introduction to Medieval and Renaissance Studies.** Introduces the literature, history, culture and art of Europe and the Mediterranean basin from late antiquity through the Renaissance. The course is interdisciplinary and focuses on topics that reveal the dynamism and diversity of premodern culture. Same as HIST 2020 and FINE 2029.

**MEDV 4020-3. Medieval and Renaissance Studies: Texts and Contexts.** Focuses on communities in the Middle Ages and Renaissance (i.e., cloister, court, and city), discussing major literary texts and visual monuments associated with them and their historical context. Emphasizes tensions between tradition and innovation, Latin and vernacular, East and West, Christian and non-Christian (Jewish and Islam), sacred and secular, authority and freedom, and male and female. Prereqs., MEDV 2020 or 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 and Renaissance Studies: Special Topics.** Different topics offered by the faculty of the Medieval and Renaissance Studies Program in alternate semesters. Topics may include the literature of pilgrimage and travel, women and minorities in the Middle Ages and Renaissance, medieval and Renaissance

theatre, music, epic, medieval and Renaissance views of the Classics, the Bible, and medieval and Renaissance theories of education. Prereqs., MEDV 2020 or 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 and Renaissance 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 and Renaissance 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.

### Molecular, Cellular, and Developmental Biology

**MCDB 1030-3. Plagues, People, Plants, and Microorganisms.** Discusses biology, history, and social impact of human plagues and plant diseases. AIDS, bubonic plague, tuberculosis, leprosy, Irish potato blight, emerging plant viral pathogens, pathogens affecting both animals and plants; and the human immune and plant defense responses are each treated in detail. The impact of modern biology on curtailing the impact of diseases will also be discussed. For non-majors. Approved for arts and sciences core curriculum: natural science.

**MCDB 1041-3. Fundamentals of Human Genetics.** Covers the basic principles of genetics, human pedigree analysis, and how genetic diseases affect DNA, RNA, and proteins. Considers implications of this research for medicine and society. For nonmajors. Recommended prereq., good background in high school chemistry and biology. Approved for arts and sciences core curriculum: natural science.

**MCDB 1150-3. Introduction to Molecular Biology.** Covers biologically important macromolecules and biological processes, together with an introduction to cell origins, evolution, structure, and physiology. Provides the foundation for advanced MCDB courses to majors, and a rigorous overview of modern biology to nonmajors. MCDB 1151 must be taken concurrently by MCDB and biochemistry majors and pre-health science students. Prereq., high school chemistry. Coreq., algebra. Approved for arts and sciences core curriculum: natural science.

**MCDB 1151-1. Introduction to Molecular Biology Laboratory.** One two-hour lab per week designed to acquaint students with research techniques and concepts in molecular and cellular biology. Topics include cell structure, function, and physiology. MCDB 1150 must be taken concurrently. Approved for arts and sciences core curriculum: natural science.

**MCDB 2150-3. Principles of Genetics.** Introduces the behavior of genes and chromosomes in eukaryotic and prokaryotic organisms. Covers three areas: transmission genetics, molecular genetics, and population genetics. Attention is given to genetic mapping, recombinant DNA

procedures, and gene expression. MCDB 2151 must also be taken by MCDB or biochemistry majors and pre-health science students. Prereq., MCDB 1150 or general biology. Approved for arts and sciences core curriculum: natural science.

**MCDB 2151-1. Principles of Genetics Laboratory.** One two-hour lab per week. Provides hands-on experience with principles introduced in MCDB 2150. Topics include mitosis, meiosis, classical genetics, cytoplasmic inheritance, complementation, mutagenesis, DNA replication, recombinant DNA, natural selection and evolution. Coreq., MCDB 2150. Approved for arts and sciences core curriculum: natural science.

**MCDB 2840 (1-3). Lower-Division Independent Study.** Instructor consent and independent study contract required. May be repeated for credit, but only 8 hours of MCDB 2840 plus MCDB 4840 can be counted toward graduation. Students with adequate prerequisites should take MCDB 4840.

**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 2150 or EPOB 1220 or instructor consent.

**MCDB 3140-2. Cell Biology Laboratory.** One four-hour lab per week. Provides hands-on experience with modern cell biology laboratory techniques. Topics include microscopy, immunocytochemistry, Western blotting, Southern blotting, and flow cytometry. This course does not use vertebrate animals. Coreq., MCDB 3120.

**MCDB 3150-3. Biology of the Cancer Cell.** Dimensions of the cancer problem; cancer as a genetic/cellular disease; chemicals, viruses, and radiation as causes of cancer; cancer and diet; cancer epidemiology; proto-oncogenes, oncogenes, and cancer suppressor genes; and prevention of cancer. Prereq., MCDB 2150 or EPOB 3200, or instructor consent. Approved for arts and sciences core curriculum: natural science.

**MCDB 3280-3. Molecular Cell Physiology.** Cellular mechanisms will be analyzed from a molecular perspective. Unicellular organisms and tissues of animals and plants will be examined to learn how cells process signals from both in and outside themselves, and use this information to react and accomplish physiological tasks. Prereq., MCDB 3120 and CHEM 1131.

**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. Recommended for students planning careers in the health sciences. Prereq., MCDB 1150 or EPOB 1210 or instructor consent.

**MCDB 3500-3. Molecular Biology.** Studies how molecular techniques are being used to characterize genes and their expression. Topics include mechanisms of DNA replication, mutation and repair, recombination, prokaryotic and eukaryotic gene expression, transposable genetic elements, current applications of recombinant DNA procedures, and identification of human genes. Prereqs., CHEM 1131 and either MCDB 2150 or EPOB 3200.

**MCDB 4000-3. Searching the Biomedical Literature (Topic).** Students learn how to locate and interpret publications describing recent research on a biomedical topic of current interest, followed by critical analysis of controversies and new trends in that research. Prereqs., MCDB 3120 and 3500. Approved for arts and sciences core curriculum: critical thinking.

**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 4130-3. Biological Electron Microscopy: Principles and Recent Advances.** Covers basic mechanisms for imaging and recent advances used in current biological research elements of electron optics, image optimization, resolution, radiation damage, various imaging modes (TEM, HVEM, SEM, STEM, STM), specimen quantitation and reconstruction (stereo and 3D), microanalysis, and electron diffraction. Specimen preparation treated only incidentally. Prereq., one of the following: MCDB 1150, EPOB 1220, MCDB 4500, PHYS 1120 or PHYS 2020. Same as MCDB 5130 and PHYS 4130.

**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, photomorphogenesis, stress responses (heat, water, salt), host-pathogen systems (bacteria, fungi, viruses, viroids), plant defense mechanisms, plant cell tissue culture, and genetic engineering of plants. Prereqs., MCDB 3120 and 3400, 3500, or instructor consent. Same as MCDB 5140. Approved for arts and sciences core curriculum: critical thinking.

**MCDB 4300-3. Immunology.** Studies cellular and molecular mechanisms by which organisms protect themselves from pathogens, emphasizing the human immune system. Discusses development, function, and malfunction of t-cells, b-cells, and other components of the immune system. Emphasizes the experimental basis for our understanding of the immune system. Prereqs., MCDB 3120 and 3500.

**MCDB 4410-3. Human Molecular Genetics.** The human organism as a genetic system: effect

of mutation on protein structure and function; biochemical basis of human genetic disease; polymorphic gene loci; gene mapping and identification; gene cloning and characterization; impact of human genetics on medicine and society. Prereq., MCDB 3400 or 3500. Approved for arts and sciences core curriculum: critical thinking.

**MCDB 4426-3. Cell Signaling and Developmental Regulation.** Introduces several cell signaling processes and their biological functions. Students read and analyze original research articles to learn the thinking processes of scientific research. Writing assignments and oral presentations are required. Prereqs., MCDB 3120 and 3400, or MCDB 3500 and CHEM 4711, or instructor consent. Same as MCDB 5426. Approved for arts and sciences core curriculum: critical thinking.

**MCDB 4471-3. Regulation of Gene Expression in Development.** Molecular biology of cell differentiation in development with special emphasis on mammalian systems. Part one focuses on biological systems, *in vivo* and in cell culture, with discussions on major cell differentiation systems, transient and permanent transfections, transgenic animals, and gene targeting technology. Part two examines molecular mechanisms of gene expression, with discussions on actively pursued systems and coordinate regulations. Prereqs., CHEM 4711 and MCDB 3400, 3500, or instructor consent. Similar to MCDB 4470/5470. Same as MCDB 5471. Approved for arts and sciences core curriculum: critical thinking.

**MCDB 4480-3. Great Literature in the Nucleic Acids.** Students read, analyze, write about, and speak on the subjects presented by important papers from the original scientific literature on nucleic acid (RNA and DNA) biology. Prereq., MCDB 3400 or 3500. Approved for arts and sciences core curriculum: critical thinking.

**MCDB 4500-4. Workshop in Electron Microscopy.** Laboratory course that gives instruction and experience in the preparation of biological specimens and operation of the transmission electron microscope as well as specialized methods of analysis and photographic techniques. This course may use vertebrate animal tissues. Instructor consent required. Same as MCDB 5500, which requires graduate standing and instructor consent.

**MCDB 4540-3. 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, 1150, or instructor consent. Same as MCDB 5540.

**MCDB 4610-3. Topics in Mammalian Developmental Biology.** Covers current research areas in mammalian developmental biology such as neural development, organogenesis, and sex determination. Considers the mouse as a model organism, with frequent reference to other species. Emphasizes the reading, presentation, and discussion of contemporary research articles. Prereqs., MCDB 3120 and 3500, or instructor

consent. 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, mechanism of differentiation and morphogenesis, and developmental genetics. Prereqs. or coreqs., MCDB 3120 and 3400, 3500, or instructor consent; coreq., MCDB 4660.

**MCDB 4660-2. Developmental Biology Laboratory.** Lab for MCDB 4650. Studies of live and prepared embryos from a variety of organisms, including amphibia, chickens, nematodes and fruit flies. Topics include descriptive and experimental embryology, developmental genetics, and molecular biology methods applied to developing systems. Coreq., MCDB 4650. This course uses living vertebrate animals and/or tissues. Same as EPOB 3660.

**MCDB 4680-3. Mechanisms of Aging.** Studies aging as a developmental process emphasizing cellular and molecular mechanisms involve Prereqs., MCDB 3120 and 3400 or 3500. Same as MCDB 5680. Approved for arts and science 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 signaling, 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 and replication 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. Includes critical analysis of primary research papers. Prereq., MCDB 3400, 3500, or instructor consent. Approved for arts and sciences core curriculum: critical thinking.

**MCDB 4790-3. Experimental Embryology.** Embryology is studied by considering experiments relevant to specific topics of early animal development. To best understand this material, the course emphasizes reading, interpretation, and discussion of research articles. Prereqs., MCDB 3120 and either EPOB 3650 or MCD 4650. Approved for arts and sciences core curriculum: critical thinking.

**MCDB 4840 (1-6). Upper-Division Independent Study.** May be repeated for credit, but only 8 hours of MCDB 2840 plus MCDB 4840 can be counted toward graduation. Prereqs., MCDB 2150, instructor consent, and independent study contract.

**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 involve 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, MCDB 3350, EPOB 3650, or instructor consent.

**MCDB 4970-3. 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. Lecture, student presentations, and occasional demonstrations. Emphasis depends on student interest. Prereqs., MCDB 1050 or 3120 and/or PHYS 1120 and 1140 or 3010 and 3020, or instructor consent. Same as MCDB 5970 and PHYS 4970 and 5970.

**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 3.20 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 3.30 or better, and approval by the MCDB honors committee.

**MCDB 5130-3. Biological Electron Microscopy: Principles and Recent Advances.** Same as MCDB 4130 and PHYS 5130.

**MCDB 5140-3. Plant Molecular Biology and Biotechnology.** Same as MCDB 4140.

**MCDB 5210-3. Cell Structure and Function (Lecture and Discussion).** Instructor consent required.

**MCDB 5220-3. Molecular Genetics (Methods and Logic).** Instructor consent required.

**MCDB 5230-3. Gene Expression (Lecture and Discussion).** Instructor consent required.

**MCDB 5250-3. Topics in Developmental Biology (Methods and Logic).** Instructor consent required.

**MCDB 5426-3. Cell Signalling and Developmental Regulation.** Same as MCDB 4426.

**MCDB 5471-3. Regulation of Gene Expression in Development.** Same as MCDB 4471.

**MCDB 5500-4. Workshop in Electron Microscopy.** Same as MCDB 4500.

**MCDB 5540-3. Analysis of Biological Sequences.** Same as MCDB 4540.

**MCDB 5680-3. Mechanisms of Aging.** Same as MCDB 4680.

**MCDB 5711-3. Topics in Immunology.** Basic immunological concepts and current topics including transplant immunology, tolerance, MHC restriction, tumor immunology, AIDS, hypersensitivity, autoimmunity, inflammatory disease, and vaccines. Instructor consent required.

**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 photosyn-

thetic membranes; plant cell secretion and assembly of plant cell walls. May be repeated. Instructor consent required.

**MCDB 5970-3. Seminar on Physical Methods in Biology.** Same as MCDB 4970 and PHYS 4970 and 5970.

**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. May be repeated up to a maximum of 9 credit hours.

**MCDB 6338-1. Current Topics in Developmental Genetics and Signal Transduction.** Discusses current research papers in the area of developmental biology and cell signaling. Each student is required to present at least one research paper and lead the discussion during presentation. Students are also required to read all presented papers and participate in discussions. Students learn the most advanced developments in the research fields, critically read scientific literatures, participate in the thinking process of doing science, and develop the skill of presenting and discussing science materials. Prereq., instructor consent.

**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 and independent study contract required.

**MCDB 7910-3. Seminar Practicum.** Designed for graduate students to give oral presentations on their thesis research, field questions, respond to critiques, and present background information.

**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.

## Museum

For additional course information, please call (303) 492-5437.

### 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 Museum Studies.** 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 (2-3). 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 5011-4. Introduction to Museum Studies.** Same as MUSM 4011.

**MUSM 5021 (2-3). Selected Museum Topics.** Same as MUSM 4021.

**MUSM 5031-3. Museums and the Public.** Covers all elements of the public side of the museum, including the audience; visitor needs assessment and advocacy; public programming and outreach; museum education, including exhibits and school programs; and volunteer and diversity training. The team approach is emphasized. Prereq., graduate standing.

**MUSM 5041-3. Museum Administration.** Covers theory of organizations and how it applies to museums; application of small business management and non-profit organizations to museums; marketing and development; and grant writing and funding strategies. Prereq., graduate standing.

**MUSM 5051-3. Collections Management.** Deals specifically with curation and data management, including acquisition practices and problems; organization, management, use, and preventative conservation of collections; and computer data management of collections. Prereqs., MUSM 5011 and appropriate level of computer literacy. Faculty with computers must be demonstrated or the student must complete an appropriate computer science course.

**MUSM 6110-2. Seminar in Museum Issues.** Course offers a weekly seminar for M.B.S. students that addresses one new topic/issue each semester relevant to museum operations, such as archival administration, museums and multiculturalism, repatriation, and others. Prereqs., graduate standing and MUSM 4011/5011.

**MUSM 6140-1. Advanced Topics and Trends.** One-hour weekly discussions to probe one or two current topics and/or trends in the museum profession. Topics will be changed annually to reflect current topics and trends and the most current museum issues. Prereqs., graduate standing. (MUSM 5011 and 5051 recommended.)

**MUSM 6930 (2-4). Museum Internship.** Provides experience in museums of different sizes, audiences, and subjects, including history, natural history, art, and children's museums. Each student is supervised individually by a faculty member as well as the appropriate person in the cooperating museum. Prereqs., MUSM 5011 and 5051.

**MUSM 6950 (1-6). Master's Thesis in Museum and Field Studies.** A thesis, which may be of a research, expository, critical, or creative type, is required of every master's degree candidate under the thesis option plan.

**MUSM 6960 (1-3). Master's Project or Paper in Museum and Field Studies.** A project or paper in the student's discipline and related to some aspect of museum studies is required of every master's degree candidate under the non-thesis option plan.

### *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 4912-3. Museum Practicum in Anthropology.** Students take part in curatorial procedures of the anthropology section of the museum: conservation, cataloguing, collection management, and administration. Prereq., MUSM 4011, 5011, or equivalent. Enrollment is limited; students should make arrangements during previous semester. Same as MUSM 5912.

**MUSM 5462-3. Museum Field Methods in Anthropology.** Same as MUSM 4462.

**MUSM 5912-3. Museum Practicum in Anthropology.** Same as MUSM 4912.

### *Botany*

**MUSM 4473-3. Museum Field Methods in Botany.** Emphasizes field techniques for observation, analysis, and identification of vascular plants, collection, preservation and date recording for museum specimens. Prereq., instructor consent. Same as MUSM 5473.

**MUSM 4913-3. Museum Practicum in Botany.** Students take part in curatorial procedures of the botany section of the museum: specimen preparation, labeling, 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 5913.

**MUSM 5473-3. Museum Field Methods in Botany.** Same as MUSM 4473. Prereq., instructor consent.

**MUSM 5913-3. Museum Practicum in Botany.** Same as MUSM 4913.

### *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, includ-

ing applicable readings. Designed for individuals who have some background in geology but little or no prior field experience. Same as MUSM 5484. *Summer only.*

**MUSM 4914-3. Museum Practicum 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 5914.

**MUSM 5484-3. Museum Field Methods in Geology.** Same as MUSM 4484.

**MUSM 5914-3. Museum Practicum in Geology.** Same as MUSM 4914.

### *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 4915-3. Museum Practicum 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 5915.

**MUSM 5795-3. Museum Field Methods in Zoology.** Same as MUSM 4795.

**MUSM 5915-3. Museum Practicum in Zoology.** Same as MUSM 4915.

### *Entomology*

**MUSM 4916-3. Museum Practicum in Entomology.** Students take part in curatorial procedures of the entomology section of the museum: field collection, specimen preparation, labeling, 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 5916.

**MUSM 5916-3. Museum Practicum in Entomology.** Same as MUSM 4916.

### *Museography*

**MUSM 4917-3. Museum Practicum in Techniques.** Students participate in museum public education functions that may include researching, planning, developing, and producing exhibits, traveling trunks, booklets, and other materials. May involve writing labels, molding and casting, conservation, and restoration. Same as MUSM 5917.

**MUSM 4937-3. Museum Practicum in Techniques 2.** Continuation of MUSM 4917. 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 5917-3. Museum Practicum in Techniques 1.** Same as MUSM 4917.

**MUSM 5937-3. Museum Practicum in Techniques 2.** Same as MUSM 4937.

### *Music*

The following courses offered in the College of Music are accepted for arts and sciences credit (see College of Music chapter 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 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 4892-3. Latin American Music.**

### *Oriental Languages and Literatures*

See East Asian Languages and Literatures.

### *Peace and Conflict Studies*

**PACS 2500-3. Introduction to Peace and Conflict 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.

**PACS 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.

**PACS 2900 (1-3). Sophomore Independent Study.** Content to be determined by consultation between student and instructor.

**PACS 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.

**PACS 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.

**PACS 3800-3. Topics in Peace and Conflict 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.

**PACS 3900 (1-3). Junior Independent Study.** Content to be determined by consultation between student and instructor.

**PACS 4500-3. Senior Seminar in Peace and Conflict Studies.** Examines specific theoretical perspectives in peace and conflict studies and conducts in-depth research projects using a case-study approach. Emphasis on using critical thinking skills in writing and class discussion. Case-study examples include: U.S. violence, peacemaking/keeping in ethnonationalist conflicts, environmental conflict resolution.

Approved for arts and sciences core curriculum: critical thinking.

**PACS 4900 (1-3). Senior Independent Study.** Content to be determined by consultation between student and instructor.

### *INVST: International and National Voluntary Service Training*

**PACS 3302-3. Facilitating Peaceful Community Change.** Students gain knowledge and skills that enable them to become effective organizers and facilitators of community social change efforts. Focuses on understanding the processes of community building and fostering grass roots democracy with a multicultural emphasis. Students are encouraged to apply concepts to life experiences and to examine themselves as potential change agents.

**PACS 3912-1. Facilitating Peaceful Community Change Practicum.** Explores and integrates topics and skills training related to facilitating peaceful community change with service activities of INVST Intern Plus. Through an experiential format, students learn to be more effective organizers and facilitators of community efforts toward social change.

**PACS 4033-3. Implementing Social Change.** Students will become familiar with initiating and confronting needed changes in an organization; assess conditions in an organization that causes it to become or remain viable, adapt to new conditions, solve problems, learn from experiences, or move toward a closer relationship between organizational functions and structure. Students will be expected to learn how to assess and respond to an individual's readiness for change. Prereq., PACS 3302.

**PACS 4034-1. Implementing Social Change Practicum.** Explores and integrates topics and skills training related to implementing social change with service activities of INVST Intern

Plus. Through an experiential format, students learn techniques of the change process.

**PACS 4115-3. Democracy and Nonviolent Social Movements.** Same as SOCY 4115.

**PACS 4732-3. Critical Thinking in Development.** Analyzes the same subject matter as PSCI 4012. Requires students to critically evaluate explanations, presented in assigned or optional readings or in student papers, on the success or failure of development and policy proposals for facilitating development. Prereqs., ECON 2010 and 2020, PSCI 2012, and one upper-division PSCI course recommended. Approved for arts and sciences core curriculum: critical thinking or contemporary societies. Same as PSCI 4732 and similar to PSCI 4012.

**PACS 4915-1. Democracy and Nonviolent Social Movements Practicum.** Explores and integrates topics and skills training related to nonviolent social movements with service activities of INVST Community SOL projects. Through an experiential format, students learn nonviolent social change tactics and techniques.

**PACS 4992-1. Global Development Practicum.** Explores and integrates topics and skills training related to global development with service activities of INVST Community SOL projects.

## Philosophy

Specific class content varies by semester. Courses at the 1000 and 2000 levels have no prerequisites.

**PHIL 1000-3. Introduction to Philosophy.** Introduces fundamental topics of philosophy, e.g., knowledge, truth, universals, self, the mind-body problem, time, God, and value. Approved for arts and sciences core curriculum: ideals and values.

**PHIL 1010-3. Introduction to Western Philosophy: Ancient.** 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. Introduction to Western Philosophy: Modern.** 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 as they apply to contemporary moral problems. 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 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 1840 (1-3). Independent Study.** May be repeated for a maximum of 8 credit hours. Prereq., freshman standing.

**PHIL 2140-3. Environmental Justice.** Traditional and contemporary theories of justice are employed in order to critically analyze social and political issues that have important environmental dimensions. Assesses the relationship of justice and equity to the presuppositions of national and global environmental issues and policies.

**PHIL 2200-3. Major Social Theories.** Introductory study of major philosophies of the past in relation to political, economic, and social issues. Approved for arts and sciences core curriculum: ideals and values.

**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 philoso-



phy 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 2610-3. From Paganism to Christianity.** Offers a cultural history of Greek and Roman religion. Students read ancient text in translation and use evidence from archaeology to reconstruct the shift from paganism to Christianity in antiquity. Same as CLAS 2610. Approved for arts and sciences core curriculum: ideals and values.

**PHIL 2840 through 2900 (1-3). Independent Study.** May be repeated for a maximum of 8 credit hours. Prereq., sophomore standing.

*Note: All courses at the 3000 level require 6 hours of philosophy and sophomore standing, unless otherwise indicated.*

**PHIL 3000-3. History of Ancient Philosophy.** Surveys selected figures in ancient Greek and Roman philosophy and in medieval philosophy. Philosophers studied may include the pre-Socratics, Plato, Aristotle, the Hellenistic philosophers, and such figures as Aquinas and Occam. Pays attention to the larger cultural context that influenced these philosophers and that was, in turn, influenced by them. Prereq., restricted to sophomore philosophy majors and upper-division students. Approved for arts and sciences core curriculum: historical context.

**PHIL 3010-3. History of Modern Philosophy.** Introduces modern philosophy, focusing on the period from Descartes through Kant. In addition to careful analysis of philosophical arguments, attention will be paid to the way in which philosophers responded to and participated in major developments in the seventeenth and eighteenth century, such as the scientific revolution. Prereq., restricted to sophomore philosophy majors and upper-division students. Approved for arts and sciences core curriculum: historical context.

**PHIL 3100-3. Ethical Theory.** Studies major issues and theories in ethics. Prereq. or coreq., PHIL 3480. Approved for arts and sciences core curriculum: ideals and values.

**PHIL 3110-3. Feminist Practical Ethics.** Explores a variety of personal and public policy issues in the light of the basic feminist commitment to opposing women's subordination. Provides a sense of the ways in which a principled commitment to feminism may influence or be influenced by prevailing interpretation of contemporary ideals and values, and gives an opportunity for developing skills of critical analysis. Same as WMST 3110. Approved for arts and sciences core curriculum: ideals and values.

**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. Bioethics.** 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. Approved for arts and sciences core curriculum: ideals and values.

**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. Prereq., junior standing. 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. Approved for arts and sciences core curriculum: ideals and values.

**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. Approved for arts and sciences core curriculum: ideals and values.

**PHIL 3340-3. Epistemology.** Studies some of the main topics of theory of knowledge, such as evidence, justification, prediction, explanation, skepticism, and concept acquisition. Prereq., 12 credit hours of philosophy, including PHIL 2440 and 3010. PHIL 3480 highly recommended.

**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 3480-3. Critical Thinking and Writing in Philosophy.** Focuses on the fundamental skills, methods, concepts, and distinctions that

are essential for the study of philosophy. Covers the writing of philosophy papers, the reading of articles, and the extraction and evaluation of arguments. Prereq. or coreq., PHIL 2440. Restricted to philosophy majors only. 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. Approved for arts and sciences core curriculum: ideals and values.

**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 (1-3). Independent Study.** May be repeated for a maximum of 8 credit hours. Prereq., junior standing.

*Note: All courses at the 4000 level require 9 hours of philosophy and junior standing, 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 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 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 4110-3. Contemporary Moral Theory.** Provides an in-depth look at some recent work in moral theory. Topics covered, varying from year to year, include: consequentialism and its critics; virtue theory; moral psychology; impartiality and the personal point of view. Prereq., PHIL 3100. Same as PHIL 5110.

**PHIL 4200-3. Contemporary Political Philosophy.** Provides a survey of recent approaches to political philosophy: liberalism (John Rawls, Ronald Dworkin); libertarianism (Robert Nozick); communitarianism (Michael Sandel, Alastair MacIntyre); and feminism (Alison Jaggar). Topics and readings may vary with instructor. May be repeated up to 6 credit hours on different topics. Same as PHIL 5200.

**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 the works of Marx and Engels.

**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, and such concepts as action, intention, desire, enjoyment, memory, imagination, dreaming, and knowledge. Prereq., restricted to students with 12 credit hours of philosophy including PHIL 2440, PHIL 3000, and PHIL 3010. Same as PHIL 5300.

**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., 12 credit hours of philosophy, including all of the following: PHIL 2440, 3000, and 3010. Same as PHIL 5360.

**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. Prereq., restricted to students with 12 credit hours of philosophy. Background in symbolic logic required. 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.** May be repeated for a maximum of 8 credit hours. Prereq., senior standing.

**PHIL 4930-3. Honors Thesis.**

**PHIL 4950-3. Honors Thesis.**

*Note: All courses at the 5000 and 6000 levels require graduate standing in philosophy 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 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 5100-3. Ethics.** Presents representative positions in normative ethics and metaethics.

**PHIL 5110-3. Contemporary Moral Theory.** Same as PHIL 4110.

**PHIL 5200-3. Contemporary Political Philosophy.** Same as PHIL 4200.

**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., wilder-

ness 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 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 6000 (3-4). Seminar in Ancient Philosophy.** Advanced topics in ancient philosophy. Examines selected classical texts or movements in an in-depth way. Topics vary, but may include: the Socratic dialogues; Plato's later metaphysics; Aristotle's ethical theory; Aristotle's metaphysics; Stoicism; Hellenistic philosophy; and Neo-Platonism. Prereqs., PHIL 3000 or equivalent. PHIL 5080 or 5081 recommended.

**PHIL 6040-3. Seminar: Phenomenology.**

**PHIL 6100-3. Seminar in Ethics.** Intensive study of selected topics in ethical theory.

**PHIL 6200-3. Seminar in Social and Political Philosophy.** Provides an in-depth look at some particular topic in social and political philosophy, such as rights, political freedom, political obligation, or democracy.

**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 6380-3. 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 (1-3). 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 or PHYS 2010. Satisfies the MAPS requirement in natural science. Prereq., one year of high school algebra or equivalent.

**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, or quantitative reasoning and mathematical skills.

**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, or quantitative reasoning and mathematical skills.

**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. 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 students may take PHYS 1140 after taking PHYS 1120. 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 the Department of Physics.

**PHYS 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 towards non-science majors. Approved for arts and sciences core curriculum: natural science.

**PHYS 1240-3. Sound and Music.** Explores the physical processes that underlie the diversity of sound and musical phenomena. Topics covered include the physical nature of sound, the perception of sound, the perception of pitch and harmony, musical instruments, synthesizers and samplers, and room acoustics. The course is non-mathematical and is geared toward non-science majors. Approved for arts and sciences core curriculum: natural science.

**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 and elementary trigonometry; 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.

**PHYS 2140-3. Methods of Theoretical Physics.** Lect. Introduces mathematical tech-

niques required for a quantitative understanding of phenomena of modern physics, including vector algebra and vector calculus, Fourier analysis, and some differential equations of physics. Computer applications in physics are also covered. 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 or PHYS 2170 but students may take PHYS 2150 after taking PHYS 2130 or 2170.

**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 the Department of Physics.

**PHYS 2170-3. Foundations of Modern Physics.** Three lect. per week. For physics majors in plans 1 and 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 concurrently with the laboratory PHYS 2150. Prereq., physics majors are encouraged, but not required, to take PHYS 2140 prior to taking PHYS 2170. Coreq., MATH 2400 or APPM 2350.

**PHYS 2810, 2820 (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 2900-4. Science, Computer Images, and the Internet.** Computer classroom overview for non-specialists of how quantitative scientific information is visualized using color images. Internet basics are covered and graphics are downloaded and processed. Macintosh lab projects use Netscape, Photoshop, PowerPoint. Limited to 18 students. Prereq., QRMS 1010 or 2380. Approved for arts and sciences core curriculum: natural science.

**PHYS 3050-3. Writing in Physics.** Teaches strategies used in scientific writing with an emphasis on argument; reviews and reinforces essential writing skills; and provides experience in writing both academic and professional communications in a style appropriate to the literature of physics. Prereqs., PHYS 2130 or 2170 and the lower-division core writing requirement. Approved for arts and sciences core curriculum: written communication.

**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 1120, 2140, and APPM 2360 or equivalent.

**PHYS 3220-3. Quantum Mechanics and Atomic Physics 1.** Lect. Introduces quantum mechanics with wave, operator, and matrix computational techniques. Investigates solutions for harmonic oscillator, potential well, and systems with angular momentum. Develops a quantitative description of one-electron atoms in lowest order. Prereqs., PHYS 2140, 2170, and 3210.

**PHYS 3310-3. Principles of Electricity and Magnetism 1.** 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., PHYS 2130 or 2170, 2140, or instructor consent.

**PHYS 3320-3. Principles of Electricity and Magnetism 2.** Continuation of PHYS 3310. Prereq., PHYS 3210.

**PHYS 3330-3. Junior Laboratory.** One lect. and one 3-hour lab per week. Combines the use of electronics with appropriate transducers to examine phenomena in thermal and solid state physics, optical communication, and nuclear particle detection. Students acquire basic skills in circuit-building and in use of modern electronic research instruments. This knowledge is applied to various experiments that students themselves design and build. Concludes with a project at which results are presented by the student. Prereq., PHYS 2130 or PHYS 2170 and 2150.

**PHYS 3340-3. Introductory Research in Optical Physics.** Two lect., one 3-hour lab plus variable unsupervised labs each week. Students design and build their own experiments using a modular type of optical research kit. Experiments cover basic research methods in instrument design, laser physics, Fourier optics, holography, spectroscopy, and interferometry. Students learn how to plan major projects and evaluate critically the significance of results. Course concludes with a four-week major project. Prereq., PHYS 3330. Approved for arts and sciences core curriculum: critical thinking.

**PHYS 4130-3. Biological Electron Microscopy: Principles and Recent Advances.** Same as PHYS 5130 and MCDB 4130/5130.

**PHYS 4150-3. Plasma Physics.** Discusses the fundamentals of plasma physics, including particle motion in electromagnetic fields, wave propagation, collisions, diffusion, and resistivity. Pre-

sents examples from space plasmas, astrophysical plasmas, laboratory fusion plasmas, and plasmas in accelerators. Prereqs., PHYS 1110-1120 and MATH 2400 or APPM 2350. Coreq., PHYS 3310.

**PHYS 4230-3. Thermodynamics and Statistical Mechanics.** Statistical mechanics applied to macroscopic physical systems; statistical thermodynamics, classical thermodynamic systems; applications to simple systems. Examines relationship of statistical to thermodynamic points of view. Prereqs., PHYS 3210 and APPM 2360.

**PHYS 4300-3. Dynamics of Fluids.** Same as ASTR 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. Quantum Mechanics and Atomic Physics 2.** Lect. Extends quantum mechanics to include perturbation theory and its application to atomic fine structure, interactions with external forces, the periodic table, and dynamical processes including electromagnetic transition rates. Prereq., PHYS 3220 and 3320.

**PHYS 4420-3. Nuclear and Particle Physics.** Lect. Introduces structure of the atomic nucleus, spectroscopy of sub-nuclear particles, scattering, reactions, radioactive decay, fundamental interactions of quarks and leptons. Prereq., PHYS 4410. Approved for arts and sciences core curriculum: critical thinking.

**PHYS 4430-3. Introduction to Research in Modern Physics.** 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. Approved for arts and sciences core curriculum: critical thinking.

**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, 4630-2. Physics Honors.** Students are matched with a faculty member and work independently on a research topic. Typically, the honors program lasts three semesters. A senior thesis and an oral presentation of the work is required. Registration by special arrangement with the Department of Physics.

**PHYS 4800-1. Frontiers of Physics Seminar.** Survey of selected topics of current research interest in physics. After reading articles on the

topics, the class will formulate questions and discuss the topics with the instructor and guest experts. Prereqs., PHYS 3210 and 3310 and instructor consent. Recommended prereq., PHYS 2170. May be repeated for a total of 3 credit hours.

**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 4970-3. Seminar on Physical Methods in Biology.** Prereq., PHYS 2020 or PHYS 1120. Same as PHYS 5970, MCDB 4970, and MCDB 5970.

**PHYS 5000-1. 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 4 credit hours to meet candidacy requirement. Prereq., graduate standing or instructor consent. Same as ASTR 5000.

**PHYS 5010-3. Health Physics.** Two lect., one lab per week. Provides job-oriented skills. Topics covered include radiation dosimetry, radiation biophysics, radioecology, reactor health physics, and medical physics. The labs include exercises with radioactive isotopes as well as tours of off-campus facilities. Prereq., consult the instructor.

**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 5130-3. Biological Electron Microscopy: Principles and Recent Advances.** Same as PHYS 4130 and MCDB 4130/5130.

**PHYS 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 ASTR 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.** 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 ATOC 5220.

**PHYS 5250-3, 5260-3. Introduction to Quantum Mechanics 1 and 2.** Quantum phenomena, relation to classical physics, Schrodinger and Heisenberg picture, application to problems, approximation techniques; angular momentum; scattering theory; Pauli spin theory. Coreq. for PHYS 5250 is PHYS 5210. Coreq. for PHYS 5260 is PHYS 7310.

**PHYS 5430-3. Introduction to Research in Modern Physics.** One lect., one lab per week. Experiments in nuclear physics, atomic physics, and condensed matter introduce student to variety of techniques useful in contemporary research. Recommended for 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 5970-3. Seminar: Physical Methods in Biology.** Same as PHYS 4970 and MCDB 5970.

**PHYS 6610-3. Earth and Planetary Physics 1.** Same as GEOL 6610 and ASTR 6610.

**PHYS 6620-3. Earth and Planetary Physics 2.** Same as GEOL 6620 and ASTR 6620.

**PHYS 6630-3. Earth and Planetary Physics 3.** Same as GEOL 6630 and ASTR 6630.

**PHYS 6650 (1-3). Seminar in Geophysics.** Same as GEOL 6650 and ASTR 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 (1-6). 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. Advanced Mathematical Physics 1.** Hilbert space, theory of distributions, new  $L^2$ -spaces, Sobolev spaces, methods of functional analysis, spectral theory of operators, applications to quantum theory, and group theory. Prereq., MATH 4310, 4320, 4450, or 6350. Same as MATH 7030.

**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 ASTR 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 1 and 2.** 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 5030.

**PHYS 7440-3, 7450-3. Theory of the Solid State 1 and 2.** 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 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 1 and 2.** 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 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 1970-3. Legal Rights of Students.** Focuses on educational law and legal rights of students. Enrollment limited to students in the Sewall Residential Academic Program.

**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. Prereq., PSCI 1101.

**PSCI 3001-3. 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. Prereqs., PSCI 1101 and junior or senior standing.

**PSCI 3011-3. The American Presidency.** Covers constitutional and institutional foundations and historical development of the presidency; roles, powers, selection, recent modifications, and institutionalization. Uses lectures and class discussion. Prereq., PSCI 1101. Approved for arts and sciences core curriculum; United States context.

**PSCI 3031-3. 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. Prereq., PSCI 1101.

**PSCI 3041-3. 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. Prereq., PSCI 1101.

**PSCI 3051-3. 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. Prereq., PSCI 1101.

**PSCI 3061-3. State Government and Politics.** Examines politics in the American states from a comparative and historical perspective. Considers major political actors—interest groups, citizens (“direct democracy”), and political parties, as well as central institutions, in the state political arena. Also focuses on major state public policy concerns. Approved for arts and sciences core curriculum: United States context.

**PSCI 3071-3. Urban Politics.** Examines structure of political, social, and economic influence in urban areas; focuses on the relationship of the political system to governmental, social, and economic institutions and the contemporary policy processes in American cities. Prereq., PSCI 1101 or 2111. Approved for arts and sciences core curriculum: United States context.

**PSCI 3101-3. Black Politics.** Examines structure of political, social, and economic influence in urban areas. Focuses on the relationship of political processes to governmental, social, and economic institutions and contemporary policy processes in American cities. Prereq., PSCI 1101 or 2111. Same as BEST 3101. Approved for arts and sciences core curriculum: cultural and gender diversity, or contemporary societies.

**PSCI 3121-3. War, Peace, and Strategic Defense.** Analysis of the employment, or the threat to employ force, in securing American interests in the post Cold War World. Special attention is paid to the utilities claimed for nuclear weapons, and, alternatively, to their control and disarmament. Prereq., PSCI 1101.

**PSCI 3171-3. 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 3181-3. 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. Prereq., PSCI 1101.

**PSCI 3191-3. National Security Organization and Policy Making.** Analyzes how the Ameri-

can governmental and political system is structured to define, select, and implement national security policies. Examines roles of the president, Congress, bureaucracy, interest groups, and other actors. Prereq., PSCI 1101 or instructor consent.

**PSCI 3201-3. 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. Prereq., PSCI 1101.

**PSCI 3261-3. 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. Prereq., PSCI 1101.

**PSCI 4021-3. Legislatures and Legislation.** Structure and organization of legislatures and process of statute lawmaking. Prereq., PSCI 1101. Approved for arts and sciences core curriculum: United States context.

**PSCI 4091-3. Comparative Urban Politics.** Comparative analysis of major urban systems in different political/economic settings and Third World countries. Special attention given to political and economic factors shaping urbanization processes and distinctive policy issues in these different settings. Prereqs., PSCI 1101 and 3071 recommended.

**PSCI 4111-3. Urban Problems and Public Policies.** Critically examines public policies designed to deal with major social, economic, and political problems facing contemporary American cities. Special emphasis on evaluation of urban programs in welfare, education, crime, housing, and urban economic vitality. Prereq., PSCI 1101.

**PSCI 4131-3. Latinos and the U.S. 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. Recommended prereq., PSCI 1101. 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. Prereq., PSCI 1101.

**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. Prereq., PSCI 1101.

**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. Prereq., PSCI 1101.

**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. Prereq., PSCI 1101.

**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. Prereqs., PSCI 1101 and junior or senior standing.

**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. Prereq., PSCI 1101 or instructor consent.

**PSCI 4271-3. Sex Discrimination: Constitutional Issues.** Examines continuity and change in legal treatment of sex and gender. Using the case method, explores areas of the law including equal protection analysis, affirmative action, and privacy rights. Same as WMST 4271. Prereq., PSCI 1101. Approved for arts and sciences core curriculum: cultural and gender diversity.

**PSCI 4291-3. Sex Discrimination: Federal and State Law.** Examines continuity and change in legal treatment of sex and gender. Using the case method, focuses on family law, education equity, employment law, and gender-related criminal law. Same as WMST 4291. Prereq., PSCI 1101. Approved for arts and sciences core curriculum: cultural and gender diversity.

**PSCI 4341-3. Political Communication, Persuasion, and Public Policy.** Political communication is a central aspect of policymaking. An inability to develop persuasive political arguments in particular circumstances invites policy failure. Examines aspects of political communication as it applies to citizens, political decision-makers, and specific public policies. Prereqs., PSCI 1101 and junior or senior standing, or instructor consent.

**PSCI 4701-3. Symbolic Politics.** Introduces uses and abuses of symbols as instruments and indicators of political change. Recommended prereqs., PSCI 1101 and junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4711-3. Selected Policy Problems.** Integrates general principles of policy inquiry with documents and other literature on specific problems in public policy, in order to evaluate courses of action. May be repeated for up to 6 credit hours on different topics. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4721-3. Rethinking American Politics.** Examines the political history and development of the United States of America. Looks at the particular policy choices we have made and examines the future political agenda. Recommended prereqs., junior or senior standing and



PSCI 1101. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4731-3. Progress and Problems in American Democracy.** Closely examines the various understandings of democracy, the arguments for and against democracy, and the progress of and prospects for democratic politics in the United States. Particular attention is paid to economic, social and political developments in the United States that affect popular sovereignty, political equality and liberty. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4741-3. American Goals, Spending, and Revenues.** Discusses how the American political system allocates resources to public goals and programs, how revenues are raised, who gets what, and who pays how much. Prereq., PSCI 1101 or instructor consent. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4751-3. The Politics of Ideas.** Examines theoretical arguments and case studies of interactions of ideas, interests, and institutions in policymaking. Analyzes processes through which ideas come to the public agenda, how institutional settings shape those ideas, and why some ideas and interests are more successful. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4761-3. Rethinking Political Values.** Encourages intellectual discipline and critical thinking by examining pressing political values from multiple analytic perspectives. Enables students to participate in oral and written discussions. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4771-3. Civil Rights and Liberties in America.** Implementation of rights and liberties in America. Examines fundamental issues of free speech, press, association, and religion along with rights to due process and equal protection under the law. Prereq., junior or senior standing. Approved for arts and sciences core: critical thinking.

**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. Prereq., PSCI 1101.

**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 5021-3. Latinos and U.S. Politics.** In-depth examination of the theoretical and empirical literature assessing the political situation and activities of Latinos (Mexican-Americans, Puerto Ricans, Cuban Americans, and others) in the

U.S. development and implementation of original research is also stressed. Same as PSCI 7021.

**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 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 5121-3. Black Leadership and Public Policy.** This seminar examines the writings of African-American political leaders, public policy critics, and politicians who have influenced black politics and society since 1900. The seminar explores the ideas and leadership of W.E.B. DuBois, E. Franklin Frazier, Martin Luther King, and others. Same as PSCI 7121.

**PSCI 5131-3. 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 7131.

**PSCI 5141-3. The Political Economy in American Politics.** Intensive examination of pluralist, voter-centered, rational choice, and neo-Marxist literature on the American state. Same as PSCI 7141.

**PSCI 5151-3. American Subnational Politics and Government.** Provides a careful and comprehensive overview of the issues and literature concerning American "subnational" politics. The three bodies of literature considered are American federalism and intergovernmental relations, state politics, and urban/local politics. A number of policy issues are also examined. Same as PSCI 7151.

**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 7021-3. Latinos and U.S. Politics.** Same as PSCI 5021.

**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 7091-3. Politics of Social Movements and Interest Groups.** Same as PSCI 5091.

**PSCI 7121-3. Black Leadership and Public Policy.** Same as PSCI 5121.

**PSCI 7131-3. Seminar: Natural Resources Policy and Administration.** Same as PSCI 5131.

**PSCI 7141-3. The Political Economy of American Politics.** Same as PSCI 5141.

**PSCI 7151-3. American Subnational Politics and Government.** Same as PSCI 5151.

**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.** Most countries confront a variety of common political problems including how to gain popular support, what kinds of political institutions will be most appropriate, and how to distribute burdens and benefits to different segments of the population. The course concentrates on learning how to compare different political systems and provides illustrative examples from several countries in both the industrialized and non-industrialized world. Approved for arts and sciences core curriculum: contemporary societies.

**PSCI 3012-3. British Politics.** An inquiry into contemporary British politics (with systematic American comparisons). Focuses on economic and imperial decline; changes in ideologies, political party fortunes, and the shape of central government; and on the legal/constitutional issues raised by Britain in Europe. Prereq., PSCI 2012.

**PSCI 3032-3. Latin American Political Systems.** Stresses different perspectives on Latin American politics and understanding key political actors and processes. Country focus varies. Prereq., PSCI 2012, political science or Latin American studies major, or instructor consent. Approved for arts and sciences core curriculum: contemporary societies.

**PSCI 3072-3. 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. Prereq., PSCI 2012.

**PSCI 3082-3. Political Systems of Sub-Saharan Africa.** Analyzes post-independence and post cold-war change in Sub-Saharan Africa and provides intensive case studies of selected countries exemplifying each type with South Africa seen as a special case. Prereq., PSCI 2012. Approved for arts and sciences core curriculum: contemporary societies.

**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. Prereq., PSCI 2012. Approved for arts and sciences core curriculum: contemporary societies.

**PSCI 4012-3. Global Development.** Examines Third World political, economic, and sociocultural development in the context of international political and economic forces. Discusses the meaning of development, why it occurs in some countries and not in others, and policy proposals for facilitating it. Prereqs., PSCI 2012, ECON 2020, ECON 2012, and one upper-division PSCI course. Students do not receive credit for both PSCI 4012 and PSCI 4732. Same as PACS 4012. Approved for arts and sciences core curriculum: contemporary societies.

**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. Prereq., PSCI 2012.

**PSCI 4062-3. The Emerging Democracies of Central and Eastern Europe.** Developments in the Soviet satellites and Yugoslavia, their governmental organizations, and their relation to the Soviet Union and the West. Prereq., PSCI 2012. Students do not receive credit for both CEES 4000 and PSCI 4062. 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. Prereq., PSCI 2012.

**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. Prereq., PSCI 2012.

**PSCI 4112-3. Problems in Latin American Politics.** Advanced course. Topic and country focus varies: current emphasis is on problems of consolidating democratic political systems. Prereqs., PSCI 2012 or upper-division course in comparative politics. Recommended: PSCI

4032 or upper-division course on Latin America or on African/Asian/Third World politics.

**PSCI 4122-3. The Military in Politics: Latin America and the U.S.** Analysis of the causes and consequences of military intervention in politics, contrasting patterns of civil-military relations, and the problem of democratic control of the armed forces. Focuses on the Latin American Military, with secondary attention to U.S. military. Prereqs., PSCI 2012 or ROTC major.

**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 economies. 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. Prereqs., PSCI 2012 and ECON 2020. Approved for arts and sciences core curriculum: contemporary societies.

**PSCI 4732-3. Critical Thinking in Development.** Analyzes the same subject matter as PSCI 4012, requiring students to critically evaluate explanations of the success or failure of development and policy proposals for facilitating it that are presented in assigned or optional readings or in student papers. Prereqs., PSCI 2012, ECON 2020, ECON 2020, and one upper-division PSCI course. Students do not receive credit for both PSCI 4012 and PSCI 4732. Same as PACS 4732. Approved for arts and sciences core curriculum: critical thinking or contemporary societies.

**PSCI 4752-3. Seminar: Central and Eastern European Studies.** Seminar on the current political and economic developments and problems faced by the countries of Central and Eastern Europe (Poland, Czechoslovakia, Hungary, Yugoslavia, Bulgaria, Romania, Albania, Estonia and Latvia). Prereqs., junior or senior standing and PSCI 4062. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4782-3. Global Issues.** Studies the principal issues confronting humanity which affect stability and survivability. These issues all have economic, social, and political implications. Prereq., senior standing. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4792-3. Issues on Latin American Politics.** Studies several Latin American countries in some depth including history and contemporary politics. With each country students hear and evaluate different sides of political controversies, learning to critically evaluate arguments. Prereqs., PSCI 2012 and junior or senior standing. 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. Prereq., PSCI 2012.

**PSCI 5012-3. Seminar: Comparative Political Systems.** Discusses current literature on com-

parative politics including theoretical and methodological issues. Same as PSCI 7012.

**PSCI 5022-3. Seminar in Political Development.** This seminar covers Third World political development in the contexts of domestic economic and sociocultural development, the global economy, and the state system. Foci include defining, explaining, and prescribing policies for successful development, and comparing Third and First World development. Same as PSCI 7022.

**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 5062-3. The Politics of Ethnicity.** Explores the political aspects of pluralism, ethnonationalism, separatism, and related phenomena. Examines theories of ethnic mobilization, conflict, and accommodation in the context of political development and "nation-building." Includes cross-policy comparisons and case studies of multiethnic societies in the developed and developing world. Same as PSCI 7062.

**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 5082-3. Subordinate Protest and Democratization.** Considers traditional studies of democratic development and democratization. Topics covered include the definition of democracy, characteristics, dilemmas, and limitations; the classical European view of democratization; democratic and nondemocratic characteristics of different social classes; contributions to democracy made by the popular classes; and transitions to democracy and subordinate groups and protest in the democratization process.

**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 5132-3. Comparative Politics and Ideologies.** Same as PSCI 7132. Available through the Division of Continuing Education.

**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 7022-3. Seminar in Political Development.** Same as PSCI 5022.

**PSCI 7032-3. Seminar: Latin American Politics.** Same as PSCI 5032.

**PSCI 7042-3. Seminar: Comparative Politics—Western Europe.** Same as PSCI 5042.

**PSCI 7062-3. The Politics of Ethnicity.** Same as PSCI 5062.

**PSCI 7072-3. Seminar: Comparative Politics—Sub-Saharan Africa.** Same as PSCI 5072.

**PSCI 7082-3. Subordinate Protest and Democratization.**

**PSCI 7112-3. Seminar: Comparative Political Parties and Interest Groups.** Same as PSCI 5112.

**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 2223-3. 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 3143-3. 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. Prereq., PSCI 2223. Approved for arts and sciences core curriculum: contemporary societies.

**PSCI 3163-3. American Foreign Policy.** Examines foundations, assumptions, objectives, dynamics and methods of U.S. foreign policy since WW II. Special attention to domestic and external problems of adapting U.S. policy to the changing world environment. Prereq., PSCI

2223. Approved for arts and sciences core curriculum: United States context.

**PSCI 3193-3. 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. Prereq., PSCI 2223.

**PSCI 4153-3. Seminar: Control of Foreign News Coverage—International Perspectives.** Addresses press freedom as absolute and relative notions, and compares "national" developments with commitments to freedom, opportunities for conceptual/analytic and empirical research with domestic and foreign materials. Upper-division students only. Prereq., PSCI 2223.

**PSCI 4173-3. International Organization.** Analyzes the phenomenon known as international organization to determine whether it is an effective instrument for achieving peace and security and for the promotion of human welfare. Prereq., PSCI 2223.

**PSCI 4183-3. 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. Prereq., PSCI 2223.

**PSCI 4213-3. Europe in the International System.** Covers European and Atlantic regionalism. Discusses such communities as the Council of Europe, NATO, EFTA, and OECD, and provides a detailed examination of the European Union. Theories of integration, problems of partnership and interdependence, rival nationalisms and strategic doctrines. Problems of the post-Cold War era. Prereq., PSCI 2223.

**PSCI 4223-3. Soviet and Russian Diplomacy.** 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. Prereq., PSCI 2223. Approved for arts and sciences core curriculum: contemporary societies.

**PSCI 4233-3. The Middle East in World Affairs.** Discusses evolution and revolution in the Middle East and 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. Prereq., PSCI 2223.

**PSCI 4263-3. Advanced 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. Prereqs., PSCI 2223. For seniors only; instructor consent required.

**PSCI 4703-3. 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. Prereqs., PSCI 2223 and junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**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. Prereq., PSCI 2223.

**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 residence. 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 warlike 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 5113-3. Advanced Readings in International Relations.** This is an advanced readings course for international relations graduate students. It is a capstone course for those preparing to take the Ph.D. comprehensive exams, and is intended to provide in-depth knowledge about core areas of international relations scholarship. Prereq., PSCI 5013. Same as PSCI 7113.

**PSCI 5223-3. Continuities and Changes in the Modern World Economy.** Introduces the topics of globalization and democratization from an interdisciplinary perspective. Examines major changes to the global political economy and explores their implications for local, national, regional, and international political and economic processes. Prereq., graduate standing in PSCI. Same as PSCI 7223, GEOG 5222, SOCY 5223, and ECON 8323.

**PSCI 5333-3. Globalization and Democratization: An Introduction.** Introduces research on globalization and democratization from an interdisciplinary perspective. Examines ongoing interdisciplinary research on the global political economy. Students learn about ongoing research, critique current efforts, and design their own research project. Prereq., graduate standing in PSCI. Same as PSCI 7333 and ECON 8333.

**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 7103-3. The Political System and Telecommunications.** Same as PSCI 5103.

**PSCI 7113-3. Advanced Readings in International Relations.** Same as PSCI 5113.

**PSCI 7223-3. Continuities and Changes in the Modern World Economy.** Same as PSCI 5223, ECON 8323, GEOG 5222, and SOCY 5223.

**PSCI 7333-3. Globalization and Democratization: An Introduction.** Same as PSCI 5333 and ECON 8333.

**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 2004-3. Survey of Western Political Thought.** 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 3054-3. 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 3064-3. Revolution and Political Violence.** Study, discussion, and evaluation of alternative theoretical frameworks for the analysis of revolution and political violence. Theoretical material is firmly couched in case situations such as ethnic class, colonial, urban, racial and religious conflicts. Prereq., PSCI 1101 or PSCI 2012.

**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. Prereq., PSCI 2004.

**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. Prereq., PSCI 2004.

**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. Prereq., PSCI 1101, 2223, or 2012.

**PSCI 4094-3. Classical Greek Political Thought.** Studies the main representatives of political philosophy in antiquity (Plato, Aristotle, Cicero) and the most important concepts and values of ancient political thought. Same as CLAS 4041, HIST 4041, PHIL 4210. Prereq., PSCI 2004.

**PSCI 4224-3. Rationality, Democracy, and Policy.** The rational choice approach to understanding social decision making; examines possibilities for choosing rational courses of social action and concrete problems of rational decision making. Prereqs., PSCI 1101 and PSCI 2012.

**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 contem-

porary Anglo-American, French, German, and Soviet legal concepts and institutions.

**PSCI 4704-3. 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. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4714-3. Liberalism and Its Critics.** Contemporary arguments for and against liberalism. Focuses on the analysis, evaluation and understanding of the philosophical contributions to this debate. Special attention to the concepts of justice, freedom, equality, and individualism. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**PSCI 4734-3. 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. Prereq., junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**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. Prereq., PSCI 2004.

**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 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 5045-3. Basic Formal Methods in Political Science.** Introduces the application and role of models in political science (domestic and international politics), in areas such as voting, committees, power, decision making, and war and peace. Models include applications of set theory, elementary probability, games, and systems analysis. Prereq., PSCI 5085, 5095, or instructor consent. Same as PSCI 7045.

**PSCI 5075-3. Introduction to Professional Political Science.** Introduces graduate students to intellectual foundations and historical development of political science; epistemologies, 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 time 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 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 and GEOG 5095/7095.

**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 7045-3. Basic Formal Methods in Political Science.** Same as PSCI 5045.

**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 Policy*

**PSCI 5046-3. Seminar: Urban Public Policy.** Focuses on formulation, revision, and outcomes of public policy in American urban communities. Some comparative Canadian and European literature also used. Same as PSCI 7046.

**PSCI 5056-3. Seminar: Natural Resources Policy and Administration.** Examines resources in the American economy; constitutional, political, and geographic factors in development of resources policy; organization procedures and programs for administration and development of natural resources; and selected topics. Same as PSCI 7056.

**PSCI 5066-3. Argument, Persuasion, and Public Policy.** The audiences for policy arguments are typically a number of somewhat autonomous "policy communities." An inability to persuade relevant audiences invites failure and frustration. Consequently, the course examines a number of types of policies in terms of what seems to persuade and why. Same as PSCI 7066.

**PSCI 5076-3. Introduction to the Policy Sciences: Problem Orientation.** Provides an introduction to the policy sciences as a distinctive tradition within the policy field. Emphasizes the use of conceptual tools to improve analysis of complex problems. Teaches problem-solving framework that students apply to an issue of their choice. Same as PSCI 7076.

**PSCI 5086-3. Introduction to Policy Sciences: The Decision Process.** Provides policy sciences frameworks for analyzing policy problems and evaluating policy alternatives, and for analyzing policy processes and designing political strategies to influence those processes in the direction of the preferred alternative. Empha-

sizes applications to problems selected by students for term projects. Same as PSCI 7086.

**PSCI 5096-3. The Political System and Telecommunications.** Introduces roles played by political institutions in the use 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 7096 and TLEN 5106.

**PSCI 5116-3. Context-Sensitive Research Methods.** Prepares students to conduct research on topics where data are not obvious or not easily available. Encompasses variations in text and setting as part of data observations. Methods include interviewing protocols, interpretive methods, cluster analyses, case study methodologies, and textual analyses. Same as PSCI 7116.

**PSCI 6906 (1-3). Graduate Research Topic.** Independent research in topic of 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 (1-4). Master's Thesis.**

**PSCI 7046-3. Seminar: Urban Public Policy.** Same as PSCI 5046.

**PSCI 7056-3. Seminar: Natural Resources Policy and Administration.** Same as PSCI 5056.

**PSCI 7066-3. Argument, Persuasion, and Public Policy.** Same as PSCI 5066.

**PSCI 7076-3. Introduction to the Policy Sciences: Problem Orientation.** Same as PSCI 5076.

**PSCI 7086-3. Introduction to the Policy Sciences: The Decision Process.** Same as PSCI 5086.

**PSCI 7096-3. The Political System and Telecommunications.** Same as PSCI 5096.

**PSCI 7116-3. Context-Sensitive Research Methods.** Same as PSCI 5116.

**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 the 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 4028-3. Special Topics.** Offers subjects not covered by existing courses. Offered when the department approves a special topic. Repeatable for up to 12 credit hours for different topics.

**PSCI 4718-3. 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. Prereq., GPA of at least 3.50. Approved for arts and sciences core curriculum: critical thinking.

**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 rele-

vant 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. Prereq., PSCI 1101.

**PSCI 5008-1. Teaching Political Science 1.** First in a sequence of three courses designed to train graduate teachers in the essentials of political science teaching, to provide a background in theories of political science teaching, and to provide practical skills development in discipline-specific education. Same as PSCI 7008.

**PSCI 5018-1. Teaching Political Science 2.** Second in a sequence of three courses designed to train graduate teachers in the essentials of political science teaching, to provide a background in theories of political science teaching, and to provide skills development in discipline-specific education. Same as PSCI 7018.

**PSCI 7008-1. Teaching Political Science 1.** Same as PSCI 5008.

**PSCI 7018-1. Teaching Political Science 2.** Same as PSCI 5018.

**PSCI 7028-1. Teaching Political Science 3.** Third in a sequence of three courses designed to train graduate teachers in the essentials of political science teaching, to provide a background in theories of political science teaching, and to provide practical skills development in discipline-specific education. Prereqs., PSCI 7008 and PSCI 7018 recommended.

### Psychology

**PSYC 1020-3. Writing in Psychology.** Teaches writing skills including basic grammar and composition. These writing skills are taught through extensive writing on specific topics in psychology. An emphasis is placed on learning to evaluate, explain, and argue issues in psychology in a written medium. Approved for arts and sciences core curriculum: written communication.

**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. Approved for arts and sciences core curriculum: cultural and gender diversity.

**PSYC 3020-3. Advanced Writing in Psychology.** Teaches argumentative writing (stating and defending a position with supporting evidence) in the context of specific psychological issues (to be determined by the instructor). Instruction and basic grammar and composition will be ongoing. The primary focus is on learning to write persuasively. Enrollment restricted to juniors and seniors. Approved for arts and sciences core curriculum: written communication. Restricted to psychology majors.

**PSYC 4220-3. Language and Mind.** 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 5300-3. Research in Psycholinguistics.** Prereq., instructor consent. Same as LING 5300.

**PSYC 5740-3. Biology of Amphibians and Reptiles.** Prereq., instructor consent. 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. Prereq., instructor consent. 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 (3-4). 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 may participate as subjects for several hours in ongoing research.

**PSYC 2101-4. Statistics and Research Methods in Psychology.** Three hours of lect. and one two-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 1.** 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 2.** Surveys contemporary issues, explores current controversies, and examines in detail selected topics in psychology. Open to juniors and seniors in the department's honors program and to others who have a GPA of 3.00 or better. Prereq., instructor consent. Approved for arts and sciences core curriculum: critical thinking.

**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. 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 psychology 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. Students must submit an application to the director of undergraduate studies.

**PSYC 5541 (1-6). Special Topics in Psychology.** Prereq., instructor consent. Same as PSYC 4541.

**PSYC 5741-4. General Statistics.** Surveys probability and statistics in psychology. Prereq., instructor consent.

**PSYC 5751-4. General Statistics.** Continuation of PSYC 5741. Prereq., instructor consent.

**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. Prereq., instructor consent.

**PSYC 7061-2. Research Practicum.** Continuation of PSYC 7051.

**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. Prereq., instructor consent.

**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. Prereq., instructor consent.

**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. Prereq., instructor consent.

**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 chapter.

### *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 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 CHEM 1111 and CHEM 1131 or PHYS 1010 and 1020 or PHYS 2010 and 2020. 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 or senior standing. Same as PSYC 5092.

**PSYC 4102-3. Behavioral Genetics.** Inheritance of behavioral characteristics. Prereq., PSYC 2101. Same as PSYC 5102.

**PSYC 4112-3. Behavioral Genetics Laboratory.** Provides laboratory experience in behavioral genetics. Students train in one or more aspects of data collection and interpretation, read research papers, contribute nine hours per week to a research project in behavioral genetics, and write a report. Prereq., PSYC 4102.

**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. 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 2012, 4052, EPOB 1210 and 1220, 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 and instructor consent.

**PSYC 5052-4. Physiological Psychology.** Same as PSYC 4052. Prereq., instructor consent.

**PSYC 5062-4. Functional Neurochemistry.** Examines mechanisms of neuronal signaling in experimental literature in areas of transmitter synthesis, transport, secretion, turnover, reuptake, and postsynaptic effect. Other special topics included. Prereq., PSYC 4052, MCDB 4190, or EPOB 4220 and instructor consent.

**PSYC 5072-3. Clinical Neuroscience.** Same as PSYC 4072. Prereq., instructor consent.

**PSYC 5082-2. Seminar: Biological Psychology.** Special topics concerning biological bases of behavior. Prereq., PSYC 4052 and instructor consent.

**PSYC 5092-3. Hormones and Behavior.** Prereq., instructor consent. Same as PSYC 4092.

**PSYC 5102-3. Behavioral Genetics.** Prereq., instructor consent. 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. Prereq., instructor consent.

**PSYC 5122-3. Quantitative Genetics.** Prereq., instructor consent. Same as PSYC 4122.

**PSYC 5132-3. Behavioral Neuropharmacology.** Prereq., instructor consent. Same as PSYC 4132.

**PSYC 5162-3. Developmental Behavioral Genetics.** Applies behavioral genetic strategies to study of individual differences in development, primarily human development. Prereq., instructor consent.

**PSYC 5212-3. Gerontology: A Multidisciplinary Perspective.** Prereq., instructor consent. 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. Prereq., PSYC 5102 or instructor consent.

**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. Prereq., instructor consent.

**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 and instructor consent.

**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. Prereq., understanding of behavioral plasticity and recovery of function, and instructor consent.

**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. Prereq., instructor consent.

### *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.** Surveys major psychological processes of 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. Prereq., PSYC 1001.

**PSYC 4423-3. 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. Prereq., instructor consent. Same as PSYC 5423.

**PSYC 4453-3. Developmental Psychopathology.** 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. Same as PSYC 5453.

**PSYC 4503-3. Behavioral Interventions for Children and Adolescents.** Students explore how principles of scientific psychology can be applied to prevention and treatment of serious behavioral problems in children and adolescents, and discover new knowledge about human behavior. Students work in teams on specific

problems, e.g. aggression. Prereq., PSYC 1001, PSYC 4313, or PSYC 4303.

**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 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 5423-3. Research Problems in Clinical Psychology.** Same as PSYC 4423. Prereq., instructor consent.

**PSYC 5433-3. Adult Psychopathology.** Intensively surveys major theories, research findings, and behavioral characteristics associated with deviant reaction patterns.

**PSYC 5453-3. Developmental Psychopathology.** Prereq., instructor consent.

**PSYC 7503-3. Developmental Child Clinical Assessment.** Provides clinical psychology students with a theoretical understanding and skills to conduct a comprehensive review of psychological and developmental functioning. Includes assessment from a variety of sources and contexts, including testing. Prereq., PSYC 7643 and enrollment in the clinical psychology graduate program.

**PSYC 7653-3. Child Psychotherapy.** 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 and instructor consent.

**PSYC 7673-3. Adult Psychotherapy.** Discusses selected topics in the field of psychotherapy, including content consideration and pertinent research. Topics vary from semester to semester. Prereq., instructor consent.

**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. Prereq., instructor consent.

**PSYC 7693-3. Personality Measurement.** Covers theory and practice primarily in areas of individual personality testing. Involves intensive field work and report writing. Prereq., instructor consent.

**PSYC 7703-3. Seminar: Clinical Psychology.** Selected topics in the area of clinical psychology. Prereq., instructor consent.

**PSYC 7713-2. Practicum in Clinical Psychology.** Direct clinical experience for Ph.D. candidates in clinical psychology only.

**PSYC 7773-2. Professional Issues and Ethics in Prevention and Intervention.** Focuses on ideographic study of attitudes, values, and personality characteristics of individuals using data obtained from personal interviews. Covers the-

ory and practice of various interviewing approaches. Open to Ph.D. candidates in clinical psychology only.

### *Developmental*

**PSYC 4684-3. Developmental Psychology.** In-depth consideration of human developmental processes across the life span. Includes coverage of the major topics in human development, such as physical, cognitive, social, and personality development. Open only to juniors and seniors. Prereq., PSYC 1001.

**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 processing capacities. Prereq., instructor consent.

**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, conceptual behavior, and thinking. Emphasis of the course varies with instructor. Prereqs., PSYC 1001 and 2101. Same as PSYC 5145.

**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 inspired. 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 EPOB 1210. 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 5145-4. Cognitive Psychology.** Introduces the study of cognitive processes of human beings: memory, conceptual behavior, and thinking. Emphasis of the course varies with instructor. An independent research project is required. One lab per week. Prereq., instructor consent. Same as PSYC 4145.

**PSYC 5175-3. Introduction to Cognitive Stimulation.** Prereq., instructor consent. Same as PSYC 4175.

**PSYC 5385-3. Ethology and Comparative Psychology.** Prereq., instructor consent. 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. Prereq., instructor consent.

**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. Prereq., instructor consent.

**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. Prereq., instructor consent.

**PSYC 7215-3. 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. Prereq., instructor consent.

**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 4136-4. Judgment and Decision Making.** One lab, three lectures per week. Introduces the study of judgment and decision making processes (estimation, prediction and diagnosis, choice under certainty, risky decision making) and the methods that have been developed to improve these processes (statistical modeling, decision analysis, expert systems). Prereqs., PSYC 1001 and 2101. Same as PSYC 5136. Similar to PSYC 4436.

**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 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. Enrollment restricted to juniors and seniors.

**PSYC 5136-4. Judgment and Decision Making.** Same as PSYC 4136.

**PSYC 5606-3. Proseminar: Social-Personality Psychology.** Provides a thorough introduction to methods and theories in social psychology concerned with topics such as the self, social cognition, judgment and decision making, attitude formation and change, small group processes, inter-group relations, health and social psychology, and others. Instructor consent required.

**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. These seminars may be on one of the following topics: stereotyping and person perception, social psychology and self, social psychology of problem behavior, health and social psychology, race and

ethnic identity, groups and small group organization. Maximum of 8 hours. Prereq., instructor consent.

## 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 2200-3. Religion and Dance.** Religions as practiced in cultures around the world frequently engage in dance. By focusing on dances and forms of movement, religious beliefs and meanings can be seen and appreciated. Select religious cultures from around the world will be studied. Theory will be developed to interrelate religion and dance. Approved for arts and sciences core curriculum: literature and the arts or 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 2400-3. Religion and Contemporary Society.** Studies the nature of contemporary American society from various theoretical perspectives in religious studies. Gives attention to the impact of secularization and to the religious elements found in aspects of secular life (e.g., politics, literature, education, and recreation). Approved for arts and sciences core curriculum: contemporary societies.

**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 Religions: 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 Religious Traditions.** 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. Same as AIST 2700. Approved for arts and sciences core curriculum: ideals and values, or cultural and gender diversity.

**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.** May be repeated for a maximum of 8 credit hours.

**RLST 3000-3. Christian Traditions.** 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 3020-3. Advanced Writing in Religious Studies:** A seminar for religious studies majors that emphasizes the development of writing skills for use inside as well as outside the academy. Writing assignments are focused on one or more core topics in religious studies. Approved for arts and sciences core curriculum: written communication.

**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 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. Same as BLST 3125. Approved for arts and sciences core curriculum: contemporary societies or ideals and values.

**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 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 3510-3. Australian Religions.** The Arunta of the Central Desert is the principal

culture examined in this introduction to the religions of the Australian Aborigines. The relationship between religion and landscape will be highlighted as will the historical development of the area by non-aboriginal Australians. Another concern will be the impact of Australian Aboriginal studies on the history of modern Western thought. Approved for arts and sciences core curriculum: cultural and gender diversity.

**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. May be repeated for a maximum of 9 credit hours as topics change.

**RLST 3830-3. Perspectives on the Study of Religion.** Limited to and required for junior majors. Offered each fall semester. Surveys basic approaches to the study of religion. Students read and respond to seminal works in religious studies selected by faculty members, who visit class for discussions. Students also visit several religious communities in the Boulder/Denver region. Prereq., religious studies major and junior standing.

**RLST 4020-3. Topics in Biblical Christianity.** Studies Christian origins, 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. Variable topics include synoptic gospels, John, and Pauline writing. May be repeated for maximum of 9 credit hours as topics change. Prereq., 6 credit hours of RLST courses at any level or instructor consent. Same as RLST 5020.

**RLST 4030-3. Religions in America.** Studies various religious movements in the U.S. (or other parts of the Americas). Includes American religion and religions, religion and nationalism, revitalization and religion, and Asian religions in America. May be repeated for a maximum of 9 credit hours as topics change. Prereq., 6 hours of RLST. Same as RLST 5030.

**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. May be repeated for a maximum of 9 credit hours as topics change. Prereq., 6 hours of RLST courses at any level or instructor consent. Same as RLST 5050.

**RLST 4150-3. Topics in Judaism.** Intensively studies a selected topic in Biblical Judaism, Jew-

ish theology, philosophy, or mysticism in the post-Biblical period. May be repeated for a maximum of 9 credit hours as topics change. Prereq., 6 hours of RLST courses at any level or instructor consent. 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. May be repeated for a maximum of 9 credit hours as topics change. Prereq., 6 hours of RLST courses at any level or instructor consent. 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, Zen, and Buddhism in America. May be repeated for a maximum of 9 credit hours as topics change. Prereq., 6 hours of RLST courses at any level including background in Buddhism or instructor consent. Same as RLST 5250.

**RLST 4300-3. Topics in Native American Religions.** Examines a topic (to vary 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. May be repeated for a maximum of 9 credit hours as topics change. Prereq., RLST 2700 and 3 additional credit hours of RLST course work or instructor consent. 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). May be repeated for a maximum of 9 credit hours as topics change. Prereq., 6 hours of RLST courses at any level or instructor consent. Same as RLST 5350.

**RLST 4550-3. Religion, War, and Peace in U.S. History.** Examines interaction between religious language/symbols/traditions and issues of war and peace in U.S. history, especially since World War II. Gives particular attention to the formation of U.S. government policies. Prereq., 6 hours of religious studies at any level or instructor consent. Same as RLST 5550.

**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. Prereq., 6 credit hours of religious studies at any level or instructor consent. 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. Prereq., 6 credit hours of religious studies at any level or instructor consent. 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. Prereq., 6 credit hours of religious studies at any

level or instructor consent. Same as RLST 5750 and CHIN 4750/5750.

**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. Prereq., 6 credit hours of religious studies at any level or instructor consent. Same as RLST 5760.

**RLST 4800-3. Critical Studies in Religion.** Focuses on a current issue or area of research in the study of religion. Students will analyze the way theories develop and learn to develop their own critical analysis. Topics will vary, e.g., comparative kingship, colonialism, ritual theories, feminist analysis. May be repeated for a maximum of 6 credit hours. Approved for arts and sciences core curriculum: critical thinking.

**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. May be repeated for a maximum of 9 credit hours as topics change. Prereq., 6 credit hours of religious studies at any level or instructor consent. 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. Restricted to majors.

**RLST 4840 (1-6). Independent Study.** May be repeated for a maximum of 8 credit hours.

**RLST 5000-3. Religion and Naming.** Investigates names and naming practices in a variety of religious traditions, emphasizing their meaning and functions in relation to deities, humans, animals, myths, rituals, places, calendars, magic hierarchies, ordering systems, and meditation.

**RLST 5020-3. Topics in Biblical Christianity.** Same as RLST 4020.

**RLST 5030-3. Religions in America.** Prereqs., graduate standing and 6 hours of RLST or instructor consent. Same as RLST 4030.

**RLST 5050-3. Topics in Christian Studies.** Same as RLST 4050.

**RLST 5150-3. Topics in Judaism.** 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 5300-3. Topics in Native American Religions.** Same as RLST 4300.

**RLST 5350-3. Native American Religions: Regional Studies.** Same as RLST 4350.

**RLST 5550-3. Religion, War, and Peace in U.S. History.** Same as RLST 4550.

**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 and CHIN 5750/4750.

**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. May be repeated for a maximum of 9 credit hours as topics change.

**RLST 5820-3. Interdisciplinary Seminar on Religion.** Same as RLST 4820. May be repeated for a maximum of 9 credit hours as topics change.

**RLST 5840 (1-6). Independent Study.** May be repeated for a maximum of 8 credit hours.

**RLST 6820-1. Religious Studies Graduate Colloquium.** A biweekly seminar for graduate students in religious studies that focuses on a different topic each semester and involves faculty, graduate students, and outside speakers in discussions of current issues in religious studies. May be repeated for a total of 6 credit hours as topics change.

**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. Prereq., RLST graduate status.

**RLST 6840 (1-6). Independent Study.** May be repeated for a maximum of 8 credit hours.

**RLST 6850-3. Comparative Studies in Religion.** Focuses on theories and methods of comparative study in religion through an examination of at least two distinct traditions (e.g., public worship in Judaism and Islam; pilgrimage in Hinduism and Christianity). May be repeated for a maximum of 6 credit hours as topics change. Prereq., must be RLST graduate student.

**RLST 6940 (1-3). Master's Degree Candidate.**

**RLST 6950 (1-6). Master's Thesis.**

## Sociology

Sociology courses numbered at the 1000- and 2000-level are designed for first- and second-year students (fewer than 56 credit hours). Sociology courses numbered at the 3000- or 4000-level are limited to students with 56 credit hours or more.

**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 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 1931-3. Sociology of Education Internship.** Provides an academically supervised opportunity for lower-division students to intern in classrooms of innovative teachers and serve as staff members of a "hands-on" learning center, devised and administered cooperatively by the sociology department and local schools.

**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.

**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 2051-3. Sociology of Sport.** Looks at the role of sport in contemporary American society, examining the function of sport, socialization to the values and power hierarchies in sport, progression through sport, race and sport, and gender and sport.

**SOCY 2061-3. Introduction to Social Statistics.** Introduces students to quantitative analysis of social phenomena. Emphasizes understanding and proper interpretation of graphs, measures of central tendency, dispersion, and association, and statistical significance to students with limited mathematical background.

**SOCY 2091-3. Topics in Sociology.** Variety of courses taught by visiting and regular faculty. See current departmental announcements for specific content. Students may receive credit for this course up to three times for different topics.

**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 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 con-

text of the individual versus the collective forces leading to conformity.

**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 Society.** Focuses on influences of both natural and built environments upon human behavior and social organization; microenvironments and their influence on individuals; the impact of macroenvironments on societal organization; and environmental movements.

**SOCY 3111-3. Social Change.** Studies historically and cross-culturally 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 3141-3. Social Movements in the U.S.** The philosophical foundations, new values, motivations for joining, leadership, strategies, organization dynamics, public response, and reasons for success and failure of social movements are the primary foci. A look at organized attempts to contest traditional ideas and values regarding the relationship of human organization and activities to various movements. Formerly SOCY 2021.

**SOCY 3151-3. Self in Modern Society.** Using a variety of eastern and western perspectives, explores how modern social institutions and culture shape our personal experiences, how personal experiences can affect the nature of those institutions and culture, and how strategies can be developed for achieving balance between the individual and society. Approved for arts and sciences core curriculum: United States context, or ideals and values.

**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. Social Statistics.** In-depth treatment of quantitative analysis of social phenomena. Emphasizes use of probability, inference, analysis of variance, correlation, and regression techniques for production of sociological research. Prepares students for more advanced-level statistics courses.

**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 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 4201-3. Research Methods 1: Introduction to Research Methods.** Introduces students to social science research, selected topics in the philosophy of science, and methods. Emphasizes use of library resources, research design, hypothesis construction, methods of data collection, verbal and written reports, observational techniques, unobtrusive methods (content analysis, secondary analysis), measurement, scaling, and report writing. Prereq.: SOCY 2061.

**SOCY 4301-3. Research Methods 2: Survey Methods.** Teaches quantitative research methods and, particularly, methods of survey research. Topics include sampling, interviewing, schedule construction, data analysis, computer methods, index construction, and statistical analysis. Students participate in a survey project, design, collect data, and prepare a research paper on the basis of collected data. Prereq.: SOCY 2061 and 4201.

**SOCY 4401-3. Research Methods 3: Field Experience.** Emphasizes the development of skills to prepare the student to conduct qualitative sociological research. "Field Experience" emphasizes ethnographic techniques, including intensive interviewing, direct observation, coding, participant observation, and report writing. Students conceive and execute a field research



project with data collection, analysis, and a report. Prereq., SOCY 2061 and 4201.

**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 4911-3. Teaching Sociology.** Students participate in a teaching seminar under the supervision of a faculty member. Includes pedagogical strategies for implementing concrete educational goals and encouraging higher levels of creativity and analysis in a large, lower-division class. Emphasizes mentorship and personal development. Prereq., instructor consent.

**SOCY 4931 (1-6). Social Action Internship.** Provides an academically supervised opportunity for junior and senior sociology majors to work in public or private organizations. Focuses on the sociology of education, institution building, and social change in educational settings. Interns work in specially devised learning centers.

**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.** 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 5031-3. Research Design.** 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 5051-3. Sociology of Religion.** Comparative analysis of religion as a social institution.

**SOCY 5071-3. Sociology of Language and Knowledge.** Student-conducted field projects are involved using 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 5121-3. Ethnographic Research Methods.** Students are trained in the systematic observation of people in situations, 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 5171-3. Issues in Contemporary Political and Social Theory.** Analysis of contemporary issues in political and social theory. Includes discussion of alternative philosophies of science, methodologies and approaches to the problems of human action, social structure, and social order. Prereq., SOCY 5001, 5011, 5021, 5031, or PSCI 5075.

**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.

**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.

**SOCY 5601-3. Advanced Data Analysis.** Extends general linear regression model to consider residual analysis, curvilinearity and interaction, and includes completion of a written research paper. Prereq., SOCY 5021.

**SOCY 5841 (1-3). Independent Study in Sociology.** Graduate variable credit. Prereq., instructor consent.

**SOCY 6821-1. Graduate Sociology Forum 1.** Introduces first-year graduate students to the full range of substantive topics, research programs, and other projects in which graduate sociology faculty are engaged. Provides a forum in which issues of the discipline are presented and discussed. Features weekly presentations by graduate Sociology faculty.

**SOCY 6831-1. Graduate Sociology Forum 2.** Introduces first-year graduate students to the full range of substantive topics, research programs, and other projects in which graduate sociology faculty are engaged. Provides a forum in which issues of the discipline are presented and discussed. Features weekly presentations by graduate Sociology faculty.

**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.

**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 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 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 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 3023-3. Afro-American Family in U.S. Society.** Systematically examines and analyzes patterns of family life for African Americans as sociocultural phenomenon within the context of U.S. society. Same as BLST 3023. Prereqs., SOCY 1015/CHST 1013 or BLST 2000. Approved for arts and sciences core curriculum: cultural and gender diversity or United States context.

**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.

**SOCY 5223-3. Continuities and Changes in the Modern World Economy.** Introduces the topics of globalization and democratization from an interdisciplinary perspective. Examines major changes to the global political economy and explores implications for local, national, regional, and international political and economic processes. Same as ECON 5223, GEOG 5222, and PSCI 5223. Prereq., graduate stand-

ing in economics, geography, political science, or sociology.

**SOCY 7223-3. Continuities and Changes in the Modern World Economy.** Same as SOCY 5223, ECON 7222, and PSCI 7223.

### *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, socio-economic 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 2024-3. Law and Society.** Introduces the field of law and society. The first half of the course reviews basic empirical research on legal institutions in contemporary American society. The second half reviews broad theoretical perspectives in law and society.

**SOCY 3044-3. 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). Prereq., SOCY 1004.

**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, causes of law violation, and methods used to control criminal behavior.

**SOCY 4024-3. Juvenile Delinquency.** Examines the history, incidence, and prevalence of delinquent behavior, as well as theoretical explanations regarding why children become involved in criminal activity. 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 4054-3. The Sociology of Law.** Explores the relationship between law and society. Examines classical and contemporary sociological theories of law, recent empirical research on selected legal institutions, and the relationship between law and social control, dispute resolution, culture, stratification, and social change. Prereq., junior or senior standing.

**SOCY 4064-3. The Sociology of White-Collar Crime.** Examines white-collar crime and organi-

zational misconduct by individuals and corporations. Explores problems of conceptualization and measurement, how the criminal justice system responds to white-collar criminals (from investigation to prosecution and sentencing), and strategies of control. Prereq., junior or senior standing.

**SOCY 4074-3. Police, Law, and Society.** Examines the historical, social, and legal development of police institutions. Emphasizes the social organization and functions of police, the exercise and structuring of discretionary decision-making, and the relationships between rule-enforcers and rule-breakers.

**SOCY 4084-3. The American Criminal Justice System: An Advanced Overview.** Examines the major actors and institutions of criminal justice: police, prosecutors, defense attorneys, plea bargaining, criminal courts, bail, sentencing, incarceration, and the death penalty. Analyzes how institutions of criminal justice discover, respond to, and process crime.

**SOCY 4094-3. Thought Reform, Influence, and Social Control.** Examines thought reform (i.e., coercive persuasion, brainwashing) and extreme forms of social control in the former Soviet Union, China, and in American cult organizations. Issues of recruitment, management, and the evolution of violence and terrorism are addressed. Recommended prereq., social psychology.

**SOCY 4934-3. Internship in Community Corrections 1.** Students gain professional experience with offender treatment practices and evaluation research approaches in community correctional settings. 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.

### *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 ETHN 1015. 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 and dynamics of nonviolent action; racial and economic justice movements; civil disobedience; and conscientious objection to war.

**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 the forces emerging to counter them, such as negotiation, nonviolent national defense, and peace movements.

**SOCY 4005-3. Sociology of War.** Considers the questions war raises by applying sociological theory and methods to armed conflicts from the Peloponnesian War to the Gulf War. 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 the theory of conflict resolution and its 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 4115-3. Democracy and Nonviolent Social Movements.** Explores theories of democracy and development engendered and tested by movements for nonviolent social change in different settings. Focuses on means and ends, spirituality, leadership, decision-making, civil society, cooperative economics, ecology, and decentralized power.

**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, exploitation, political economy, alienation, culture, and the state as discussed in the work of Althusser, Gramsci, Lukacs, Mandel, Marcuse, Roemen, 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 5205-3. Collective Action.** Studies collective action in its primary forms: movements 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.

**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.

**SOCY 5615-3. Teaching in Sociology.** Students learn how to teach sociology more effectively while developing depth in a new content area and a clearer sense of the field. Each student chooses a content area within sociology as the basis for planning a course and developing and practicing different teaching techniques.

**SOCY 5915-3. Conflict Management Practicum.** 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. Approved for arts and sciences core curriculum: cultural and gender diversity.

**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.

**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. Approved for arts and sciences core curriculum United States context. Same as WMST 3016.

**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 feminism.

**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 topic

**SOCY 4016-3. Sex, Gender, and Society 2.** Studies status and power differences between 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.** Analyzes the social construction of mental illness, historical and present, with a focus on relationships between gendered, race-based, and class-based social structures defining mental health. Looks at alternatives to traditional interpretations of mental health/illness.

**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. 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 5026-3. Feminist Research Methods.** Epistemological and methodological issues generated by feminist research and students' own projects.

**SOCY 5036-3. Feminist Theory.** Examines the main schools of feminist thought and their impact upon sociological theories. Also examines current feminist theoretical debates (e.g., on the relationship between class, gender, and race/ethnicity, on identity politics and subjectivity) and their relevance for feminist sociology.

**SOCY 5086-3. Family and Society.** Same as SOCY 4086.

## Spanish and Portuguese

### Spanish

**SPAN 1000-3. Cultural Difference through Hispanic Literature.** For freshmen only. Organized around the general topic of cultural differences. Focuses on a related issue such as gender or history articulated in the literature of Spain, Latin America, and the Hispanic United States. Taught in English; students read selected literary texts in English from the various traditions. Does not count towards the Spanish major. Approved for arts and sciences core curriculum: literature and the arts.

**SPAN 1010-5. Beginning Spanish 1.** Offers students a firm command of Spanish grammar. Grammar is used as a point of departure for development of oral skills. Reading and writing 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 2110-3. Second-Year Spanish 1.** Grammar review. Emphasizes reading, writing, and speaking skills. Attendance at the language laboratory may be mandatory. Prereq., SPAN 1020 or 1150 or placement.

**SPAN 2120-3. Second-Year Spanish 2.** Grammar review. Emphasizes reading, writing, and speaking skills. Attendance at the language laboratory may be mandatory. Prereq., SPAN 2110 or placement.

**SPAN 2150-5. Intensive Second-Year Spanish.** Intensive review of grammar and other subjects covered in SPAN 2110 and 2120. Attendance at the language laboratory may be mandatory. 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 course that introduces students to the Spanish major and improves their writing skills. Involves composition, reading, and to a lesser extent, conversation. Prereq., SPAN 2120, 2150, equivalent, or placement.

**SPAN 3001-3. Spanish Conversation.** Emphasizes vocabulary acquisition and speaking fluency. Through structured and carefully monitored individual, group, and class work, students achieve enduring language growth and meaningful acculturation that otherwise could only be achieved through an extended stay in a Hispanic country. Prereq., SPAN 2120, 2150, 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.** 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 3800-3. Selected Readings: Latin American Literature in Translation.** Introduces selected Latin American (Spanish and Portuguese) literature masterpieces. Taught in English. Does not count toward the Spanish major. 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. Hispanic Women Writers.** Discusses the 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 Hispanics 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 4430-3. Special Topics in Hispanic Linguistics.** Examines intensively particular topics or issues concerning Hispanic linguistics selected by the instructor. May be repeated for up to 9 credit hours on different topics. Prereq., SPAN 3100, 3120, and additional course above 3000.

**SPAN 4440-3. Introduction to Hispanic Linguistics.** Introduces students to the main areas of inquiry within the field of Hispanic linguistics.

tics. Topics to be covered include speech and language, phonetics and phonology, morphology and syntax, semantics, linguistic change and variation, and Spanish spoken in the United States. Prereq., SPAN 3100, 3120, and an additional course above 3000.

**SPAN 4500-3. Methods of Teaching Hispanic Literature and Cultures.** Introduces the methodologies associated with teaching Hispanic literature and culture in the secondary schools. Prereqs., SPAN 3100, 3120, and an additional course above SPAN 3000. Same as SPAN 5500.

**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, an additional course above SPAN 3000, and admission to the teacher certification program or departmental approval. 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. Taught in English.

*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 given 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 or departmental consent. 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 Quixote 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 departmental 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 5500-3. Seminar: Methods of Teaching Hispanic Literature and Cultures.** Prereq., graduate standing or departmental consent. Same as SPAN 4500.

**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 chapter 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 with a grade of C- or better, 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, SPAN 3000, placement, 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 1: Forms of Classical Theatre and Drama.** Exam-

ines the interaction of dramatic literature and performance in classical forms of European and Asian theatre, including Greek, Roman, Indian, Japanese, Medieval, and Renaissance Europe. Approved for arts and sciences core curriculum: literature and the arts.

**THTR 2021-3. Development of Theatre 2: Forms of Modern Theatre and Drama.** Examines the interaction of dramatic literature and performance in European theatre from 1800 to 1975, with attention to innovators like Wagner, Ibsen, Strindberg, Stanislavsky, Meyerhold, Pirandello, Brecht, Beckett, and Churchill.

**THTR 3031-3. Development of Theatre 3: Twentieth Century International Drama.** Introduces twentieth century international drama. Discusses selected plays by major African, Asian, and European authors and explores different dramatic traditions and their increasing interactions throughout the twentieth century. Videotapes and slides are used.

**THTR 3071-3. Directing.** Theory and practice of directing for the stage. Prereqs., THTR 2003, 2005, 2013, 2025 or 2035, and two semesters of 3035.

**THTR 4001-3. Development of Theatre 4: American Theatre and Drama.** Explores theatre in America from its beginnings to the present, with particular attention to theatres, plays, and players since 1800. Includes frontier theatres, regional repertory theatres, major dramatists, and the development of Broadway and Off-Broadway. Prereq., 3 THTR credit hours. Approved for arts and sciences core curriculum: literature and the arts.

**THTR 4011-3. Seminar: Theory and Criticism.** Studies theories and criticisms of drama and theatrical performance from Plato to post-modernism.

**THTR 4041-3. Women and Theatre of the 20th Century.** Explores a body of 20th-century dramatic literature central to the study of women and theatre as well as the study of 20th-century cultural history from a cross-national and multiracial feminist perspective. Major playwrights, particularly women from Asia, Africa, and Europe, are read and discussed. Same as THTR 5041.

**THTR 4051-3. Playwriting.** Introductory course in craft of playwriting; primary focus on technique of developing short plays. Instructor consent required.

**THTR 4081-3. Senior Seminar.** Intellectual and conceptual capstone course for theatre and dance majors. Course promotes integration of ideas regarding history, criticism, and theory in performance and production. All inquiry throughout the semester relates to the theme of "creative process." Approved for arts and sciences core curriculum: critical thinking.

**THTR 5011-3. Seminar: Theory and Criticism.** Studies theories and criticism of drama and theatrical performance from Plato to Post-modernism.

**THTR 5041-3. Women and Theatre of the 20th Century.** Same as THTR 4041.

**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*. May be repeated for up to 9 credit hours on different topics.

**THTR 5061-3. Seminar: Asian Theatre.** Study of theatre and drama of India, China, and Japan: theatre history, production styles, and social functions of theatre. Background required in theatre, Asian studies, or both.

**THTR 5071-3. Perspectives on Directing.** Advanced study of theory and practice of stage directing through examination of the work of leading directors, analysis of texts, and classroom exercises.

*Note: The following courses are open to graduate students only.*

**THTR 6001-3. Theatre Dramaturgy.** Students will work as production dramaturgs for the Colorado Shakespeare Festival, developing detailed textual, historical, and critical research for CSF productions, participating in education and outreach programs, and writing production-related articles for publication.

**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 dramatic texts as playscripts for performance, with particular attention to contemporary Shakespeare criticism and landmark Shakespeare productions over the last two centuries.

**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. 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 advisor. See department's variable credit guidelines.

**THTR 6071-3. 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 variety of theories about acting that remain today.

**THTR 6081-3. Seminar in American Theatre: Lesbians and Gays.** Studies the portrayal of lesbians and gays in mainstream American theatre during the twentieth century, as well as the contributions of gay and lesbian theatre artists during the same period.

## Performance

**THTR 1003-3. Beginning Acting.** Teaches the basic principles of acting to nontheatre majors, focusing on relaxation, concentration, improvisation, use of imagination, actions, objectives, initial monologue and scene work, and basic terms and concepts of process work for the actor. In addition to required texts, there is a required reading list of plays.

**THTR 2003-3. Beginning Acting with Experience.** 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 stories. Performances, both solo and ensemble, embody literary texts diverse in terms of gender and ethnicity.

**THTR 2023-3. Intermediate Acting.** 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 1003 or 2003.

**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 or instructor consent.

**THTR 3003-3. Advanced Acting.** 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 2023 and 2043.

**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 3023-4. Studio 2: Acting Process—Scene Study.** Continued development of acting technique and tools for play analysis, with particular emphasis on American realism from the 1930s to early 1960s. Prereq., THTR 3013 or instructor consent.

**THTR 3043-3. 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. Coreq., THTR 3013.

**THTR 4013-4. Studio 3: Shakespeare.** In-depth study of Shakespearean texts from the perspective of their demands on the actor, including the conventions and performance

styles of Elizabethan theatre. Prereq., THTR 3013 and 3023 or instructor consent.

**THTR 4063-3. 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 4073-3. Performing Voices of Women.** Explores theories underlying the "feminine voice," varied perspectives in prose and poetry, ways of embodying these voices and perspectives in performance forms, and ultimately the students' own voices through creation of autobiographical performance pieces (some to be presented for student audiences). Open to both men and women. Prereq., instructor consent.

**THTR 4083-3. Studio 4: Contemporary British and American Theatre.** Studies selected authors and plays, as well as professional issues in contemporary British and American theatre, and the demands made on the actor. Prereqs., THTR 3013, 3023, 4013, or instructor consent.

**THTR 4093-4. Studio 5: Ibsen, Shaw, and Chekhov.** In-depth study of selected texts by three major progenitors of modern theatre. Emphasizes the world views and conventions implicit in the texts, and how these shape the actor's vocal and physical choices. Prereqs., THTR 3013, 3023, 4013, or instructor consent.

**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. 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 advisor. See department's variable credit guidelines.

## Design and Technical Theatre

**THTR 2005-3. Introduction to Technical Production 1.** Introduces technical production elements and procedures, including materials, organization, methods, and equipment to realize theatrical scenery, properties, lighting, and sound designs. Coreq., THTR 2015, which provides practical application of lectures and work on assigned projects.

**THTR 2015-1. Introduction to Technical Production 1: Lab.** One three-hour lab per week providing practical, hands-on experience in production preparation of sets, props, and lights. Coreq., THTR 2005.

**THTR 2025-3. Introduction to Technical Production 2.** Introduces costume construction for the stage and the basics of stage makeup.

**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 2065-3. Computer Applications in the Performing Arts.** Introduces software and program uses of computers in spreadsheet, database, CAD, and word processing through projects in theatre management, budgeting, and design. All course software is taught on both IBM and Mac platforms. Prereqs., typing skills and basic familiarity with computers.

**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 and 2015, or instructor consent.

**THTR 3035-2. Theatre Practicum.** Practical production projects within a designated area of technical theatre, design, stage management, and production running crews, normally related to the department's major season. May be repeated to a maximum of 8 credits. Prereqs., THTR 2005, 2015, and 2025 or 2035.

**THTR 3045-3. Stage Management.** Covers stage management from the inception of a production concept through the process of mounting a production, focusing on the interrelationships of the various artists involved, management and scheduling of time, and the psychology of handling a wide range of personalities. Prereqs., THTR 2005 and 2015.

**THTR 3055-3. Stage Lighting Design 1.** Provides study and practice in lighting technology and design, emphasizing principles of electricity, optics, color theory, instrumentation, and their aesthetic application to the stage.

**THTR 3065-3. Theatre Management.** Introduces theory and practice of management aspects of the performing arts, with primary emphasis on theatre and dance. Includes marketing, budgeting, house and stage management, audience development, grant writing, unions, and season development. Practical experience included. Prereq., THTR 2005.

**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.

**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 4025-3. Costume Construction.** Includes techniques such as patterning of period

garments, understructure, dance wear, millinery, masks, and/or footwear. Interrelated with Costume Design and Fashion History, the work is planned in relation to the major season.

**THTR 4035-3. Scene Painting.** One-hour lecture, two three-hour labs per week. Introduces the techniques of scene painting for the stage.

**THTR 4055-3. Stage Lighting Design 2.** Assumes a basic knowledge of stage lighting; concentrates on advanced technology, processes, and design projects. Prereq., THTR 3055.

**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. See department's variable credit guidelines.

**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. See department's variable credit guidelines.

**THTR 4095 (1-3). Special Topics in Theatre Technology and Design.** Intensive study of specialized topics in theatre technology and design. Topic and credits specified in the *Registration Handbook and Schedule of Courses*. Prereq., instructor consent. See department's variable credit guidelines.

**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 advisor. See department's variable credit guidelines.

### *Shakespearean Production*

Offered in summer only.

**THTR 3037 (2-3). Shakespeare Practicum.** Students are assigned to work with production artisans of the Colorado Shakespeare Festival. While there are many possible areas, production designs for each season determine the number of available positions. May substitute for one semester of THTR 3035. Prereq., THTR 2005, 2015, 2025, and instructor consent.

**THTR 4047-3. Shakespeare in Production.** Detailed study of script analysis, directing concepts, staging and criticism of plays being produced by the Colorado Shakespeare Festival.

**THTR 4057-3. Shakespeare in Performance.** Studies Shakespeare's plays in performance with special attention to the way in which key performance elements have been addressed in twentieth-century productions. Focus will be on the

Shakespeare plays produced by the Colorado Shakespeare Festival. Prereq., upper-division or graduate-level status.

### *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 attendance at University theatre productions. 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; recommended prereq., 3 credit hours in THTR, DNCE, or MUSC. Approved for arts and sciences core curriculum: literature and the arts.

**THTR 4009-3. Strategies of Teaching Theatre.** Curriculum, materials, methods, evaluation, and related aspects of instruction. Secondary level. Offered in summer only.

**THTR 4019 (3-12). Touring Theatre.** Participation in Colorado Caravan Touring Theatre Program. See department's variable credit guidelines.

**THTR 4029 (3-12). Touring Theatre Dance.** Participation in Colorado Caravan Touring Theatre Dance Program. See department's variable credit guidelines. May be repeated for a maximum of 12 credit hours.

**THTR 4039-3. Musical Theatre Repertory.** Developed around the learning of complete scenes, songs and dances that are representative of the major 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. See department's variable credit guidelines.

**THTR 4059-3. Open Topics in Theatre and Drama.** Covers topics not otherwise listed in the curriculum. Topics for each semester are specified in the *Registration Handbook and Schedule of Courses*.

**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 6009-1. 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, professional organizations and publications, program funding, season planning, and a comparison of professional and academic theatre rules and policies.

**THTR 6849 (1-3). Independent Study.**

**THTR 6949 (1-4). Master's Candidate.**

**THTR 6959 (1-6). 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 basic concepts and skills of modern dance. In-class technique work develops muscle strength, flexibility, coordination, rhythm, and dynamic and spatial awareness. Lecture/discussions focus on various aspects of modern dance including history, composition, kinesiology, and criticism. Limited amount of written work is required.

**DNCE 1020-1. Beginning Modern Dance with Experience.** Studio course that continues the work from the beginning level on basic concepts and skills in modern dance technique to increase strength, flexibility, and coordination.

**DNCE 1100, 1110-1. Beginning Ballet.** Ballet for beginners; no previous experience required. Stretching, basic barre, simple terre a terre, and jumping steps are learned, as well as alignment and basic extended positions such as arabesque and attitude. Mastery of simple enchainements and rhythmic patterns. Repeatable for up to 2 credit hours.

**DNCE 1120, 1130-1. Beginning Ballet with Experience.** An extension of beginning ballet, when basic concepts of ballet have been mastered. Enchainements are of greater complication and variety. Dance vocabulary is more extensive. Pirouettes and more complex musical phrases are expected. Prereq., DNCE 1100 or 1110 or equivalent dance experience. Repeatable for up to 2 credit hours.

**DNCE 1160-1. Recreational Dance Forms.** Survey course which includes dance fundamentals, country western dance, international folk dance, square dance, and ballroom dance. Novelty dances as well as some current dances of the day are included.

**DNCE 1200, 1210-1. Beginning Jazz Dance.** Introduces various styles of movement unique to jazz dance. Students learn fundamental technical dance skills as well as specific jazz vocabulary. Designed for students with little or no dance experience. Repeatable for up to 2 credit hours.

**DNCE 1220, 1230-1. Beginning Jazz with Experience.** Further develops work begun in

Beginning Jazz. Exercises and jazz dance phrases are more complex. Prereq., DNCE 1200 or 1210 or equivalent dance experience. Repeatable for up to 2 credit hours.

**DNCE 2040, 2050-2. Intermediate/Advanced Modern Dance.** See DNCE 1020. More in-depth study of modern dance concepts. Class technique work more advanced. Prereq., DNCE 1000 or 1020 or equivalent dance experience. Repeatable for up to 8 credit hours. Audition required.

**DNCE 2140, 2150-1. Low Intermediate Ballet.** All basic ballet steps should have been mastered, including pirouettes en de hors and en dedans, knowledge of the principles and placement, and the ability to master simple enchainements. Prereqs., DNCE 1120 or 1130 or equivalent dance experience. Repeatable for up to 2 credit hours.

**DNCE 2240, 2250-1. Intermediate Jazz.** Designed for the experienced jazz dancer. Includes dance techniques that further improve alignment, strength, flexibility, and coordination within the jazz idiom. Greater emphasis on style and rhythm and challenging dance combinations. Audition required. Repeatable for up to 2 credit hours.

**DNCE 2400-2. Theatre Dance Forms.** Each class begins with a dance warm-up designed to increase strength, flexibility, and coordination. This is 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.** Explores the technique, rhythm, and movement style of African/African-American dance. History, anthropology, ritual, games, and songs are included in the total cultural experience. Same as BLST 2400.

**DNCE 2510-2. African-American Dance 2.** Continuation of DNCE 2500. Technique and rhythms explore various Caribbean, African, and dance forms of the Americas not taught in DNCE 2500. Music, history, and folklore help to enhance the dance and provide a total cultural experience. Same as BLST 2410.

**DNCE 3160-1. Intermediate Ballet.** Covers the general vocabulary of classical ballet technique and enchainements of medium complexity. Multiple pirouettes in all positions are required. Audition required. Repeatable for up to 8 credit hours.

**DNCE 4180-1. Advanced Ballet.** Advanced professional-level classical ballet, covering the complete vocabulary. Enchainements are of complex structure. Tour de force work required. Audition required. Repeatable for up to 8 credit hours.

**DNCE 4260-1. Advanced Jazz Dance Technique.** This class is for advanced dancers who want to expand their technical skills in the jazz form. Each class will include a standing warm-up, floorwork for strength and flexibility, adagio combination for line and balance, and a locomotor combination for turns, leaps, rhythm, and fast floorwork. Emphasis is placed on technique, musicality, style, and performance.

Enrollment by audition only. Same as DNCE 5260.

**DNCE 5260-1. Advanced Jazz Dance Technique.** Same as DNCE 4260. Restricted to graduate students.

### Major Technique

The following undergraduate dance courses are open to dance majors. Other students are admitted by audition.

**DNCE 2021-2. Beginning Modern Dance for Majors.** Repeatable for up to 16 credit hours.

**DNCE 3041-2. Intermediate Modern Dance for Majors.** Repeatable for up to 16 credit hours.

**DNCE 4061-2. Advanced Modern Dance for Majors.** Repeatable for up to 16 credit hours.

*Note: The following graduate-level courses are open only to graduate dance majors.*

**DNCE 5001-2. Modern Dance for Graduate Students.** Repeatable for up to 12 credit hours. Restricted to graduate students.

**DNCE 5101-1. Intermediate Graduate Ballet.** Repeatable for up to 8 credit hours. Restricted to graduate students.

**DNCE 6101-1. Advanced Graduate Ballet.** Repeatable for up to 8 credit hours. Restricted to graduate students.

### Production

**DNCE 2012-1. Dance Production 1.** Provide practical experience in producing formal and semi-formal concerts. Introduces and provides basic familiarity with production and promotional responsibilities, theatrical equipment and systems, and backstage and front-of-house duties and procedures. Restricted to dance majors.

**DNCE 2022-1. Dance Production 2.** Establishes awareness of supporting technical theatre arts available to the choreographer; provides practical hands-on introduction to systems and equipment; and provides vocabulary with which the choreographer communicates with lighting designer and technicians. Restricted to dance majors.

**DNCE 5052 (1-3). Studio Concert.** Restricted to dance majors with 87 credit hours or more.

### Composition

**DNCE 2013-2. Dance Improvisation.** An opportunity for students to develop skills of dance improvisation through the exploration of structured movement problems. Students will study selected contemporary dance artists whose work stresses improvisation in performance and/or as a training vehicle. Restricted to dance majors.

**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 2021 and 2033.

**DNCE 4013-2. Contact Improvisation.** Contact improvisation is the practice of spontaneously generating movement guided by moment-to-moment physical contact and sharing of weight between two or more dancers. Class work includes contact improvisation skills: rolling, falling, giving and taking weight, and use of momentum and gravity. Skills are developed in both duets and larger groups. Same as DNCE 5013.

**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 5013-2. Contact Improvisation.** Same as DNCE 4013, with the addition of graduate papers and a project. Restricted to graduate students.

**DNCE 5053-3. Advanced Dance Composition.** Same as DNCE 4053, with the addition of graduate papers and/or a project.

**DNCE 6073-3. Choreography.** Covers in-depth practical and theoretical approaches to dance composition for graduate students; solo and group forms; and analysis of historical and contemporary dance works. May be repeated for up to 6 credit hours with different instructors. Restricted to graduate students.

### 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 within western musical tradition. Special emphasis on twentieth-century techniques and on the relationship of various music to dance. Coreq., DNCE 2014 or instructor consent.

**DNCE 5054-3. West African Music and Dance.** Studies music and dance of selected West African cultures. Uses both the academic inquiry tradition of lectures and research as well as the traditional African methodology of music and dancing. Combines intellectual and creative learning experiences. Enrollment by instructor consent. Same as MUSC 5012.

**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., dance/music experience, or instructor consent. Restricted to graduate students.

### Movement Analysis

**DNCE 1005-3. Movement Awareness and Injury Prevention for the Dancer.** Helps

dancers 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. Restricted to dance majors.

**DNCE 4015-3. Movement Analysis.** Introduces Rudolf Laban's theories of movement and exposes several body therapies to heighten students' awareness of movement as a multifaceted (neuromuscular/spatial/dynamic) event. Emphasizes refinement of movement, observation skills, and improvement of performance. Prereq., DNCE 1005. Same as DNCE 5015.

**DNCE 5015-3. Movement Analysis.** Same as DNCE 4015. Restricted to graduate students.

**DNCE 5055-3. 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. Prereq., DNCE 5015. Restricted to graduate students.

### 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 4015. Same as DNCE 5036.

**DNCE 5016-3. Creative Dance for Children.** Same as DNCE 4016 with addition of readings and a paper. Restricted to graduate students.

**DNCE 5036-3. Methods of Teaching Dance.** Same as DNCE 4036 with addition of readings and a paper. Restricted to graduate students.

**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. Restricted to graduate students.

**DNCE 6056-2. Dance Administration.** Examines current trends, issues, and problems of dance at colleges, in secondary education, in the community, and professional dance. Explores curriculum development and educational dance trends along with other topics such as freelance work, grant writing, and dance advocacy. Restricted to graduate students.

### History

**DNCE 4017-3. History and Philosophy of Dance.** Studies dance as a social, economic, and artistic force from primitive times to the early 1900's, emphasizing the development of dance as a theatre art in western civilization. Approved for arts and sciences core curriculum; literature

and the arts. Same as DNCE 5017. Restricted to students with 57 credit hours or more.

**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. Restricted to graduate students.

**DNCE 5027-3. Dance in the Twentieth Century.** Same as DNCE 4027 with addition of graduate papers and/or a project. Restricted to graduate students.

### Performance

**DNCE 4018-2. Performance Improvisation Techniques.** Explores movement and vocal improvisational techniques to enhance creative and performance skills. Helps individuals discover and make accessible the diversity of the human instrument and develops practical tools to broaden expressive range. Same as DNCE 5018. Enrollment by instructor consent.

**DNCE 4028-1. Performance Movement Laboratory.** Designed to give students an opportunity to develop advanced movement skills introduced in DNCE 4018 and THTR 4033. Prereq., DNCE 4018 and THTR 4033.

**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. Enrollment by audition only.

**DNCE 4128-2. Pointe and Variation.** For the more advanced classical ballet student this class would entail working on 'pointe' and learning dances from Classical, Romantic, and Neo-Classical ballets. Same as DNCE 5128. Enrollment by audition only.

**DNCE 5018-2. Performance Improvisation Techniques.** Same as DNCE 4018 with the addition of written analysis and creative assignments. Restricted to graduate students.

**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. Enrollment by audition only. Restricted to graduate students.

**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. Enrollment by audition only. Restricted to graduate students.

**DNCE 5128-2. Poente and Variation.** Same as DNCE 4128. Restricted to graduate students.

### *Philosophy and Independent Study*

**DNCE 1029-3. Dance as a Universal Language.** Introduces non-Western dance that demonstrates an appreciation for dance throughout the world. This world view of dance will be studied as a universal, historical, cross-cultural art form through the process of research, interpretation, criticism, and creative activity. Approved for arts and sciences core curriculum: literature and the arts.

**DNCE 2849 (1-3). Independent Study.** Involves creative or scholarly investigation of an area of interest to the student not addressed in the curriculum. Work must be arranged with and advised by a faculty member.

**DNCE 3029-3. Looking at Dance.** Examines the inner workings of the art of dance from the varying perspectives of audience, performer, and choreographer. Encourages a more informed, and therefore a more responsive, viewing of dance as an art form.

**DNCE 3849 (1-3). Independent Study.** Same as 2849, junior level.

**DNCE 4849 (1-3). Independent Study.** Same as 2849, senior level.

**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.** Same as 2849, graduate level.

**DNCE 5909-2. Problems in Dance.** Same as DNCE 4909.

**DNCE 5919 (1-3). Dance Practicum.** Same as DNCE 4919.

**DNCE 6009-1. 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. Restricted to dance graduate students.

**DNCE 6049-3. Seminar: Dance.** Intensive study of selected topics related to the art of dance, dance criticism, dance aesthetics, and dance in relationship to the other arts (performing and visual) with an emphasis on contemporary trends. Restricted to graduate students.

**DNCE 6949 (1-4). Candidate for Degrée.**

**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 1150-3. Introductory Composition: Expository Writing.** For students who have already mastered the basic conventions of written English, but still require instruction in expository and analytical writing. Emphasizes organization and clarity. All sections are conducted as workshops; that is, student papers are discussed at every class meeting. Students write several short essays, revising each several times. Approved for arts and sciences core curriculum: written communication.

**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 enrolling at the freshman level should assess their own skills and choose the course (UWRP 1150 or 1250) appropriate to their needs. Approved for arts and sciences core curriculum: written communication.

**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 are 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 more readings 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, analysis, and argument. Approved for arts and sciences core curriculum: written communication.

**UWRP 3030-3. 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, the course emphasizes effective communication with non-technical audiences. Classes are conducted as workshops. Prereq., junior standing. Intended for engineering students and natural and biological science majors. Approved for arts and sciences core curriculum: written communication.

**UWRP 3040-3. Writing on Business and Society.** Through selected readings and daily writing assignments, students examine ethical and social issues that arise in business. Focusing on critical thinking, analytical and argumentative writing, and oral presentation, the course emphasizes effective communication with non-technical audiences. Classes are conducted as workshops. Prereq., junior standing. Course intended for business majors and minors. Approved for arts and sciences core curriculum: written communication.

**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 3090 (1-3). Open Topics in Writing: Advanced.** An advanced topics course providing intensive, specialized writing instruction in selected topics. May be repeated for credit once if the topics are different, up to a total of 6 credit hours. Check with the program for semester offerings. Prereq., UWRP 3020, or UWRP 3030 or instructor consent. Same as ENGL 3151.

**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. Same as ENGL 3151. 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. Prereqs., upper-division standing and one college-level writing course.

**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 Feminist 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 2020-3. Social Construction of Femininities and Masculinities.** Examines the impact of race, ethnicity, social class and sexual orientation on the social construction of femininities and masculinities. Studies key issues as

they arise over the course of the lifecycle, e.g. sexual identity; work/family conflicts; violence; dating and relationships, etc. Approved for arts and sciences core curriculum: cultural and gender diversity.

**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. Approved for arts and sciences core curriculum: cultural and gender diversity.

**WMST 2090-3. Feminist Theories.** Explores a variety of alternative systematic accounts of, and explanations for, gender inequities. Social norms of both masculinity and femininity are analyzed in relation to other axes of inequality such as class, sexuality, race/ethnicity, neocolonialism, and the domination of nonhuman nature. Recommended prereq., WMST 2000.

**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 scholarship.

**WMST 2400-3. Women and Social Activism.** Relying heavily on the history of women of color, combines readings in history, literature, and autobiography to examine women's impact on social change in the United States. Includes U.S. colonization, slavery, immigration, industrialization and labor, art and socialism, lesbianism, civil rights movements, sexual politics, and contemporary feminism.

**WMST 2500-3. History of the U.S. Feminist Movement.** Provides a historical survey of the U.S. feminist movement. Covers nineteenth-century endeavors for women's rights, the woman suffrage 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 2600-3. Gender, Race, and Class in Contemporary U.S. Society.** Introduces the main forms of domination in U.S. society around gender, class, and race relations. Examines intersections of the relations and influences in institutions and everyday life. Particular attention is given to women of color perspectives and resistance to domination. Approved for arts and sciences core curriculum: contemporary societies.

**WMST 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. Same as PSYC 2700. Approved for arts and sciences core curriculum: cultural and gender diversity.

**WMST 3000-3. Workplace Diversity.** As our society, and thus the workforce, becomes

increasingly diverse, new forms of awareness, knowledge, and competencies are required. Focuses on four dimensions of diversity: race/ethnicity, gender, sexual orientation, and age. Students are required to examine these issues at four levels: personal, interpersonal, institutional, and cultural. Prereq., WMST 2000 or 2050.

**WMST 3090-3. Critical Thinking in Feminist Theory.** Through close reading, class discussion, and writing papers, students analyze the concepts, ideas, arguments, and assumptions that inform major texts in feminist theory. Emphasizes developing reading and writing skills to interpret theoretical arguments. Prereqs., WMST 2000 and junior or senior standing. Approved for arts and sciences core curriculum: critical thinking.

**WMST 3110-3. Feminist Practical Ethics.** Explores a variety of personal and public policy issues in light of basic feminist commitment to opposing women's subordination. Provides students not only with a deeper understanding of the specific issues discussed but also with a sense of the ways in which a principled commitment to feminism may influence and be influenced by prevailing interpretations of contemporary ideals and values (such as freedom, equality, and community). Provides an opportunity to develop skills of critical analysis useful in a wide range of contexts. Prereq., WMST 2000 or 2050 and junior or senior standing. Same as PHIL 3110. Approved for arts and sciences core curriculum: ideals and values.

**WMST 3200-3. Religion and Feminist Thought.** Examines the origin of patriarchal culture in the theology and practices of Judaism and Christianity. Through reading and discussion, attitudes and beliefs concerning women are explored as Judeo-Christian culture impacts gender roles and gender stratification. Women's religious experience is studied from the perspective of feminist interpretations of religiosity. Prereq., WMST 2000 or WMST/RLST 2800.

**WMST 3300-2. Women and the Legal System.** Explores the role of women in the legal system by looking at women as jurors, witnesses, law students, lawyers, law professors, and judges. Two areas of the law are examined that impact women in particular: divorce and sexual assault. Prereq., WMST 2000.

**WMST 3400-3. Gender, Culture, and Personality.** Explores the relationship among gender, culture, and personality. The disciplines of psychology and sociology are brought together in the study of gender and personality formation through investigation of psychoanalytic theory and the social environment. Prereqs., WMST 2000 or 2700, and junior or senior standing.

**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 BLST 2000. Same as BLST 3505.

**WMST 3550-3. Facilitating Differences.** 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 psy-

chology, problems in male/female relationships and changing roles and changing arrangements. Cross-disciplinary course that draws from sociology, psychology, and communication.

**WMST 3656-3. History of Women in Progressive Social Movements.** This course has two components. The first goal is to explore women's involvement in the United States and international peace, feminist and civil rights movements of the nineteenth and twentieth centuries. Secondly, students will learn research methods by using a variety of primary and secondary sources and writing an original research paper. Prereq., WMST 2000 or HIST 1015 or 1025. Same as HIST 3656. Approved for arts and sciences core curriculum: critical thinking.

**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., women working; women and health; mothers and daughters in literature; and women, war, and peace in literature. Prereq., WMST 2000. May be repeated for up to 6 credit hours for different topics.

**WMST 3730-3. Feminism and Global 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. Prereq., WMST 2000 or 2050.

**WMST 3800-3. Advanced Writing in Feminist Studies.** Expository writing course offers training in analytical and descriptive skills, structures of argument, critical thinking, the rhetoric of persuasion, and the development of a personal voice. Readings and papers will focus on basic issues in gender studies. Prereq., WMST 2000 and junior or senior standing. Approved for arts and sciences core curriculum: written communication.

**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 social psychology of women). Course work includes discussion, reading, and written projects. Prereq., WMST 2000. 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. Prereq., WMST 2000.

**WMST 4636-3. Lesbian and Gay History: Culture and Politics and Social Change in the U.S.** Considers current theoretical approaches to the history of sexuality and traces the changing meaning of same-sex sexuality in the U.S. through investigation of lesbian and gay identity formation, community development, politics, and "queer" cultural resistance. Prereqs., WMST 2000 or 2600, and junior or senior standing. Same as HIST 4636.

**WMST 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., WMST/PSYC 2700 or WMST 2000. Same as PSYC 4700.

**WMST 4800-3. Capstone Seminar.** Encourages students to sum up, evaluate, and develop a project based on their experiences as women studies majors or certificate students. Students collect materials from their previous women studies courses and write a narrative that describes the process of their learning and evaluates that process. They complete a project that extends their previous work, and then present their projects to other members of the class. Prereq., senior standing and women studies major.

**WMST 4840 (1-6). Independent Study.**

**WMST 4999 (1-3). Senior Honors Thesis.** Qualified WMST majors may write an honors thesis, an in-depth research paper on a topic chosen by the student. Thesis hours available to majors only after successfully completing the research phase.

#### *Cross-Listed Courses by Discipline:*

##### *Anthropology*

**WMST 2080-3. Anthropology of Gender.** Same as ANTH 2080.

##### *Chicano Studies*

**WMST 3135-3. Study of Chicanas.** Same as CHST 3135.

##### *Classics*

**WMST 2100-3. Women in Antiquity: Greece.** Same as CLAS 2100.

**WMST 2110-3. Women in Antiquity: Rome.** Same as CLAS 2110.

##### *English*

**WMST 1260-3. Introduction to Women's Literature.** Same as ENGL 1260.

**WMST 3268-3. Women Writers.** Same as ENGL 3268.

**WMST 4278-3. Topics in Women's Literature.** Same as ENGL 4278.

##### *Fine Arts*

**WMST 4809-3. Women Artists from the Middle Ages to the Present.** Same as FINE 4809.

##### *Geography*

**WMST 3672-3. Gender and Global Economy.** Same as GEOG 3672.

##### *History*

**WMST 4063-3. Women in Victorian England.** Same as HIST 4063.

**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.

##### *Philosophy*

**WMST 2290-3. Philosophy and Women.** Same as PHIL 2290.

##### *Political Science*

**WMST 4271-3. Sex Discrimination: Constitutional Issues.** Same as PSCI 4271.

**WMST 4291-3. Sex Discrimination: Federal and State Laws.** Same as PSCI 4291.

##### *Religious Studies*

**WMST 2800-3. Women and Religion.** Same as RLST 2800.

##### *Sociology*

**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 2016-3. Sex and Gender in Futuristic Literature.** Same as SOCY 2016.

**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 4016-2. Sex, Gender, and Society 2.** Same as SOCY 4016.

**WMST 4086-3. Family and Society.** Same as SOCY 4086.

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ROBERT J. SHANNON, Lecturer.

NANCY L. SPANIER, Professor. B.A., Middlebury College; M.A., Mills College.

LETITIA S. WILLIAMS, Senior Instructor. B.S., Tuskegee Institute; M.S., Smith College.

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ANNE BLISS, Instructor. B.A., Seattle University; M.A., Ph.D., University of Colorado.

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NANCY D. MANN, Senior Instructor. B.A., Eckerd College; M.A., Ph.D., Stanford University.

PAUL T. MURPHY, Instructor. B.A., Boston College; M.A., McGill University; Ph.D., University of Colorado.

ROLF NORGAARD, Senior Instructor. B.A., Wesleyan University; M.A., Ph.D., Stanford University.

KATHRYN D. PALMER, Instructor. B.A., Kansas State University; M.A., University of Colorado.

JOHN PIIRTO, Instructor. B.S., M.S., University of Wisconsin; M.F.A., University of California.

J. E. RIVERS, Professor. A.B., Davidson College; M.A., Ph.D., University of Oregon.

JACK A. URQUHART, Instructor. B.A., University of Florida; M.A., University of Colorado.

### Women Studies

ALISON M. JAGGAR, Director of Women Studies; Professor of Women Studies and Philosophy. B.A., University of London; M.Litt., University of Edinburgh; Ph.D., State University of New York at Buffalo.

NAN ALAMILLA BOYD, Assistant Professor. B.A., University of California, Berkeley; M.A., Ph.D., Brown University.

MARY C. CHURCHILL, Instructor. B.A., University of California, Berkeley; M.A., University of California, Santa Barbara.

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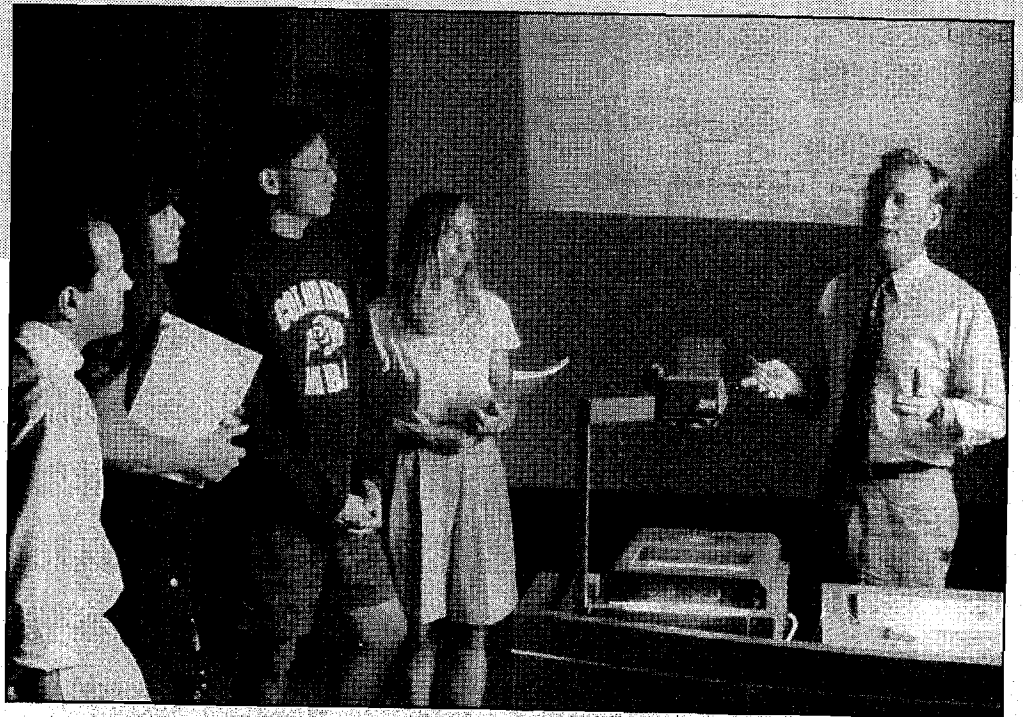
KAMALA KEMPADOO, Assistant Professor. B.A., University of Amsterdam; M.A., Ohio State University; Ph.D., University of Colorado.

ANNE MARIE POIS, Instructor. B.A., State University of New York, Stony Brook; M.A., Ph.D., University of Colorado.

MARCIA C. WESKOTT, Professor. B.A., Ursinus College; M.A., Ph.D., University of Pennsylvania.



*Associate Professor  
Michael Lawless  
uses a PowerPoint  
presentation in a  
discussion with  
several M.B.A.  
students.*



# COLLEGE OF BUSINESS AND ADMINISTRATION AND GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

LARRY D. SINGELL, DEAN

The College of Business and Administration and Graduate School of Business Administration (collectively referred to as the college) educate and prepare students for management positions, continue the education of those already in such positions, and promote ongoing business 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 of Business and Administration and Graduate School of Business Administration are committed to maintaining high standards of academic excellence. The programs and curricula of the college are reviewed, changed, and enhanced as dictated by a rapidly advancing business environment.

The college has historically maintained close ties with the business community. The Business Advisory Council (BAC) is an effective advocate for the college, both within the University and to the external community. As high-level executives, members of the BAC provide advice, counsel, and an outside perspective to the dean and his administration. Council members spearhead major parts of development programs, strengthen the college's network nationwide in business and political arenas, and provide significant input in curriculum design.

Each year, high-level executives come to the college to share their working-world experiences, their expertise, and often their reflections on life outside of business. Students enjoy the informal, personalized classroom presentations and the casual discussion environment. Visiting executives speak at classroom lectures as well as informal luncheons and after-hours meetings. Each executive holds office hours while at the college. Classroom conversations cover a range of subjects including what kind of courses students are taking, career planning, domestic and international marketing, risk taking, and corporate hiring procedures.

The faculty of the college is made up of men and women with a diverse range of expertise and research activities. Many maintain strong ties with the business community and bring a current business perspective to the classroom. A number of professors are frequently published and are recognized nationwide as top researchers.

Business faculty members strive to deliver the most effective teaching in both management theory and real-world business applications. Their experience and competence ensure a quality learning experience for business graduates.

## Facilities and Research Activities

The College of Business and Administration is an educational environment that houses several resources for the specific needs of business students. The facilities include the William M. White Business Library, the Douglas H. Buck Electronic Media Center, computerized classrooms, technology team rooms equipped with multimedia Pentium computers and software, a large microcomputer lab equipped with personal computers, a student lounge, 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 the American stock exchanges. Company reports are also available on Compact Disclosure, Disclosure Select, Compustat, and Lexis-Nexis. Bibliographic information is available on ABI-Inform, the General Business File and Academic Index, the III system, and Lexis-Nexis. Brokerage House Investment Reports are available on the General Business File and Standard & Poor's Stock Reports CD.

The White Library has over 74,000 volumes, which include monographs and bound serials. Subscriptions to more than 650 serials and access to 400 more are available on the Business Collection.

The Douglas H. Buck Electronic Media Center is devoted to on-line resources and compact disc subscriptions including the General Business File and Academic Index,

Standard and Poor's Stock Reports, National Trade Data Bank, Mutual Fund Scoreboard, the F & S Indexes, Compact Disclosure, PC Compustat, and Lexis-Nexis. These resources can be accessed by the center's 22 workstations.

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. The combined collections contain more than 10 million books, periodicals, microforms, computer-based sources, and other materials. The library system is also a regional depository for state, U.S. government, United Nations, and international documents.

The College of Business and Administration houses 10 electronic classrooms, one of which is devoted to M.B.A. students. The computerized classrooms are equipped with Pentium and Pentium Pro computers; Microsoft Office applications including Excel, PowerPoint, Word, Fox-Pro, and Access; state-of-the-art projection systems; and multimedia capabilities including video, cable, and Internet connections. The college has Pentium computers in both the large microcomputer lab for students and a teaching lab. All resources are connected to the campus Ethernet network and the Internet. Computing resources on the Boulder campus include many microcomputer labs and various UNIX-based computers used for large statistical jobs and programming languages. Technology is also incorporated in class assignments. Professors post course information, PowerPoint presentations, and Excel spreadsheets electronically. E-mail accounts are available to all students. View the College of Business home page at <http://www-bus.colorado.edu>.

The College of Business and Administration recently joined with leading international information technology firms to establish technology team rooms. The eight rooms are equipped with multimedia Pentium computers; full Internet and World Wide Web access; Microsoft Office applications; and software for graphing, statistical analysis, and programming languages. Additional audio/visual equipment

may be checked out by students as needed. In addition to the computing facilities, the rooms hold writing boards, tack boards, and conference tables.

### **Bureau of Business Research**

Established in 1915, the Bureau of Business Research is one of the earliest organized state service-oriented bureaus in the country. The bureau houses the Business Research Division and three centers, which serve various outreach functions of the college.

The **Business Research 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 conduct 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; and to obtain and hold copyrights and to publish research results.

In addition to the Business Research Division, the bureau houses three focused centers—the Rocky Mountain Trade Adjustment Assistance Center, the CU Business Advancement Center, and the Center for Recreation and Tourism Development. Funding for center activities comes from various sources including the College of Business and Administration, the University, state agencies, the federal government, state and local business firms, and from the sale of research products and services.

The centers provide a variety of services, including services to the state, publications, contract research, and support for faculty research, both theoretical and applied. In addition, the centers provide outreach and community service activities 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.

The **Rocky Mountain Trade Adjustment Assistance Center (RMTAAC)** is one of 12 centers across the nation funded by the Department of Commerce to assist U.S. manufacturers who have been hurt

by foreign competition. The assistance is provided on a cost-share basis where RMTAAC typically pays more than 50 percent of the cost.

The purpose of the Trade Adjustment Assistance program is to retain and create U.S. manufacturing jobs. From its location in Boulder, RMTAAC assists manufacturers in the Rocky Mountain region. A typical client has \$10 million in annual sales and 100 employees.

Once a firm has been certified as eligible for assistance, a strategic business plan is developed to improve the firm's competitiveness. Necessary technical expertise is then brought in to implement the recommendations in the plan. Assistance, which normally takes two to three years, can be provided in all the functional areas.

The **CU Business Advancement Center (CU-BAC)** is an external outreach service to Colorado business and industry specializing in technology and new product commercialization. Services include (1) database searches for technologies to provide licensure, technical reports, patents and market information; (2) market assessment for new technologies and products; and (3) identification of expertise and research partnerships with CU and federal laboratories.

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.

### **Academic Centers**

In addition to the Bureau of Business Research, the college has two centers linking college academic programs and the business community—the Center for Entrepreneurship and the Center for Real Estate.

The **Center for Entrepreneurship** is a joint program of the colleges of business and engineering. With CU-Boulder

located in one of the leading entrepreneurial centers in the country, it is the program's mission to ensure that undergraduate and graduate students receive a thorough grounding in entrepreneurial management skills via an integrated entrepreneurship course curriculum. These uniquely-focused courses and programs enable students to expand both their academic and career horizons as they view business from an entrepreneur's perspective. Students practice the creative thinking required to launch, develop, and effectively manage new and unstructured ventures.

To achieve the experiential aspects of the program, leading entrepreneurs are invited into the classroom as topical guest speakers throughout the year. Real-life encounters with professionals are supplemented by student field projects and internships with entrepreneurially-oriented companies.

The center, via its courses and programs, provides students the opportunity to not only prepare themselves, but to have an edge in gaining employment and contributing in a meaningful way with the exciting new enterprises and emerging growth companies that are driving our nation's economy today.

The **Center for Real Estate** was founded in 1995 with the support of an industry council with the goal of advancing academic excellence in real estate education and scholarship. The center oversees the college's teaching programs in real estate. It also provides support for faculty teaching and research activities in that area.

### **Career Opportunities**

College of Business and Administration graduates are prepared for positions in the following fields:

- Accounting—public, private, and governmental
- Banking and other financial institutions
- Corporate financial management
- Information systems
- International business
- Investments
- Marketing and sales management
- Personnel management
- Production management
- Real estate
- Recreation and tourism management
- Retailing
- Transportation

Other graduates hold positions in fields as diverse as business journalism, public relations, city planning, chamber of commerce and trade association management,

college administration, and government. The entrepreneurial area of application prepares students to start their own business ventures.

### Study Abroad

Study abroad programs are available for students interested in international business or in cultural experiences abroad. One such program is the College of Business-sponsored London Seminar in International Finance and Business, a month-long program held each summer in the finance district of London. The seminar is open to juniors, seniors, and graduate students.

### Student Organizations

Listed below are organizations that promote professional interests and provide recognition of scholastic attainment:

- AAS, Association of Accounting Students
- AIESEC, international business association
- Beta Alpha Psi, national honorary and professional accounting society
- Beta Gamma Sigma, national honorary scholastic society in business
- BSC, Business Students of Color
- CUAMA, student chapter of the American Marketing Association
- CU Entrepreneurship Organization
- CUFMA, CU Financial Management Association
- Delta Nu Alpha, honorary transportation society
- Delta Sigma Pi, professional business society
- Doctoral Business Student Association
- Graduate School of Business Association
- ISO, Information Systems Organization
- Leadership Council
- Phi Chi Theta, professional business and economics society
- SAM, Student Association of Management
- Sigma Iota Epsilon, professional and honorary management society
- 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

### Business Board (B-Board)

As the student governing body of the College of Business and Administration, the Business 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, usually officers, are required to serve on the College of Business and Administration Academic Ethics Committee.

### Graduation Recognition Ceremony

Every December and May the Office of the Dean and the Business 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 for Students Entering Prior to Summer 1995

Upon recommendation of the faculty, students who demonstrate superior scholarship are given special recognition at graduation.

Students must achieve an overall grade point average (GPA) of 3.30 and a GPA of 3.50 in all business courses taken at the University of Colorado at Boulder to be considered for *cum laude*.

Those who achieve an overall GPA of 3.50 and a GPA of 3.70 in all business courses taken at the University of Colorado at Boulder will be considered for *magna cum laude*.

Students who achieve an overall GPA of 3.80 and a GPA 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*.

### Honors for Students Entering During Summer 1995 or Thereafter

In recognition of high scholastic achievement, upon recommendation of the faculty, the designation "With High Distinction" or "With Distinction" will be awarded at graduation. To qualify for the "With High Distinction" designation, the student's cumulative University of Colorado GPA must be at least 3.90. For the "With Distinction" designation, the student's cumulative GPA must be at least 3.75 but less than 3.90. In addition, for these designations, at least 60 semester hours must have been earned at CU-Boulder.

In addition to the distinction of honors, College of Business and Administration students also may participate in the Latin honors granted by the College of Arts and Sciences. Qualified students are encouraged to participate in this program, which coordinates the offering of a variety of honors

seminars as well as the granting of Latin honors (*cum laude*, *magna cum laude*, *summa cum laude*) at graduation. Granting of these honors is determined by the Honors Council based on several criteria, including the quality of original scholarly work (generally reported in the form of a thesis). Latin honors are not conferred on a graduate simply by virtue of high grades. Interested students should consult the Honors Program listing in the College of Arts and Sciences chapter of this catalog or contact the Honors Program in Norlin Library.

### 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.

Master's students who have completed 9 semester hours of graded work during the fall or spring semester and earn a GPA of 3.75 or better on the Boulder campus are included on the graduate dean's list.

### 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 7 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. Business scholarships are generally 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 or Graduate 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 and Appeals Committee at the discretion of the associate dean, a member of the instructional staff, or another appropriate university representative.

Students are advised that plagiarism consists of any act involving the offering of someone else's work as the student's own. It is recommended that students consult with 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.

Students entering the graduate programs are required to adhere to the ethical behavior and honor codes established by the student body.

### 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 speech, accuracy in calculations, and general quality of scholastic workmanship.

In general, examinations are required in all courses and for all students.

To be in good standing, students must have an overall grade point average of 2.00 or better for all course work taken, and a 2.00 or better for all business courses taken. Students must earn a passing grade for all required courses. These requirements apply to courses taken at all university campuses. Physical education activity courses, repeated 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 is not 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 are placed on probation or suspension. Students are responsible for being aware of their academic status at all times. College rules governing probation and suspension are as follows:

**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 will have two semesters to raise the cumulative or business grade point average to at least a 2.00. Students who have a cumulative or business grade point average below a 2.00 after the second probation will be suspended and will not be able to register for University of Colorado daytime courses on any campus during the fall or spring semester.

**Note:** Suspended College of Business students who transfer into another school or college of the University will not be eligible to register for business courses or for readmission to the College of Business.

**Suspension.** Suspended students may attend summer session at any University of Colorado campus, take correspondence courses, and/or take Continuing Education Boulder evening credit classes in order to improve their GPA in the area of deficiency. They may return as transfer students by overcoming their deficiencies at another institution [i.e., by achieving an overall 2.00 GPA in their University of Colorado work and all work taken elsewhere since dismissal; these transfer grades (nonbusiness courses only) are only used for the purpose of readmission and do not remain in the University of Colorado GPA]. Dismissed students pursuing this latter option have two semesters after readmission to raise their University of Colorado GPA to 2.00 or they will be permanently suspended.

A student who has been under suspension for one calendar year and elected none of the above may apply for readmission to the College of Business and Administration. Students have two semesters to raise their cumulative or business GPA to at least 2.00.

Students who make up their grade deficiencies prior to the expiration of the one-year suspension 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 stated 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 should be directed to the college. The college cannot assume responsibility for problems resulting from a student's failure to follow the policies stated in the catalog or from incorrect advice 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 College of Business Office of Undergraduate Studies, room 227, (303) 492-6515.

### 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 Undergraduate Admission in the General Information chapter 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.

### Intrauniversity Transfer

A large number of students admitted each year to the College of Business and Administration 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 (IUT) application to the college after completing at least 12 semester hours of specific graded course work at the University of Colorado. The deadline is October 1 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 considers other factors that contribute to diversity in the student body. Factors 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. 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 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 must 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 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 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

their own college or school before submitting the concurrent registration form.

### *Scholastic Load*

The normal scholastic load of an undergraduate student 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 no 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 official transcript by the Office of the Registrar. Credit is then evaluated by the College of Business and Administration to determine degree acceptability.

### *Cooperative Education Credit*

No credit is given for work experience or cooperative education programs.

### *Correspondence Credit*

No business courses can be taken by correspondence. All nonbusiness correspondence courses must have prior approval and be evaluated to determine their acceptability.

### *Credit by Examination*

#### **Advanced Placement (College Board).**

For students who earn scores of 3, 4, or 5 on advanced placement exams, college credit will be given where appropriate. See page 11 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.

CLEP credit is only appropriate for pre-business 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 enrollment 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 that 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.

### *Academic Internship Credit*

Junior or senior business students desiring to work beyond regular business course curriculum may seek permission to take a business academic internship under the direction of a designated faculty member. Students may not preregister for the class. Up to 6 credit hours of academic internship and other types of nontraditional credit may be accepted as degree credit. A maximum of 3 hours may be taken in any one semester. Internships are only offered on a pass/fail basis. Students must hold a minimum GPA of 2.50 or obtain consent from the instructor to enroll in the course.

### *Independent Study*

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.

To receive credit for independent study, academic internships, 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 College of Business Office of Undergraduate Studies.

### *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 Office of International Education.

### Transfer Credit

The college reserves the right to disallow any credit that it deems inappropriate 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. 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 carefully checked catalog description and course syllabus for course equivalency determination, since 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 apply course work from another institution or University of Colorado campus toward the B.S. degree in business administration must have prior approval of the College of Business and Administration. Only nonbusiness requirements or 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 257) must be taken at the University of Colorado at Boulder unless written approval is given by the associate dean of undergraduate studies. Transfer students must take a minimum of 30 hours of business courses, including the area of emphasis, in residence after admission to the college. For more information on transfer of credit policies, see Transfer of College-Level Credit on page 12.

### Grading Policies

In addition to the campuswide grading system and pass/fail policy listed under Registration in the General Information chapter, the College of Business and Administration 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, required nonbusiness, or elective business courses, with the exception of an approved academic internship. 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 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 any time *before* the beginning 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 also in related academic disciplines.

### 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 12 noon and 1:00 P.M. to 4:30 P.M. During registration periods, advisors are available to answer registration questions. Individual advising and scheduling are not possible during registration periods; rather, they should be obtained 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

The College of Business and Administration now has two sets of degree requirements. The undergraduate degree requirements listed in the 1995-1996 catalog will apply to those students who begin their undergraduate study at any institution of

higher education in the summer of 1995 or thereafter; the degree requirements listed in the 1994-1995 catalog will affect those students who began their undergraduate study before the summer of 1995. No portion of either curriculum may be substituted for a portion of the other.

### 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

Business core requirements . . . . .	27
Business area of emphasis requirements . . . . .	15
Business electives . . . . .	18
Nonbusiness course requirements . . . . .	42
Nonbusiness electives . . . . .	18

The college reserves the right to disallow any credit that it determines is not appropriate academic credit.

**Residence.** Students must complete 30 hours of business courses in residence on the Boulder campus after admission to the college, including the 15 hours in the area of emphasis and the 9 hours in the area of application. Students must be in residence at the campus awarding the degree, and must be registered as business degree students during the term of graduation.

**Grade Point Average.** A minimum scholastic cumulative grade point average of 2.00 is required for all courses attempted at the University, including 2.00 cumulative for all business courses, 2.00 cumulative in the required areas of emphasis courses, and 2.00 cumulative in the area of application courses.

### General Requirements for Those Who Began Their Undergraduate Study in the Summer of 1995 and Thereafter

College of Business and Administration students who began their undergraduate study in the summer of 1995 and thereafter must fulfill the following requirements for graduation.

#### Nonbusiness Requirements (42 semester hours)

- Mathematical Skills (6 semester hours) (Note 1)
- Written Communication 3040 (3 semester hours)
- Historical Context (3 semester hours)
- Cultural and Gender Diversity (3 semester hours)
- United States Context (3 semester hours)
- Literature and the Arts (6 semester hours, 3 of which must be upper-division)
- Natural Sciences (7 semester hours, including one course with a laboratory)
- Contemporary Societies (8 semester hours) (Note 2)

Ideals and Values (3 semester hours)

A list of courses that fulfill specific requirements for each area can be found in the College of Business Degree Requirements Brochure.

#### Curriculum Notes

1. Math requirements are as follows: Students take MATH 1050, 1060, and 1070, and 1080, 1090, and 1100. A college-level calculus course may be substituted for MATH 1080, 1090, and 1100. All math requirements must be completed for junior standing.
2. A minimum of 3 semester hours of both microeconomics and macroeconomics is required.

#### Business Core Requirements (27 semester hours)

BCOR 1000 Business Computing Skills . . . . .	3
BCOR 1100 Profiles in American Enterprise . . . . .	3
BCOR 2010 Business Statistics . . . . .	3
BCOR 2000 Accounting and Financial Analysis I . . . . .	4
BCOR 2100 Accounting and Financial Analysis II . . . . .	3
BCOR 2050 Adding Value with Management and Marketing I . . . . .	3
BCOR 2150 Adding Value with Management and Marketing II . . . . .	3
BCOR 3000 Business Law, Ethics, and Public Policy . . . . .	3
BCOR 4000 Business Senior Seminar . . . . .	3

#### Business Area of Emphasis (15 semester hours)

Students must choose an area of emphasis in accounting, finance, information systems, management, or marketing. Areas of emphasis consist of 15 semester hours beyond any business core courses.

#### Business Electives (18 semester hours)

Business courses required for areas of application are included in business electives.

A maximum of 6 credit hours of business academic internship or independent study is included in business electives.

Business courses required by specific areas in excess of the 15 hours listed under areas of emphasis are included in business electives.

#### Nonbusiness Electives (18 semester hours)

Not all classes are accepted as elective credits. Generally, to be acceptable, electives must be taught by 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:

MAPS courses devoted to satisfying Minimum Academic Preparation Standards can only be used to satisfy nonbusiness elective credit.

A maximum of 6 hours of theory courses in kinesiology, physical education, or dance. (Note 1)

A maximum of 12 hours of advanced ROTC

credit, providing the student is enrolled in the program and completes the program.

A maximum of 6 hours of academic internship, independent study, choir, band, music lessons, or art lessons. (Note 2)

#### Curriculum Notes

1. The college will not accept physical education activity, workshops, orientations, dance classes, teaching methods, practica, certain teacher education classes, or certain classes offered by the College of Arts and Sciences.
2. The college will accept a maximum of 6 credit hours of business or nonbusiness academic internships, independent study, choir, band, music lessons, or art lessons toward the 120 credit hours required for graduation.

The previous examples are not exclusive but are intended to be 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.

#### Senior Audit

Prospective graduates must schedule an appointment with the Office of Undergraduate Studies and the Office of Career Development 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; and December graduates must complete a senior audit by the previous March 16. Failure to do so will delay graduation.

Students desiring to change their area of emphasis after completing the senior audit 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 graduates 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, and 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 further information contact the Office of Undergraduate Studies.

### Minor in Business for Nonbusiness Students

A minor in business consists of 21 semester hours in addition to any prerequisite courses.

<i>Required Courses</i>	<i>Semester Hours</i>
BCOR 1000 Business Computing Skills . . .	3
BCOR 2010 Business Statistics . . . . .	3
BCOR 2000 Accounting and Financial Analysis I . . . . .	4
BCOR 2100 Accounting and Financial Analysis II . . . . .	3
BCOR 2050 Adding Value with Management and Marketing I . . . . .	3
BCOR 2150 Adding Value with Management and Marketing II . . . . .	3
BCOR 3000 Business Law, Ethics, and Public Policy . . . . .	3

In addition to the required 21 semester hours of course work, the following requirements apply to the minor program in business:

1. No pass/fail work may be applied toward the minor.
2. The cumulative grade point average for all minor degree course work must equal 2.00 or higher.
3. Students will be allowed to apply no more than 9 credit hours of transfer work.
4. Students must complete prerequisite courses as stated in the course descriptions.

## AREAS OF EMPHASIS

### College of Business Programs

All business students pursuing a bachelor's degree in business administration must complete the prescribed courses in at least one area of emphasis. The college offers programs in five areas of emphasis: accounting, finance, information systems, management, and marketing. An area of emphasis consists of a minimum of 15 semester hours taken at the University of Colorado at Boulder. A 2.00 cumulative grade point average is mandatory for the required area of emphasis courses.

In addition to the areas of emphasis, students may also complete an area of application program. The college offers the following areas of application: entrepreneurship and small business management, international business, tourism management, transportation and logistics, and real estate. An area of application consists of a minimum of 9 semester hours taken at the University of Colorado at Boulder. A 2.00

cumulative grade point average is required for the required area of application courses. Successful completion of additional requirements in some of these areas of application entitles students to a certificate issued by the dean of the college.

The college also offers a minor program in business for nonbusiness students.

### Accounting

The areas of accounting study are financial accounting, managerial accounting, taxation, and auditing. The accounting area of emphasis is designed to prepare students for careers in accounting, business, not-for-profit, and government organizations.

Course work in accounting conveys a comprehensive understanding of the theory and concepts that underlie accounting practice. Emphasis is placed on logical reasoning and development and use of information, which enables students to solve problems in accounting and management of organizations and to make sound accounting policy decisions.

Accounting students planning careers in business enterprises are strongly encouraged to take additional course work in finance, information systems, and international business. In addition, students planning to take the CPA examination should take most of the undergraduate accounting courses offered and BSLW 4120 Business Law. Since many states require 150 semester hours of course work to qualify for the CPA exam, students might consider applying for the master of science in business administration (M.S.) program with an emphasis in accounting. The state of Colorado currently requires 30 semester hours of accounting (including BSLW) to qualify to take the CPA exam.

An additional year of study leading to an M.S. is available to graduates of four-year programs in accounting. For those students who do not have an undergraduate degree in accounting but wish to pursue a graduate degree in the field, the M.B.A. with a self-designed major in accounting is available. Please consult the graduate section of this catalog for more information about advanced degree programs.

The undergraduate area of emphasis in accounting consists of at least 15 semester hours of course work beyond the undergraduate core requirements.

<i>Required Courses</i>	<i>Semester Hours</i>
ACCT 3220 Intermediate Financial Accounting I . . . . .	3
ACCT 3230 Intermediate Financial Accounting II . . . . .	3
ACCT 3320 Cost Management . . . . .	3

Plus at least 6 credit hours from the following courses:

ACCT 4240 Advanced Financial Accounting . . . . .	3
ACCT 4250 Financial Accounting Issues and Cases . . . . .	3
ACCT 4330 Advanced Cost Management . . . . .	3
ACCT 4430 Income Taxation . . . . .	3
ACCT 4440 Advanced Income Tax Accounting . . . . .	3
ACCT 4620 Auditing . . . . .	3
ACCT 4700 International Accounting . . . . .	3
ACCT 4800 Accounting for Government and Nonprofit Organizations . . . . .	3

### Finance

The finance area of emphasis 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 derivative securities, and financial institutions.

Finance is an applied discipline with an analytical orientation. 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 area of emphasis are also applicable to not-for-profit and governmental organizations.

It is strongly recommended that finance students take additional accounting (such as ACCT 3220 and ACCT 3230) beyond the business core requirements.

<i>Required Courses</i>	<i>Semester Hours</i>
FNCE 3010 Corporate Finance . . . . .	3
FNCE 3020 Financial Markets and Institutions . . . . .	3
Plus any <i>three</i> of the following six courses:	
FNCE 4010 Applied Business Finance . . . . .	3
FNCE 4020 Financial Institutions Management . . . . .	3
FNCE 4030 Investment and Portfolio Management . . . . .	3
FNCE 4040 Derivative Securities . . . . .	3
FNCE 4050 Capital Investment Analysis . . . . .	3
FNCE 4060 Special Topics in Finance . . . . .	variable credit

### Information Systems

The information systems area of emphasis prepares students for professional careers in information systems involving people, organizations, computers, and networks. Students develop the technical skills and organizational insights required to analyze, design, implement, and manage information systems in a networked world. The degree

focuses on the analysis, design, and implementation of integrated, networked, and distributed information systems. The areas of study include systems development, database design, network design, and the integration of these skills for solving problems and creating opportunities.

Students completing this area of emphasis may take jobs as systems analysts, systems designers, software engineers, network administrators, and the like. When combined with a second area of emphasis in accounting, finance, management, or marketing, additional opportunities exist for technology analyst positions within these other business areas. For students interested in improving their information technology background for application to other fields but not wishing to take the entire area of emphasis, the 3000-level courses in information systems provide a strong foundation to support the effective application of information technology to other business areas.

*Prerequisite Courses*      *Semester Hours*  
Students must complete at least 6 hours from the following courses:

CSCI 1200 Introduction to Programming I . . . . .	3
CSCI 1210 Introduction to Programming II . . . . .	4
CSCI 1300 Introduction to Computing for Majors . . . . .	4
INFS 2010 Visual Language Programming . . . . .	3

<i>Required Courses</i> <i>Semester Hours</i>	
INFS 3010 Systems Analysis and Conceptual Design . . . . .	3
INFS 3020 Database Modeling and Inquiry . . . . .	3
INFS 3510 Physical Systems Design and Implementation . . . . .	3

Plus any *two* of the following three courses

INFS 4020 Advanced Systems Development with Object-Oriented Methods . . . . .	3
INFS 4030 Computer Network Design and Management . . . . .	3
INFS 4510 Systems Integration in a Network Environment . . . . .	3

<i>Elective Course</i>	
INFS 3050 Competing with Information Technology . . . . .	3

## Management

The management area of emphasis addresses the effective management of people, organizations, and technology to improve the performance of diverse public and private organizations. The area provides the managerial skills necessary for success in entry-level positions, and builds the foundations required for success in management positions of greater responsibility, authority, and leadership. Students

completing the management area of emphasis are viewed by potential employers as having the broad-gauged education required in the team oriented, horizontally organized, and globally competitive environments of the twenty-first century. The management area of emphasis prepares students for careers in general management, or can serve as a strong secondary major to complement another functional area.

The management area of emphasis begins with two required courses covering modern theories of quality management and the development of critical managerial skills.

<i>Required Courses</i> <i>Semester Hours</i>	
MGMT 3020 Total Quality Management . . . . .	3
MGMT 3030 Critical Leadership Skills . . . . .	3

Students must choose one of two tracks, one emphasizing the management of human resources, and the other emphasizing the management of operations. Cross-over courses are also possible with students in one track taking elective courses in the other track.

### Human Resource Track

The human resource management track provides students with the knowledge and skills necessary to earn certification in human resources from the Society of Human Resources, the principal professional society in the field. Graduates are qualified to act as human resource generalists in small- to medium-sized companies; specialists in organizations with more diverse human resource units; or well-rounded general managers in any organization. Under the human resource track, students must select three of the following courses.

MGMT 4010 Employee-Employer Relationship . . . . .	3
MGMT 4020 Hiring and Retaining Human Resources . . . . .	3
MGMT 4030 Managing Employee Reward Systems . . . . .	3
MGMT 4040 Individual, Team, and Organizational Development . . . . .	3

### Operations Management Track

The principal function of any organization is the efficient creation and delivery of products and services to its customers. The operations management track focuses on this creative process and identifies how organizations use productivity, quality, flexibility, timeliness, and technology to compete and prevail in their markets. Students graduating from the operations management track will have a broad understanding of the importance of operations in the success of any organization,

and will be qualified to serve in entry-level line management positions and as general managers later in their careers. Under the operations management track, students must select three of the following courses.

MGMT 4050 Competing with Operations . . . . .	3
MGMT 4060 Business Process Re-engineering . . . . .	3
MGMT 4070 International Operations Management . . . . .	3
MGMT 4080 Environmental Operations . . . . .	3

## Marketing

The marketing area of emphasis hones skills in analysis and decision-making for a wide spectrum of marketing careers in fields such as advertising, market research, selling and sales management, distribution, industrial and business-to-business marketing, international marketing, the marketing of services, and marketing for not-for-profit organizations.

Marketing cuts across tangible products, services, and ideas, across consumer and business markets, and across domestic and global boundaries. Key concepts focus on identifying customer needs and wants, developing products and/or services to meet those needs and wants, establishing channels and communications to move those products and services through intermediaries to end users, and monitoring these transactions and customer response to guide future activities.

Students must choose one of the following two plans for taking the 9 hours of required marketing courses. It is strongly recommended that students with a marketing area of emphasis select plan A. Plan B appeals to those students wishing to take marketing courses as part of their business elective.

**Plan A:** Recommended for students with marketing as their area of emphasis

<i>Required Courses</i> <i>Semester Hours</i>	
MKTG 3600 Marketing Analysis . . . . .	6
MKTG 4800 Marketing Strategy and Policy . . . . .	3

<b>Plan B</b>	
MKTG 3250 Buyer Behavior . . . . .	3
MKTG 3350 Marketing Research . . . . .	3
MKTG 4800 Marketing Strategy and Policy . . . . .	3

After taking the 9 required hours, students select *one* course from the following two courses:

MKTG 4550 Advertising and Promotion Management . . . . .	3
MKTG 4750 Sales Management . . . . .	3

And *one* course from the following three courses for a total of 15 hours:

MKTG 4250 Product Strategy ..... 3  
 MKTG 4350 Services Marketing  
 Strategy ..... 3  
 MKTG 4650 Institutional Relationships  
 and Strategy ..... 3

**AREAS OF APPLICATION**

**Entrepreneurship and Small Business Management**

The entrepreneurship and small business management area of application reflects the fact that practically all new job creation in the United States is produced by new ventures and small/medium-sized businesses. In addition, Boulder and the College of Business and Administration are highly recognized for a unique entrepreneurship climate. Students enhance their functional area knowledge by applying such learning to entrepreneurship and small/medium-sized business environments. This application area provides the knowledge, understanding, and skills for creating, organizing, and managing new ventures or small/medium-sized businesses as independent entities, or within corporate structures.

Students examine theory and research, but the fundamental thrust of this application area is to experience entrepreneurial cultures through professional experiences such as field projects, meeting entrepreneurs in the classroom, internships, writing business plans, and developing other practical skills.

After completing the required lower-division core courses, students will begin the study of entrepreneurial environments in their junior year. Entrepreneurial finance, business plan preparation, and an academic internship may be taken in the junior and/or senior year.

Students who complete the three required entrepreneurship courses with a 3.30 grade point average or better, and who complete an academic internship of at least 3 credit hours, will qualify to sit for the entrepreneurship honors exam. Those who pass the exam will be awarded the Certificate of Excellence in Entrepreneurial Studies.

*Required Courses Semester Hours*  
 ESBM 3700 Entrepreneurial  
 Environments ..... 3  
 ESBM 4570 Entrepreneurial Finance ..... 3  
 ESBM 4830 Business Plan Preparation ..... 3  
 Note: Students wishing to take an academic  
 internship should have completed ESBM  
 3700 by the end of their junior year.

**International Business**

The globalization of the marketplace has created a need for managers who can function effectively in the international business environment. Despite this movement

toward globalization, there remains significant environmental differences (cultural, economic, and political) between countries and/or regions. Managers in an international business must be sensitive to these differences and also must adopt the appropriate policies and strategies for dealing with them.

To address these issues, the College of Business and Administration offers an area of application in international business. In addition to this area of application, students can complete additional requirements that result in an International Business Certificate. The area of application and certificate program build on the student's understanding of the functional areas of business and provides them with an appreciation of the international environment and a framework for developing policies and strategies appropriate for this environment.

*Required Courses Semester Hours*  
 INBU 4100 International Business and  
 Marketing ..... 3  
 INBU 4200 International Financial  
 Management ..... 3  
 INBU 4300 International Business  
 Management ..... 3  
 Note: These 9 hours represent the area of  
 application in international business.

In addition, the certificate program requires the completion of the following:

1. Six hours of economics, geography, or political science beyond arts and sciences course requirements. Courses must be selected from an approved list (students should see the advising office for details).
  2. Three hours of foreign language beyond MAPS requirements.
  3. Six hours of an international experience. This requirement can be satisfied through either study abroad programs or academic internships of an international business nature.
- Finally, it is recommended that students in the international business area of application or the certificate program consider additional electives from the following courses: MGMT 4070 International Operations Management, TRMG 4500 International Transportation and Freight Management, and ACCT 4700 International Accounting.

**Tourism Management**

The tourism area of application is designed to prepare students to take advantage of the opportunities provided by this industry, including the management and operation of tourism attractions, the various businesses that serve travelers, and the private and government organizations devoted to tourism industry development.

When combined with the skills and knowledge attained in a student's area of

emphasis and an internship, the tourism area of application enhances students' opportunities to pursue their chosen area in the tourism industry. As the tourism management area of application combines academic and practical experience, students are encouraged to complete an academic internship with a tourism business, typically during the summer preceding their senior year.

*Required Courses Semester Hours*  
 TOMG 3400 Tourism Management ..... 3  
 TOMG 3500 Tourism Destination  
 Development ..... 3  
 TOMG 3600 International Tourism ..... 3

**Transportation and Logistics**

The transportation and logistics area of application prepares students with knowledge and competence to work in any mode of transportation or shipping. Completion of the area will readily apply to a variety of applications throughout a student's career. The course work will qualify students to become certified with the American Society of Transportation and Logistics. This area of application also provides students with the opportunity to obtain scholarships and to work directly with leaders in the transportation/logistics industry.

*Required Courses Semester Hours*  
 TRMG 4500 International Transportation and  
 Freight Management ..... 3  
 TRMG 4600 Carrier Quality and  
 Performance ..... 3  
 TRMG 4700 Logistics Strategies and  
 Policy ..... 3

**Real Estate**

The real estate area of application is designed to provide students with exposure to the concepts, tools, and techniques necessary for entry-level positions. Real estate is one segment of the economy where it is still possible for people to be their own boss, whether they are brokers, appraisers, developers, property managers, consultants, or investors. Students interested in a career in real estate finance or investments should combine this application area with the finance area of emphasis. Students interested in becoming a broker or being involved in the sales and marketing of real estate should consider combining this application area with the marketing area of emphasis.

*Required Courses Semester Hours*  
 REAL 3000 Principles of Real Estate  
 Practice ..... 3  
 REAL 4000 Real Estate Law and Financing  
 Instruments ..... 3  
 REAL 4100 Real Estate Finance and  
 Investment Analysis ..... 3

## 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.), master of business administration/master of science in telecommunications (M.B.A./M.S.-TLEN), and doctor of philosophy in business administration (Ph.D.) degrees. Students may enroll in the M.B.A. program on a full- or part-time basis. 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.

### Master of Business Administration and Master of Science in Business Administration

#### Requirements for Admission

For both master's programs:

The Admissions Committee reviews the applicant's complete application with consideration given to the following:

1. An applicant's academic record.
2. An applicant's score on the Graduate Management Admission Test (GMAT). The GMAT must be retaken if the test date was more than five years ago.
3. International students must provide a TOEFL exam score.

In addition, letters of recommendation, two official transcripts, a work history record, and a nonrefundable application fee is required of all applicants. Applicants must also submit a personal statement.

For the M.B.A. Program:

1. Personal interviews and/or phone interviews may be required of an applicant. These interviews are an expense to be borne by the applicant.
2. Individuals with a minimum of two to three years of work experience are encouraged to apply.
3. One semester of college calculus is required and must be completed prior to the beginning of fall classes.

The address for graduate applications is:  
University of Colorado at Boulder  
Graduate School of Business Administration  
Campus Box 419  
Boulder, CO 80309-0419  
(303) 492-1831 (general information)  
(303) 492-7662 (application request line)

#### Diversity

The Graduate School of Business Administration encourages qualified individuals to apply regardless of sex, race, religion, national origin, age, or physical limitations.

#### Requirements for Degrees

**Advising.** All graduate students are required to check in with an advisor during the first semester of study to ascertain degree requirements.

**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.

Students entering the M.B.A. program take a prescribed sequence of classes prior to initiating major and elective courses. A minimum of 51 credit hours is needed to graduate. Credit will not be transferred into the full-time program. A student in the full-time program may petition to waive one core course based on the established waiver policy. Because this publication is compiled well in advance of the academic year it covers, all information announced is subject to change without notice or obligation.

Students entering the part-time M.B.A. program are required to take 6 credit hours per semester, and must take no more than five years to graduate. Core curriculum courses are currently offered in the evening for part-time students. However, major and elective courses are not guaranteed to be offered in the evening. Part-time students should have flexible schedules to accommodate daytime classes. Part-time students may petition to transfer a maximum of 6 credit hours of course work or waive one core course and transfer 3 credit hours into the program from another AACSB-accredited master's program, excluding core course work.

Students accepted into the part-time or full-time M.B.A. program are required to attend an orientation prior to the start of classes.

**Transfer Work.** 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 October, 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 may result in suspension.

Grades below C- are failing grades for graduate students. Students must repeat a course if 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. Students in the M.B.A. program may not withdraw from specified, lock-step course work.

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. M.B.A. students in the full-time program must complete their degree in two years. Part-time M.B.A. students must complete their degree within five years.

### Master of Business Administration

The breadth of training that master of business administration graduates receive prepares them to become high-level managers and participants or become involved in new business ventures in a challenging and evolving business environment.

The M.B.A. program is rigorous and comprehensive, and demands student commitment. The core curriculum provides a set of broad-based, integrative skills, rather than narrowly focused, highly specialized skills.

Core courses provide a solid 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 and student field projects are used broadly throughout 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.

### *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 (required to take remaining courses)  
MBAM 6150 Marketing Field Project  
MBAM 6200 International Marketing Management  
MBAM 6250 Marketing of Technology and Innovation  
MBAM 6300 Strategic Marketing Management  
MBAM 6600 Special Topics in Marketing Management

#### **Management Major** (four courses required)

MBAO 6010 Management of Organizational Change  
MBAO 6020 (Re)Designing Dynamic Organizations  
MBAO 6030 Human Resources Management  
MBAO 6040 Negotiating and Conflict Management  
MBAO 6050 Management Consultation

#### **Technology and Innovation Management Major** (four courses required)

MBAT 6100 Management of Technology and Innovation  
MBAT 6250 Marketing of Technology and Innovation  
MBAT 6450 Managing Process Technology  
MBAT 6500 Entrepreneurial Finance  
MBAT 6600 Special Topics in Technology and Innovation Management  
MBAT 6700 Entrepreneurship and Small Business Management

#### **Self-Designed Major** (four courses required)

Must be approved—graduate-level courses may be elected within or outside the Graduate School of Business Administration.

### **Juris Doctor/Master of Business Administration Degree**

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 four (or fewer) 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 J.D./M.B.A. double-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 they may apply for the double-degree program during their first year of study in the degree program of either school.

**Course of Study.** A student enrolled in the J.D./M.B.A. program may commence studies under the program in either the School of Law or the Graduate School of Business Administration. Joint-degree students are strongly encouraged to begin their course of study at the School of Law. However, a student must take the first year of the J.D. curriculum as a unit exclusively in the School of Law. Likewise, a student must take the first semester of the M.B.A. curriculum as a unit exclusively in the Graduate School of Business Administration. Students can then take additional courses 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.

#### *Credit for Law Courses in the J.D./M.B.A. Program*

The Graduate School of Business Administration grants credit toward the M.B.A. degree for up to 12 semester hours of acceptable performance in law courses taken by a J.D./M.B.A. student at the School of Law. Core courses required in the law school program cannot be counted toward the 12 hours. A student must earn

at least a 72 grade in a law school course to be accepted for Graduate School of Business Administration credit. For credit to be granted, the law school courses must be approved before enrollment by an M.B.A. advisor. Only courses taken after admission into the M.B.A. program are credited toward the degree.

#### *Grading in the Joint Degree Program*

Graduate School of Business Administration credit for courses completed in the School of Law as part of the joint degree program is recorded on a pass/fail basis and is not included in the required M.B.A. 3.00 cumulative average.

### **Master of Business Administration/Master of Science—Telecommunications**

The College of Business and Administration, in conjunction with the College of Engineering and Applied Science, offers a double-degree program resulting in a master of business administration (M.B.A.) and master of science in telecommunications (M.S./TLEN). The double-degree program combines broad-based business management study with an in-depth understanding of telecommunications technology. This program prepares students to be competent, effective managers in the telecommunications industry.

**Admission.** An individual must apply separately and be admitted to both programs under each college's admission procedures and standards. Applicants are encouraged to apply to the programs concurrently.

**Course of Study.** Students considering the M.B.A./M.S. in telecommunications are strongly encouraged to begin their course of study in the M.B.A. program.

**Credit for Telecommunications Courses in the M.B.A./M.S. Program.** Eighteen credit hours taken in the telecommunications program will be credited toward the M.B.A. and grades received for these courses will be included in the 3.00 cumulative average. Course work completed in the M.S./Telecommunications program prior to acceptance into the M.B.A. program will not be credited toward the 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 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./M.S. 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 College of Engineering and the Graduate School of Business Administration.

### Master of Science in Business Administration (Emphasis in Accounting or Taxation)

The master of science in business administration (M.S.) enables graduate students to study either accounting or taxation in depth. This degree is designed for students who have an undergraduate degree in accounting. Students with other undergraduate backgrounds may apply to the program; however, these students will be required to complete up to 30 hours of deficiency requirements in addition to the regular program requirements. Please note that M.S. students are required to complete all degree requirements within four years. Graduate students are not given preferential enrollment in undergraduate courses needed for the deficiency requirements.

For detailed information concerning program requirements, course selection, and applications, please contact the College of Business and Administration at (303) 492-1831.

#### Minimum Requirements

Accounting and taxation students must complete a minimum of 30 semester hours of graduate-level work. The newly accepted M.S. student should consult with the faculty advisor for the program to develop an individualized degree plan. No thesis is required, but all students must pass a written final comprehensive exam during their last enrolled semester.

Most states now require 150 semester hours to qualify to take the Certified Public Accountant exam. In response to this requirement, the accounting and taxation programs offer a diverse selection of courses that qualify students for the exam.

#### Accounting

The expanding role and increased level of technical knowledge expected of accountants make graduate study in accounting highly desirable. Courses offered for the accounting area of emphasis prepare students for high-level, professional careers in the field. The graduate program in accounting is designed to provide a broad

understanding of accounting issues as well as to enhance an undergraduate degree in accounting. It also provides the opportunity to develop knowledge in a related minor area, such as economics, finance, information systems, management, marketing, taxation, or telecommunications.

#### Taxation

The masters of science in business administration with an emphasis in taxation is designed as integrated accounting and law school courses. Some of the tax and law courses are strictly tax-related while others include related legal aspects of a particular subject area. The combination of courses is designed to give exposure to taxation from the accounting and law faculty perspectives.

The purpose of this program is to prepare students for professional careers as Certified Public Accountants (CPAs) specialized in taxation. Therefore, the focus of the program is to train students to:

1. develop a refined ability to recognize tax problems and understand the framework of our existing tax structure
2. understand some of the legal ramifications surrounding a tax issue
3. research and present well-developed strategies or solutions to tax problems
4. communicate those solutions verbally or in writing to a superior, a client, or the IRS, and
5. operate in an environment of uncertainty, as few tax problems have an absolutely right answer and the law is constantly changing.

### Doctor of Philosophy in Business Administration

A Ph.D. degree recognizes scholarly achievement and is the highest academic honor that CU-Boulder bestows. The Ph.D. in business administration prepares scholars to be preeminent in their field of expertise. The program focuses on developing the necessary skills for the design and execution of original, innovative research and for the dissemination of knowledge through teaching and writing.

#### Requirements for Admission

To preserve the individualized character of the Ph.D. program and its quality, the number of students is limited and the application process is very competitive. Students are admitted for study in a specific area for doctoral work. The College of Business and Administration currently offers the following areas of study: accounting, business strategy, finance, information systems, marketing, operations research and operations management, and organization management.

For more information on the application requirements and process, contact:

College of Business and Administration  
Graduate Student Services Office  
Campus Box 419  
Boulder, CO 80309-0419  
(303) 492-1831 (general information)  
(303) 492-7662 (applications—please specify Ph.D. degree, area of study, and domestic or international status).

View our web site at: <http://bus.col-orado.edu/>.

#### Background, Prerequisites, and Deficiencies

Each student must have a background in mathematics at or beyond calculus. Based on experience, background, and at the discretion of the academic advisor and/or division chair and/or the associate dean of academic programs, additional prerequisites may be required of the Ph.D. student.

#### Requirements for the Degree

As a result of the decentralization of the Ph.D. program, most curriculum and program requirements are decided by the division. Please consult the Ph.D. program advisor or the appropriate division for information regarding course selection, graduate teaching program certification, research internships, and other division requirements. Students must complete all Graduate School, College of Business and Administration, and division requirements to be conferred the Ph.D. in business administration.

The newly accepted Ph.D. student should consult with the division chair and/or academic advisor to develop an individualized degree plan. Students are required to become proficient in their primary area of study. In addition, all students are required to complete course work in a field outside their division. These "second fields" are governed by the departments offering the course work but typically require 9 to 12 credit hours. The second field may also require an additional comprehensive exam.

#### Course Work

All doctoral students are required to complete a minimum of 30 hours of course work and 30 hours of dissertation credit at the CU-Boulder. To comply with this 30-hour requirement, a course must have been taught by a member of the University's graduate faculty, must be at the 5000 level or above, and the student must achieve a grade of B- or better.

Course selection must be approved by the student's academic advisor before registration. Most students are required by their divisions to complete 7000- and 8000-level doctoral seminars.

For full-time status, the College of Business and Administration requires successful completion of 9 credit hours of course work each semester. During and after comprehensive exams, full-time status requires completion of a minimum of 7 dissertation hours each semester.

### *Transfer of Credit*

A maximum of 9 semester hours of courses taken at other schools (this includes other University of Colorado campuses) or taken as a special student at the University may be transferred into the doctoral program. Course work must be recent and of doctoral-level quality. A doctoral student must establish a satisfactory record of residence in the doctoral program before the course work is eligible for transfer. The transfer of credit must be approved by the division, the associate dean of academic programs, and the Graduate School. There is no guarantee any course work will be accepted for transfer.

### *Residence*

The College of Business and Administration adheres to the Graduate School rules regarding residency. 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 the comprehensive examinations). Doctoral students are expected to be available to participate in colloquia and other informal academic discussions. Full-time employment outside the University is prohibited during the residency period. Any off-campus status must be approved by the division, the associate dean of academic programs, and the Graduate School.

### *Time Limit*

Doctoral students have six years from the commencement of course work to complete all requirements of the degree, but students are encouraged to complete their program within four years. Students are not eligible for graduate appointments after their fourth year in the program.

### *Comprehensive Examination*

Before admission to candidacy, a doctoral student must pass a comprehensive examination in the field of concentration. The examination may be oral, written, or both, and will test the student's mastery of a broad field of knowledge, not merely the formal course work completed. Each division will determine the required content, length, and standards of evaluation for the exam. Please check with the division as to the specific requirements for the comprehensive exam.

### *Admission to Candidacy*

Students are admitted to candidacy according to Graduate School procedures and requirements. Students shall complete all course work and any other requirements listed on their degree plans, earn at least four semesters of residence, and successfully pass the comprehensive exams before admission to candidacy is approved by the Graduate School. In addition, requirements related to academic quality of work, graduate-level course work, the minimum number of course hours, and graduate faculty membership must be met before admission to candidacy is approved.

### *Dissertation*

A dissertation based upon original investigation showing mature scholarship and critical judgment, as well as competence with research tools and methods, must be written on a subject approved by the candidate's dissertation committee. To be acceptable, the dissertation must be a significant contribution to knowledge in the candidate's primary field.

### *Final Examination (Defense)*

Upon recommendation of the candidate's doctoral dissertation committee, a final oral examination shall be given. This examination covers both the dissertation and the primary field of study. The oral examination is open to the public.

### *Filing the Dissertation*

The dissertation must comply in mechanical features with the *University of Colorado Graduate School Thesis and Dissertation Specifications*. The dissertation must be filed with the Graduate School by the posted deadline for the semester in which the degree is to be conferred.

## **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 M.B.A. program are listed at the end of these descriptions. M.B.A. courses (see page 274) are open only to M.B.A. students. Across all business areas, M.B.A. students have enrollment priority for courses with an M.B.A.

prefix. Other elective options for M.B.A. students may be found in the main business course 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 3220-3. Intermediate Financial Accounting I.** Intensive analysis of generally accepted accounting principles, accounting theory, and preparation of annual financial statements for public corporations. Prereqs., BCOR 2100 and junior standing.

**ACCT 3230-3. Intermediate Financial Accounting II.** Continuation of ACCT 3220. Prereqs., ACCT 3220 and junior standing.

**ACCT 3320-3. Cost Management.** Cost analysis for purposes of control and decision making. Analysis of activities, cost behavior, role of accounting in planning, financial modeling, and managerial uses of cost data. Prereqs., BCOR 2100 and junior standing.

**ACCT 4240-3. Advanced Financial Accounting.** Advanced financial accounting theory and practice, emphasizing accounting for partnerships, business combinations, and consolidations. Prereqs., ACCT 3230. 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 equivalent. Same as ACCT 5250.

**ACCT 4330-3. Advanced Cost Management.** Critical analysis of advanced topics in managerial accounting. Considerable use of cases and current readings. Prereq., ACCT 3320. Same as ACCT 5330.

**ACCT 4430-3. Income Taxation.** Concepts and structure of the United States income tax system. Focuses on concepts and economic analysis of tax consequences of transactions affecting all taxpayers, with emphasis on tax

issues unique to corporations. Prereq., ACCT 3220. Same as ACCT 5430. Formerly ACCT 4420.

**ACCT 4440-3. Advanced Income Taxation.** Continuation of ACCT 4430, with focus on tax issues of individual taxpayers and the conduit business entities (partnerships, S corporations, and Limited Liability Companies). Prereq., ACCT 4430. Formerly ACCT 3410.

**ACCT 4620-3. Auditing.** Explores generally accepted accounting standards, professional ethics, and auditing techniques. Stresses authoritative pronouncements of the AICPA. Prereq., ACCT 3230. Same as ACCT 5260.

**ACCT 4700-3. International Accounting.** Covers international financial statement analysis, cultural and economic differences that affect financial reporting in various countries, International Accounting Standards, and accounting for foreign currency transactions. Prereqs., ACCT 3230 and senior standing or instructor's consent. Same as ACCT 5700.

**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 3220. Same as ACCT 5800.

**ACCT 4820-variable credit. Experimental Seminar.** Offered irregularly to provide opportunity for investigation of new frontiers in accounting. Same as ACCT 5820.

**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 5240-3. Advanced Financial Accounting.** Same as ACCT 4240. Prereq., ACCT 6220 or equivalent.

**ACCT 5250-3. Financial Accounting Issues and Cases.** Same as ACCT 4250. Prereq., ACCT 6220 or equivalent.

**ACCT 5330-3. Advanced Cost Management.** Same as ACCT 4330. Prereq., ACCT 3320 or equivalent.

**ACCT 5430-3. Income Taxation.** Same as ACCT 4430. Prereq., ACCT 6220 or equivalent.

**ACCT 5700-3. International Accounting.** Same as ACCT 4700. Prereq., ACCT 6220 or equivalent.

**ACCT 5800-3. Accounting for Government and Nonprofit Organizations.** Same as ACCT 4800. Prereq., ACCT 6220 or equivalent.

**ACCT 5820-variable credit. Experimental Seminar.** Same as ACCT 4820.

**ACCT 6220-3. 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., BCOR 2100, MBAC 6020, or equivalent.

**ACCT 6250-3. Seminar: Financial Accounting.** In-depth analysis of contemporary accounting issues, the development of accounting thought and principles, and critical review of generally accepted accounting principles. Prereq., ACCT 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 3320 or equivalent, or instructor consent.

**ACCT 6270-3. Seminar: Income Determination.** Critical analysis of problems and theory of measurement and reporting of periodic net income of business organizations. Covers net income models, research efforts, and the role of professional accounting organizations. Gives special attention to current issues and problems. Prereq., 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 6220 or equivalent, or instructor consent.

**ACCT 6420-3. Research Problems in Income Tax Accounting.** Study and application of the methodology used in tax research and tax planning, with a goal of developing tax research and writing skills. Prereq., ACCT 4430 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 4430 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 prepare a publishable research paper on a tax policy topic mutually agreed upon with the instructor. Prereq., ACCT 4430 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 4430 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 current interest and to draw on the strengths of leading outside authorities as guest lecturers in various topic areas. Prereq., ACCT 6420.

**ACCT 6620-3. Advanced Auditing Theory.** Explores contemporary issues, historical developments, and selected topics pertinent to independent audits by certified public accountants.

Emphasizes the critical analysis of current standards and practices. Prereq., ACCT 4620, 5620, 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.

**ACCT 7320-3. Doctoral Seminar: Accounting Research 2.** 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 7330-3. Doctoral Seminar: Accounting Research 3.** 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 the development of thesis topics.

**ACCT 8820-variable credit. Graduate Seminar.** Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in accounting. Prereq., varies.

**ACCT 8900-variable credit. Independent Study.** Instructor's consent and departmental form required (taught as doctoral seminar).

**ACCT 8990 (1-10). Doctoral Thesis.**

## Business Administration

**BADM 1250-1. Freshman Seminar.** Designed to help freshmen business students adjust to the College of Business and Administration and learn more about the business environment. In addition to addressing issues in business, students are introduced to the internal environment of the college, including business clubs and other professional organizations of interest to business students. No credit.

**BADM 3820-3. Analysis of Business Enterprise.** Exposes students to theory, leadership, small group management, and oral and written communication. Stresses the analysis and synthesis of industry, company, and other business information. Prereqs., BCOR 1100 and junior standing.

**BADM 3830-3. Interpretation of American Enterprise.** Exposes students to theory, leadership, small group management, and oral and written communication. Stresses the analysis and synthesis of industry, company, and other business information. Students act as peer teaching associates and assume primary responsibility for recitation/discussion sections of BCOR 1100. Prereqs., BCOR 1100, BADM 3820, and junior standing.

**BADM 3930/4930-3. Academic Internship.** The academic internship program offers students the opportunity to gain professional work experience while still in school. It provides academically relevant work experience that complements students' studies and enhances their career potential. Lectures and a course paper are requirements of the internship. Students may not preregister for this course, and they must contact the director of the college's academic internship program for approval. To enroll in the course, students must hold a minimum GPA of 2.50 or must obtain instructor consent. Students also must have completed at least 60 credit hours of course work to enroll in the course.

## Business Core

**BCOR 1000-3. Business Computing Skills.** Focuses on the development of business computing skills while introducing important concepts and principles related to working smart in a networked world. The skills component of the course focuses on use of productivity tools such as operating systems, word processing, spreadsheets, presentation packages, and databases. Students also learn how to explore and utilize the global Internet with a variety of tools. Individual exercises cover applications in accounting, finance, marketing, management, and information systems. Lectures and labs. Formerly INFS 2000.

**BCOR 1100-3. Profiles in American Enterprise.** Familiarizes students with the structure, operations, management, and socioeconomic aspects of business and nonbusiness entities. Course builds on the college themes of entrepreneurship, technology, team building, and international competitiveness to establish a foundation for integrating information encountered in more advanced business courses. Major presentations by business leaders augment faculty and student presentations with inside information and insights about companies, industries, and functional areas in business. Weekly recitation sessions include discussions of presented information and current business topics. Formerly BADM 2850.

**BCOR 2000-4. Accounting and Financial Analysis I.** Builds a basic understanding of how information regarding a firm's resources and obligations is conveyed to decision makers both outside and within the firm. Focuses on the form and content of corporate financial statements. Students learn the principles of revenue and expense recognition as well as the basic accounting for assets, liabilities, and equities. In

addition, students are introduced to accounting, information systems, and financial statement analysis for decision makers. Prereq., sophomore standing.

**BCOR 2010-3. Business Statistics.** Topics covered include descriptive statistics, basic probability theory, statistical inference, correlation and regression analysis, and time series analysis. The course will make heavy use of statistical features of commonly used business spreadsheet software. Students will use this software to solve problems using real business data. Prereqs., Math 1050, 1060, 1070, or calculus and BCOR 1000. Formerly OPMG 2010.

**BCOR 2050-3. Adding Value with Management and Marketing I.** Focuses on how modern business firms compete in the global marketplace by adding value. The over-arching paradigm of the course will be an examination of the value-chain of a firm and how firms use people, organizations, operations, and information systems to compete and win in world markets. Integrated into the course will be contemporary issues such as total quality management, process reengineering, teams and team building, employee empowerment, and horizontal organizations. Prereq., ECON 2010 or 2020. Coreq., second semester of ECON series and sophomore standing.

**BCOR 2100-3. Accounting and Financial Analysis II.** Develops an understanding of how financial decisions are made in a business firm. Emphasis is placed on learning the concepts and skills needed to make sound financial decisions within the context of a changing domestic and international economic environment. Corporate financial statements are used to prepare both short-term and long-term financial plans. The management of working capital is also examined. Discounted cash flow techniques are used in developing capital budgeting concepts and as tools for making investment decisions. Methods for deciding how assets are to be financed and factors influencing capital structure decisions are also covered. Prereqs., BCOR 2000, BCOR 2010, ECON 2010 or 2020; coreq., second semester of ECON series.

**BCOR 2150-3. Adding Value with Management and Marketing II.** Examines how activities in organizations provide value to the purchasers of its products and services. Topics include gathering information about consumers and competitors through research and information systems, applying knowledge and technology to the design of products and services, communicating information to consumers and organizational units, and pricing and distributing products and services. Also included are issues in global marketing, ethics and diversity, relationship marketing, integrating marketing with financial analysis, and organizational and operations management. Prereqs., BCOR 2000, 2010, and 2050.

**BCOR 3000-3. Business Law, Ethics, and Public Policy.** Surveys major topics in business law, business ethics, and government policy. Students will spend approximately five weeks on each subject. Business law topics include the American legal system; constitutional law; and the fundamentals of contracts, criminal law, torts, and business entities. Ethics topics

include the theory of ethics, legal versus moral issues, theories of justice, and practical issues including the rights and duties of the corporations and stakeholder theory. Public policy topics include the roles of business and government, types of government intervention, and the nature and theory of governmental policy formulation. Prereq., junior standing.

**BCOR 4000-3. Business Senior Seminar.** Surveys the sources of competitive advantage in a global economy. Principles, frameworks, and techniques are discussed that help managers and students understand markets and competitive positioning. Focuses on specific company examples. Interdisciplinary team exploration of the evolving strategies across different industries will be formally presented to an executive panel. Prereqs., senior standing and four upper-division business courses.

## 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 that affect business, labor, and consumers. Prereqs., BCOR 2100, 2150, 3000, and senior standing.

**BECN 4200-3. 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., BCOR 2100, 2150, 3000, and senior standing. Formerly BECN 4550.

**BECN 6110-3. Public Policies toward Business.** Provides understanding of the various roles of business and government in helping societies attain their goals. Examines various roles and functions of government, business, and the markets. Case issues are integrated into substantive law areas involving ethical dilemmas that managers are likely to face.

## Business Law

**BSLW 4120-3. Advanced Business Law.** Continuation of BCOR 3000. Covers secured transactions, agency, bankruptcy, partnerships, corporations, suretyship, guarantees, and other advanced topics in legal and regulatory environment. Prereq., BCOR 3000. Same as BSLW 5120.

**BSLW 4820-variable credit. Topics in Business Law.** Experimental course offered irregularly for purpose of presenting new subject matter in business law.

**BSLW 5120-3. Advanced Business Law.** Same as BSLW 4120.

## Business Policy and Strategy Management

**BPOL 7500-3. Doctoral Seminar: Strategic Management I.** Provides an overview of the literature, including classic articles and books, in business strategy and policy (strategic management). Brings the student up to date on schools of thought, research issues, and practical applications in strategic management.

**BPOL 7530-3. Doctoral Seminar: Strategic Management 2.** Continuation of BPOL 7500. Prereq., BPOL 7500.

**BPOL 7560-3. Directed Study and Research in Strategic Management.** Addresses special topical areas are addressed to fit the research interests of Ph.D. students and faculty in strategic management.

**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.**

## Entrepreneurship and Small Business Management

**ESBM 3700-3. Entrepreneurial Environments.** Exposes students to the environment of entrepreneurship within firms varying in size from start ups 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 processes of venture idea screening (feasibility analyses and plans) and business planning. Case studies and guest visits by entrepreneurs highlight the course process. Prereqs., BCOR 2000, 2050, 2100, and 2150. Students may take this course in their junior or senior year. Formerly ESBM 4700.

**ESBM 4570-3. Entrepreneurial Finance.** Focuses on the financial concepts, issues, methods, and industry practices relevant to entrepreneurial decision makers. Addresses a variety of topics including financial valuation, various sources of funds, structures and legal issues in arranging financing, the private and public venture capital markets, and preparation for, and execution of, an initial public securities offering. Students completing this course should more clearly understand the segments of the capital markets specializing in start-ups and growth financing. Classroom activities include lectures, numerous case discussions, and guest speakers. Prereq., BCOR 2100. Formerly FNCE 4570.

**ESBM 4830-3. Business Plan Preparation.** Completion of a sophisticated business plan within task groups from the concept through all the elements of a professionally written business plan. Provides students high interaction with businesses and entrepreneurs. Business plan writing becomes a résumé valued skill. Prereqs., coreqs., ESBM 3700 and 4570. Same as ESBM 5830.

**ESBM 4900-3. Projects in Entrepreneurial Companies.** Students complete projects in pre-selected entrepreneurial companies. Prereq., instructor consent.

**ESBM 5830-3. Business Plan Preparation.** Same as ESBM 4830.

**ESBM 6500-3. Entrepreneurial Finance.** Same as MBAT 6500.

**ESBM 6700-3. Entrepreneurship and Small Business Management.** Examines the development of emerging ventures from the entrepreneurial perspective. An advanced graduate-level version of ESBM 3700, with a significant component of doing research in entrepreneurial companies and/or feasibility studies. Same as MBAT 6700.

**ESBM 6900-variable credit. Independent Study/Projects in Entrepreneurial Companies.** Student must have consent of instructor under whose direction study is taken. Departmental form required.

## Finance

**FNCE 3010-3. Corporate Finance.** Covers the theory and practices governing the management of capital in a business firm. Examines the determinants of capital requirements, methods of obtaining capital, problems of internal financial management, and methods of financial analysis. Prereq., BCOR 2100. Formerly FNCE 4010.

**FNCE 3020-3. Financial Markets and Institutions.** Examines the economics of financial markets and the management of financial institutions, both domestic and international. Topics include an overview of U.S. and international financial markets, pricing and risk factors, interest rates, markets for securities and financial services, and markets for derivative financial instruments. Prereq., BCOR 2100. Formerly FNCE 4550.

**FNCE 4010-3. Applied Business Finance.** Develops analytical and decision-making skills in the context of problems that confront financial management. Topics include planning, control, and financing of current operations and longer term needs, expansion, leasing, valuation, and capital structure policies. A combination of lecture and cases is used. Prereqs., FNCE 3010 and 3020. Formerly FNCE 4020.

**FNCE 4020-3. Financial Institutions Management.** Analyzes the structure, markets, and regulations of financial institutions. Studies problems and policies of internal management of funds, loan practices and procedures, investment behavior, deposit and capital adequacy, liquidity, and solvency. Prereqs., FNCE 3010 and 3020. Formerly FNCE 4530.

**FNCE 4030-3. Investment and Portfolio Management.** Develops modern portfolio theory and applies it to pricing both individual assets and portfolios of assets. Specific topics covered include the Markowitz portfolio-selection model, the Capital Asset Pricing Model, Arbitrage Pricing theory, options, futures, bonds, portfolio performance measurement, and issues of market efficiency. Prereqs., FNCE 3010 and 3020. Formerly FNCE 4330.

**FNCE 4040-3. Derivative Securities.** Develops the modern theory of contingent claims in a mathematical framework oriented toward applications. Examines how to use derivatives for risk management and to tailor portfolio payoffs. Provides an in-depth analysis of the properties of options, and a discussion of other derivative securities such as futures and forwards. Prereqs., FNCE 3010 and 3020. Formerly FNCE 4600.

**FNCE 4050-3. Capital Investment Analysis.** Focuses on capital budgeting and investment issues. Emphasis will be on issues relating to cash flows, capital rationing, the investment versus financing decision, leasing, fluctuating rates of output, investment timing, capital budgeting under uncertainty, and investment decisions with additional information. Prereqs., FNCE 3010 and 3020.

**FNCE 4060-variable credit. Special Topics in Finance.** These are courses offered for the pur-

pose of presenting new subject matter in finance. The summer offering is the London Seminar in International Finance and Business. Prereqs., vary depending upon course offering. Please see advising office. Formerly FNCE 4820.

**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 7100-3. Doctoral Seminar: Finance Theory.** Develops the foundations for the study of modern financial economics by analyzing individuals' consumption and portfolio decisions in the context of risk and then traces the implications to market valuation of traded securities. Topics include the meaning and measurement of risk, portfolio theory, the Capital Asset Pricing Model, and arbitrage pricing arguments like those employed in Modigliani and Miller's capital structure theory and the Black-Scholes option pricing model.

**FNCE 7200-3. Doctoral Seminar: Empirical Research Methods in Finance.** Develops an understanding of current empirical methods employed to examine research issues related to corporate finance and the capital markets.

**FNCE 7330-3. Doctoral Seminar: Corporate Finance, Theoretical, and Empirical Issues.** Develops and examines theories and issues in corporate finance. Topics may include corporate control, capital structure, financial signaling, and payout policy.

**FNCE 7550-3. Doctoral Seminar: Special Topics in Finance.** Closely examines areas of specific interest to academic research in finance. Subjects vary and may include game theory, stochastic processes in finance, continuous-time modeling, derivative security pricing, the microstructure of securities markets and financial institutions, innovation, and engineering.

**FNCE 7830-1. Doctoral Seminar: Dissertation Research.** Assists the doctoral student in integrating courses and fields of study in order to apply their 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 2010-3. Visual-Language Programming.** Focuses on the programming task of the systems development life cycle. Introduces structured programming techniques in a graphical user interface (GUI) environment. The hands-on portion of the course focuses on use of the Visual Basic language, which is learned and practiced by writing program modules to solve



Visual Basic language, which is learned and practiced by writing program modules to solve pre-specified business problems. Prereq., BCOR 1000.

**INFS 3010-3. Systems Analysis and Conceptual Design.** Focuses on the analysis and conceptual design phases of the systems development life cycle. Introduces systems planning, project origination, and the role of the systems analyst. Covers requirements analysis in-depth, including fact finding, process modeling, network modeling, project repositories, and business process redesign (data modeling is covered in the database course). Introduces conceptual design including feasibility analysis, architectural selection, and specification of alternatives to traditional development such as end-user computing, packaged software, and outsourcing. Coreq., INFS 3020. Formerly INFS 4120.

**INFS 3020-3. Database Modeling and Inquiry.** Emphasizes the fundamentals of modern database design in the context of large-scale applications. Covers analysis phase activities such as data modeling for requirements analysis. Covers the extended entity-relationship model and the semantic data model in depth. Covers design phase activities such as the normalization criteria of the relational model and transformation from conceptual to physical design. Introduces object-oriented databases. Coreq., INFS 3010. Formerly INFS 4140.

**INFS 3050-3. Competing with Information Technology.** Focuses on the role of information systems in the global competitive landscape. Introduces the information technology industry, the convergence of communications, education, and entertainment media, current technology developments in multimedia, wireless, and other advanced applications and their implications for electronic commerce and gaining competitive advantage. Also covers entrepreneurial issues such as making money with software applications and services, and protecting intellectual property rights through software licensing. Since many of these topics involve reading recent cases and staying current with breaking news stories, course coverage will vary somewhat from one semester to the next. Prereqs., BCOR 2100 and 2150.

**INFS 3510-3. Physical Systems Design and Implementation.** Focuses on the physical design and implementation phases of the systems development life cycle. Covers physical design in depth including interface design, file and database design, program module design, performance tradeoffs, and security and control design. It also covers implementation phase software engineering skills such as programming management, test procedures, file conversion, documentation, training, and system installation. Also covers the basic project management tools and skills needed to guide a systems development effort and introduces planning for post-implementation support. Prereq., INFS 2010 (or another computer programming course), INFS 3010, and 3020. Formerly INFS 4130.

**INFS 4020-3. Advanced Systems Development with Object-Oriented Methods.** Focuses on the object paradigm, a new approach to software construction that promises to deliver

higher quality software through increased reliability and extensibility. Emphasizes the fundamentals of object-oriented analysis, design, and implementation. Emphasizes systems semantics and validity. Prereq., INFS 3020. Same as INFS 5020.

**INFS 4030-3. Computer Network Design and Management.** Focuses on the backbone of an organization's information infrastructure that ties various kinds of computers together into a coherent whole. Introduces the component building blocks of network design such as servers, routers, bridges, gateways, transmission media, communication protocols, network operating systems, and middleware. Covers local area networks in some depth and introduces metropolitan and wide-area networks. Also covers data compression, encryption, network security, and performance tuning. Prereqs., INFS 2010 or another computer programming course and INFS 3010. Same as INFS 5030.

**INFS 4510-3. Systems Integration in a Network Environment.** Serves as a technical capstone course for Information Systems majors who have completed the necessary prerequisites. Focuses on solving the complex problems present in systems integration projects that include a mix of in-house developed, user-developed, legacy software, and new commercial packaged software products. Prereqs., INFS 3510 and 4030. Same as INFS 5510.

**INFS 4820-variable credit. Experimental seminar** offered irregularly to provide opportunity for investigation of new frontiers in information systems.

**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 5020-3. Advanced Systems Development with Object-Oriented Methods.** Same as INFS 4020.

**INFS 5030-3. Computer Network Design and Management.** Same as INFS 4030.

**INFS 5510-3. Systems Integration in a Network Environment.** Same as INFS 4510.

**INFS 6120-3. System Analysis and Design.** Introduces basic system analysis and design tools and the procedures for conducting analysis and design. 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 6140-3. Database Modeling.** 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 6150-3. Competing with Information Technology.** Focuses on the role of the information system in the global competitive landscape. It introduces the information technology industry and its evolving distribution channels. It surveys recent technology developments and their implications for gaining competitive advantage. It also covers electronic commerce, world-ready applications, and entrepreneurial issues. Since many of these topics involve reading recent cases and staying current with breaking news stories, course coverage may vary somewhat from one semester to the next.

**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.**

## International Business

**INBU 4100-3. International Business and Marketing.** Introduces the student to the global business environment. Examines international trade issues, direct foreign investment, barriers to trade and cross border investment, economic integration and trading blocs, doing business in major overseas markets, and ethics in international business. Explores the policies and practices of firms marketing products and services in foreign countries, and includes an analytical survey of the culture, institutions, functions, policies, and practices in international marketing. Prereq., BCOR 2050. Same as INBU 5100. Formerly MKTG 4100/5100.

**INBU 4200-3. International Financial Management.** Examines the financial policies and problems associated with firms doing business internationally. Topics include the foreign exchange environment, country risk, managing foreign exchange exposure, international working capital management, international capital budgeting, and international financial markets. Prereq., BCOR 2100. Same as INBU 5200. Formerly FNCE 4400/5400.

**INBU 4300-3. International Business Management.** Exposes students to the concerns and management of international activities that fall largely within functional disciplines. Through the case method of instruction, topics might include overseas market assessment and analysis, marketing internationally, export-import procedures, financial issues, production systems, labor

relations, strategic planning, organizational design, control and staffing, and transportation. Prereqs., INBU 4100 and 4200. Same as INBU 5300.

**INBU 5100-3. International Business and Marketing.** Same as INBU 4100.

**INBU 5200-3. International Financial Management.** Same as INBU 4200.

**INBU 5300-3. International Business Management.** Same as INBU 4300.

## Management

**MGMT 3020-3. Total Quality Management.** Examines concepts, tools, and techniques used in the management and measurement of quality, productivity, and competitiveness in an international environment. Focuses on how firms add value and compete with quality. Topics include total quality control and management, employee involvement in quality, team building for quality, quality circles, relation between quality, productivity, and competitiveness, and statistical process control. Emphasizes the development of decision-making skills through the use of case analysis, field study, consultation with local organizations, and other experimental activities. Prereq., BCOR 2050. Formerly OPMG 4440.

**MGMT 3030-3. Critical Leadership Skills.** Provides an opportunity to learn about and practice the skills required of all managers. These skills include leadership, negotiation, conducting performance appraisals, delegation, effective communication, interviewing and making hiring decisions, and managing employees with problem behaviors. Objectives of the course include developing self-awareness of strengths and weaknesses as a manager, gaining familiarity with theory-based skills, and developing proficiency in the use of these skills. Emphasizes experiential learning through group work, role plays, and case analysis. Prereq., BCOR 2050.

**MGMT 4010-3. Redefining the Employee-Employer Relationship.** Explores developments in such areas as employee relations law and procedures, employee and employer rights worker involvement programs, environmental safety and health, and the effects of technology on emerging organization forms. Prereqs., MGMT 3020 and MGMT 3030. Formerly PHRM 4410.

**MGMT 4020-3. Hiring and Retaining Critical Human Resources.** Students practice conducting job analyses and then use this information to develop employee selection and performance appraisal systems. Provides thorough coverage of employers' Equal Employment Opportunity and Affirmative Action obligations, as well as various approaches to gender, cultural and ethnic diversity. Prereqs., MGMT 3020 and 3030. Formerly PHRM 4420.

**MGMT 4030-3. Managing Employee Reward Systems.** Examines theories of work motivation and relates them to the strategic use of compensation and other reward systems. Topics include procedures for managing base pay; linking pay incentives to productivity at the individual, group and organizational levels; developing cost-effective programs of employee benefits; and the use of nonfinancial reward systems. Prereqs., MGMT 3020 and 3030. Formerly PHRM 4430.

**MGMT 4040-3. Individual, Team and Organizational Development.** Explores how to determine where an organization needs to focus its development efforts, how to develop and deliver an effective training program, and how to evaluate the impact of development programs on organizational effectiveness. Individual, team and organization-wide development will be explored, including such topics as skills training, team-building and managing change. Student teams will then work with local businesses to practice applying the course material to practical problems. Prereqs., MGMT 3020 and 3030.

**MGMT 4050-3. Competing with Operations.** Introduces the design and analysis of modern production systems in manufacturing, service, and public organizations. Themes include the relationship between productivity and competitiveness; the role of operations in winning competitive advantage; and adding value through improvements in productivity, quality, flexibility, and timeliness. Specific topics may include operations strategy, operations planning, service operations, inventory management, and just-in-time concepts. Prereqs., MGMT 3020 and 3030. Formerly OPMG 4470.

**MGMT 4060-3. Business Process Re-engineering.** Covers the methods and means by which firms add value and compete by re-engineering their key processes. Emphasizes operational planning as an important element of Business Process Re-engineering. Topics include logistics and customer service re-engineering (focusing on cycle-time reduction), manufacturing re-engineering (emphasizing lead-time reduction and quality improvement), and the use of technology to support re-engineering activities. A graphical object-based computer simulation package is used to model and re-engineer business processes and predict the effect of changes. Prereqs., MGMT 3020 and 3030. Formerly OPMG 4600.

**MGMT 4070-3. International Operations Management.** Compares systems of production/operations management in the United States with those in Japan, Europe, and Asia. Contrasts various regional and national approaches to business, quality management, labor practices, management styles, international competitiveness, productivity, distribution systems, trade practices, and strategies for penetrating foreign markets. Examines different socio-cultural environments, government-business relationships, banking industries, operations strategies, and the potential for transferring industrial management practices and techniques between countries. Prereqs., MGMT 3020 and 3030. Formerly OPMG 4400.

**MGMT 4080-3. Environmental Operations.** Addresses the increasingly important topic of "green" operations, and how firms are using environmental awareness to reduce costs, add value, and increase competitiveness. Various approaches to reducing waste-streams will be considered, including reuse, recycling, and recovery. Other topics will include the role of government regulation and public pressure, comparisons between different national approaches to green operations, individual company programs, and prospects for the future. Prereqs., MGMT 3020 and 3030.

**MGMT 5050-3. Competing with Operations.** Same as MGMT 4050.

**MGMT 5060-3. Business Process Re-engineering.** Same as MGMT 4060.

**MGMT 5070-3. International Operations Management.** Same as MGMT 4070.

**MGMT 5080-3. Environmental Operations.** Same as MGMT 4080.

## Marketing

**MKTG 3250-3. Buyer Behavior.** Covers both consumer buying behavior and organizational buying behavior. Consumer behavior topics include needs and motives, personality, perception, learning, attitudes, cultural sensitivity, and contributions of behavioral sciences that lead to understanding consumer decision making and behavior. Business buyer behavior explores differences between business and consumer markets, business buying motives, the organizational buying center and roles, and the organizational buying process. Prereq., BCOR 2150 and junior standing. Formerly MKTG 3200.

**MKTG 3350-3. Marketing Research.** Explores fundamental techniques of data collection and analysis used to solve marketing problems. Specific topics include problem definition, planning an investigation, developing questionnaires, sampling, tabulation, interpreting results, and preparing and presenting a final report. Prereqs., BCOR 2010, 2150, and junior standing. Formerly MKTG 3300.

**MKTG 3600-6. Market Analysis.** Covers key concepts in consumer and industrial buyer behavior and techniques of marketing research. Conceptual topics include consumer needs and motives, personality, perception, learning, attitudes, individual and group decision making, social class, culture, and other contributions of behavioral sciences to the understanding of buyer decision making and behavior. Methodological topics will include techniques of measurement, sampling, data analysis, and other issues related to the definition, planning, implementation, and interpretation of a marketing research project. Includes a major field project, the goal of which is to develop student skills in activities such as market demand analysis, competitive analysis, opportunity analysis, and market segmentation. Students taking MKTG 3600 will not receive credit for MKTG 3250 or 3350. Prereqs., BCOR 2150 and junior standing.

**MKTG 4250-3. Product Strategy.** Covers major topics in managing long-term customer relationships that derive from products. Focuses on concepts, analyses, and strategies for existing and new products. Topics include product positioning, brand image measurements and brand management, brand equity, conjoint analysis, concept development and testing, and product issues in public policy and ethics. Methods of instruction include lectures, case discussions, student group papers and projects, and examinations. Prereqs., MKTG 3600 or 3250 and 3350.

**MKTG 4350-3. Services Marketing Strategy.** Designed for those students interested in working in the service industries. Addresses the distinct needs and problems of service organizations in the area of marketing and service

quality. The theme is that service organizations (i.e., banks, transportation companies, hotels, hospitals, educational institutions, professional services, etc.) require a distinctive approach to marketing strategy—both in its development and execution. Builds and expands on marketing ideas and how to make them work in service settings. Prereqs., MKTG 3600 or 3250 and 3350.

**MKTG 4550-3. Advertising and Promotion Management.** Analyzes advertising and promotion principles and practices from the marketing manager's point of view. Considers the decision to advertise, market analysis as a planning phase of the advertising program, media selection, public relations, sales promotion, promotion budgets, campaigns, evaluation of results, and agency relations. Prereqs., MKTG 3600 or 3250 and 3350. Formerly MKTG 3500 and 4500.

**MKTG 4650-3. Institutional Relationships and Strategy.** Focuses on the management of a firm's relationships with other businesses. Addresses business-to-business marketing strategies, relationships with channel members, and strategic alliances/partnerships. Topics include relationship structures, power, conflict, negotiation, industry analysis, selection of business partners, and managing for long-term stability. Prereqs., MKTG 3600 or 3250 and 3350. Formerly MKTG 3400 and 4600.

**MKTG 4750. Sales Management.** Explores the selling task and the essentials of managing the sales force. Includes recruiting, selecting and hiring, training, compensating, supervising, and controlling. Sales organization, sales planning, sales forecasting, assigning territories, quotas, and sales analysis are covered. Prereqs., MKTG 3600 or 3250 and 3350. Formerly MKTG 3100 and 4700.

**MKTG 4800-3. Marketing Strategy and Policy.** Provides students with the insight and skills necessary to formulate and implement sound marketing strategies. Examines pricing strategies, product introduction and innovation strategies, product line management strategies, promotional and product/service communication strategies, and distribution strategies. Capstone marketing course integrates and further develops what students have learned in other courses. Utilizes cases and computer exercises. Prereqs., MKTG 3600 or 3250 and 3350, two additional marketing courses, and senior standing. Formerly MKTG 4800.

**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 3250 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.

**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 MANOVA.

**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, sales force 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 6010-3. Survey of Operations Research.** Applications oriented survey of operations research topics including linear and integer

programming, network analysis, dynamic programming, nonlinear programming, decision analysis, Markov chain and Markovian decision models, queuing theory, and stimulation. Same as EMEN 5030.

**OPMG 6030-3. Total Quality Management.** Examines the concepts, tools, and techniques used in the management and measurement of quality, productivity, and competitiveness in an international environment. The theme of the course will be on how firms add-value and compete with quality. Topics will include total quality control and management, employee involvement in quality, team building for quality, quality circles, the relation between quality, productivity, and competitiveness, and statistical process control. Emphasizes the development of decision-making skills through the use of case analysis, field study, consultation with local organizations, and other experimental activities. Same as EMEN 5040. Formerly OPMG 5440.

**OPMG 6040-3. Project Management.** Presents the basic tools required to manage a wide variety of programs—product development, software development, process development, and government projects. Systems engineering concepts and computer decision aids are included. Students apply tools as a representative project. Topics include production planning, scheduling and control techniques, work structures, CPM/PERT resource allocation, cost control, and earned value systems. Same as EMEN 5030.

**OPMG 6050-3. Operations Strategy.** Examines operations strategy in manufacturing, service, and public organizations. Themes include the relation between productivity and competitiveness and the role of operations in acquiring competitive advantage by adding value with productivity, quality, flexibility, timeliness, and technology. Emphasizes developing decision-making skills through the use of case analysis, field study, and consultation with local organizations. Same as MBMT 4050. Formerly OPMG 5470.

**OPMG 6060-3. Business Process Reengineering.** Business Process Reengineering (BPR) has been defined as the fundamental rethinking and radical design of business process to achieve dramatic improvements in critical, contemporary measures of performance such as cost, quality, service, flexibility, and speed. BPR improves corporate performance by simultaneously tackling cross-functional business, organization and human resources, and information technology needs. Covers the methods and means by which firms add value and compete by reengineering key processes. Emphasizes operational planning as an important element of BPR. A graphical object-based computer simulation package is used to model and reengineer business processes and predict the effect of changes. Formerly OPMG 5600.

**OPMG 6080-3. Environmental Operations.** Addresses the increasingly important topic of "green" operations, and how firms are using environmental awareness to reduce costs, add value, and increase competitiveness. Various approaches to reducing waste-streams will be considered, including reuse, recycling, and recovery. Other topics will include the role of government regulation and public pressure, life-

cycle responsibility, competitive effects, environmentally responsible manufacturing, comparisons between different national approaches to "green" operations, individual company programs, and prospects for the future.

**OPMG 6120-3. Operation Management.** Covers demand forecasting, capacity management, scheduling, inventory planning and management, production planning and control, materials requirements planning, just-in-time production systems, product design and process selection, elements of statistical process control, service operations, and quantitative techniques for operations decision-making.

**OPMG 6200-3. Intermediate Statistics.** Provides an intermediate-level working knowledge of multiple regression, analysis of variance, statistical forecasting techniques, sampling, survey sampling, parametric and nonparametric statistical inferences, and decision analysis under uncertainty. Includes an introduction to multivariate data analysis. Formerly OPMG 5020. Prereq., MBAC 6030.

**OPMG 6300-3. Business Forecasting.** Examines qualitative and quantitative business forecasting techniques including judgmental forecasting, exponential smoothing, time series composition, ARIMA models, and an introduction to Box-Jenkins methodology. Formerly OPMG 5300. Prereq., MBAC 6030.

**OPMG 6700-3. International Operations.** Compares production/operations management systems in the U.S. with Japan, Asia, and Europe. Contrasts various regional approaches to business issues and practices. Examines socio-cultural environments, operation strategies and potential for transferring management practices, and techniques between countries. Formerly OPMG 5400.

**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 8820-3. 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 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.** A seminar for Ph.D. and advanced master's students in the development of intervention skills in conflict management, team building, third party facilitation, role negotiations, confrontation designs, intergroup meetings, organizational effectiveness, total quality management, and ethical issues.

**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 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, power, culture, innovation, 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.** Considers philosophical topics and concepts related to the social sciences and examines various methodologies relevant to business and dissertation research.

**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 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. Prereq., BCOR 2100.

**REAL 4000-3. Real Estate Law and Financing Instruments.** Covers estates in land, purchase and sales contracts, conveyances, mortgage and trust deed transactions, property taxes, and leases. Prereqs., REAL 3000 and BCOR 3000. Same as REAL 5000. Formerly REAL 4730.

**REAL 4100-3. Real Estate Finance and Investment Analysis.** Covers the link between real estate and the capital markets through an examination of the financial institutions and instruments used to finance real property. Examines methods used to analyze value in real property investments. Prereq., REAL 3000. Same as REAL 5100. Formerly REAL 4330 and 4540.

**REAL 5000. Real Estate Law and Financing Instruments.** Same as REAL 4000.

**REAL 5100. Real Estate Finance and Investment Analysis.** Same as REAL 4100.

**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. Tourism Management.** Introduces the basic concepts, tools, and techniques of tourism management. Examines the primary trends and issues of tourism management and the unique problems and applications of management practice in the tourism industry. Prereq., junior standing.

**TOMG 3500-3. Tourism Destination Development.** Examines the economic, social, and environmental impacts of tourism development and the planning and policy implications of those impacts. Special emphasis is given to the tourism development process and concerns in rural communities and natural environments. Prereq., junior standing. Formerly TOMG 4020.

**TOMG 3600-3. International Tourism.** Examines international tourism trends, management, and development issues. Special emphasis is given to the factors affecting patterns of international travel, management practices, facilities, and services necessary to attract and host international tourists, and the development and operation of tourism facilities in developing countries. Prereq., junior standing.

## Transportation and Logistics

**TRMG 4500-3. International Transportation and Freight Management.** The theme of this course is using logistics and transportation to obtain a competitive advantage in the global environment. Focuses on adding value with effective and efficient logistic and transportation in a multicountry, multicultural environment. Topics include benchmarking, sourcing, carrier quality and performance, and effective import/export management, port selection, insurance, freight forwarders, and cost containment. Prereqs., ECON 2010 and 2020. Same as TRMG 5500. Formerly TRMG 4580.

**TRMG 4600-3. Carrier Quality and Performance.** The theme of this course is providing quality carrier service (air, motor, rail, and ocean) to meet or exceed the expectations of shippers and passengers in a dynamic, global environment. Topics include carrier operations and performance, regulatory environment, policy, environmental impact, evolving transportation services, and entrepreneurship opportunities within the industry. Prereq., TRMG 4500, or instructor consent. Same as TRMG 5600. Formerly TRMG 4500.

**TRMG 4700-3. Logistics Strategies and Policy.** The theme of this course is the development of effective logistical strategies that result in increased value to the firm and competitive advantages in the changing world. Topics include the relationship between logistical elements (transportation, inventory, warehousing, customer service); comprehension of global material flows, supply chain management, and the planning, implementation and control of these flows to meet or exceed customer expectations; and the use of logistical strategies as the catalyst for improving corporate performance. Prereq., instructor consent. Same as TRMG 5700. Formerly TRMG 4650.

**TRMG 5500-3. International Transportation and Freight Management.** Same as TRMG 4500.

**TRMG 5600-3. Carrier Quality and Performance.** Same as TRMG 4600.

**TRMG 5700. Logistics Strategies and Policy.** Same as TRMG 4700.

**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

M.B.A. core courses are open only to M.B.A. students. Across all business areas, M.B.A. students have enrollment priority for courses with an M.B.A. prefix. Non-M.B.A. students seeking enrollment in the non-core courses must meet the prerequisite requirements. Other elective options for M.B.A. students may be found in the main business course descriptions.

### 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 and statistics 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.** 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. Management Behavior in Organizations.** Develops an awareness of the impact of individual and group processes on effective organizational functioning. Develops understanding of the impact of behavioral concepts and practices their application through discussion and experiential learning.

**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 6080-3. Decision Modeling and Applications.** Integrates topics from decision analysis, operations management, and information systems as they relate to modeling management decisions. Field projects involving the university, local companies, and/or government agencies are the focus of this course.

**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. Emphasizes 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.

**MBAC 6130-3. Business Policy.** Gives experience with the real-world problems facing general managers while enhancing students' skill at solving complex, real-business problems in strategy. Blends functional with strategic management, and introduces students to the best new thinking in strategy. Integrates previous M.B.A. learning, and instills a broadened perspective, competence, and familiarity with good practice in strategic management.

### M.B.A.—Electives

**MBAE 6060-variable credit. Seminar in International Finance and Business.** Summer study abroad program held in London. Focuses on the financial and business issues facing financial markets and institutions in London and Europe, and the impact of the political climate on these issues. Formerly FNCE 5410.

### M.B.A.—Finance

**MBAF 6200-3. Advanced Corporate Finance.** Covers at a more advanced level capital budgeting techniques using the option pricing model, financial engineering, hedging strategies, international financial management, and pension fund management. Emphasizes theoretical concepts and their practical applications. Prereq., MBAC 6060.

**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. Techniques include theory and case studies. Prereq., MBAC 6060.

**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. Prereq., MBAC 6060.

**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 one or more of the following areas of financial management, investments, and markets. Topics include capital structure, theory, financial signaling, corporate control, international developments, derivative securities, and market microstructure issues. Prereq., MBAC 6060.

**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. Prereq., MBAC 6090.

**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. Prereq., MBAC 6050.

**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. Prereq., MBAM 6050.

**MBAM 6250-3. Marketing of Technology and Innovation.** Same as MBAT 6250.

**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. Focuses on segmentation procedures, competitive analysis, portfolio lectures, case analysis, and a computer-based simulation of strategic marketing management. Prereq., MBAM 6050.

**MBAM 6600-3. Special Topics in Marketing Management.** Provides students with exposure to diverse subject matter in marketing management. Prereq., MBAM 6050.

**M.B.A.—Management**

**MBAO 6010-3. Management of Organizational Change.** Explores ways to change organizations, ranging from start-up companies to established institutions, to meet the demands of ever-changing environments. Areas of in-depth discussion include the theoretical framework of organization development and change, models of planned organizational change, barriers to implementing change and ways to overcome them, and the roles of the change agent and/or consultant. Students will gain skills in organizational entry and contracting, and will gain a better understanding of the challenge of change through analysis of the theory, research, and practice of organization development. Prereq., MBAC 6040 or instructor consent.

**MBAO 6020-3. (Re)Designing Dynamic Organizations.** Emphasizes restructuring and rightsizing in response to changing, global, technology-enabled business environment. Focuses on designing from the outside in, and on identifying alternative dynamic designs. Students learn the tools and techniques necessary to design and implement new organizational forms, including the boundaryless and networked organization. Students will also learn how an organization should operate to meet the requirements of disparate cultural values, and how to stimulate organizational innovation by using team-based work groups. Students will diagnose and assess the structural design of an actual organization and develop a change strategy to improve organizational effectiveness and efficiency. Prereq., MBAC 6040 or instructor consent.

**MBAO 6030. Human Resources Management.** Focuses on the role of the human resource manager as an internal change agent in an organization with clients who range from managers to diverse employee groups to individual employees. The student will examine the scope of human resource management issues, including staffing and rightsizing, managing work force diversity, performance appraisals, employee relations and feedback systems, reward and recognition systems, training and employee development, and human resource information systems (HRIS). Cases and projects will be used extensively in this course. Prereq., MBAC 6040 or instructor consent.

**MBAO 6040-3. Negotiating and Conflict Management.** Provides an understanding of practice and theory in conflict management and negotiation. It builds skills that allow individuals to deal with a broad spectrum of conflict management and negotiation problems faced by managers (e.g., dealing effectively with subordinates, peers, superiors, and clients). Considerable emphasis will be placed on simulations, role playing, and cases. Content is relevant to all business students, especially those interested in management, accounting, entrepreneurship finance, and marketing. Prereq., MBAC 6040 or instructor consent.

**MBAO 6050-3. Management Consultation.** Using skills developed in prior courses, this course provides an integrative, hands-on exercise in managing change. Students will develop skills in writing proposals, negotiating contracts, collecting and analyzing data for an organizational diagnosis, and writing reports. Student teams will practice these skills by conducting an organizational diagnosis consulting project with an organization. Prereq., MBAO 6010.

**M.B.A.—Technology and 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 6250-3. 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 6450-3. Managing Process Technology.** Examines the critical role of technological process innovation in the global competitiveness of the firm. Provides students with tools and techniques for managing process technology.

**MBAT 6500-3. Entrepreneurial Finance.** Focuses on the financial concepts, issues, methods, and industry practices relevant to entrepreneurial decision makers. Addresses a variety of topics including financial valuation, various sources of funds, structures and legal issues in arranging financing, the private and public venture capital markets, and preparation for, and execution of, an initial public securities offering. Students completing this course should more clearly understand the segments of the capital markets specializing in start-ups and growth financing. Classroom activities include lectures, numerous case discussions, and guest speakers. Same as ESBM 6500. Formerly FNCE 4570.

**MBAT 6600-3. Special Topics in Technology and Innovation Management.** Provides students with exposure to diverse subject matter in technology and innovation management.

**MBAT 6700-3. Entrepreneurship and Small Business Management.** Same as ESBM 6700.

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PHILLIP D. WHITE, Associate Professor of Marketing. B.S., M.B.A., Oklahoma State University; Ph.D., University of Texas.

DARYL WINN, Associate Professor of Business Economics. B.S., Arizona State University; M.B.A., Ph.D., University of Michigan.

RICHARD WOBBEKIND, Assistant Professor of Business Economics; Director of the Business Research Division. B.A., Bucknell University; M.A., Ph.D., University of Colorado.

ILZE ZIGURS, Associate Professor of Information Systems. B.A., University of Washington; M.B.A., University of Nebraska; Ph.D., University of Minnesota.



*Students in the School of Education must complete the teacher education program, which includes a semester's worth of teaching at a local school, in order to become licensed to teach. Here, a student in the Music Education program teaches music to children at a nearby school.*

# SCHOOL OF EDUCATION

LORETTA A. SHEPARD, INTERIM 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 licensure programs, it prepares teachers and researchers for all levels of education. Faculty and students participate in research that develops new knowledge and understanding of the educational process.

## Accreditation

The licensure 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 teacher licensure. Officers elected each fall serve as liaisons between the students in licensure programs and the University of Colorado Student Union. The organization also performs vital advising and student assistance functions.

The Student Association of Graduate Education (SAGE) 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. Students should contact the Office of Student Services (either EDUC 151 or 153) to obtain scholarship and award information and applications. Application procedures and deadlines will be publicized, although we anticipate that University-funded awards will be made during the fall semester. A typical application deadline is March 1.

## ACADEMIC STANDARDS

Any student registered in the Teacher Education Program who fails to maintain a 2.75 grade point average will be placed on probation or may be suspended. Readmission is then subject to program requirements in effect at the time of reapplication. The same conditions apply to students in other colleges and schools who have been admitted to the teacher education program.

## TEACHER EDUCATION REQUIREMENTS

The School of Education awards the diploma in education to students who simultaneously complete their bachelor's degree and a teacher education program at the University of Colorado. The certificate in education is awarded to students who complete a teacher education program.

Each state, including Colorado, requires public school teachers to be licensed as qualified teachers by its state Department of Education. Licensure 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 licensure (Colorado Provisional License) in:

- Elementary education
- K-12 music
- Secondary education fields:
  - English
  - Foreign language (French, German, Italian, Japanese, Latin, Russian, Spanish)
  - Mathematics
  - Sciences
  - Social studies

Teacher education at the University of Colorado, while administered by the School of Education, is a Universitywide function. Many academic departments provide course work that supports the teacher in training. The program involves a combination of courses at the University and off-campus educational experiences in cooperation with the public schools.

Students simultaneously completing teacher education 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 teacher education requirements. No professional education course work taken more than 10 years ago may count for teacher education requirements.

The following assumptions guide the teacher education programs. All teachers should:

1. Demonstrate knowledge of subject matter.
2. Have a strong background in liberal arts.
3. Demonstrate knowledge of pedagogy.
4. Be prepared to educate students in a diverse society.
5. Understand professional obligations and demonstrate professional dispositions of teachers in a democracy.

The objectives of the University relative to teacher education are the following:

1. To provide programs of undergraduate and graduate studies designed to develop outstanding teachers, supervisors, college teachers, 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 education program.
4. To cooperate with other state, regional, and federal agencies to improve educational programs.

## Admission

Admission to all School of Education programs is competitive. Satisfying minimal admission criteria does not guarantee admission. Please see Undergraduate Admission in the General Information chapter of this catalog for specific requirements.

### *Students Entering or Currently Enrolled at the University of Colorado*

Undergraduate students seeking to complete a School of Education teacher education program must be enrolled in a degree

program in one of the colleges or schools of the University. All undergraduates interested in teaching may seek teacher education advising at the time they enter the University. Freshman and sophomore students are encouraged to satisfy as many of the degree and major requirements as they can before applying for admission to the teacher education program during the second semester of their sophomore year. Students should pick up advising materials in Education 151.

### **Transfer Students**

Undergraduate 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 undergraduate degree-granting colleges or schools of the University and also apply for admission to the teacher education program in the School of Education after completing one semester of course work at CU-Boulder. At least 30 hours of course work for licensure *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. Please see Undergraduate Admission in the General Information chapter of this catalog for specific requirements.

### **Former Students**

Former students who have not completed an undergraduate degree may reenter the University according to general University policies; however, subsequent to that readmission, they must apply separately for entry into the teacher education program.

Undergraduate students who anticipate that they will graduate prior to completing a teacher education program must apply for readmission to the University through the School of Education by March 1 (for summer or fall readmission) or October 1 (for spring readmission). All admitted students who remain continuously enrolled will be expected to complete the program in effect at the time of their admission to the program unless state accrediting changes dictate otherwise.

### **Postbaccalaureate Students Seeking Teacher Training**

Students who already hold a bachelor's degree and wish to pursue licensure in elementary or secondary teaching must apply directly to the School of Education. Students desiring institutional recommendation for licensure must complete at least 30

semester hours of work at the University of Colorado and must also fulfill the same requirements as undergraduate students. The actual number of required hours will depend on the courses already completed.

### **Requirements for Application**

Students may apply to one of the programs in Education 151 if the following requirements have been fulfilled:

1. **GPA.** Students must have and maintain a 2.75 (on a 4.00 scale) cumulative GPA overall, 2.75 at CU-Boulder, 2.75 in the subject area (secondary teaching fields and K-12 music only), and 2.75 in education.

2. **Junior Standing.** Students must complete (or will complete at the end of the current semester) at least 56 hours of course work.

3. **Youth Experience.** Students must provide written verification of 25 clock hours of satisfactory experiences with elementary, middle/ junior high, or senior high school-aged youth (the actual level should "match" the level of the teacher education program desired) in the past five years.

4. **Basic Skills.** Verification must be presented of taking the *Basic Skills* portion of the *Professional Licensing Assessments for Colorado Educators (PLACE)*.

5. **Fee.** The materials fee must be paid.

6. **Liberal Arts.** Postbaccalaureate students and currently enrolled students in colleges or schools other than arts and sciences are required to have 40 combined semester hours in the humanities, the natural sciences, and the social sciences, with no less than 6 credit hours in each when they finish the program.

7. **Deadlines.** Students who hold degrees should apply to the teacher education program by March 1 for fall or summer admission and October 1 for spring admission.

When a student has been admitted to the University by the Office of Admissions, he or she will be admitted to a teacher education program if complete application forms have been sent to the Office of Teacher Education, successful experiences with youths can be verified, all transcripts have been received, and the specified materials fee has been paid. Students are notified in writing of formal admission once this process is completed.

Once an undergraduate student enrolled in a teacher education program graduates from CU-Boulder, the student will have to reapply to the University for admission as a postbaccalaureate student through the School of Education in accordance with application deadlines noted above.

### **Prerequisites to the Teacher Education Program**

Students should take the Basic Skills portion of the Program for Licensing Assessments for Colorado Educators (PLACE) prior to seeking admission to the teacher education program or in the first semester of education course work. PLACE registration forms are available in Education 151 or 153.

### **Application for Admission**

Individuals interested in completing a teacher education program at the University of Colorado at Boulder should request application materials from the Teacher Education 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 to the Office of Teacher Education, room 151 of the School of Education.

Individuals who have completed a baccalaureate degree at an accredited institution and are not currently enrolled at the University must complete a program application, apply for admission to the University, and submit official transcripts from all previous colleges directly to the School of Education. Applications cannot be processed until all materials are received in the Office of Teacher Education, 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. The manual includes specific information for all teaching fields as well as a list of advisors.

Off-campus students may obtain a manual by writing to the University of Colorado at Boulder, Office of Teacher Education, Campus Box 249, 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.

Students are encouraged to become familiar with the teacher education requirements by comparing their own transcripts to the published advising materials. Students can then talk with an advisor before



applying to the program or they may wait until after their applications are processed. Students wishing to discuss their evaluations should meet with the student advisor to discuss discrepancies. Students seeking teacher training in French, German, Italian, Japanese, Latin, Russian, Spanish, or music should see the designated advisor for that teaching field.

Advising may also be obtained by e-mail through EdAdvise@Colorado.EDU. When requesting e-mail advising, students should make questions as specific as possible.

### 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 teacher education 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 teacher education requirements, students, especially those seeking elementary licensure, 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 may see one of the School of Education 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 and check sheets available in Education 151.

Teacher education in some secondary fields is not offered at the University of Colorado. For example, there are no programs in art, early childhood education, theatre, 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:

University of Colorado at Boulder  
Office of Graduate Study  
School of Education  
Campus Box 249  
Boulder, CO 80309-0249

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**  
(education; English education; general curriculum in elementary and secondary education; mathematics; reading; science education; secondary experiential/alternative education; and social studies 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**  
(bilingual and multicultural education; bilingual/special education; education and cultural diversity; English as a second language; foundations; international/comparative education; philosophical foundations and social policy; and policy and practice)

Master of arts  
Doctor of philosophy

CU-Boulder does not offer a program in early childhood education.

### Teaching Endorsements at the Graduate Level

Through the School of Education (and in conjunction with other departments), the University of Colorado at Boulder offers course work leading to graduate level teaching and special services training in the following areas:

Linguistically different:  
Bilingual (grades K-6)  
Bilingual/English as a second language (K-6)  
English as a second language (grades 7-12)  
Reading teacher (grades K-12)  
Special education (moderate needs)

Special services (offered through CDSS):  
Audiologist  
Speech/language pathologist

All of the above programs have degree, licensure, or experience requirements that must be fulfilled before admission. Please check with the department before applying.

Special programs (called the "master's plus" programs) leading to provisional teacher licensure with endorsement in elementary education or secondary English, mathematics, science, or social studies are available through the master of arts programs in instruction and curriculum in the content areas.

These graduate teacher education programs are approved by all accrediting agencies.

### Admission

Prospective students seeking admission to a graduate degree program should request application forms from the University of Colorado at Boulder, Education Graduate Office, Campus Box 249, Boulder, CO, 80309-0249. 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. If test scores are required for admission to the desired program, applicants should request that the Educational Testing Service send their scores on the verbal, analytical, and quantitative sections of the 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 or Miller's Analogy Test (MAT) scores, if these scores are required for admission to the desired program, must be in the School of Education Graduate Office by September 1 for spring semester and February 1 for summer session and fall semester.

### Advising

Graduate students are assigned an individual faculty advisor after admission 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 semester hours in any one semester may be applied toward degree requirements. During the summer, 9 semester hours is the maximum that will be counted toward education graduate degrees. Within this limit, students may take up to 6 semester hours in a five-week summer term, and/or 3 semester hours in a three-week term. During the academic year, students will be regarded as having a full load if they are registered for 5 or more 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* (3.00) 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* will 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* (3.00) 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 master's degree must be completed within four years of initial enrollment. The M.A. plan II (nonthesis) degree requires a minimum of 30 semester hours. See the *Graduate School chapter of this catalog on page 349 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.

All 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.

At the beginning of the final term of study, 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, and the student's advisor and then submitted to the Education Graduate Office for School of Education approval and then to the Graduate School for final approval. All students are required to write a four-hour comprehensive-final examination or its equivalent, as determined by the program's faculty committee. (For time limits and other information, see the Graduate School chapter under Master's Degree.)

### *Education as a Minor Field*

In M.A. programs 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 9 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 chapter of this catalog, and obtain a current copy of the *School of Education Graduate Handbook*.

The School of Education offers the doctor of philosophy (Ph.D.) in education. The doctoral program requires a period of study and research of at least two academic years (four semesters) or more beyond a master's degree or three years beyond a bachelor's degree.

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. All doctoral students in the school will be required to complete, at a minimum, one publishable scholarly product 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 product 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. A minimum undergraduate grade point average of 2.75 is required, but applicants are judged competitively so that most admitted applicants have GPAs of 3.00 or higher. 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 1500 or above (total on verbal, quantitative, and analytical portions of the basic test) 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, but is a prerequisite to EDUC 7316. 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. All Ph.D. students are also expected to meet both the conversational foreign language and multiculturalism requirement.

**The Conversational Foreign Language** component is focused on oral proficiency in another language. This requirement can be satisfied by completing a one-semester college-level conversational language course at an accredited institution *within the past three years*. Courses can be introductory college-level courses, such as SPAN 1010, FREN 1010, GRMN 1010, and ITAL 1010, because instruction is conducted in the language and substantial language labs are part of the course expectations. Courses taken at another institution must be equivalent to CU-Boulder courses to count toward this requirement. Students must earn a grade of C- or better.

**The Multiculturalism Course** should be completed after taking the language component. A specially designed doctoral-level course provides for both the theoretical analysis of issues and a substantial field-based component. The course is team-taught by faculty from the two foundations programs, thus including both theoretical and practical perspectives from sociology, anthropology, sociolinguistics, philosophy, and bilingual and multicultural education. The field experience, focused on linguistically or culturally different students or

school communities, is a project of the student's choosing (e.g., action research, quasi-experiment, participant-observation, ethnographic community study, or case study of an individual student), planned in conjunction with the course instructors.

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 program specialization. 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 dissertation committee agree on a subject for the dissertation, they work with the director of graduate studies to identify a five-person committee. Then the student prepares a detailed prospectus and arranges for a meeting with the committee. 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 chapter 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 *Registration Handbook and 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 education.

### 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 (1-9). Special Topics.** Designed to meet needs of students with topics of pertinent interest.

**EDUC 4810 (1-9). Special Topics.** May be repeatable for a maximum of 18 credit hours, provided the topics vary.

**EDUC 4820 (1-9). 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 4831-3. Advanced Peer Counseling Training (spring semesters only).** The second semester of an academic year's training for students interested in learning about the skills and knowledge associated with peer counseling. It is a continuation of ARSC 2274 (offered only during fall semesters).

**EDUC 4840 (1-4). Independent Study.**

**EDUC 4910-3. Peer Counseling Practicum (previously EDUC 4830, 4840).** Controlled enrollment. Repeatable for degree credit. Credit given for peer counseling activities. Students are selected to participate in this class and act as peer counselors or TAs for the Peer Counseling Training.

## Elementary Education

**EDUC 4311 (4-5). Integrated Literacy/Social Studies for the Elementary School I.** Prepares preservice elementary teachers for teaching literacy and social studies in a social context through an integrated understanding of what constitutes literacy and civic participation in today's society, literacy and social studies processes, and classroom instruction that fosters integrating such processes. Prereq. or coreq., EDUC 3013 and EDUC 3023. Prereq., admission to the elementary teacher education program.

**EDUC 4321 (4-5). Integrated Literacy/Social Studies for the Elementary School II.** Continuation of EDUC 4311. Prereq., EDUC 4311.

**EDUC 4411 (7-9). Integrated Mathematics/Science/Education Psychology for the Elementary School.** Integration of theories and ideas from elementary school mathematics and science education, child development, and educational psychology. Explores theories, teacher strengths, responsibilities for learning, academic achievement, and self-esteem. Prereq., EDUC 4311. Must precede student teaching.

**EDUC 4691 (12-14). Student Teaching—Elementary School 1.** Kindergarten and grades one through six. Coreqs., EDUC 4511. Open only to formally admitted elementary teacher education students.

**EDUC 4701-8. Student Teaching—Elementary School 2.** Kindergarten and grades one through six in music. Should be taken concurrently with student teaching in home department.

**PHED 4200-2 Physical Education and Health for the Elementary School.** A study of activities, teaching methods, and program planning for grades one through six. Also involves discussions of middle/junior high school activities and programs. Opportunities to work with children are provided. Open only to elementary education students. Prereq., junior standing.

## Secondary Education

**EDUC 4112-3. Educational Psychology and Adolescent Development.** Analyzes fundamental psychological concepts underlying classroom instruction, as well as adolescent growth and development. Prereq., 56 hours completed or in progress, and admission to the secondary teacher education program.

**EDUC 4122 (2-3). Principles and Methods of Secondary Education.** Emphasizes objectives, functions, modern philosophy, curriculum, discipline, planning, learning styles, and educational media. For middle/junior high through senior high school levels. Includes in-school experience. Prereq., admission to the secondary teacher education program.

**EDUC 4232-3. Teaching Reading in the Content Areas.** Methods and materials for content area reading, including vocabulary, comprehension, and study skills strategies. Open only to formally admitted secondary teacher education students.

### EDUC 4322-3. Literature for Adolescents.

Reading and evaluation of books for middle/junior high and senior high school pupils. Emphasizes modern literature. Prereq., 56 hours completed or in progress and admission to the secondary English teacher education program.

### 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. Prereq., 56 hours completed or in progress and admission to the secondary English teacher education program.

**EDUC 4352 (3-4). Methods and Materials in Secondary Social Studies.** Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Open only to formally admitted secondary social studies teacher education students.

**EDUC 4362 (3-4). Methods and Materials in Secondary English.** Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Open only to formally admitted secondary English teacher education students.

**EDUC 4372 (3-4). Methods and Materials in Secondary Mathematics.** Curriculum, materials, methods, evaluation, and related subjects of instruction. Integration of content and methodology. Open only to formally admitted secondary math teacher education students.

**EDUC 4382 (3-4). Methods and Materials in Secondary Science.** Curriculum, materials, methods, evaluation, and related aspects of instruction. Integration of content and methodology. Open only to formally admitted secondary science teacher education students.

**EDUC 4712-14. Student Teaching—Secondary School 1.** Student teacher attends a middle/junior high or senior high school in the Boulder-Denver metropolitan area. Open only to formally admitted secondary teacher education students.

**EDUC 4722-8. Student Teaching—Secondary School 2.** Student teacher attends a middle/junior high 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. Open only to formally admitted secondary teacher education students.

**EDUC 4732 (8-14). Student Teaching—K-12.** Required experience for music students seeking education at both elementary and secondary levels. Open only to formally admitted secondary or K-12 music teacher education students.

**EDUC 4912-1. Practicum in Teacher Education.** In-school practicum experience.

## Elementary and Secondary Education

**EDUC 3013 (3-4). Proseminar I: Becoming a Teacher.** Introduces the real world of schools, teaching, and learning. Integrates linguistically different child, communication, and the history, philosophy, sociology, and anthropology foundations of education. Integrates theory and practice by including hands-on experiences in community settings. Prereq., 56 credit hours completed or in-progress.

**EDUC 3023 (3-4). Proseminar II: Schools, Culture, and Society.** Continuation of EDUC 3103. Emphasizes schools and teaching and learning. Integrates special education, teaching the linguistically different child, communication, and the history, philosophy, sociology, and anthropology foundations of education. Includes hands-on experiences in school settings. Prereq., admission to the elementary, secondary, or K-12 music teacher education program.

**EDUC 4513-2. Proseminar III: Education and Practice.** Meets during student teaching assignment. Includes topics of concern to teachers, such as classroom organization and management, lesson planning, assessment, journals, preparation of a professional teaching portfolio, etc. Coreq., student teaching.

## 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 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 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 5065-3. Curriculum Theories.** The study of current theories of school curriculum, related trends, and actual practices in elementary, middle/junior high, and secondary schools.

**EDUC 5085-3. History of American Education.** Social and intellectual history perspectives of American education, major reform movements from the eighteenth century to the present, interpretation of American educational history, and assessment of how differences of race, class, ethnicity, religion, power, and gender have affected American education.

**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 5195-4. 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 5225-4. 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. Prereq., EDUC 5275.

**EDUC 5305 (3-4). Proseminar: Teaching and Learning.** Presentation and discussion of issues in secondary school curriculum, instruction, and management. Students examine, analyze, and evaluate a variety of instructional delivery strategies, their effectiveness for students, and teacher dispositions to facilitate learning.

**EDUC 5325-3. Literature for Adolescents.** Reading and evaluation of books for middle/junior high 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 (3-4). Advanced Methods in Secondary 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 seven through twelve, but also profitable for elementary teachers with a specialization in social studies.

**EDUC 5365 (3-4). Advanced Methods in Secondary English Education.** Designed to give experienced teachers an opportunity to investigate specific methods and strategies for teaching English from the middle/junior high through senior high school levels.

**EDUC 5375 (3-4). Advanced Methods in Secondary Mathematics.** In-depth investigation of specific methods and strategies suitable for teaching mathematics from the middle/junior high through senior high school levels. Participants actively involved in the process of instruction by utilizing methods and strategies being considered.

**EDUC 5385 (3-4). Advanced Methods in Secondary Science.** Studies of methods, techniques, and strategies for teaching science from middle/junior high 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.** Introduces 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 various 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 education requirements.

**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. Observation of model classrooms where handicapped students are being mainstreamed with special emphasis on various modifications that can be made in curriculum and teaching approaches. Meets Colorado exceptional child education 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 (1-4). Elementary Moderate Needs Practicum.** Supervised field experience in special education with moderate needs handicapped students. Each credit hour requires 50 contact hours. Prereqs., EDUC 5465, 5505, 5545, and 5515.

**EDUC 5565 (1-4). Secondary Moderate Needs Practicum.** Supervised field experience in special education with cognitive needs handicapped students. Each credit hour requires 50 contact 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. Recommended prereq., EDUC 5615.

**EDUC 5635-3. Education and Sociolinguistics.** Introduces students to the discipline of sociolinguistics, which is the study of language variation and use, and its application within education settings. Not designed as an advanced sociology or linguistics course. Areas of study include language variation, speech communities, the ethnography of communication, speech and social identities, and sociolinguistic research related to teaching and learning.

**EDUC 5705-3. Theories of Learning and Development.** Examines current theory and research on child development, learning, and motivation. Emphasizes the relationship between and among development, learning, motivation, and how theory and research can inform instructional decisions in the elementary classroom. Prereq., admission to the elementary MA+ program.

**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 5715-4. Education, Society, and the Elementary Teacher.** Introduces issues affecting teachers and the teaching profession. Students examine these issues from a variety of theoretical viewpoints including conservative, radical, progressive, and socially efficient orientations. Students also examine and analyze the cultural, structural, and institutional features of schooling. Prereq., admission to the elementary MA+ program.

**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 5725-4. Issues in Elementary Education.** Introduces the role of practical reasoning in curricular and pedagogical practice. Students examine and analyze current curriculum material, pedagogical practices, and institutional contexts. Prereqs., EDUC 5705 and 5715.

**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 5735-3. School-Based Professional Seminar.** Required of both cooperating and student teachers in the student teaching semester of the elementary MA+ program. Includes observation and analysis of classroom interaction, models for school based professional study groups, and development of action research projects. Prereqs., EDUC 5705, 5715, and 5725.

**EDUC 5736 (1-4). Workshop in Research and Evaluation Methodology.**

**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 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 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 6528 (1-4). Workshop in Educational and Psychological Studies.**

**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 6855 (1-4). Independent Study in Instruction and Curriculum in Content Areas—Master's.**

**EDUC 6888 (1-4). Independent Study in Educational and Psychological Studies—Master's Level.**

**EDUC 6899 (1-4). Independent Study in Social, Multicultural, and Bilingual Foundations—Master's Level.** Instructor consent required.

**EDUC 6915 (1-4). Practicum in Instruction and Curriculum in Content Areas.**

**EDUC 6916 (1-4). Practicum in Research and Evaluation Methodology.**

**EDUC 6918 (1-4). Practicum in Educational and Psychological Studies.**

**EDUC 6919 (1-4). Practicum in Social, Multicultural, and Bilingual Foundations.** Instructor consent required.

**EDUC 6925 (1-4). Readings in Instruction and Curriculum in Content Areas.**

**EDUC 6926 (1-4). Readings in Research and Evaluation Methodology.**

**EDUC 6928 (1-4). Readings in Educational and Psychological Studies.**

**EDUC 6929 (1-4). Readings in Social, Multicultural, and Bilingual Foundations.** Instructor consent required.

**EDUC 6944-3. Master's Degree Candidate.**

**EDUC 6954-4. Master's Thesis.**

**EDUC 7015-3. Teaching Internship in Teacher Education.** One-semester teaching internship in an undergraduate or graduate foundations course.

**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 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. Ethnographic Methods in Educational 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 reporting. Prereq., EDUC 6325 or equivalent doctoral-level course in anthropological theory, sociological theory, or sociology of education.

**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 7416-3. Seminar: Research Methodology.** Selected topics for advanced study in educational research, statistics, measurement, and evaluation.



**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 8014-3. Doctoral Seminar in Multiculturalism and Education.** Addresses the sociopolitical context of multiculturalism and education, and the sociocultural context of learning. Topics and themes examine critical issues involved in making schooling responsive to an increasingly multicultural and multilingual society.

**EDUC 8035-3. Conceptual Change.** Explores the nature of conceptual change and the conditions that facilitate or impede a learner's process in knowledge construction and reorganization. Integrates central themes with case studies of particular projects and focus areas.

**EDUC 8125-3. Seminar on Radical Education Theories.** Radical (class, gender, and race based) analyses of United States public schooling maintain that dynamics of oppression and domination undermine schools' democratic promise. This course scrutinizes the explanatory adequacy and ethical justification of the radical claims.

**EDUC 8135-3. Seminar on Research on Teaching.** Substantive and methodological issues that underlie contemporary research on teaching. Explores areas of research on teaching including effective teacher behavior, classroom management, student mediation of teaching, teacher cognition, and pedagogical expertise.

**EDUC 8145-3. Seminar Research on Teacher Education and Learning to Teach.** Substantive and methodological issues that underlie current research, and in-depth analysis of exemplary research programs on teacher education and learning to teach. Explores theory, research, and policy related to the participants, curriculum, content, and contexts.

**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 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 8855 (1-4). Independent Study in Instruction and Curriculum in Content Areas—Doctoral Level.**

**EDUC 8866 (1-4). Independent Study in Research and Evaluation Methodology—Doctoral Level.**

**EDUC 8888 (1-4). Independent Study in Educational and Psychological Studies—Doctoral Level.**

**EDUC 8899 (1-4). Independent Study in Social, Multicultural, and Bilingual Foundations—Doctoral Level.** Instructor consent required.

**EDUC 8935 (1-6). Internship in Instruction and Curriculum in Content Areas.**

**EDUC 8936 (1-6). Internship in Research and Evaluation Methodology.**

**EDUC 8938 (1-6). Internship in Educational and Psychological Studies.**

**EDUC 8939 (1-6). Internship in Social, Multicultural, and Bilingual Foundations.** Instructor consent required.

**EDUC 8984 (1-10). Ed.D. Doctoral Dissertation.**

**EDUC 8994 (1-10). Ph.D. Doctoral Dissertation.**

## FACULTY

LORETTA A. SHEPARD, Interim Dean; Professor. B.A., Pomona College; M.A., Ph.D., University of Colorado.

HAROLD MILTON ANDERSON, Professor Emeritus.

RONALD DeLAINE ANDERSON, Professor. B.S., Ph.D., University of Wisconsin.

LEONARD M. BACA, Professor. S.T.B., Catholic University of America; M.A., University of New Mexico; Ed.D., University of Northern Colorado.

CAROL J. BEAUMONT, Assistant Professor. B.A., University of Iowa; M.A., University of Illinois; Ph.D., University of California, Berkeley.

HILDA BORKO, Professor. B.A., M.A., Ph.D., University of California at Los Angeles.

RUTH K. CLINE, Professor Emerita.

JACK EUGENE COUSINS, Professor Emeritus.

ROBERT de KIEFFER, Associate Dean Emeritus, Continuing Education.

PHILIP DiSTEFANO, Professor. M.A., West Virginia University; B.S., Ph.D., Ohio State University.

RUBEN DONATO, Assistant Professor. B.A., University of California, Santa Cruz; M.A., Ph.D., Stanford University.

MARGARET A. EISENHART, Director of Graduate Studies; Professor. B.A., Emory University; M.A., Ph.D., University of North Carolina.

ROBERTA FLEXER, Associate Professor. B.S., Tufts University; M.Ed., Harvard University; Ph.D., University of Colorado.

PAMELA FORD, Director of Field Experiences; Senior Instructor. B.S., University of Missouri; M.A., University of Northern Colorado; Ph.D., University of Colorado at Boulder.

MARIA E. FRANQUIZ, Assistant Professor. B.A., M.A., Ph.D., University of California, Santa Barbara.

STEVEN R. GUBERMAN, Assistant Professor. B.A., University of Chicago; M.A., Ph.D., University of California at Los Angeles.

JOHN HAAS, Professor Emeritus.

RICHARD HARPEL, Director of Federal Programs, President's Office; Associate Professor. B.A., Wheaton College (Illinois); M.P.S., Ph.D., University of Colorado.

JENIFER HELMS, Assistant Professor. B.A., University of Washington; M.A., Ph.D., Stanford University.

MYRLE EMERY HEMENWAY, Associate Professor Emeritus.

STEPHEN E. HODGE, Associate Professor. A.B., Sacramento State College; M.Ed., Ph.D., University of Missouri.

KENNETH D. HOPKINS, Professor. A.B., Pasadena College; M.S., Ph.D., University of Southern California.

ERNEST R. HOUSE, Professor. A.B., Washington University; M.S., Southern Illinois University; Ed.D., University of Illinois.

KENNETH R. HOWE, Associate Professor. B.A.; M.A., Ph.D., Michigan State University.

KENNETH LAWRENCE HUSBANDS, Professor Emeritus.

MICHAEL KALK, Professor Emeritus.

VERNE CHARLES KEENAN, Associate Professor Emeritus.

RICHARD JOHN KRAFT, Professor. B.A., Wheaton College (Illinois); M.S.Ed., Northern Illinois University; Ph.D., Michigan State University.

PHILIP LANGER, Professor. A.B., University of Michigan; M.A., New York University; Ph.D., University of Connecticut.

MARGARET D. LeCOMPTE, Associate Professor. B.A., Northwestern University; M.A., Ph.D., University of Chicago.

ROBERT L. LINN, Professor. A.B., University of California, Los Angeles; M.A., Ph.D., University of Illinois.

DANIEL P. LISTON, Associate Professor. B.A., Earlham College; Ph.D., University of Wisconsin, Madison.

ROY P. LUDTKE, Professor Emeritus.

WILLIAM MCGINLEY, Associate Professor. A.B., Western Kentucky University; M.Ed., Idaho State University; Ph.D., University of Illinois.

ROBERT C. MCKEAN, Professor Emeritus.

PATRICK McQUILLAN, Assistant Professor. B.S., M.A. Wesleyan University; Ph.D., Brown University.

SHUAIB J. MEACHAM, Assistant Professor. B.A., M.A., University of Michigan; Ph.D., University of Illinois.

MICHAEL S. MELOTH, Associate Professor. B.S., Boise State University; M.A., San Francisco State University; Ph.D., Michigan State University.

HUBERT H. MILLS, Professor Emeritus.

OFELIA MIRAMONTES, Associate Professor. M.A., United States International University; B.A., Ph.D., San Diego State University.

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MILES C. OLSON, Professor Emeritus.

KARL OPENSHAW, Professor Emeritus.

DOMINIC PERESSINI, Assistant Professor. B.S., Montana State University; M.S., Ph.D., University of Wisconsin, Madison.

ROBERT D. PRICE, Professor Emeritus.

FRANCES RAINŠ, Assistant Professor. B.S., M.S., Ph.D., Indiana University (Bloomington).

LOREN STANLEY RATLIFF, Associate Professor Emeritus.

MARIA de la LUZ REYES, Associate Professor. B.A., Webster University (St. Louis); M.Ed., Texas Woman's University; Ph.D., University of California, Santa Barbara.

ALBERT EDWARD ROARK, Professor Emeritus.

STEPHEN ROMINE, Professor Emeritus.

JAMES S. ROSE, Professor Emeritus.

DARYL L. SANDER, Professor Emeritus.

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.

JAMES R. WAILES, Professor Emeritus.

SHELBY ANNE WOLF, Assistant Professor. B.A., University of Richmond; B.A., M.S., University of Utah; Ph.D., Stanford University.

*Two students work on a project for the Women in Engineering (WIE) Program. WIE's goal is to minimize barriers and maximize retention and graduation of women studying engineering through a variety of support services and activities.*



# COLLEGE OF ENGINEERING AND APPLIED SCIENCE

ROSS B. COROTIS, DEAN

The College of Engineering and Applied Science offers 10 undergraduate degrees: aerospace engineering sciences, architectural engineering, chemical engineering, civil engineering, electrical engineering, electrical and computer engineering, mechanical engineering, computer science, applied mathematics, and engineering physics. The first seven are accredited by the Accreditation Board for Engineering and Technology; the remaining are applied science degrees. The degrees in applied mathematics and engineering physics are offered in cooperation with the Applied Mathematics Program and the Department of Physics of the College of Arts and Sciences.

## College Policy on Equal Opportunity

The College of Engineering and Applied Science is dedicated to an open, inclusive, and supportive human climate for all of its students, staff, and faculty. It is guided by the principle of empowerment and respect for all individuals.

The college does not discriminate on the basis of race, color, sex, age, religion, sexual orientation, national or ethnic origin, disability, or veteran status in any of its programs or activities, including admission, employment, and the administration of its education and research policies.

The Department of Human Resources is responsible for educational and employment opportunity, implementation of affirmative action programs, and coordination of Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1973, the Vietnam Era Veteran's Readjustment Act of 1974, and Section 504 of the Rehabilitation Act of 1973. For further information about these provisions, or about issues of equity, discrimination, or fairness, contact University of Colorado at Boulder, Garnett K. Tatum, Director of Affirmative Action and Services, 1511 University Avenue, Campus Box 475, Boulder, CO 80309-0475, or call (303) 492-6706.

## Facilities

Students have an opportunity to study engineering with over 160 faculty of national and international reputation. They have access to the superb facilities of the College of Engineering and Applied

Science. Each engineering department has laboratories suitable for undergraduate and graduate instruction and experimental research through the doctoral or postdoctoral level. Specific information on these facilities may be obtained from the departments concerned.

## Computing

Classes in all departments of the college place strong emphasis on the use of computers. All entering freshmen receive instruction and undertake academic projects involving computers. While many students choose to obtain personal computers, several hundred computers are available in open laboratories on campus for student use. Many of these computer laboratories are located in the Engineering Center.

Further information on computing can be found under Campus Facilities in the General Information chapter of this catalog, engineering department summaries, and the description of research facilities found in the Graduate School chapter.

## Degree Programs

Within most departments, several options are offered within each degree program. Several departments offer options of bioengineering and/or premedicine and environmental engineering. Some programs of study are oriented toward graduate work; others toward engineering practice.

Engineers work in a wide variety of disciplines, with the college's 10 undergraduate and eight graduate degree programs reflecting 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. The systems education of aerospace engineers also prepares them for careers in mass transit, undersea exploration, and nuclear engineering. Because of their extensive background in mathematics and physics, they are often at the forefront of emerging technologies.

Applied mathematicians have the expertise and mathematical sophistication necessary to make contributions in a wide variety of fields, including scientific computation, actuarial science, financial modeling, and

most areas of science and engineering that have a mathematical basis.

A professional applied mathematician may work with engineers, scientists, programmers, and other specialists. The curriculum at CU-Boulder is designed to have the breadth for such an interdisciplinary career.

Course offerings at the undergraduate level focus on providing students with mathematical tools, problem-solving strategies, and expertise useful in science and engineering. To fulfill requirements, a concentrated area of engineering courses (or approved natural science courses) must be completed. The college has formulated several recommended options within the discipline.

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 using a wide variety of processing techniques. 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 general undergraduate program with curricular options in environmental, materials, computing, and bioengineering/premedicine options. It has active research and educational programs in the exciting field of biotechnology, which involves the use of individual cells and their components for producing pharmaceuticals and other important products. The department is also involved in environmental pollution

control, novel membrane separations, and materials.

Civil 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, human-computer interaction, software engineering, operating systems, parallel processing, 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 current area of major interest is the study of parallel processing.

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 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 training in research, and is especially appropriate to space technology and research.

Mechanical engineering prepares students for careers in a variety of industrial sectors including transportation, energy, electronics manufacturing, medical, and environmental. Basing their education on the fundamentals of mathematics, physics, and chemistry, mechanical engineers deal with internal combustion engines, automobiles, computers, power plants, aircraft, medical instruments, space platforms, and pollution control devices. Career opportunities include work in basic and applied research and development, design, manufacturing, project management, consulting, and teaching. They are employed by a wide variety of industrial, governmental, and educational organizations. A mechanical engineering background also provides a firm foundation for other professional careers such as engineering management, law, and medicine.

**Open Option Program.** The College of Engineering and Applied Science provides the opportunity for new freshmen to delay their selection of a specific engineering major by enrolling in the open option (OPEN) program. The open option program is available only to new freshmen, and students are required to select a specific engineering degree program no later than the end of the spring semester, regardless of when they entered the OPEN program. This provides students with one or two semesters to explore the variety of engineering degree programs before selecting a major.

The dean's office provides general advising for all open option students through staff advisors. This advising is supplemented with freshmen faculty advisors in each engineering degree program. Students selecting the open option program are subject to all College of Engineering and Applied Science academic rules and policies. They are also required to satisfy any remaining minimum academic preparation standards (MAPS) that are required for graduation.

### 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. 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. The University of Colorado has several programs that enable students to undertake course work in engineering: the Universities of New South Wales and Wollongong in Australia; the Universidad de Costa Rica; the Universities of East Anglia, Lancaster, and Sussex in England; Denmark's International Study Program; the American University of Cairo in Egypt; Uppsala University in Sweden; and the Instituto Tecnológico y de Estudios Superiores de Monterrey in Mexico. All participants in the University study abroad programs remain enrolled at the University, all credit earned while abroad is considered in residence, and the pass/fail grade option is used for all course work taken during study abroad. Financial aid from the University can be applied to the program costs in most cases, and special study abroad scholarships are available to program participants. More information about studying abroad is available at the University of Colorado at Boulder, Office of International Education, Campus Box 123, Boulder, CO 80309-0123, (303) 492-7741.

Engineering departments may also assist students wishing to study engineering at the Ecole National des Ponts et Chaussées in Paris, the Ecole Polytechnique Feminine in Paris, and the University of Oviedo in Spain.

With the proper preparation, students may complete one or two semesters of engineering education during study abroad.

### Student Organizations

The following honorary engineering societies have active student chapters in the College of Engineering and Applied Science:

- Chi Epsilon, civil and architectural society
- Eta Kappa Nu, electrical engineering society
- Omega Chi Epsilon, chemical engineering society
- Pi Tau Sigma, mechanical engineering society



Sigma Gamma Tau, aerospace society  
Tau Beta Pi, engineering society

Student chapters of the following professional or social 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  
Asian Engineering 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 Automotive Engineers  
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  
Structural Engineers Council

A representative student organization, the University of Colorado Engineering Council (UCEC), is comprised of all students in the College of Engineering and Applied Science. UCEC supervises matters of interest to all undergraduate students through the control board, its legislative body.

### Minority Engineering Program

The College of Engineering and Applied Science is committed to increasing underrepresented minority enrollment and retention through graduation. This commitment is carried out through the Minority Engineering Program (MEP). MEP recruits students (American Indian, Black, and Hispanic) into the college and provides supportive programs that challenge students to excel. In addition to scholarships, MEP provides a five-week summer bridge program, a freshman leadership course, academic excellence workshops, advising, counseling, tutoring, internship assistance, and an MEP Resource Center that serves as a central meeting place for studying and networking.

This MEP effort is steadily increasing the minority representation and retention in the College of Engineering and Applied Science. MEP has achieved minority retention and graduation rates far above the national average. The program is funded by donations from industry and the college.

### Women in Engineering Program

The Women in Engineering (WIE) program provides support services to current and prospective women students, eliminating or minimizing the barriers some women face in pursuing and successfully completing an engineering education. WIE strives to maximize the retention and graduation of women by providing counseling, supplemental academic advising, peer and professional mentoring, job shadowing, brown bag lunches, and an electronic mail network to keep women informed on important issues and events. WIE offers scholarships to selected incoming Colorado first-year and transfer students, and provides some assistance in job placement.

The WIE program is committed to maintaining a supportive academic and social environment for all students. The Storage Tek Women in Engineering Resource Center provides a place where students can work and study together, in a collaborative atmosphere.

The program enjoys the support of students, staff, faculty, administration, corporate, and alumnae sponsors.

### Herbst Program of Humanities

The Herbst Program of Humanities is a two-semester, 6-credit-hour sequence for engineering students of at least junior status. Classes are small (14 students, two teachers), and are almost entirely devoted to roundtable discussion of original texts, primarily in literature and philosophy. The syllabus varies from year to year, but regularly includes drama, short stories, and novels as well as philosophical treatises on ethics, epistemology, and political science. Classwork stresses responsible reading and cooperative learning. By taking the two consecutive semesters of the Herbst seminar, students fulfill the college's writing requirements. Courses offered by the Herbst Program in Humanities have a prefix of HUEN.

## ACADEMIC EXCELLENCE

### Dean's List

A student in the College of Engineering and Applied Science who completes at least 12 credit hours of course work for a letter grade during the fall or spring semester on the Boulder campus (excluding continuing

education), and who earns a semester grade point average (GPA) of at least 3.50, will be included on the college dean's list for that semester. Notation of "Dean's List" is placed on the student's internal transcript by the Office of the Registrar.

### Honors at Graduation

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.

Interested students are also 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 determined by the Honors Council. Interested students should consult with the director of the Honors Program for detailed information.

### Scholarships

Undergraduate scholarships are provided primarily by private donations by alumni, corporations, and friends of the college through gifts to the University of Colorado Foundation, Inc. In some cases, endowments have been established; other scholarships are based on annual gifts. Many companies provide matching funds for gifts from their employees who are alumni. More than 400 scholarships have been made available to qualified students.

Awards are based on demonstrated academic ability and performance. Financial need will be considered if designated by the donor (see the Financial Aid section of this catalog on page 21). For additional information about college-based scholarships, contact the deans' office at (303) 492-5071. Students may also contact the University's Office of Financial Aid at (303) 492-5091.

Anyone interested in providing an undergraduate scholarship or contributing to the scholarship fund may contact the University of Colorado at Boulder, Engineering Development Office, Campus Box 422, Boulder, CO 80309-0422, (303) 492-7335.



## 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 brought before the Undergraduate Academic Affairs Committee. (See also, Academic Integrity and Student Conduct under Campus Policies in the General Information chapter of this catalog.)*

### 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 on academic probation and if not corrected, on academic suspension. Under exceptional circumstances, a student may be directly placed on academic suspension if retroactive grade changes lower the cumulative or prior semester GPA.

#### *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 each of the following two consecutive semesters of enrollment as an undergraduate student in the College of Engineering and Applied Science.

If a student's cumulative University of Colorado 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. *Once placed on probation, the student must immediately correct all academic deficiencies or be subsequently suspended*

*from the College of Engineering and Applied Science.*

A student placed on academic probation by cumulative grade point average must raise the cumulative University of Colorado GPA to at least 2.00 during the next semester of enrollment and keep it above a 2.00 for each of the two following consecutive semesters. The student also is subject to probation by the consecutive semester GPA rule; this rule prescribes that a student 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 each of 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 each of 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 that 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. Under exceptional circumstances, a student may be placed directly on academic suspension if retroactive grade changes lower the cumulative or prior semester grade point averages.

The conditions of academic suspension are as follows:

1. The period of the suspension is indefinite, but must be for at least one academic year.
2. This academic suspension applies to the College of Engineering and Applied Science on all campuses of the University of Colorado.
3. Suspended students may not enroll in courses, except those offered during summer session and those offered by correspondence through the Division of Continuing Education, University of Colorado at Boulder. Under no circumstances are suspended students to enroll for courses through the Division of Extended Studies, University of Colorado at Denver.

4. If a student, while on academic probation or suspension, transfers to another college or school of the University of Colorado, the College of Engineering and Applied Science considers that student to have permanently changed their choice of academic major to one offered by that college or school. Therefore, the suspended student is not permitted to enroll in any courses taught by this college that may apply toward engineering degree requirements. If the suspended 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 Undergraduate Academic Affairs Committee for removal of the Dean's Scholastic Stop.

5. The suspended student may elect to attend another accredited institution and petition the committee for removal of the Dean's Scholastic Stop that was imposed upon suspension. However, the student seeking readmission to the college must have a cumulative CU grade point average of at least 2.00. Grades earned at other institutions do not transfer to the University of Colorado.

Under select circumstances, the dean reserves the option of extending the period of academic probation for one semester. This option is exercised only in cases involving the student's cumulative grade point average (GPA) and the conditions noted below:

- The student must have a CU cumulative GPA of at least a 1.95.
- The pattern of academic performance must demonstrate a highly significant improvement over the semester in which the student was placed on academic probation.
- The student must have been enrolled in a curriculum of study related to one of the degree programs offered by this college and demonstrate an intent to complete that degree program.
- The student cannot have elected the option of enrolling in any course during the past two semesters with the *pass/fail* or no-credit options, or have taken any incomplete (*IF* or *IW*) grades.
- The student must have successfully completed at least 15 semester credit hours each of the last two semesters, or a total of 30 hours during the past two semesters on the Boulder campus.
- The student must have abided by all conditions imposed by the academic probation.

This special review of academic suspension is exercised at the option of the dean of the College of Engineering and Applied Science. A student can receive this special

review only once during his or her period of undergraduate enrollment.

Readmission of suspended students must be approved by the college and the CU-Boulder Office of Admissions; such readmission is not assured. 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.

## 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. Strong skills are also essential in written and oral communications.

The college seeks applicants who demonstrate a high probability of completing their designated engineering 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 Undergraduate Admission in the General Information chapter 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 transfer student admissions requirements outlined in Undergraduate Admission in the General Information chapter of this catalog.

### Intercampus Transfer Students

The acceptance of a student transferring from one campus to another within the University of Colorado system is determined by the Office of Admissions on the basis of guidelines established by the respective College of Engineering and Applied Science.

Intercampus transfer applications are considered on the basis of the student's University of Colorado system grade point average, grades earned in engineering-related courses, grades earned at other institutions, satisfactory academic progress toward degree requirements, course load completed, and the residency requirement of the gaining engineering college.

The student is advised that the engineering degree requirements differ from one campus to another in the number of credit hours required for the degree, specific course content and titles, and residency required in the college. Where there is a difference in credit hours between courses listed as equivalent, the College of Engineering and Applied Science at CU-Boulder applies the smaller number of credit hours. To ensure the maximum acceptance of credit toward degree requirements and minimize the length of time required to complete the degree, the student planning an intercampus transfer must contact the gaining major department as soon as possible once deciding to complete an engineering degree on another University of Colorado campus.

Generally, an intercampus transfer should be accomplished at the end of the first year, with some course selection coordination required between the student and the degree granting major department during that year. With increased course selection coordination, some students may be able to delay their transfer until the middle or end of the sophomore year. Beyond that point, the student is most likely to lose extensive course credit and time in completing degree requirements.

Any minimum academic preparation standards (MAPS) deficiencies are to be completed prior to the intercampus transfer. A sample freshman year for the intercampus transfer student would include the following courses:

First Semester	
Calculus 1	4 hrs.
Chemistry 1	5 hrs.
Computer Science*	3-4 hrs.
Humanities/Social Science	3 hrs.

### Second Semester

Calculus 2	4 hrs.
Physics 1	4 hrs.
Engineering Draw/Graphics*	2-3 hrs.
Humanities/Social Science	3 hrs.
Humanities/Social Science*	3 hrs.

To assist the prospective intercampus transfer student in contacting a faculty or staff advisor in the gaining major department, the following list is provided.

### University of Colorado, Boulder Campus

Dean's Office, ECAD 100, (303) 492-5071
Aerospace Engineering Sciences, ECOT 632, (303) 492-6417
Applied Mathematics, ECOT 226, (303) 492-4668
Chemical Engineering, ECCH 111, (303) 492-7471
Civil, Environmental, and Architectural Engineering, ECOT 444, (303) 492-4193
Computer Science, ECOT 725, (303) 492-7514
Electrical Engineering and Electrical and Computer Engineering, ECEE 1B55, (303) 492-7327
Engineering Physics, Duane E-032, (303) 492-6952
Mechanical Engineering, ECME 134, (303) 492-7151

### University of Colorado, Colorado Springs Campus

Dean's Office, Engr. Bldg. 201, (719) 593-3246
Applied Mathematics, Engr. Bldg. 274, (719) 593-3311
Computer Science, Engr. Bldg. 199, (719) 593-3325
Electrical Engineering, Engr. Bldg. 299, (719) 593-3351

### University of Colorado, Denver Campus

Dean's Office, NC Bldg. 3024, (303) 556-2870
Applied Mathematics, UCD Bldg. 540, (303) 556-4276
Civil Engineering, NC Bldg. 3027, (303) 556-2871
Computer Science, NC Bldg. 2605, (303) 556-4314
Electrical Engineering, NC Bldg. 2615, (303) 556-2872
Mechanical Engineering, NC Bldg. 3502, (303) 556-8516

\*Coordination is required on these course selections to ensure the application of this credit toward degree requirements. If transferring to CU-Boulder, the student should not enroll in any English composition or speech courses. Engineering drawing and/or graphics courses are applicable in select majors only. The student is expected to use this opportunity to complete any MAPS deficiencies.

## UNIVERSITY OF COLORADO SYSTEM COURSE EQUIVALENCIES

The following course by course equivalency table should assist a student anticipating an intercampus transfer between the Colleges of Engineering and Applied Science within the University of Colorado system. Course equivalencies do not always accurately indicate the number of credit hours applicable toward degree requirements.

CU-Boulder Course	Equivalent Colorado Springs Course	Equivalent Denver Campus Course
<b>COLLEGE OF ARTS AND SCIENCES</b>		
APPM 1350-4 Calculus 1 for Engineers	MATH 135	MATH 1401
APPM 1360-4 Calculus 2 for Engineers	MATH 136	MATH 2411
APPM 2350-4 Calculus 3 for Engineers	MATH 235	MATH 2422/2423
APPM 2360-4 Linear Algebra/Differential Equations	MATH 313/340	MATH 3191/3200
CHEM 1211-3 Engineering General Chemistry	CHEM 103	CHEM 2031
CHEN 1211-2 General Chemistry Lab	CHEM 103	CHEM 2031
CHEM 3311-3 Organic Chemistry 1	CHEM 331	CHEM 3411
CHEM 3321-1 Organic Chemistry 1 Laboratory	CHEM 333	CHEM 3418
CHEM 3331-3 Organic Chemistry 2	CHEM 332	CHEM 3421
CHEM 3341-1 Organic Chemistry 2 Laboratory	CHEM 334	CHEM 3428
PHYS 1110-4 General Physics 1	PES 111/112	PHYS 2311
PHYS 1120-4 General Physics 2	PES 112/213	PHYS 2331
PHYS 1140-1 Experimental Physics 1	PES 115/215	PHYS 2321/2341
PHYS 2130-4 General Physics 3	PES 313	PHYS 2811
PHYS 2150-1 Experimental Physics	PES 315	PHYS 3171
<b>COLLEGE OF ENGINEERING AND APPLIED SCIENCE</b>		
<i>Architectural Engineering</i>		
AREN 1316-1 Introduction to Architectural Engineering	NONE	NONE
AREN 1017-2 Engineering Drawing	ENGR 125	ENGR 1025
AREN 1027-2 Descriptive Geometry	NONE	NONE
AREN 2010-3 Introduction to Solar Utilization	CHE 405	NONE
AREN 2020-3 Energy Fundamentals	ENGR 211	ENGR 3012
<i>Aerospace Engineering</i>		
ASEN 2010-3 Mechanics 1	ENGR 201	ME 2023
ASEN 2020-3 Mechanics 2	ENGR 202	ME 2033
ASEN 2022-3 Material Science/Engineering	ASE 202	NONE
ASEN 2023-3 Thermodynamics	ENGR 211	ENGR 3012
<i>Chemical Engineering</i>		
CHEN 1300-1 Introduction to Chemical Engineering	NONE	NONE
CHEN 2120-3 Chemical Material/Energy Balance	CHE 212	NONE
CHEN 3200-3 Chemical Engineering Principles 1	NONE	NONE
<i>Civil and Environmental Engineering</i>		
CVEN 1317-1 Introduction to Civil/Environmental Engineering	NONE	NONE
CVEN 2012-3 Plane Surveying	NONE	CE 2212
CVEN 2121-3 Analysis Mechanics 1	CE 212	CE 2121
CVEN 3161-3 Mechanics of Materials 1	CE 312	CE 3121
CVEN 3313-3 Theory of Fluid Mechanics	NONE	CE 3313
<i>Computer Science</i>		
CSCI 1210-3 Introduction to Programming 2	CS 113	CSC 1410/2320
CSCI 1300-4 Introduction to Computing for Majors	CS 115/206	CSC 1410/2320
CSCI 2224-3 Discrete Structures	NONE	NONE
CSCI 2270-4 Data Structures	CS 145/206	CSC 2421/2320
CSCI 3104-3 Algorithms	CS 472	CSC 3401
CSCI 3155-4 Principles of Programming Languages	NONE	CSC 3415
<i>General Engineering</i>		
GEEN 1300-3 Introduction to Engineering Computing	CS 105	CSC 1100
<i>Electrical and Computer Engineering</i>		
ECEN 1400-3 Methods and Problems ECE	ECE 101	NONE
ECEN 2050-5 Circuits/Electronics 1	ECE 221/223	EE 2132/2532
ECEN 2060-5 Circuits/ Electronics 2	NONE	NONE
ECEN 3030-3 Electricity and Electrical Circuits for Non-Majors	ECE 325	EE 3030
<i>Mechanical Engineering</i>		
MCEN 1020-3 Analytical and Computational Tools	CS 105	CSC 1100
MCEN 1025-3 Computer Aided Drawing/Fabrication	ENGR 125	ENGR 1025
MCEN 2022-3 Engineering Thermodynamics	ENGR 211	ENGR 3012
MCEN 2023-3 Mechanics of Particles	ENGR 201	ME 2023
MCEN 2043-3 Mechanics of Rigid Bodies	ENGR 202	ME 2033

A course by course equivalency list is on page 294 of this catalog for each campus of the University of Colorado. This list should be consulted to assure the transferability and applicability of courses toward degree requirements.

### ***Intrauniversity Transfer Students***

Undergraduate intrauniversity transfers (IUTs) on the Boulder campus of the University to the College of Engineering and Applied Science are considered on an individual basis. The applicant is expected to apply during the semester he or she is enrolled in the second semester of calculus and the appropriate laboratory science course. The applicant's academic record must fulfill the IUT admissions requirements of the College of Engineering and Applied Science. The applicant must apply prior to the college IUT deadline of April 1 (for summer and fall) or November 1 (for spring). Specific application details are available in the Office of the Dean (AD 1-1).

### ***Former Students***

A former student must meet the requirements outlined in Undergraduate Admissions in the General Information chapter of this catalog and must reapply to the University. Courses taken at other collegiate institutions will not necessarily be a determining factor in the student's readmission to the University of Colorado, but transcripts on all such work must be submitted.

Interruption of studies may require completion of current degree work in addition to repetition of course work for 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).* If a student has received a final grade of *F* for nonattendance because of a failure to properly drop a course, the student can request the college to insert a letter of explanation in their college file for future reference.

If a student misses a final examination because of illness or other valid personal emergency, the student 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 properly notify these officials may result in an *F* in the course.

### **Changing Majors**

The form necessary for transferring from one undergraduate engineering major to another and to apply for double-degree programs is available in the dean's office (ECAD 100).

### **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 credit 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. All CLEP credit must be validated by satisfactory achievement in subsequent courses, in accordance with the transfer credit policies of the college.

#### ***Credit for ROTC***

Any student may, with departmental approval, receive up to 6 semester hours of credit toward an engineering degree from among ROTC courses appearing on an approved list available in the Office of the Dean (AD1-1). Humanities and social science courses that are cross-listed with ROTC courses may be used to fulfill the college humanities and social science requirements, subject to departmental approval.

### ***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 TW (incomplete, withdrawn) may not be awarded to undergraduate students in courses taught by this 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. Individual departments may have rules that should be checked before registering for the pass/fail option. The college pass/fail policy is:

1. The maximum number of credit hours a student may elect with the pass/fail option shall be designated by the student's major department. No more than 16 semester hours of pass/fail credit can be applied toward degree requirements.

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

University registration or schedule adjustment period.

4. A transfer student may count toward graduation 1 hour of pass/fail credit for each 9 credit hours 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 made a part of the student's college record. The appropriate faculty transfer credit evaluator uses this form to indicate which of those courses are acceptable in meeting engineering degree requirements. *It is the responsibility of the transfer student to request final validation of the transfer credit hours by the major department and 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 faculty transfer credit evaluator and petition the dean through the department for approval of the course.

**Nontransferable Credit Hours.** Students desiring to transfer credit hours from engineering technology programs should note that such credit hours 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 in similar engineering courses. These courses may still not be equivalent to engineering courses because the areas of academic emphasis are 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.

c. The student may seek credit for the course by examination.

For more information on transfer of credit policies, see Transfer of College-Level Credit on page 12.

### **Work Experience**

It is the academic policy of the College of Engineering and Applied Science that 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.

A listing of undergraduate lower-division course equivalencies between the Colleges of Engineering and Applied Science at CU-Boulder, CU-Colorado Springs, and CU-Denver is found on page 295 of this catalog.

#### **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, electrical engineering and engineering with space operations. Students may also complete work for master of engineering and Ph.D. degrees through the systemwide Graduate School.

#### **University of Colorado at Denver**

The College of Engineering and Applied Science at the Denver campus of the University of Colorado offers bachelor's, master's, and doctoral degree programs. The

bachelor of science degree is offered in civil engineering, computer science and engineering, electrical engineering, mechanical engineering, and applied mathematics. Master of science degrees are offered in civil engineering, computer science, electrical engineering, and mechanical engineering. The master of engineering degree is also available. At the Denver campus, the Ph.D. degree is offered in civil engineering, and the Ph.D. degrees in electrical engineering and mechanical engineering are available through the systemwide Graduate School.

### **Registration**

To ensure the prompt completion of degree requirements, the undergraduate student is expected to register for, and complete each semester, a full-time course load as outlined in this catalog or approved departmental curriculum guide.

If a student elects to register for fewer than 12 credit hours in any semester, the student must declare in writing that he or she is a part-time student and secure approval of that semester's course schedule by a designated faculty advisor in the major department and by the college dean's office.

### **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 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 student may petition to enroll for equivalent study.

### **Grading System, Pass/Fail, and Drop/Add Procedures**

See Registration in the General Information chapter 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 *Registration Handbook and Schedule of Courses* and current *Student Guide to Success*.

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 students take a course for credit more than once, *all grades are used in determining their University of Colorado grade point average.* A final grade of F in a required course necessitates that the course be repeated and a satisfactory final grade attained. *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 contact the Office of the Registrar or the academic department that teaches the course.

## 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 from the college may be required for re-enrollment. 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 and staff from their respective major academic

department or program. The college also provides professional advising staff.

Advising information is available at the administrative offices of the College of Engineering, ECAD 100, telephone (303) 492-5071, or directly through the major departments.

Aerospace Engineering Sciences,  
ECOT 632, (303) 492-6417  
Applied Mathematics Program,  
ECOT 226, (303) 492-4668  
Chemical Engineering, ECCH 111,  
(303) 492-7471  
Civil, Environmental, and Architectural  
Engineering, ECOT 444,  
(303) 492-4193  
Computer Science, ECOT 725,  
(303) 492-7514  
Electrical Engineering, ECEE 1B55,  
(303) 492-7327  
Engineering Physics, Gamow E-032,  
(303) 492-6952  
Mechanical Engineering, ECME 134,  
(303) 492-7151  
Open Option, ECAD 100,  
(303) 492-5071

These sources of help are readily available to assist students with academic, vocational, or personal concerns. *Students are assigned departmental advisors for academic planning and should consult with the departmental chair or designated representative for assignment.* Additional advising information is contained in a series of advising guides available within the College of Engineering and Applied Science. Contact the appropriate academic department or the dean's office, ECAD 100, (303) 492-5071, about these advising guides.

## Four-Year Graduation

The College of Engineering and Applied Science at the University of Colorado at Boulder is committed to provide an undergraduate educational experience among the best offered by any comprehensive university in the country.

The College of Engineering and Applied Science offers 10 bachelor of science degree programs, each of which may be completed within eight full-time semesters. Many students elect to extend their studies at the University of Colorado beyond eight semesters to take advantage of research and employment opportunities, add minor programs, complete double-degree programs, and/or to pursue specialized plans of study.

For new freshmen who do not wish to extend their studies beyond eight semesters, the University of Colorado extends a guarantee that required or essential courses, or acceptable alternative courses, will be available so as to allow each student to complete all course work required for a bachelor of science degree from the College of

Engineering and Applied Science no later than the end of the eighth consecutive semester of full-time enrollment. In the event the University of Colorado is not successful in meeting the terms of this guarantee, the University will reimburse the student all tuition and course fees for those courses remaining to successfully complete the previously designated bachelor of science degree. This guarantee is subject to the conditions noted later in this document.

This guarantee is offered to all new freshmen who matriculate beginning with the fall semester 1996 or thereafter directly into the College of Engineering and Applied Science at the University of Colorado at Boulder.

To qualify for the guarantee, students must satisfy the following requirements:

- Enroll in CU-Boulder course work for eight consecutive fall and spring semesters. Because of the sequential nature of some courses, this enrollment must begin with the fall semester.
- Satisfactorily complete all prescribed course work directly applicable toward major degree requirements in accordance with the following schedule: at least 30 credit hours by the end of the first year (12 months), at least 62 credit hours by the end of the second year (24 months), at least 94 credit hours by the end of the third year (36 months), and at least 128 credit hours by the end of the fourth year (48 months).
- Follow the prescribed curriculum guide approved by the major department. Any deviations from this guide must be approved, in advance and in writing, by a faculty or staff advisor from the major department.
- Complete all minimum academic preparation standards (MAPS) deficiencies in mathematics, physics, chemistry, and foreign language no later than the beginning of the second semester of enrollment.
- Earn a grade point average of at least a 2.00 each semester and a 2.00 in all required and elective courses taken from the major department. The student must maintain a cumulative CU grade point average of at least 2.00. Also, each prerequisite course must be completed with a final grade of at least of C-
- Begin a recommended plan of study, toward the major in which the student will be graduating, no later than the start of the second semester of the freshman year.
- The student must schedule and meet with a departmental staff and/or faculty advisor at periods recommended by the major department. There must be at least



one documented conference between the student and approved departmental advisor each academic year, during which specific degree requirements are discussed. The student must also meet with a faculty or staff advisor whenever required to resolve academic problems, and to answer questions relating to course work and/or satisfactory academic progress.

- Register each semester within one week of the day and time assigned by the Office of the Registrar.
- Enroll only in courses approved by the designated major department faculty and/or staff advisor.
- Strictly adhere to the Admission and Enrollment Policies section beginning on page 292, and the Undergraduate Degree Requirements section beginning on page 297.
- Do not enroll in any courses or participate in any activities or employment having a time conflict with major degree course requirements.
- Notify the College of Engineering and Applied Science of your intent to graduate no later than the beginning of the seventh semester of enrollment.

The student is urged to maintain a personal academic file, documenting meetings with faculty and a staff advisors, copies of change of record forms, change of major forms, and any other documents that relate to the requirements of this guarantee.

## 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 they may have enrolled in courses that do not carry credit toward a degree.

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 GPA of 2.00 is required in these courses used to fulfill degree requirements. In addition, a separately computed GPA of 2.00 must be attained in those courses taken from 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.

3. Each degree program requires a minimum of 18 credit hours of approved course work in the humanities and social sciences. Humanities and social science electives must not be limited to a selection of unrelated introductory courses. At least 6 credit hours must be at an advanced level (3000 or above) and must include UWRP 3030, HUEN 3100 and HUEN 3200, or GEEN 3000. 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 are considered technical electives.

The dean's office will prepare a list of acceptable humanities or social science courses for student reference. This list is available in the dean's office (ECAD 100), departmental offices, with faculty and staff advisors, and under the College of Engineering and Applied Science home page at <http://www.colorado.edu/engineering>.

4. Students who graduated from high school in the spring of 1988 and thereafter must complete any minimum academic preparation standards (MAPS) deficiencies prior to graduation. Students should consult with a faculty advisor or the dean's office (ECAD 100) to determine any MAPS deficiencies and how to satisfy these deficiencies.

5. The college also requires the successful completion of an educational outcome measurement for graduation. This requirement is mandated and must be satisfied in addition to the prescribed academic curriculum. Students should contact their major department to determine which outcome measurement is required and when it must be taken.

## 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 the "Application for Diploma" form 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 appropriate 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 credit hours (see Graduate Study in Engineering on this page).

### Minors

The college offers a minor in applied mathematics and a minor in computer science. A student interested in these minor programs should contact the Applied Mathematics Program office, ECOT 226, (303) 492-4668, or the Computer Science Department, ECOT 725, (303) 492-7514.

### 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 credit 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 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.

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 chapter 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 GPA of at least 3.00. If the GPA 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 chapter 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 and computer engineering
- engineering management
- mechanical engineering
- telecommunications

The master of science in applied mathematics is offered through the program in Applied Mathematics in the College of Arts and Sciences. Please see page 69 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 290 and 316 of the College of Engineering and Applied Science chapter and on page 360 of the Graduate School chapter of this catalog.

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 astrodynamics, orbit determination, remote sensing, control systems, space structures, computing, fluid mechanics, spacecraft and space experiment design, and biological systems in space.

Key activities in chemical engineering include membrane and thin-film science, biochemical engineering and biotechnology, surface science, process control, enhanced oil recovery, materials engineering, environmental engineering, and cryogenics.

Fields emphasized in civil engineering include geotechnical engineering, structural mechanics and engineering, building systems engineering, construction management and engineering, and environmental and water-resource engineering.

Strengths in computer science include algorithm design, artificial intelligence, database design, numerical optimization,

operating systems, parallel processing, programming languages, software engineering, systems, and theoretical computer science.

Areas of focus in electrical and computer engineering include biomedical engineering, communications and digital signal processing, computers, control theory, energy conversion and systems, fields and propagation, information systems, materials and quantum electronics, optics and optoelectronics, remote sensing, and VLSI/design automation.

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, design and manufacturing, nondestructive structural evaluation, wave propagation and scattering, and fluid mechanics.

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 chapter of this catalog.

### Graduate Study for Practicing Engineers

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. CATECS courses are delivered from the Boulder campus via live instructional television with two-way audio or via videotape to business, government, and industry along the Front Range, across the country, and overseas.

Course sequences can lead to a master's degree with a concentration in computer

science, engineering management, telecommunications, and most engineering disciplines. Students receiving the televised courses live 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 that are mailed to those outside the signal range.

There is no limit on the number of CATECS courses applicable to the M.E. or M.S. degree, as long as the courses fulfill departmental degree requirements. However, any CATECS course taught outside the Boulder campus may not fulfill residency requirements. Courses taught on other campuses will be treated as transfer courses.

Students in industry may enroll in CATECS courses prior to acceptance in the Graduate School, but they must apply for the degree before finishing the third CATECS course. All applicable courses taken after admission will count toward the degree.

CATECS also provides ongoing access to over 100 courses taught in previous semesters through the Tape Library. Tape Library courses are primarily available for noncredit review of the material. For those who want to take a Tape Library course for credit, special permission must be received from the instructor.

The Tape Library 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 place or the University of Colorado at Boulder, CATECS, Campus Box 435, Boulder, CO, 80309-0435, call (303) 492-6331, or visit the home page at <http://www.colorado.edu/CATECS>.

### 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 chapter 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 may be 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 concerning the timing or requirement 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; dynamics and control; guidance and navigation; aerospace structures; materials; 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;

In addition, students completing the degree in aerospace engineering 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 that confront the engineering 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 experiments to meet scientific and societal goals;
- the skill to design air and space transportation systems to serve society's needs;
- the skills to manage aerospace projects;
- the ability to conduct laboratory experimental investigations necessary to validate aerospace system analysis and designs; 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 hours. 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 core course work. 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

GEEN 1400 Engineering Projects	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

APPM 1360 Calculus 2 for Engineers	4
PHYS 1110 General Physics 1	4
GEEN 1300 Introduction to Engineering Computing	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 2023 Thermodynamics	3
Humanities or social science elective	3

###### 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 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
Humanities or social science elective	3

###### Spring Semester

ASEN 3010 Aerospace Dynamics	3
ASEN 3021 Fluid Dynamics 2	3
ASEN 3022 Structures 2	3
ASEN 3024 Systems Analysis 2	3
ASEN 3028 Flight Mechanics	3
Design elective	3

##### Senior Year

###### Fall Semester

ASEN 4013 Foundations of Propulsion	3
ASEN 4018 Senior Design Lab 1	3
Computational elective	3
Capstone design elective	3
Technical elective	3

###### Spring Semester

ASEN 4028 Senior Design Lab 2	3
UWRP 3030 Writing on Science and Society (Note 1)	3
Design elective	3
Technical elective	6

### Curriculum Note

1. Also satisfies 3 semester hours of upper-division humanities or social science elective. May be waived by completing HUEN 3100 and HUEN 3200.

**Humanities and Social Science Electives**

For details on these requirements, a separate booklet titled *Guide to Humanities and Social Science Requirements* 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 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. NAVR 2020 is acceptable for 3 semester hours of humanities and social science elective credit.
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. Most 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 12 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**

For details on these requirements, a separate booklet titled *Choosing a Technical Elective* is available in the department office.

1. Any ASEN course at the 3000 level or 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, 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, CSCI, and physics courses. It is suggested that students secure advance approval for technical elective courses from their advisor.
3. Independent study or undergraduate research is acceptable for up to 3 credit hours of 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 design courses:

- ASEN 4098 System Engineering and Design
- ASEN 4138\* Aircraft Design
- ASEN 4148\* Spacecraft Design
- ASEN 4158\* Space Habitation
- ASEN 4218 Large Space Structures Design
- ASEN 4238 Computer-Aided Control System Design
- ASEN 4248 Computer-Aided Control System Design 2
- ASEN 4338 Structures Computer Laboratory
- ASEN 4418 Design of Aerospace Structural Components
- ASEN 5168 Experimental Space Science
- CVEN 4545 Steel Design
- MCEN 4025 Component Design
- MCEN 4045 Mechanical Engineering Design Project

Note: Capstone design courses, identified as (\*), must account for 3 of the 9 credit hours for the design elective requirement. 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. 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 aero-space 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/neurobioengineering (life support systems, neuromodeling, and biomanufacturing in space).

Aerospace-related research centers recently established in the college include the Colorado Center for Astrodynamics Research, the Center for Aerospace Structures, 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 (GRE) 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. Once students have selected a research area for the thesis, academic advising is done by their thesis advisor.

**Master of Science Degree****Plan I (Thesis Option)**

1. A total of 30 semester hours, at least 21 semester hours of which must be completed at the 5000 level or above, and 18 credits from ASEN. Note: The ASEN requirement exceeds the University requirement for total semester hours for the thesis option.
2. A minimum of 4 and a maximum of 6 thesis hours.
3. Completion of an M.S. thesis and oral examination based upon this thesis.
4. Completion of all degree requirements within four years of the date of commencing course work, but normally completed in one to two years.
5. Master's degree residence requirements can be met only by residence on the CU-Boulder campus for two semesters or three summer sessions.

**Plan II (Nonthesis Option)**

1. A total of 30 semester hours, at least 24 semester hours of which must be completed at the 5000 level or above, and 18 credits from ASEN.
2. Pass four ASEN core courses with a grade of B or better. Note: This meets the Graduate School requirement for a comprehensive examination.
3. Completion of all degree requirements within four years of the date of commencing course work, but normally completed in one to two years.
4. Master's degree residence requirements can be met only by residence on the CU-Boulder campus for two semesters or three summer sessions.

The M.S. comprehensive examination shall consist of passing four core disciplinary courses with a grade of B or better.

**Ph.D. Degree**

**Course Requirements.** A minimum of 36 semester credit hours of courses numbered 5000 or above (at least 18 of these must be in ASEN) 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 18 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 a written, open book examination in mathematics and aerospace engineering disciplinary core fields.

**Comprehensive Examination.** The degree program culminates in an oral examination before the student's committee of five or more graduate faculty members chosen by the student and approved by the department and 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 Department of Applied Mathematics in the College of Arts and Sciences offers a B.S. degree in applied mathematics through the College of Engineering and Applied Science. The B.S. degree is designed to prepare graduates for exciting and diverse professional careers, and for graduate study in a wide variety of disciplines. The department also offers an M.S. degree jointly with the mathematics department and a Ph.D. degree through the Graduate School.

Courses at the undergraduate level provide training in a broad range of mathematical techniques and problem-solving strategies. These courses teach the concepts and methods central to applications of linear algebra, ordinary and partial differential equations, numerical analysis, probability and statistics, complex variables, and nonlinear dynamics. Since applied mathematicians are often involved in interdisciplinary work, the B.S. degree requires an in-depth knowledge of some area of science or engineering where mathematics is used. This knowledge prepares graduates to successfully communicate and cooperate with engineers and scientists. The B.S. degree also requires knowledge of a programming language and skill in using the computer.

**Minor Program**

The department also offers a minor in applied mathematics that is available to engineering as well as to arts and sciences students. A minor in applied mathematics indicates that a student has received in-depth training mathematical techniques and computational methods well beyond the training usually received by science and engineering majors.

**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) with a minimum grade of C- in each course.
2. Computing experience (CSCI 1300 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 2360 Linear Algebra and 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 3000 Introduction to Analysis or MATH 4310 Introduction to Abstract Mathematics.

5. A two-semester course sequence of applied mathematics or mathematics courses numbered 4000 or above in addition to APPM 4350 (for example, APPM 4570 and 4580, APPM 4560 and 4520, APPM 4650 and 4660, or MATH 4310 and 4320).

6. A minimum of 24 credit hours in applied mathematics or mathematics courses numbered 3000 or above (including the required courses).

7. A minimum of 24 credit hours in engineering courses (or approved science courses in the College of Arts and Sciences) with at least 15 credit hours in courses numbered 2000 or above and at least 6 credit hours in courses numbered 3000 or above. These 24 credit hours are in addition to those required credit hours listed in numbers two and three (mentioned above). HUEN 3100, 3200, 4100, and GEEN 4200 may not be used to fulfill this requirement, although they may be used as social and humanistic electives. Several possible options are listed separately.

8. The general bachelor's degree requirements of the College of Engineering and Applied Science (18 credit hours of social and humanistic electives that include UWRP 3030, a writing course offered through the University Writing Program).

**Some Recommended Options for Applied Math Majors**

Aerospace Engineering Sciences Option  
Recommended courses (total of 21 credit hours):

*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 CHEM 1221 .....5  
 Recommended courses (total of 22 credit hours):

*In sophomore year:*

CHEM 2120 Material and Energy Balance ....3  
 CHEM 3200 Fluids .....3

*In junior year:*

CHEM 3210 Heat Transfer .....3  
 CHEM 3220 Mass Transfer .....4  
 CHEM 3320 Thermodynamics.....3  
 CHEM 4511 Physical Chemistry.....3

*In senior year:*

CHEM-4330 Reaction Kinetics.....3  
 Also recommended:  
 APPM 3570 Applied Probability and Statistics.....3

**Computer Science Option**

Recommended courses (total of 21 credit hours)  
 CSCI 1300 Introduction to Computing .....4  
 CSCI 2224 Discrete Structures .....3  
 CSCI 2270 Data Structures .....3  
 CSCI 3155 Programming Languages .....3  
 ECEN 2100 Logic Circuits.....4  
 ECEN 2220 Microcomputer Architecture and Programming .....4

Note: An additional 3000-level course is required.

**Electrical and Computer Engineering Option**

Recommended courses (total of 25 credit hours)  
 ECEN Digital 1\* .....5  
 ECEN Digital 2\* .....5  
 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  
 \*Course numbers not yet available

**Engineering Physics Option**

Recommended courses after first-year physics (18 or 19 credit hours)

*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 Applied Probability.....3  
 MATH 3140 Introduction to Modern Algebra.....3

**Mechanical Engineering Option**

Recommended courses (total of 25 credit hours):

*In sophomore year:*

PHYS 2130 General Physics 3 .....3  
 PHYS 2150 Experimental Modern Physics ....1  
 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 .....3

Also recommended:

APPM 3570 Applied Probability and Statistics .....3  
 MCEN 3024 Introduction to Material Science .....3  
 APPM 4570 Statistical Methods .....3

**Civil, Environmental, and Architectural Engineering Option**

Recommended basic courses (total of 15 credit hours):

AREN 2020 Energy Fundamentals .....3  
 CVEN 2121 Analytical Mechanics 1 .....3  
 CVEN 3161 Mechanics of Materials 1 .....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) AREN 2010 Introduction to Solar Utilization .....3  
 AREN 3010 Building Energy Analysis and Design .....3  
 AREN 3540 Illumination 1 .....3  
 b) CVEN 3414 Introduction to Environmental Engineering .....3  
 CVEN 4333 Applied Hydraulics .....3  
 c) CVEN 3525 Structural Engineering 1 .....3  
 CVEN 3708 Soil Mechanics .....3

**Actuarial Option**

- a) The following courses should be taken:  
 BCOR 2000 Accounting and Financial Analysis 1 .....3  
 BCOR 2100 Accounting and Financial Analysis 2 .....3  
 BCOR 3000 Business Law, Ethics, and Public Policy .....3  
 FNCE 3010 Corporate Finance .....3  
 ECON 3818 Introduction to Statistics with Computer Applications .....4  
 ECON 4818 Introduction to Econometrics .....3

- b) Some of the following courses should be taken:  
 ACCT 3220 Intermediate Financial Accounting 1 .....3  
 ACCT 3230 Intermediate Financial Accounting 2 .....3  
 FNCE 3020 Financial Markets and Institutions.....3  
 FNCE 4040 Derivative Securities .....3  
 ASEN 4054 Operating Research Models for Systems Engineering.....3

ASEN 4034 Stochastic Methods for Systems Engineering .....3  
 ECON 6828 Applied Time Series Analysis (Box-Jenkins) and Forecasting.....3

Other areas of academic focus are also possible. Please check with the Applied Mathematics office for more information.

## ARCHITECTURAL ENGINEERING

Architectural engineering has many elements in common with civil and mechanical 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 Architecture and Planning.

The overall goal of the department 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 architectural engineering that can be separated into the subdisciplines of building systems and energy conservation; construction engineering and management; and structural engineering. 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:

- basic principles of mathematics, physics, and chemistry;
- computer-aided engineering;
- manual and computer-aided drawing;
- surveying;
- building construction practices and materials;
- engineering mechanics;
- structural analysis and design;
- building electrical and mechanical systems;
- HVAC analysis and design;
- solar energy utilization;
- illumination;
- architectural appreciation and design; and
- professional practice and ethics.

## 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 1316 Introduction to Architectural Engineering.....	1
APPM 1350 Calculus 1 for Engineers .....	4
CHEM 1211 General Chemistry for Engineers .....	3
CHEN 1221 Engineering Chemistry Lab .....	2
GEEN 1300 Introduction to Engineering Computing .....	3
Humanities or social science elective .....	3

##### Spring Semester

APPM 1360 Calculus 2 for Engineers .....	4
AREN 1017 Engineering Drawing .....	2
AREN 2010 Introduction to Solar Utilization .....	3
CVEN 2012 Plane Surveying .....	3
PHYS 1110 General Physics 1 .....	4

#### Sophomore Year

##### Fall Semester

AREN 1027 Descriptive Geometry .....	2
AREN 3050 Environmental Systems for Buildings 1 .....	3
APPM 2350 Calculus 3 for Engineers .....	4
CVEN 2121 Analytical Mechanics 1 .....	3
PHYS 1120 General Physics 2 .....	4
PHYS 1140 Experimental Physics .....	1

##### Spring Semester

AREN 2020 Energy Fundamentals .....	3
APPM 2360 Introduction to Linear Algebra and Differential Equations .....	4
AREN 3060 Environmental Systems for Buildings 2 .....	3
AREN 3406 Introduction to Building Construction .....	3
CVEN 3161 Mechanics of Materials 1 .....	3

#### Junior Year

##### Fall Semester

AREN 3010 Mechanical Systems for Buildings .....	3
AREN 3540 Illumination 1 .....	3
CVEN 3246 Introduction to Construction .....	3
CVEN 3525 Structural Engineering 1 .....	3
UWRP 3030 Writing for Science and Society .....	3
Basic science elective .....	3

##### Spring Semester

AREN 4110 Heating, Ventilating, and Air Conditioning Design 1 .....	3
AREN 4550 Illumination 2 (Note 1) .....	3
CVEN 3535 Structural Engineering 2 .....	3
ECEN 3030 Electronics and Electric Circuits .....	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
AREN 4570 Building Electrical Systems Design 1 .....	3
Technical elective .....	3

##### Spring Semester

AREN 3130 Building Energy Laboratory or AREN 3140 Illumination Laboratory .....	3
ARCH 3214 History and Theories of Architecture 2 .....	3
CVEN 4039 Senior Seminar .....	1
Technical elective .....	3
Technical elective .....	2
Humanities or social science elective .....	3
Minimum hours for degree .....	128

#### Curriculum Notes

- 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 technical elective 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 3130 Building Energy Laboratory	
AREN 3140 Illumination Laboratory	
AREN 4010 Solar Design	
AREN 4315 Design of Masonry Structures	
AREN 4416 Estimating and Costs	
AREN 4466 Construction Planning and Scheduling	
AREN 4550 Illumination 2	
AREN 4560 Luminous Radiative Transfer	
AREN 4580 Daylighting	
CVEN 3313 Theoretical Fluid Mechanics	
CVEN 3323 Applied Fluid Mechanics	
CVEN 3708 Geotechnical Engineering 1	
CVEN 3718 Geotechnical Engineering 2	
CVEN 4161 Mechanics of Materials 2	
CVEN 4525 Matrix Structural Analysis	
CVEN 4545 Steel Design	
CVEN 4555 Reinforced Concrete Design	
CVEN 4565 Timber Design	
CVEN 4087 Engineering Contracts	
CVEN 4161 Mechanics of Materials 2	
CVEN 5010 HVAC System Controls 1	
CVEN 5020 Building Energy Measurements	

CVEN 5050 Advanced Solar Design	
CVEN 5060 Advanced Passive Solar Design	
CVEN 5070 Thermal Analysis of Buildings	
CVEN 5110 HVAC Design 1	
CVEN 5111 Introduction to Structural Dynamics*	
CVEN 5161 Advanced Mechanics of Materials* 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 in school. 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 Energy Controls Systems	
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 Systems Design 1	
CVEN 5111 Introduction to Structural Dynamics	
CVEN 5161 Advanced Mechanics of Materials	
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

## 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 convert 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; and
- communicate effectively 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; they design, build, operate, and manage chemical processes and plants; and they supply petroleum products, plastics, detergents, agricultural chemicals, pharmaceuticals, biological compounds,

photographic materials, microelectronic 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, computers, physics, and often biology and biochemistry. Students must learn to apply these fundamentals in the process industries. Paralleling the technical courses are studies in the humanities and the social sciences. Chemical engineering also offers environmental, computer, and materials options.

There is a natural affinity between chemical engineering, biotechnology, and medicine, and the department offers a pre-medicine and bioengineering option.

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 part of their studies in another country (see the Office of International Education in this catalog), and are encouraged to consider this opportunity, given the international nature of most large chemical and 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 options requires careful planning and course selection by student and advisor.

**Premedicine and Bioengineering 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 to 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 this option are: CHEN 3700 Bioenergetics: Structure and Function, CHEN 4800 Bioprocess Engineering, and CHEN 4820 Biochemical Separations. In addition, biotechnology students are required to complete two semesters of general biology and one semester of biochemistry.

The department also offers graduate biotechnology research programs at both the M.S. and Ph.D. levels. These programs are oriented toward specialization in various aspects of biochemical engineering, biotechnology, and sensory physiology.

**Environmental Option.** Chemical engineers can make major contributions in the fields of pollution prevention and 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.

The courses taken by students following this option include electives in environmental science and engineering. A capstone course in environmental engineering processes or environmental separations is taken in the senior year.

**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 computer architecture and interfacing; machine, assembly, and high-level language programming; 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 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.

**Senior Thesis Option.** The department offers this program for undergraduates with a strong interest in research. The student carries out a year-long project under the direction of a faculty member in lieu of taking CHEN 4130 Chemical Engineering Laboratory 2. Students must apply at the end of their junior year.

## 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
CHEM 1221 General Chemistry Laboratory for Engineers.....	2
GEEN 1300 Introduction to Engineering Computing (Note 1).....	3
Humanities or social science elective (Note 3).....	3

## Spring Semester

APPM 1360 Calculus 2 for Engineers.....	4
CHEM 1300 Introduction to Chemical Engineering (Note 1).....	1
PHYS 1110 General Physics 1.....	4
Humanities or social science elective (Note 2).....	3
Elective (Note 4).....	3

## Sophomore Year

## Fall Semester

APPM 2350 Calculus 3 for Engineers.....	4
CHEM 3311 Organic Chemistry 1.....	3
CHEM 3321 Laboratory in Organic Chemistry.....	1
CHEM 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
CHEM 3331 Organic Chemistry 2.....	3
CHEM 3341 Laboratory in Organic Chemistry 2.....	1
CHEM 3200 Chemical Engineering Principles 1 (Note 1).....	3
Elective (Note 4).....	3
Humanities or social science elective (Note 2).....	3

## Junior Year

## Fall Semester

CHEM 4511 Physical Chemistry 1.....	3
CHEM 3210 Chemical Engineering Principles 2 (Note 1).....	4
CHEM 3010 Applied Data Analysis (Note 1).....	3
UWRP 3030 Writing on Science and Society.....	3
Elective (Note 4).....	3

## Spring Semester

CHEM 4541 Physical Chemistry Lab.....	2
CHEM 3130 Chemical Engineering Laboratory 1 (Note 1).....	2
CHEM 3220 Chemical Engineering Principles 3 (Note 1).....	4
CHEM 3320 Chemical Engineering Thermodynamics (Note 1).....	3
Chemistry elective (Note 3).....	3
Humanities or social science elective (Note 2).....	3

## Senior Year

## Fall Semester

CHEM 4130 Chemical Engineering Laboratory 2 (Note 1).....	2
CHEM 4330 Chemical Engineering Reaction Kinetics (Note 1).....	3
CHEM 4440 Chemical Engineering Materials (Note 1).....	3
CHEM 4580 Numerical Methods for Process Simulation (Note 1).....	3
Elective (Note 4).....	4

## Spring Semester

CHEM 4520 Chemical Process Synthesis (Note 1).....	4
CHEM 4570 Instrumentation and Process Control (Note 1).....	4
Humanities or social science elective (Note 2).....	3
Elective (Note 4).....	3
Elective (Note 4).....	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 and the current *ChE Help Guide*.
3. Students should consult the current *ChE Help Guide* about chemistry electives.
4. Electives must meet specific requirements. At least one 3-credit-hour elective must be in engineering, outside of chemical engineering. See the current *ChE Help Guide*.

## Graduate Degree Programs

Major areas of current research interest in the chemical engineering department are bioengineering and biotechnology, colloid science, environmental engineering, heterogeneous catalysis and kinetics, fluid dynamics, low gravity science, mass transfer, materials engineering, statistical mechanics, membrane and polymer science, phase equilibria, process control and optimization, separations, 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. This total is reduced to 24 semester hours for students whose undergraduate degrees are not in chemical engineering. Maximum credit of 6 semester hours will be allowed for the completion of the master's thesis. Fifteen of the remaining semester hours must be chemical engineering courses at the 5000 level or above. A nonthesis master's degree is available and requires completion of 33 semester hours of course work.

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.

Four of the following core courses must be taken for the M.S. degree:

CHEM 5210 Transport Phenomena
CHEM 5220 Mass Transport
CHEM 5370 Intermediate Chemical Engineering Thermodynamics
CHEM 5390 Chemical Reactor Engineering
CHEM 5740 Analytical Methods in Chemical Engineering

A degree plan must be prepared at the beginning of the academic program in consultation with an advisory committee. The student is urged to maintain close contact with this advisory committee during the entire course of study.

The M.S. thesis committee must consist of three members, including at least 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 GPA 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.

### *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 GPA 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 chapter. A minimum of 33 semester hours of courses numbered 5000 or above is required for the degree, including those applied toward an M.S. degree. These must include at least 24 semester hours of chemical courses, including all five core courses listed previously.

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 outside 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 chapter 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 and environmental 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; 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, structural or foundation 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 the 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.)*

The civil engineering program has been separated into two tracks, general civil engineering and environmental/water resources. The first four semesters are common to both tracks.

#### *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
CVEN 1317 Introduction to Civil and Environmental Engineering .....	1
GEEN 1300 Introduction to Engineering Computing .....	3
Humanities or social science elective .....	3

##### *Spring Semester*

APPM 1360 Calculus 2 for Engineers .....	4
CVEN 2012 Plane Surveying .....	3
CVEN 3698 Engineering Geology .....	3
PHYS 1110 General Physics 1 .....	4
Humanities or social science elective .....	3

#### **Sophomore Year**

##### *Fall Semester*

APPM 2350 Calculus 3 for Engineers .....	4
AREN 1017 Engineering Drawing .....	2
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
AREN 2020 Energy Fundamentals .....	3
CVEN 3161 Mechanics of Materials 1 .....	3
CVEN 3313 Theoretical Fluid Mechanics .....	3
Humanities or social science elective .....	3

### *Curriculum for B.S. (C.E.) General Civil Engineering*

#### **Junior Year**

##### *Fall Semester*

CVEN 3227 Probability, Statistics, and Decision for Engineers .....	3
CVEN 3323 Applied Fluid Mechanics .....	3
CVEN 3414 Introduction to Environmental Engineering .....	3
CVEN 3525 Structural Engineering 1 .....	3
CVEN 3708 Geotechnical Engineering 1 .....	3

##### *Spring Semester*

AREN 3406 Building Construction .....	3
CVEN 4161 Mechanics of Materials 2 .....	3
CVEN 3535 Structural Engineering 2 .....	3
CVEN 3718 Geotechnical Engineering 2 .....	3
UWRP 3030 Writing on Science and Society .....	3

#### **Senior Year**

##### *Fall Semester*

CVEN 3111 Analytical Mechanics 2 .....	3
CVEN 3246 Introduction to Construction .....	3
CVEN 3602 Transportation Engineering .....	3
ECEN 3030 Electronics and Electric Circuits .....	3
Technical elective (Note 1) .....	4

*Spring Semester*

CVEN 4039 Senior Seminar.....	1
Capstone course (Note 2) or technical elective.....	3
Technical electives (Note 1).....	9
Humanities or social science elective (3000- level or above).....	3
Minimum hours for degree.....	128

**Curriculum for B.S. (C.E.)  
Environmental Option***Junior Year**Fall Semester*

CHEN 2120 Chemical Engineering Material and Energy Balance.....	3
CVEN 3323 Applied Fluid Mechanics.....	3
CVEN 3414 Introduction to Environmental Engineering.....	3
CVEN 3525 Structural Engineering I.....	3
CVEN 3708 Geotechnical Engineering I.....	3

*Spring Semester*

CHEM 3311 Organic Chemistry.....	3
CVEN 3227 Probability, Statistics, and Deci- sion for Engineers.....	3
CVEN 3424 Water and Wastewater Treatment.....	3
CVEN 4147 Engineering Economy and System Design.....	3
UWRP 3030 Writing on Science and Society.....	3

*Senior Year**Fall Semester*

CVEN 3246 Introduction to Construction.....	3
CVEN 3454 Water Quality.....	4
CVEN 4434 Environmental Engineering Design.....	3
CVEN 4511 Physical Chemistry or CVEN 4353 Groundwater Engineering.....	3
Technical elective.....	3

*Spring Semester*

CVEN 4039 Senior Seminar.....	1
CVEN 4333 Engineering Hydrology.....	3
CVEN 4423 Water Resources Engineering Design.....	3
CVEN 4474 Hazardous and Industrial Waste Management.....	3
Technical electives (Note 1).....	3
Humanities or social science elective (3000- level or above).....	3
Minimum hours for degree.....	128

**Curriculum Notes**

1. Not more than 6 hours of technical electives may be taken outside the department, and then only for defensible reasons.
2. The capstone course requirement may be satisfied by CVEN 4423, 4545, 4555, or 4728 and may be taken in fall or spring, since each of these courses will normally be offered only once per academic year.

**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 in school. 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 master of science, master of engineering, and doctor of philosophy degrees with study emphasis in seven major areas: building energy systems, construction engineering and management, environmental engineering, geotechnical engineering, geoenvironmental, 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 credit hours of course work are required.

**Master of Engineering Degree**

Requirements for this professionally oriented degree are available from the Office of the Dean, 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 40 Sun workstations, and the new M.Y. Leung Computational Laboratory for Soils and Structures. 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 multi-axial 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.

The Center for Advanced Decision Support for Water and Environmental Systems (CADSWES) is an interdisciplinary center of excellence, housed within the Department of Civil, Environmental, and Architectural Engineering. CADSWES focuses on applying advanced computing techniques to provide decision makers with decision support systems (DSSs) to help them more effectively manage water and environmental systems.

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. A minor in computer science is available as well. 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.

Additional information about the department's programs is available on the World Wide Web at <http://www.cs.colorado.edu/> or by contacting the department at (303) 492-7514.

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 ranging from circuits and computer architecture, operating systems, programming languages, algorithms, and large application systems;
- an understanding of the interdependence of hardware and software;
- 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, database systems, parallel processing, and computer networks.

It is also vital for the socially responsible computer professional to have a broad background in the liberal arts. Consequently, students are encouraged to pursue interests in nontechnical, as well as technical, areas outside of computer science. Twenty-four hours of courses in the humanities and social sciences are required. 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 and interests of individual students (e.g., transfer students, open option students, and students interested in the junior year abroad). 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 on the degree program.

### Curriculum for B.S. (Comp. Sci.)

#### Semester Hours

#### Freshman Year

##### Fall Semester

CSCI 1300 Introduction to Computing for Majors .....	4
APPM 1350 Calculus 1 for Engineers Science .....	4
Humanities or social science elective .....	5
Humanities or social science elective .....	3

##### Spring Semester

CSCI 2270 Data Structures .....	4
APPM 1360 Calculus 2 for Engineers Science .....	4
Humanities or social science elective .....	4
Humanities or social science elective .....	3

#### Sophomore Year

##### Fall Semester

CSCI 3308 Software Engineering Methods .....	3
APPM 2350 Calculus 3 for Engineers .....	4
ECEN 2830 Digital 1 .....	5
Humanities or social science elective .....	3
Free elective .....	3

##### Spring Semester

CSCI 3104 Algorithms .....	3
ECEN 3003 Digital 2 .....	5
MATH 3130 Linear Algebra .....	3
Humanities or social science elective .....	3
Free elective .....	3

#### Junior Year

##### Fall Semester

CSCI 3155 Principles of Programming Languages .....	4
CSCI 3656 Numerical Computation .....	3
Science .....	3
Humanities or social science elective .....	3
Free elective .....	3

##### Spring Semester

CSCI 3434 Computer Science Theory .....	3
CSCI 3753 Systems .....	4

ECEN 4593 Computer Organization .....	3
UWRP 3030 Writing on Science and Society .....	3
Science .....	3

#### Senior Year

##### Fall Semester

CSCI 4308 Software Engineering Project 1 .....	4
Computer science elective .....	3
Statistics .....	3
Science .....	3
Humanities or social science elective .....	3

##### Spring Semester

CSCI 4318 Software Engineering Project 2 .....	4
Computer science elective .....	3
Upper-division humanities or social science elective .....	3
Free electives .....	6
Total credit hours .....	128

### 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., methods by which algorithms are implemented on a computer, techniques for using computers accurately and efficiently, design of computer systems, and languages and interfaces. 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 at the upper-division level, and a number of academic computer science courses.

Applicants should satisfy the following requirements for mathematics courses: at least three semesters of mathematics at the level of sophistication of calculus or above, courses such as: differential equations, linear algebra, probability, statistics, and abstract algebra. These courses need not be in a mathematics department; however, they should require mathematical maturity expected of a junior or senior mathematics undergraduate.

In computer science, applicants should have the equivalent of the following University of Colorado courses: CSCI 1200 and 1210 Introduction to Programming; ECEN 2830 Computers as Components; one course out of CSCI 3155 Programming Languages or CSCI 3753 Operating

Systems; two courses out of CSCI 2270 Data Structures, CSCI 3104 Algorithms or CSCI 3434 Theory of Computation; and one other upper-division computer science course. Upper-division courses in areas such as artificial intelligence, databases, numerical computation, operating systems, parallel processing, software engineering, 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 admitted students lacking their equivalent will usually be required to make them up, without graduate credit (or alternatively take their graduate level equivalents). 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 listed above are sometimes considered for admission as provisional 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 ensure 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 from the aptitude portion of the Graduate Record Examination (GRE). 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. GRE scores are optional for M.S. applicants but are required if the undergraduate GPA is less than 3.00 (but above a 2.75). These scores are encouraged if previous study was 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. 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.

Applications for international students

should be received by the Office of Admissions by December 1 for fall admission and by September 15 for spring 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. Students in plan II must pass the master's comprehensive exam. 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 three 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 from 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, 155 Mbit/sec links to NCAR and beyond (either the commercial MCINET DS3, or the Ubns OC3). High-speed modem dial-up access to this network is available. In addition, departmental instruction is based on a network of workstations and servers described below. These machines, together with associated peripherals, laser printers, and x-terminals, provide ready access for graduate students and faculty.

#### Faculty and Graduate Student General Use Workstations

SUN Workstations	Sun4s, SPARCstation 1, 2, 5, 10, 20 ultras
DEC Workstations	Alpha AXP's, DECstations, Alpha Servers
Hewlett Packard Workstations	9000/300s, 9000/700s
SGI Workstations	Indigos, Extrêmes, Indys
NeXT Workstations	NeXTCubes, NeXTstations
Solbourne Workstations	S4000, S4/500
NCD Xterminals	

#### CPU, File, and Network Servers

Sun 4 Servers	4/2x0s, 4/3x0s, 4/670MP
Network Appliances	12GB 4 ethernet file server

#### Artificial Intelligence

HP workstations	AI instruction and research
Macintosh workstations	AI research

#### Parallel Computation Research

Solbourne 5/603	(3 processors)
Convex C3220	(2 processors)
Intel Hypercubes	(16 & 32 processors)
CMS Connection Machine	(32K processors)
<i>in cooperation with the National Center for Atmospheric Research (NCAR)</i>	
INTEL Paragon	(208 processors)
<i>in cooperation with the National Oceanographic and Atmospheric Administration (NOAA)</i>	

#### Central Services (Computing Center)

DECstation 5000/250 (rinitinun)	
Alpha AXP (ucsu)	General CU student system
PC, Macintosh, and terminal labs	Instruction and access

### *Undergraduate Labs*

Undergraduate computer science majors and students taking upper-level computer science classes have access to UNIX workstations in the department's undergraduate lab. The lab contains a total of about 80 workstations of various kinds. All support the X-windows system and are on the Internet. An adjacent lab, the High Performance Scientific Computing Lab (HPSC), containing color workstations, also supports CS undergraduate classes. The HPSC lab will become the Simulation Lab in the new Integrated Teaching and Learning Laboratory (ITLL).

A partial list of facilities in CS undergraduate laboratories follows:

HP workstations  
DEC MIPS workstations  
IBM RS-6000 workstations  
HP X-Terminals  
NCD X-Terminals  
IBM X-Terminals  
PCs running UNIX

### *Alumni Services*

MIPS m/1000 CSEN Alumni  
For on-line information, see: <http://www.cs.colorado.edu>.

## **ELECTRICAL AND COMPUTER ENGINEERING**

The electrical engineering curriculum is under extensive revision at this time. The information herein will 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 and on the World Wide Web at <http://ece-www.colorado.edu>.

### **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 communication 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  
biomedical engineering  
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, computer engineering students take additional courses in software and hardware. 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.

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, control systems,

electromagnetics, electronics, materials, optics, power, 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, may be elected at any time 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 undertake independent study 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)**

The electrical engineering curriculum is under major revision at this time. Because these revisions result in substantial change in course formats, it is necessary to use intermediate, temporary course numbers as follows:

Old No.	Hrs.	Temporary No.	Hrs.
ECEN 2150	4	ECEN 2050	5
ECEN 2550	1		
ECEN 2160	4	ECEN 2060	5
ECEN 2560	1		

ECEN 2220	3	ECEN 2830	5
ECEN 2230	1		
ECEN 2100	3	ECEN 3003	5
ECEN 2110	1		
ECEN 3130	3	ECEN 3004	5
ECEN 3310	3	ECEN 3002	5

The information herein will be superseded by the time this catalog is printed and distributed. Up-to-date policies are contained in the department's *HELP! Guide*.

*Semester Hours*

**Freshman Year**

*Fall Semester*

APPM 1350 Calculus 1 for Engineers	4
CSCI 1300 Introduction to Computing	4
PHYS 1110 General Physics	4
Humanities or social science elective (Note 1)	3

*Spring Semester*

APPM 1360 Calculus 2 for Engineers	4
CHEM 1211 General Chemistry for Engineers	3
CHEM 1221 General Chemistry Lab for Engineers	2
Freshman elective (Note 2)	3-4
Humanities or social science elective	3

**Sophomore Year**

*Fall Semester*

APPM 2360 Introduction to Linear Algebra and Differential Equations	4
ECEN 2050 Circuits/Electronics 1 (formerly 2150/2550)	5
PHYS 1120 Physics 2	4
PHYS 1140 Experimental Physics Lab	1
Humanities or social science elective	3

*Spring Semester*

APPM 2350 Calculus 3 for Engineers	4
ECEN 2830 Digital 1 (formerly 2220/2230)	5
ECEN 2060 Circuits/Electronics 2 (formerly 2160/2560)	5
PHYS 2130 Modern Physics	3

**Junior Year**

*Fall Semester*

ECEN 3004 Electromagnetic Fields and Waves (formerly 3130)	5
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

*Spring Semester*

ECEN 3003 Digital 2 (formerly 2100/2110)	5
ECEN 3002 Linear Systems (formerly 3310)	5
ECEN elective (Note 3)	3
Humanities or social science elective	3

**Senior Year**

*Fall Semester*

ECEN elective	3
Engineering science (Note 4)	3
Humanities or social science elective	3
Two senior-level ECEN theory courses	6
Senior-level ECEN laboratory course	2-3

*Spring Semester*

Senior-level ECEN theory course	3
Two senior-level ECEN laboratory courses	4-5
Humanities or social science electives	3
Technical electives	2-5

**Curriculum for B.S. (ECE)**

**Junior Year**

Freshman and sophomore years are the same as for B.S. (EE).

*Fall Semester*

ECEN 3003 Digital 2 (formerly 2100/2110)	5
ECEN 3004 Electromagnetic Fields and Waves (formerly 3130)	5
ECEN 3810 Introduction to Probability Theory	3
UWRP 3030 Writing on Science and Society	3

*Spring Semester*

CSCI 2270 Data Structures and Algorithms	4
ECEN 3002 Linear Systems (formerly 3310)	5
ECEN 3230 Circuits/Electronics 3	4
ECEN 3530 Circuits/Electronics Lab 3	1
Humanities or social science elective	3

**Senior Year**

*Fall Semester*

ECEN 4703 Switching and Finite Automata	3
ECEN 4593 Computer Organization	3
Engineering science elective (Note 4)	3
Humanities or social science elective	3
Software elective (Note 6)	3

*Spring Semester*

CSCI 3155 Principles of Programming Languages	4
ECEN 4573 Microprocessor Lab or ECEN 4603 Computer Lab	2
Senior-level ECEN theory course	3
Senior-level ECEN laboratory	2-3
Humanities or social science elective	3
Technical electives (Note 5)	0-2
Minimum total hours for degree	128

**Curriculum Notes**

- Humanities or social science elective courses must be selected from a list of approved courses available from the engineering dean's office. Of the 21 hours of required humanities or social science courses, at least 6 credit hours must be at the upper-division level (3000 or 4000 level).
- The freshman elective is chosen from ECEN 1400 Methods and Problems in ECE, EPOB 1210 and 1230 General Biology with Laboratory 1, GEEN 1400 Freshman Projects, or the introductory course from any other engineering department.

3. ECEN electives for the EE degree include a minimum of two of the following three courses: ECEN 3140 Electromagnetic Waves and Transmission, ECEN 3170 Energy Conversion 1, and ECEN 3320 Semiconductor Devices.
4. The engineering science course should be selected from ECEN 3120 Statistical Thermodynamics, ASEN 2023 Thermodynamics, MCEN 2022 Engineering Thermodynamics 1, or PHYS 3210 Analytical Mechanics.
5. 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.
6. 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; 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 and computer engineering include the design of computer interfaces and computer software; electromagnetic fields and optics, which are basic to radio, television, and related systems; communication theory and signal processing; electrical machinery; solid-state, integrated-circuit, and electron devices; energy and power; electronics; control systems; and others.

### Graduate Degree Programs

Electrical and computer engineering graduate programs leading to M.E., M.S., and Ph.D. degrees include the areas of atmospheric remote sensing; biomedical engineering; communications and digital signal processing; computer languages and logic circuits; control theory and robotics; electromechanical energy conversion and power systems; fields and propagation; information systems; microwave optics;

optoelectronics; materials, devices, and systems; and VLSI/design automation. 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 adjunct 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 3.35 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 University of Colorado at Boulder, Director of Graduate Admissions, Department of Electrical and Computer Engineering, Campus Box 425, 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 credit hours 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. The M.E. program is discussed in the College of Engineering and Applied Science general section on graduate study.

All students accepted into the Ph.D. program must take the Ph.D. preliminary examination the first time it is offered (usually in January). The exam will include their designated area of specialization. For further information, contact the ECE Graduate Office.

### 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; an advanced optical metrology lab; 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 40 HP 9000/300, 400, and 700-series machines. These machines are connected to the campuswide Ethernet network. There are numerous Apple Macintoshes and IBM-compatible PCs.

Up-to-the-minute information on all department programs, as well as more detailed descriptions of departmental activities, may be found at the World Wide Web internet address <http://ece-www.colorado.edu>.

## 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 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 complete the curriculum below. In addition,

they must meet the general undergraduate degree requirements of the College of Engineering and Applied Science. Specifically included in the general requirements is the achievement of a GPA of at least 2.00 in the student's physics courses.

### Curriculum for B.S. (E. Phys.)

#### Semester Hours

#### Freshman Year

##### Fall Semester

APPM 1350 Calculus 1 for Engineers	4
AREN 1017 Engineering Drawing (Note 1)	2
PHYS 1110 General Physics 1	4
Humanities or social science electives (Note 2)	6

##### Spring Semester

APPM 1360 Calculus 2 for Engineers	4
CSCI 1300 Introduction to Computing	4
PHYS 1120 General Physics 2	4
PHYS 1140 Experimental Physics	1
Humanities or social science elective (Note 2)	3

#### Sophomore Year

##### Fall Semester

APPM 2350 Calculus 3 for Engineers	4
CHEM 1211 and CHEN 1221 General Chemistry for Engineers and Lab (Note 5)	5
PHYS 2140 Methods of Theoretical Physics	3
Elective	3

##### Spring Semester

APPM 2360 Introduction to Linear Algebra and Differential Equations (Note 6)	4
PHYS 2150 Experimental Physics	1
PHYS 2170 Modern Physics	3
Humanities or social science elective (Note 2)	3
Engineering elective (Note 3)	4

#### Junior Year

##### Fall Semester

CHEM 4511 Physical Chemistry 1 (Note 7)	3
PHYS 3210 Analytical Mechanics	3
PHYS 3310 Principles of Electricity and Magnetism 1	3
PHYS 3330 Junior Laboratory	2
Upper-division mathematics elective (Note 6)	3
Engineering elective (Note 3)	3

##### Spring Semester

CHEM 4541 Physical Chemistry Lab (Note 7)	2
PHYS 3220 Quantum Mechanics	3
PHYS 3320 Principles of Electricity and Magnetism 2	3
PHYS 4230 Thermodynamics and Statistical Mechanics	3
Engineering elective (Note 3)	3

#### Senior Year

##### Fall Semester

PHYS 4410 Atomic and Nuclear Physics 1	3
Physics elective (Note 4)	3
Electives (Note 3)	8
Humanities or social science elective (Note 2)	3

#### Spring Semester

Engineering electives (Note 3)	10-12
Physics electives (Note 4)	3-5
Humanities or social science elective (Note 2)	3
Minimum total hours for the degree	128

Approved ROTC courses may be substituted for a maximum of 6 hours of electives.

#### Curriculum Notes

1. GEEN 1300 Introduction to Engineering Computing or another computer science course or MCEN 1025 may be substituted for either AREN 1017 or CSCI 1300.
2. A total of 18 semester hours of humanities or social science courses is required. At least 6 of these semester hours must be at or above the 3000 level and must include 3 hours of an upper-division expository writing course. The remaining courses are to be chosen from the College of Engineering and Applied Science list of approved humanities and social science courses.
3. Engineering electives, 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. Physics electives (9 hours minimum of which 3 hours must be lab or experiment) from the following list: PHYS 3340 (lab), 4150, 4300, 4340, 4420, 4430 (lab), 4450, 4510, 4610-4630, 4810-4830, 4840-4860, 4970, 5010, 5030, 5040, and 5770.
5. CHEM 1111 General Chemistry 1 may replace CHEM 1211-1221.
6. 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.
7. CHEM 1131 General Chemistry 2 may replace CHEM 4511-4541.

## MECHANICAL ENGINEERING

### Bachelor's Degree Requirements

The undergraduate curriculum in mechanical engineering incorporates engineering science, physical science, mathematics, and the humanities and social sciences. The engineering science component provides basic theoretical and practical concepts in solid mechanics, materials, thermodynamics, fluid mechanics, design, and manufacturing. Required courses in engineering science, physical science, and mathematics are interwoven throughout the curriculum to provide a balanced education in the fundamentals of the profession and comprise three-fourths of the

minimum curriculum requirement of 129 semester hours; they are complemented by six technical electives, six electives in the humanities and social sciences, and a free elective.

To meet the needs of a diverse student population with varied professional objectives, the department provides two basic plans for obtaining the bachelor of science in mechanical engineering degree. In the first plan, the required course curriculum is augmented with 18 semester hours of technical electives selected to provide a broad background in mechanical engineering. The second plan is designed for the student with more specific career plans in which technical electives are utilized for in-depth study in a specific technical area or track. In addition to in-depth study in the six basic engineering science areas previously cited, opportunities exist for concentration in interdisciplinary areas such as environmental, biomedical, and systems engineering.

### Curriculum for B.S. (M.E.)

The following constituted a representative course schedule for freshmen entering the program in the fall of 1996.

#### 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	3
Humanities or social science elective	3

##### Spring Semester

APPM 1360 Calculus 2 for Engineers	4
MCEN 1000 Introduction to Mechanical Engineering	3
MCEN 1025 Computer-Aided Drawing and Fabrication	3
PHYS 1110 General Physics 1	4
Humanities or social science elective	3

#### Sophomore Year

##### Fall Semester

APPM 2350 Calculus 3 for Engineers	4
MCEN 2023 Mechanics of Particles	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
MCEN 2022 Engineering Thermodynamics 1	3
MCEN 2043 Mechanics of Rigid Bodies	3
PHYS 2130 General Physics 3	3
Humanities or social science elective	3



**Junior Year***Fall Semester*

ECEN 3030 Electronics and Electric Circuits .....	3
ECEN 3430 Electronics/Circuits Laboratory for Nonmajors .....	1
MCEN 3024 Introduction to Materials Science .....	3
MCEN 3020 Mathematical Methods .....	3
MCEN 3021 Fluid Mechanics .....	3
UWRP 3030 Writing on Science and Society .....	3

*Spring Semester*

MCEN 3022 Heat Transfer .....	3
MCEN 3023 Mechanics of Deformable Bodies .....	3
MCEN 3027 Measurements Laboratory .....	3
MCEN 3030 Computational Methods .....	3
Humanities or social science elective .....	3
Technical elective .....	3

**Senior Year***Fall Semester*

MCEN 3026 Control Systems .....	3
MCEN 4025 Component Design .....	3
MCEN 4026 Manufacturing Processes and Systems .....	4
Technical electives .....	6

*Spring Semester*

MCEN 4045 Mechanical Design Project .....	3
MCEN 4027 Mechanical Engineering Laboratory .....	3
Technical electives .....	9
Minimum total hours for degree .....	129

**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 nondestructive 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 Advanced Manufacturing and Packaging for Microwave, Optical, and Digital Electronics is a new NSF-Industry-University Cooperative research center funded by NSF and a consortium of contributing companies to support path-finding research and educational programs on the manufacturing and packaging of integrated microwave, optical, and digital electronic systems. The focus of effort is in electrical and mechanical modeling, thermal management, fabrication and assembly, functional design and analysis, run-to-run and real-time process control, test and measurement, and reliability and cost prediction.

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 should 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 preliminary examination. As a part of this evaluation, students must do well in a number of

required courses and pass an oral examination based on the project selected in the research course. The examination will be given by a committee of at least four faculty members. Overall performance in the required course work and oral examination will determine pass/fail status. The oral 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 chapter 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 chapter 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 *Registration Handbook and Schedule of Courses* issued for registration 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 1000-1. Introduction to Aerospace Engineering Sciences.** Students are introduced to aerospace history, curriculum, and the many areas of emphasis within aerospace engineering. Field trips to industry will be arranged. Students present an oral presentation and/or papers on various aerospace topics.

**ASEN 1020-2. Introduction to Space Science.** Introduces space science, including Earth, moon, and 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 aerospace engineering.

**ASEN 2010-3. Mechanics 1. Elements of vector algebra and fundamental principles of mechanics.** Vector methods and free-body diagrams are developed for two- and three-dimensional systems. Applications to structures and composite bodies in equilibrium. Prereqs., APPM 1360 and PHYS 1110.

**ASEN 2020-3. Mechanics 2. Kinematics and kinetics of particles, particle systems, and rigid bodies.** Introduction to vibrating mechanical systems. Prereqs., APPM 2350 and ASEN 2010.

**ASEN 3010-3. Aerospace Dynamics.** Applies 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. Prereqs., 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 4050-3. Space Exploration.** Describes the basic physics of the Earth's upper atmosphere, ionosphere, and magnetosphere and how the Sun influences this space environment. Describes the Galileo mission to Jupiter and the Cassini mission to Saturn including the gravity-assist trajectories and the Jupiter and Saturn space environments. Prereq., ASEN 4010.

**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 5090-3. Introduction to the Global Positioning System.** Describes Global Positioning System (GPS) as an important tool for navigation, science, and engineering; its significant error sources; and state-of-the-art modeling techniques. Programming experience required. Prereq., graduate standing or instructor consent.

**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 5190-3. Global Positioning System Technology.** Laboratory introduction to the technology used in Global Positioning System. Lab exercises include using GPS receivers, designing simple circuits to generate GPS-like signals, analyzing spread spectrum signals, constructing GPS antennas, and evaluating errors in basic GPS measurements.

**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 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 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. Prereqs., ASEN 3011 and ASEN 2023.

**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, conformal 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., graduate 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 5151-3. High Speed Aerodynamics.** Provides aerodynamic theory applicable to the high speed flight of subsonic, transonic, and supersonic aircraft, and hypersonic vehicles. Topics include linear theory of subsonic and supersonic speeds, the nonlinear theories of transonic and hypersonic speeds, and compressible boundary layers. Prereq., graduate standing or 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. Prereqs., CHEM 1211 and CHEN 1221 or CHEM 1111; coreq., ASEN 2023.

**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 5002-3. Introduction to Dynamics of Aerospace Structures.** Applies concepts covered in undergraduate dynamics, structures, and

mathematics to the dynamics of aerospace structural components, including methods of dynamic analysis, vibrational characteristics, vibration measurements, and dynamic stability. Prereq., ASEN 3010, 3022, or equivalent.

**ASEN 5012-3. Mechanics of Aerospace Structures.** Applies fundamental concepts of continuum mechanics, theory of elasticity, and energy methods to the analysis of thin structures of importance in aerospace products. Provides a brief introduction to alternative design concepts considering shape, weight, cost, and safety trade-offs. Prereqs., ASEN 2020 and APPM 2360.

**ASEN 5112-3. Mechanical and Structural Vibrations of N Degree-of-Freedom Systems.** Emphasizes the physical understanding of vibrations and the mathematical rigor of their analysis. Covers analytical dynamics of discrete systems, undamped and damped vibrations of n degree-of-freedom systems, continuous systems, approximation of continuous systems by displacement methods, solution methods for the eigenvalue problem, and direct time-integration methods.

**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 2023-3. 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 1360 and PHYS 1110; coreq., APPM 2350.

**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 2023 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. Introduces thermal-hydraulic aspects, related low-gravity fluid dynamics, and current scientific issues. Prereq., ASEN 2023 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 Thermohydraulics.** 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, queuing 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 nonlinear 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.** Introduces descriptive and dynamical physical oceanography, primarily focusing on the nature and

dynamics of ocean currents and their role in the distribution of heat and other aspects of ocean physics related to the Earth's climate. Dynamical material is limited to a mathematical description of oceanic physical systems. Prereq., ASEN 3021. Same as ASEN 5215.

**ASEN 4225-3. Thermodynamics of Atmospheres and Oceans.** Examines the thermodynamics of water in the Earth's atmosphere, including the formation of clouds and cloud physics. Studies atmospheres of Venus and Mars; and examines thermodynamics of oceans and sea ice. Prereq., ASEN 2023; MCEN 2022, or instructor consent. Same as ASEN 5225.

**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 5225-3. Thermodynamics of Atmospheres and Oceans.** Same as ASEN 4225.

**ASEN 5235-3. Remote Sensing of the Atmosphere and Oceans.** Applies principles of radiative transfer to the remote sensing of the Earth's atmosphere and oceans. Topics include: extinction and scattering-based remote sensing, emission-based passive remote sensing, and active remote sensing. Prereq., graduate standing or instructor consent.

**ASEN 5255-3. Environmental Aerodynamics.** Same as ASEN 4255.

**ASEN 5315-3. Ocean Modeling.** Introduces students to basic principles behind, and the current practices in, ocean modeling. Different prevailing approaches will be discussed. Students get hands-on experience with the use of supercomputers and workstations for model running and pre- and post-processing. Prereq., graduate standing or instructor consent.

**ASEN 5325-3. Small Scale Processes in Geophysical Fluids.** A broad overview of mixing and wave processes in the oceans and the atmosphere. Turbulent boundary layers in the lower atmosphere and the upper ocean, air-sea interactions, surface and internal waves are the principal topics covered. Prereq., graduate standing or instructor consent.

**ASEN 5335-3. Aerospace Environment.** The various components of the solar-terrestrial system (sun, solar wind, magnetosphere, thermosphere, ionosphere, middle atmosphere) and their interactions are examined to provide a solid understanding of the reentry and orbital environments within which aerospace vehicles operate. Prereq., senior or graduate standing in engineering or related physical sciences.

### *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 2023, 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., CSCJ 1700 or GEEN 1300 and instructor consent. Same as ASEN 5446.

**ASEN 5016-3. Introduction to Space Life Sciences.** Familiarizes students with factors affecting living organisms in the reduced-gravity environment of space flight. Covers basic life support requirements, human physiological adaptations, and cellular and molecular gravity dependent processes. Prereq., senior or graduate standing or instructor consent.

**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 4047-3. Probability and Statistics for Aerospace Engineering Sciences.** Probability concepts and theory for better design and control of aerospace engineering systems. Descriptive and inferential statistical methods for experimental analysis. Discrete and continuous random variable distributions, estimators, confidence intervals, regression, analysis of variance, hypothesis testing, non-parametric statistics, random processes, and quality control, including software models of same. Prereq., junior or graduate standing or instructor consent. Same as ASEN 5047.

**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., CSCJ 1700 or GEEN 1300 and ASEN 3021.

**ASEN 4337-3. Remote Sensing Data Analysis.** 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. Prereq., senior or graduate standing or instructor consent. Same as ASEN 5337.

**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 5047-3. Probability and Statistics for Aerospace Engineering Sciences. Same as ASEN 4047.

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 stability. Prereq., ASEN 5007.

ASEN 5227-3. Mathematics for Aerospace Engineering Sciences 1. Covers vector and tensor analysis with linear algebra, complex analysis, and calculus of variations. Prereq., APPM 2350.

ASEN 5237-3. Mathematics for Aerospace Engineering Sciences 2. Covers the most important topics in applied mathematics needed for the various subfields of aerospace engineering sciences. Covers ordinary differential equations with variable coefficients, the higher functions of analysis, partial differential equations, and an introduction to probability and statistics. Prereq., APPM 2360.

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 GEEN 1300, 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 5337-3. Remote Sensing Data Analysis. Same as ASEN 4337.

ASEN 5347-3. Mathematical Methods in Dynamics. Two-part graduate-level course on dynamics. Covers both flexible and rigid multi-body 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 5427-3. Computational Gasdynamics. Addresses the numerical issues pertinent to gasdynamics, stressing the relationships with and differences between general numerical analysis, general computational fluid dynamics, and

classical gasdynamics. Prereq., senior or graduate standing in engineering, math, or physics, or instructor consent.

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.

ASEN 5637-3. Variational Methods in Mechanics. Covers energy and variational methods in mechanics and their application in the formulation and numerical solution of static and dynamic problems in solid, structural, and thermodynamic mechanics. Prereq., graduate standing or instructor consent.

### *Design*

ASEN 1038-1. Freshman Aerospace Laboratory. This airplane model building laboratory introduces aerodynamics, fluid mechanics, aircraft design, basic instrumentation and measurement methodologies, and technical writing. Students review current research topics in aerospace engineering and form competitive groups to build, fly, and analyze balsa gliders in various conditions of aerodynamic trim. Coreq., ASEN 1011.

ASEN 3028-3. Flight Mechanics. Airfoil design, performance of propeller-driven and jet-driven aircraft, static stability and control, design trade-offs of stability and control, and maneuvering flight. Prereq., ASEN 3011; coreq., ASEN 3021.

ASEN 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 account 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 4218-3. Large Space Structures Design. Develops the necessary structural analysis skills for conducting conceptual and preliminary designs of large space structures with a practical emphasis on structures considered by NASA over the past 20 years. Analysis skills are applied to a broad range of space missions requiring large space structures, emphasizing low cost and practical design. Prereq., senior standing in ASEN or MCEN, or instructor consent. Same as ASEN 5218.

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 4248-3. Computer-Aided Control System Design 2. Multivariable Computer-Aided Control System Design using modern linear-quadratic techniques for design and multivariable frequency domain singular value methods for design evaluation. Emphasis is on the synergistic use of classical design insights and modern control design tools. Prereq., ASEN 4238.

ASEN 4338-3. Computer Analysis of Structures. 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 5218-3. Design of Large Space Structures. Same as ASEN 4218.

### *Specialized Topics*

ASEN 2519 (1-3). Special Topics. Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the lower-division level. Course content is indicated in the *Registration Handbook and Schedule of Courses*. Prereq. varies.



ASEN 3519 (1-3). Special Topics. Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the upper-division level. Course content is indicated in the *Registration Handbook and Schedule of Courses*. Prereq. varies.

ASEN 4519 (1-3). Special Topics. Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the upper-division level. Course content is indicated in the *Registration Handbook and 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 5519 (1-3). Selected Topics. Treatment of specialized aspects of aerospace engineering sciences by staff or visiting lecturers. Course content indicated in the *Registration Handbook and Schedule of Courses*. Prereq. varies.

ASEN 5849 (1-6). Independent Study. Study of special projects.

ASEN 6519 (1-3). Special Topics. Treatment of specialized aspects of aerospace engineering sciences by staff or visiting lecturers. Course content indicated in the *Registration Handbook and Schedule of Courses*. Prereq. varies.

ASEN 6849 (1-6). Independent Study. Study of special projects agreed upon by student and instructor.

## Applied Mathematics

APPM 1350-4. Calculus 1 for Engineers. Selected topics in analytical geometry and calculus. Rates of change of functions, limits, derivatives of algebraic and transcendental functions, applications of derivatives, and integration. Prereqs., two years of high school algebra, one year of geometry, one-half year of trigonometry or approval by faculty advisor. Note: GEEN 1351, a 2-credit lab, is available for students who would like more practice working calculus problems in a group learning environment.

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 with a minimum grade of C-.

APPM 2350-4. Calculus 3 for Engineers. Covers multivariable calculus, vector analysis, and theorems of Gauss, Green, and Stokes. Prereqs., APPM 1360 or MATH 2300 with a minimum grade of C-.

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 1360 or MATH 2300.

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 3010-3. An Introduction to Nonlinear Systems: Chaos. Aims at both majors and minors in the physical sciences with at least one year of university calculus. Provides students with an introduction to classes of tools that are useful in the analysis of nonlinear systems. Prereqs., APPM 1350 and 1360.

APPM 3050-3. An Introduction to Mathematica or Maple and Numerical Computation. Introduces symbolic and numerical computing at an elementary level. Designed to teach some principles of computational and applied mathematics using computational tools such as Mathematica, Maple, Reduce, or Derive. Prereqs., APPM 1350, 1360, and 2360.

APPM 3170-3. Discrete Applied Mathematics. Introduces discrete structures, their representations, and applications. Emphasizes applications of graph theory to applications in computer science, engineering, operations research, social sciences, and biology, depending on student interests. Topics include the basic properties of graphs and digraphs and their matrix representations. Relates graph properties to their applications: for example, graph coloring problems are related to scheduling problems; n-cubes to logic circuits and the architecture of parallel processors; Hamilton circuits to gray codes and the traveling salesman problem; covering problems to assignment problems, etc. Prereq. or coreq., APPM 3310.

APPM 3310-3. Matrix Methods and Applications. Introduces linear algebra and matrices, with emphasis on applications; including methods to solve systems of linear algebraic and linear ordinary differential equations. Computational algorithms that implement these methods are discussed. Applications in operations research are included as time permits. Prereqs., APPM 2350 and 2360. Comparable to MATH 3130, but with more emphasis on applications. Credit for both courses will not be given.

APPM 3570-3. Applied Probability. Axioms; counting formulas; conditional probability; independence; random variables; continuous and discrete distribution; expectation; moment generating functions; law of large numbers; central limit theorem; poisson process; multivariate Gaussian distribution. Students may not receive credit for both APPM 3570 and ECEN 3810 or for both APPM 3570 and MATH 4510. Prereq., APPM 2350 or MATH 2400.

APPM 4350-3. Methods in Applied Mathematics: Fourier Series and Boundary Value Problems. Reviews ordinary differential equations, including solutions by Fourier 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 2350 and 2360 or 2380 with a minimum grade of C-. Same as APPM 5350.

APPM 4360-3. Methods in Applied Mathematics: Complex Variable and Applications. 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 2350 and 2360 or 3310 with a minimum grade of C- or instructor consent. Same as APPM 5360.

APPM 4380-3. Modeling in Applied Mathematics. Exposition of a variety of mathematical models arising in the physical and biological sciences. Models from applications in classical and celestial mechanics, fluid dynamics, traffic flow, population dynamics, economics, and elsewhere. Prereqs., APPM 4350 and PHYS 1120 with a minimum grade of C-.

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 or APPM 3570 or 4560 with a minimum grade of C-. Same as MATH 4520.

APPM 4560-3. Introduction to Probability Models. Develops tools and applies to analysis of probability models used in engineering, management sciences, the physical and social sciences, genetics, and operations research. Prereq., APPM 2350 or MATH 2400.

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. Prereq., Calculus 2 with a minimum grade of C-.

APPM 4580-3. Statistical Methods for Data Analysis. Continuation of APPM 5570. Combines statistical methods with practical applications and computer software. Develops commonly used statistical models such as analysis of variance as well as linear and logistic regression. The statistical models are implemented and interpreted in the context of actual data sets using available statistical software. Prereqs., any previous course in statistics. Same as APPM 5580.

APPM 4650-3. Intermediate Numerical Analysis 1. Numerical solution of linear algebraic, nonlinear algebraic, and transcendental equations. Interpolation. Linear systems and matrix eigenvalue problems. Significant computer applications and use of existing software will be stressed. Prereqs., APPM 2350 and 2360 and either APPM 3310 or MATH 9130. Related courses: This course and its sequel (4660) are crosslisted with MATH 4650 and 4660 respectively.

APPM 4660-3. Intermediate Numerical Analysis 2. Continuation of APPM 4650. Methods of numerical integration. Numerical solution of initial-value problems, of two-point boundary-value problems, and of partial differential equations. Significant computer applications and use of existing software are stressed. Prereq., APPM 4650 or consent of the instructor; coreq., APPM 4350.



APPM 4840 (1-3). Reading and Research in Applied Mathematics. Independent study course designed to introduce undergraduate students to research foci of the program in applied mathematics. Prereq., APPM 3310 or MATH 3130. Recommended: a course in ordinary or partial differential equations.

APPM 4955-3. Seminar in Applied Mathematics. Introduces undergraduate students to the research foci of the program in applied mathematics. It is also designed to be a capstone experience for the program's majors. Prereq., APPM 3310 or MATH 3130. Recommended: a course in ordinary or partial differential equations.

## Architectural Engineering

### Building Systems Engineering

AREN 2010-3. Introduction to Solar Utilization. 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. or coreq., PHYS 1110.

AREN 2020-3. Energy Fundamentals. Presents basic principles of heat transfer and thermodynamics, emphasizing building energy applications. Prereq., PHYS 1110. Coreq. (or prereq.), APPM 2360.

AREN 3010-3. Mechanical Systems for Buildings. Psychrometrics, thermal comfort, building heating and cooling loads, fluid flow basics, HVAC components and systems. Prereq., AREN 2020.

AREN 3130-3. Building Energy Laboratory. Two lect., one three-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 3140-3. Illumination Laboratory. 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. Continues 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. Studies the fundamentals of architectural illumination. Introduces and applies 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 4010-3. Solar Design for Buildings. 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. One of several "capstone" courses available to architectural engineering students. Prereq., AREN 2010.

AREN 4110-3. HVAC Design 1. 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. One of several "capstone" courses available to architectural engineering students. Prereq., AREN 3010. Same as CVEN 5110.

AREN 4550-3. Illumination 2. 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. One of several "capstone" courses available to architectural engineering students. Prereq., AREN 3540.

AREN 4560-3. Luminous Radiative Transfer. 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. Introduces the generation and distribution of electrical power. Focuses on understanding the loads, control, and protection of secondary electrical distribution systems in building. Applies the national electric code to residential and commercial buildings.

AREN 4580-3. Daylighting. 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 Graphics in Lighting Engineering. Studies the numerical methods and computer implementation of computer graphics visualization for architectural lighting engineering and design. Finite element radiative transfer and ray-tracing are implemented in computer programs. The use of computer graphics visualization in lighting analysis is studied. Prereqs., AREN 3540 and 4560.

### Structures

AREN 4035-3. Architectural Structures 1. Analysis of basic structural systems. Principles of mechanics and mechanical properties of materials; analysis and design of trusses, arches, and cable structures. For nonengineering students; does not apply toward an engineering degree. Prereq., senior standing or instructor consent.

AREN 4045-3. Architectural Structures 2. Analysis of basic structural systems. Principles of mechanics as applied to the design of flexural members, columns, continuous beams, and rigid

frames. For nonengineering students; does not apply toward an engineering degree. Prereq., AREN 4035.

AREN 4315-2. Design of Masonry Structures. 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 1316-1. Introduction to Architectural Engineering. Surveys the broad subject of architectural engineering and professional practices. Includes professional design services, design documents, methods of construction delivery, materials for construction, codes and standards, life safety, professional ethics, structural systems, mechanical systems, electrical systems, and building systems integration.

AREN 3406-3. Introduction to Building Construction. Covers the broad subject of building materials, assembly details, and their method of construction. Includes codes and classifications, foundations, wood, steel, concrete, masonry, cladding, doors and windows, interiors, and finishes.

AREN 4416-3. Construction Costs and Estimating. 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. Comprehensive study of construction management including the contractor's role in preconstruction and construction activities; the construction contract; bonds and insurance; and the particular application of CPM/PERT techniques to the planning, scheduling, and control of a construction project. Prereq., senior standing or instructor consent.

### Miscellaneous

AREN 1017-2. Engineering Drawing. Beginning engineering drawing; covers the use of instruments, orthographic projection, pictorial drawing, sections, dimensioning, and working drawings.

AREN 1027-2. Descriptive Geometry. Orthographic projection: point, line, and plane problems; angle problems, intersections; computer graphics using Autocad on PCs. Prereq., GEEN 1017 or equivalent.

### Special Topics

AREN 4830 through 4839 (1-3). Special Topics in Architectural Engineering. Special courses in selected topics in building energy, design, construction, acoustics, or illumination. Offerings vary. Students should consult the Department of Civil, Environmental, and Architectural Engineering.

AREN 4840 through 4849 (1-3). Independent Study. Independent, in-depth study, research, or design in a selected area of architectural engineering. Offerings are coordinated with individual faculty. Students should consult the Department of Civil, Environmental, and Architectural Engineering.

## 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.** Meets for one lect. per week. Introduces chemical engineering including history of the profession, curriculum, chemical industry, and industrial chemistry. Students visit industry, make oral presentations, meet faculty and professionals, and develop a goals statement.

**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 Department of Chemical Engineering. Subject arranged to fit needs of student.

**CHEN 3010-3. Applied Data Analysis.** Lecture with in-class group workshops. Prepares students in the various aspects of data analysis so that they can process and interpret experimental data in subsequent laboratory courses and in professional practice. Topics include fundamentals of engineering measurements, graphical presentation and interpretation, numerical treatment of data, statistical inference, and regression analysis. Computer-based tools are used extensively.

**CHEN 3130-2. Chemical Engineering Laboratory 1.** Meets one lect. hour and one three-hour lab. session per week. Investigates chemical engineering fluid flow, heat transfer, and thermodynamics. Communication by written reports and oral presentations is emphasized as is laboratory safety. Prereqs., CHEN 3200 and 3210; coreq., CHEN 3220.

**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 3210-4. Chemical Engineering Principles 2.** Three lect. and one rec. or calculation session per week. Continues 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 4130-2. Chemical Engineering Laboratory 2.** Meets one lecture hour and one three-hour laboratory session per week. Investigates mass transfer, separations, chemical reactions, and typical chemical engineering unit operations. Communication by written reports and oral presentations is emphasized as is laboratory safety. Prereqs., CHEN 3130 and 3220; coreq., CHEN 4330.

**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 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 4450-3. Polymer Chemistry.** Lect. Introduces polymer science with a focus on polymer chemistry and polymerization reactions. Focus is on polymerization reaction engineering and how polymer properties depend on structure. Same as CHEN 5450.

**CHEN 4520-4. Chemical Process Synthesis.** Three lect., one rec. or calculation session per week. Solves selected comprehensive problems dealing with development, equipment, process design, process control systems, materials, product allocations, and chemical process optimization. Prereqs., CHEN 3210, 3220, and 4330.

**CHEN 4570-4. Instrumentation and Process Control.** Students learn principles of control theory and their application to chemical processes. The primary focus is on analog single-loop feedback and feedforward control. Laboratory sessions cover measurement fundamentals, pneumatic and electronic signal transmission, conventional feedback controllers, and programmed logic control. Prereqs., APPM 2360 and CHEN 3130.

**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.

**CHEN 4670-3. Environmental Separations.** Lect. Covers traditional, as well as new, chemical separations processes that have environmental applications. Course material includes chemically benign processing (pollution prevention) as well as approaches to address existing pollution problems. Prereq., senior or graduate student standing. Same as CHEN 5670.

**CHEN 4680-3. Environmental Process Engineering.** Lect. Surveys the field of environmental process engineering and covers the topics of waste minimization and pollution, air pollution control, water pollution control, hazardous waste control, risk assessment and management, and ecological systems. Prereq., senior or graduate standing in engineering. Same as CHEN 5680.

**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. Bioprocess Engineering.** Lect. and lab. Reviews the recent developments in the fields of microbiology, molecular genetics, and genetic engineering that 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. Presents purification methods, mass transfer coefficients, problems specific to biologicals, and scale-up of processes. Also covers chromatography, phase extraction, supercritical fluids, sedimentation, precipitation, electrophoresis, dialysis, affinity techniques, cell separation, application of separations to bioreactors, and comparison of batch and continuous processes. Prereq., senior standing or above in engineering or science. 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 student.

**CHEN 5090-1. 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 multi-component 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 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 CHEM or CHEN.

**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 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 thermodynamics of interfaces, surface tension measurement; adsorption at liquid-gas, liquid-liquid, and solid-gas interfaces; monolayers; conservation equations for a fluid interface; rheology of interfaces; surface tension driven flows; contact angle and wettability; double layer phenomena. Prereq., CHEN 3200 or equivalent.

**CHEN 5450-3. Polymer Chemistry.** Same as CHEN 4450.

**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 4570 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 5670-3. Environmental Separations.** Same as CHEN 4670.

**CHEN 5680-3. Environmental Process Engineering.** Same as CHEN 4680.

**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 in Chemical Engineering.** Students learn numerical methods for solving ordinary differential, partial differential, and integral equations. These principles are employed to develop, test, and assess computer programs for solving problems of interest to chemical engineers. Prereq., graduate standing or instructor consent.

**CHEN 5800-3. Bioprocess Engineering.** 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 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 6230-3. Chemically Specific Separations.** Covers the various methods for improving the productivity and selectivity of various separations processes. Discusses fundamental approaches, applications in various processing schemes, and new research thrusts.

**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 CHEM, CHEN, 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.** 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 Audits.** 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.** 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.** 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.** 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.** Introduces major simulation programs for analysis of building energy loads and system performance. Focus on one hourly simulation program 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 I.** 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 Degree Candidate.

CVEN 6950 through 6959-variable credit. Master's Thesis.

CVEN 8990 through 8999 (1-10). Doctoral Thesis. A minimum of 30 credit hours is required.

### Mechanics

CVEN 2121-3. Analytical Mechanics 1. 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. 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 3161-3. Mechanics of Materials 1. Concepts of stress and strain; material properties, axial loading, torsion, simple bending, transverse shear; analysis of stress and strain; deflections of beams. Selected experimental and computational laboratories. Prereq., CVEN 2121; coreq., APPM 2360.

CVEN 4161-3. Mechanics of Materials 2. Concepts of triaxial stress and strain; equilibrium; kinematic relations; basic constitutive relations of engineering materials; strain energy; failure theories; thin and thick-walled cylinders; symmetric/nonsymmetric bending; torsion of thin-walled members; combined loading; buckling of columns; and elastic stability. Selected experimental and computational laboratories. Prereq., CVEN 3161.

CVEN 4511-3. Introduction to Finite Element Analysis. 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. Introduces dynamic response of structural systems, both linear and nonlinear. Prereq., instructor consent.

CVEN 5161-3. Advanced Mechanics of Materials. Energy methods; inelastic behavior; torsion of open sections and torsion of noncircular sections; curved beams; thick-wall pressure vessels; and failure theories.

CVEN 5511-3. Introduction to Finite Element Analysis. Same as CVEN 4511. Prereq., graduate standing.

CVEN 7111-3. Dynamics of Structures. 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. 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. 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. 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 4161.

CVEN 7511-3. Computational Mechanics of Solids and Structures. 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. Observation, analysis, and presentation of basic linear, angular, area, and volume field measurements common to civil engineering endeavors. Prereq., APPM 1350 or equivalent.

CVEN 3022-3. Engineering Measurements. Construction and highway surveying, horizontal and vertical curves, earthwork, and analysis of data. Prereq., CVEN 2012.

CVEN 3032-3. Photogrammetry. Characteristics of aerial photographs; measuring and interpreting from aerial photos for planimetric, topographic, hydrologic, soil, and land use surveys; analysis and presentation of field measurements over extensive reaches. Prereq., instructor consent.

CVEN 3602-3. Transportation Systems. 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.

### Fluid Mechanics and Water Resources

CVEN 3313-3. Theoretical Fluid Mechanics. 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. Hydraulic Engineering. 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. Engineering Hydrology. 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.

CVEN 4343-3. Open Channel Hydraulics. Study of flow in open channels both natural and constructed. Topics include application of energy equation and momentum relationships, tractive force on erodible boundaries, water surface profiles theory and calculations, and design of transitions. Prereq., CVEN 3313. Same as CVEN 5343.

CVEN 4353-3. Groundwater Engineering. Studies the occurrence, movement, extraction for use, and quantity and quality aspects of groundwater. Introduction and use of basic concepts to solve engineering and geohydrologic problems.

CVEN 4423-3. Water Resource Engineering Design. Applications to the design of water supply and distribution systems; waste and storm water collection systems; flood protection structures and plans; reservoirs; irrigation and drainage canal networks. One of two required capstone courses for environmental/water resources track. Prereqs., CVEN 3227 and 4147.

CVEN 5333-3. Hydrology. Prereq., instructor consent.

CVEN 5343-3. Open Channel Hydraulics. Graduate standing required.

CVEN 5353-3. Groundwater Hydrology. Studies the occurrence, movement, extraction for use, and quantity and quality aspects of groundwater. Introduces and uses 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. Prereq., instructor consent.

CVEN 5373-3. Water Law, Policy, and Institutions. 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 5383-3. Groundwater Modeling. Studies mathematical and numerical techniques needed to develop models to solve problems in water flow and chemical transport in the saturated and unsaturated zones of aquifers. Not only emphasizes the learning of modeling techniques from fundamentals, but also the application of models and modeling methods to solve problems in groundwater engineering, geo-environmental engineering, hazardous waste management, aquifer remediation design, and aquifer clean-up. Prereq., CVEN 5353.

CVEN 5393-3. Water Resources Development and Management. 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 6555.

### *Environmental*

**CVEN 3414-3. Introduction to Environmental Engineering.** 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.** Introduces 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 3454-4. Water Quality.** Lectures introduce fundamentals of aquatic chemistry of inorganic and organic compounds. Topics include thermodynamics and kinetics of acids and bases, carbonate chemistry, air-water exchange, precipitation and dissolution, complexation, oxidation-reduction, and sorption. Laboratories illustrate concepts through examination of water quality of Boulder Creek and other local waters. Prereq. or coreq., CVEN 3414, or instructor consent.

**CVEN 4434-3. Environmental Engineering Design.** Applications to the design of facilities for the treatment of municipal water supplies and wastewater, hazardous waste, and industrial waste. One of two required capstone courses for the environmental/water resources track. Prereqs., CVEN 3424 and 3454.

**CVEN 4474-3. Hazardous and Industrial Waste Management.** 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 3414 and CVEN 3424 or equivalent.

**CVEN 5404-3. Environmental Engineering Chemistry.** Comprehensive analysis of the chemistry of natural and polluted waters and the application to environmental engineering problems. Topics include energetic principles, chemical equilibrium, coordination chemistry, adsorption phenomena, solid phase interactions, redox phenomena, natural water models, metal pollution, dynamics in aquatic ecosystems, and biogeochemical and nutrient cycling. Computer simulations are used to illustrate more complex chemical systems. Prereqs., CVEN 3414 and 3424, or instructor consent. Same as CVEN 5444.

**CVEN 5414-3. Pilot Plant Laboratory.** 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 5524-3. Water Treatment.** Advanced studies on theory of treatment; design and operation of domestic and industrial water supplies. Prereq., graduate standing or instructor consent.

**CVEN 5534-3. Wastewater Treatment.** 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.

**CVEN 5444-3. Municipal Design Project.** Same as CVEN 4424.

**CVEN 5454-3. Quantitative Methods.** 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 used to analyze more complex problems. Prereqs., instructor consent and computer background.

**CVEN 5474-3. Hazardous and Industrial Waste Management.** 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 5494-3. Environmental Pollutants.** 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 6404-3. Advanced Aquatic Chemistry.** Examines aquatic equilibria, corrosion, colloid and polymer chemistry, behavior of natural-organic matter in engineered systems, and application of personal computers to model aquatic equilibria. A term project is required of all students. Prereq., CVEN 5402. Offered in the spring every other year.

**CVEN 6414-3. Aquatic Surface Particle.** Examination of the role of surfaces and particles in the fate and transport of contaminants in the aquatic environment. Emphasis on modeling of adsorption, dissolution, precipitation, surface-catalyzed reactions, and coagulation and filtration kinetics. Prereqs. CVEN 5404 or GEOL 5280.

### *Structures*

**CVEN 3525-3. Structural Engineering 1.** Introductory course in structural analysis and structural design of statically determinate systems, deflections, energy methods, design philosophies, design of steel and reinforced concrete flexural members. Prereq., CVEN 3161.

**CVEN 3535-3. Structural Engineering 2.** Intermediate course in structural analysis and structural design of statically indeterminate systems, force method, design of steel and reinforced concrete structures. Prereq., CVEN 3525.

**CVEN 4525-3. Matrix Structural Analysis.** Matrix formulation of principles of structural analysis. Development of direct stiffness and flexibility methods for analysis of frame and truss structures. Topics include support settlements, thermal loads, and energy formulations of force-displacement relationships. Prereq., CVEN 3535. Same as CVEN 5525.

**CVEN 4545-3. Steel Design.** Applies 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 3535.

**CVEN 4555-3. Reinforced Concrete Design.** 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 3535.

**CVEN 4565-2. Timber Design.** Applies design methods to beams, columns, trusses, and connections using timber and glued laminated members. Prereq., CVEN 3525.

**CVEN 5525-3. Matrix Structural Analysis.** Same as CVEN 4525.

**CVEN 5555-3. Structural Reliability.** Students explore principles and methods of structural reliability, and formulate bases for design to insure adequate safety and performance of elements and structural systems. Prereqs., CVEN 3535, 4525, or instructor consent.

**CVEN 5575-3. Advanced Topics in Steel Design.** Advanced topics relating to design and analysis of steel structures. Includes plate girders, moment connections for beams, design of multi-story frames, and other topics determined by class interest. Prereq., CVEN 4545 or equivalent.

**CVEN 5585-3. Advanced Topics in Reinforced Concrete Design.** 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.** Review of membrane, plate, and shell elements; displacement and mixed models; Kirchhoff 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.** 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.** 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 7565-3. Inelastic Theory of Structures.** 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 3246-3. Introduction to Construction.** 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 and construction activities; and the particular application of CPM 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. Same as AREN 4466.

**CVEN 5246-3. Engineering Contracts.** 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. Prereq., graduate standing or instructor consent. Same as CVEN 4087.

**CVEN 5256-3. Construction Management.** 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, total quality management, value engineering, disputes and claims, and engineering technology. Stresses investigations to improve construction management efficiency. Prereq., graduate standing or instructor consent.

**CVEN 5286-3. Construction Engineering 1.** Considers topics associated with the effective and efficient design of construction operations. Topics include construction productivity measurement systems, methods improvement and short interval scheduling. Several computer based simulation techniques are introduced and applied to real-world problems. The course concludes with a discussion of quality control and quality assurance with special emphasis on statistical QC procedures. Prereq., graduate standing or instructor consent.

**CVEN 5296-3. Construction Engineering 2.** Advanced study of the application and analysis of construction equipment and methods. Topics include drilling, blasting, tunneling, dewatering foundations, earthmoving and safety. Course is applicable to both building and public works construction. Prereq., graduate standing or instructor consent.

### Miscellaneous

**CVEN 1317-1. Introduction to Civil and Environmental Engineering.** Surveys the broad subject of civil and environmental engineering and professional practice, emphasizing study of construction methods including foundations, structural systems, building materials, and systems applications in building construction. Same as AREN 1316.

**CVEN 3207-2. City Planning.** 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 3227-3. Probability, Statistics, and Decision for Civil Engineers.** Introduces uncertainty-based analysis concepts and applications in planning and design of civil engineering systems emphasizing probabilistic, statistics, and decision concepts and methods. Prereqs., APPM 2360 and junior standing.

**CVEN 4087-3. Engineering Contracts.** 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 and System Design.** 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.** 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 5537-3. Numerical Methods in Civil Engineering.** Prereq., graduate standing. Same as CVEN 4537.

### Geotechnical

**CVEN 3698-3. Engineering Geology.** Role of geology in engineering minerals; rocks; surficial 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.** 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. Selected experimental and computational laboratories. Prereq., CVEN 3161.

**CVEN 3718-3. Geotechnical Engineering 2.** 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. Selected experimental and computational laboratories. Prereq., CVEN 3708.

**CVEN 4728-3. Foundation Engineering.** 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. Prereq., CVEN 3718 or instructor consent. Same as CVEN 5728.

**CVEN 5708-3. Soil Mechanics.** 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. Prereq., CVEN 3718.

**CVEN 5728-3. Foundation Engineering.** Prereqs., CVEN 3718 and graduate standing. Same as CVEN 4728.

**CVEN 5738-3. Applied Geotechnical Analysis.** 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 analysis of deformations in soil structures. Prereq., CVEN 5708 or instructor consent.

**CVEN 5748-3. Design of Earth Structures.** Theory, design, and construction of earth embankments and waste facilities, including isolation systems. Use of published data, field exploration, and laboratory tests on soils and rock in investigating foundations and construction materials. Principles of compaction and settlement. Permeability analysis, landslide recognition and control, use of composite clay and liner systems. Prereq., CVEN 5708 or instructor consent.

**CVEN 5758-3. Seepage and Consolidation.** 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. Prereq., CVEN 3718 or instructor consent.



**CVEN 5768-3. Introduction to Rock Mechanics.** 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. Prereq., CVEN 3718 or instructor consent.

**CVEN 5778-3. Applied Rock Mechanics.** 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 5798-3. Dynamics of Soils and Foundations.** 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. Prereq., CVEN 5708 or instructor consent.

**CVEN 7718-3. Engineering Properties of Soils.** Constitutive behavior of cohesive and cohesionless soils including stress-strain, strength, pore water pressure, and volume change behavior under drained and undrained loading conditions. Linear and nonlinear analysis techniques. Determination of constitutive properties in the laboratory. Prereq., CVEN 5708 or instructor consent.

**CVEN 7788-3. Soil Behavior.** 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 physico-chemical principles. Applications to stabilization and improvement of soils, and disposal of waste materials. Prereq., CVEN 3718 or instructor consent.

### *Special Topics*

**CVEN 4039-1. Senior Seminar.** 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 4840 through 4878 (1-3). Independent Study.** Independent, in-depth study, research, or design in a selected area of civil or environmental engineering. Offerings are coordinated with individual faculty. Students should consult the Department of Civil, Environmental, and Architectural Engineering.

**CVEN 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 (1-6). Independent Study.** Available only through approval of graduate advisor. Subject arranged to fit needs of student.

**CVEN 8929-3. Selected Topics.** Credit and subject matter to be arranged. Prereq.; instructor consent.

## **Computer Science**

### *General Computer Science*

**CSCI 1200-4. Introduction to Programming 1.** Presents an introduction to various uses of computers, including text processing, communication, spreadsheets, and database systems as well as an introduction to computer programming.

**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.** Students learn to analyze problems and synthesize programs for the solution, emphasizing good engineering practices for program construction, documentation, testing, and debugging. Programming projects use C.

**CSCI 2270-4. Data Structures.** Studies data abstractions (e.g., stacks, queues, lists, trees) and their representation techniques (e.g., linking, arrays). Introduces concepts used in algorithm design and analysis including criteria for selecting data structures to fit their applications. Uses Unix systems. Prereqs., CSCI 1300, APPM 1350 or MATH 1300. CSCI 1210 can be substituted for CSCI 1300.

**CSCI 2830-3. Special Topics in Computer Science.** Covers topics of interest in computer science at the sophomore level. Content varies from semester to semester. Prereq., instructor consent.

**CSCI 2900 (1-3). Independent Study.** Selected topics at the elementary level for students with little or no previous computing experience.

**CSCI 4440-3. Object-Oriented Programming and Design.** An applied programming and design course addressing object-oriented technology. Covers programming topics such as data abstraction, classes and objects, polymorphism, inheritance; contemporary object-oriented design and analysis models and methodology; and case studies of object-oriented systems. Prereq., CSCI 3155 or expertise in a high-level programming language similar to C.

**CSCI 4830-3. Special Topics in Computer Science.** Covers topics of interest in computer science at the senior undergraduate level. Content varies from semester to semester. Prereq., instructor consent.

**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 or 1300.

**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 3104 and 3155, or instructor consent.

**CSCI 4202-3. Artificial Intelligence 2.** A second course in artificial intelligence. Topics may vary, but typically cover neural networks, natural language processing, and artificial life. Prereq., CSCI 3202 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 3155 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 5830-3. **Special Topics in Computer Science.** Covers topics of interest in computer science at the first-year graduate level. Content varies from semester to semester. Prereq., 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.** Studies knowledge-based systems in depth; engages students in a major system-building effort; prepares students for active research in artificial intelligence. Prereq., CSCI 6582.

CSCI 6622-3. **Advanced Connectionist Modeling.** 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.

CSCI 7830-3. **Special Topics in Computer Science.** Covers topics of interest in computer science at the advanced graduate level. Content varies from semester to semester. Prereq., instructor consent.

### *Operating Systems and Hardware*

CSCI 3753-4. **Operating 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, 3308, and ECEN 2220.

CSCI 4113-3. **Unix System Administration Workshop.** Introduces the internals of UNIX, trouble shooting system and network problems, hardware and software configuration and installation, and security aspects of hosts on the Internet. Students gain hands-on experience on dedicated laboratory workstations. Prereq., CSCI 2270 or instructor consent. Recommended, CSCI 3308.

CSCI 4273-3. **Network Systems.** Focuses on design and implementation of network programs and systems, including topics in network protocols, file transfer, client-server computing, remote procedure call, and other contemporary network system design and programming techniques. Prereqs., CSCI 3753 and familiarity with C and UNIX.

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 characterization, and analysis of data; design of experiments; simulation; queuing theory and queuing network models. Prereqs., CSCI 3753 or equivalent, and second-semester calculus. Recommended prereq., a course in statistics. Same as CSCI 5753 and ECEN 4753 and 5753.

CSCI 5513-3. **Real-Time Hardware-Software System Design.** Same as ECEN 5513.

CSCI 5573-3. **Operating Systems.** Studies 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 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 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 3104-4. **Algorithms.** Studies how to design and analyze efficient algorithms and how to select algorithms for given tasks. Classes of algorithms include divide-and-conquer algorithms, randomized algorithms, branch-and-bound algorithms, greedy algorithms, and dynamic programming. Prereqs., CSCI 2270 and APPM 1360.

CSCI 3434-3. **Computer Science Theory.** Introduces the foundations of formal language theory, computability, and complexity. Shows relationship between automata and various classes of languages. Addresses the issue of which problems can be solved by computational means, and studies complexity of solutions. Prereqs., CSCI 2270 and 3104.

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 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 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 3155-4. 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. Prereqs., CSCI 2270 and ECEN 2220.

CSCI 4555-3. Introduction to Compiler Construction. Same as ECEN 4553.

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. 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 or 1300.

CSCI 4446-3. Chaotic Dynamics. Explores chaotic dynamics theoretically and through computer simulations. Covers standard computational and analytical tools used in nonlinear dynamics and concludes with an overview of leading-edge chaos research. Topics include time and phase-space dynamics, surfaces of section, bifurcation diagrams, fractal dimension, and Lyapunov exponents, etc. Prereqs., two semesters of calculus; CSCI 1200 or equivalent; and PHYS 1110. Recommended, PHYS 1120; CSCI 3656; MATH 3130.

CSCI 4676-4. 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. Prereq., CSCI 3656 or equivalent.

CSCI 4686-4. 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 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. Eigen value and eigenvector calculations. Error analysis. Reduction by orthogonal transformation. Prereq., CSCI 5606.

CSCI 5676-3. High Performance Scientific Computing 1. Same as CSCI 4676. This course cannot be used to fulfill the M.S. in computer science breadth requirement.

CSCI 5686-3. High Performance Scientific Computing 2. Same as CSCI 4686. This course cannot be used to fulfill the M.S. in Computer Science breadth requirement.

CSCI 6446-3. Chaotic Dynamics. Same as CSCI 4446.

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 3104.

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 3308-3. Software Engineering Methods and Tools. Software engineering methods and tools for application development: design and system organization; using and creating reusable libraries; building, testing; and debugging; performance evaluation. Two hours of lecture, three hours of lab per week. Prereq., CSCI 2270.

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 4308-4/318 continuously, as the project spans entire academic year. Prereqs., CSCI 3151 and 3753, and UWRP 3030. Open only to seniors.

CSCI 5548-3. Software System Engineering. Same as ECEN 5543.

CSCI 5608-3. Software Project Management. Same as ECEN 5603.

CSCI 5828-3. Foundations of Software Engineering. Techniques, languages, and tools for development and maintenance of software systems. Topics include specification languages, configuration modeling, testing techniques, process modeling, program annotations, and program proofs.

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 2270. Same as CSCI 5229.

CSCI 5229-3. Computer Graphics. Same as CSCI 4229.

## Electrical and Computer Engineering

The ECE department is revising its curriculum to include seven 5-credit-hour required courses. In addition to Circuits/Electronics 1, 2, and 3, the two digital courses (currently ECEN 2100/2110 and 2220/2230) are each being offered as 5-credit-hour courses with labs included. Electromagnetic Fields and Waves (ECEN 3130) is now 5 credit hours as is Linear Systems (ECEN 3310), which is now required instead of elective. The course numbers for all seven courses will change but as of the catalog publication deadline have not been formally approved. Therefore, the old course numbers and descriptions must still be included here.

### General

ECEN 1400-3. Methods and Problems in ECE. Introduces types of problems that electrical and computer engineers are expected to solve; develops 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 or 1300.

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 in electrical engineering and many related fields. Also covers design of memory elements, synchronous, and asynchronous sequential machines. Coreq., ECEN 2110.

ECEN 2110-1. Logic Laboratory. Laboratory experience in design and construction of digital logic circuits. Experiments are performed in combinational circuits and sequential machines. Instrumentation includes logic source and display station, and breadboarding system. Coreq., ECEN 2100.

ECEN 2150-4. Circuits/Electronics 1. DC network analysis by mesh, node, 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. Prereq., APPM 1360; coreqs., ECEN 2550 and APPM 2360.

ECEN 2160-4. Circuits/Electronics 2. Continues 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 1300; 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 3030-3. Electronics and Electric Circuits. For students not majoring in electrical engineering. Covers analysis of electric circuits by use of Ohm's law; network reduction; superposition; node and loop analysis; Thevenin's and Norton's theorems; sinusoidal signals; phasors; power in AC circuits; transient response of simple circuits; operational amplifiers; logic circuits; and flip-flops. Prereq., APPM 2350.

ECEN 3120-3. 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 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 are 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 2160 and 2560; coreq., ECEN 3530.

ECEN 3310-3. Linear Systems. Characterization of linear systems in time and frequency domains. Impulse response and convolution, frequency response, and transfer functions. Both continuous and discrete time systems are covered using linear differential and difference equations and state variable descriptions. Transform methods include Z transforms, Fourier series, Fourier integral, and discrete Fourier transform. Applications to communication and control systems. Prereqs., ECEN 2160 and 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.

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. 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. Prereqs., APPM 2350 and 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 4099 (0-3). Special Topics. Credit and subject matter to be arranged. Prereqs. vary.

ECEN 4200-1. Effective Presentation. Prepares students to make polished and professional oral presentations. Stresses effective use of visual aids. Student presentations are critiqued by class and videotaped.

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 5099 (0-3). Special Topics. Intermediate graduate-level courses of variable titles and variable credit; 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 6000 through 6099 (0-3). Special 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 6940 through 6949-3. Master's Degree Candidate.

ECEN 6950-variable credit. Master's Thesis.

ECEN 6800 (0-8). Master of Engineering Report.

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. Prereq., ECEN 2160 or 3030, or instructor consent. Same as ECEN 5821, ASEN 4426, and ASEN 5426.

ECEN 4831-3. Brains, Minds, and Computers. Provides background for the design of artificially intelligent systems based upon our present knowledge of the human brain. Includes similarities and differences between the brain and computers, robots, and common computer models of "brain" and "mind." Emphasizes the neuron as an information processor and organization of natural as well as synthetic neural networks. 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, ASEN 4216 and ASEN 5216.

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 3230 and 3810.

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 and ECEN 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. 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. Prereqs., ECEN 3310 and ECEN 3810 or MATH 4510.

ECEN 5642-3. Modern Methods of Spectral Estimation. Reviews Fourier analysis for continuous, discrete, sampled-data, PAM, and subsampled signals; quadratic estimators of the power spectrum; autoregressive and autoregressive moving average models; modal analysis; nonstationary spectrum analysis; and least square theory of linear prediction. Covers applications to speech processing, seismic data, and radar and sonar processing. 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.

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. Prereqs., ECEN 3310 and ECEN 3810 or MATH 4510.

ECEN 5672-3. Digital Image Processing. Covers the following topics: image formation and visual perception; digitization of images; transform coding, modeling, 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 ECEN 3810 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. Design and construction of microprocessor systems in measurement and control applications. Development of medium-sized systems



based upon microprocessors. Student teams 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 2270 recommended but not required. Prereqs., ECEN 2220 and CSCI 1300.

**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. Prereq., ECEN 2220. Same as CSCI 4593.

**ECEN 4603-2. Computer Laboratory.** Student teams design, build, and document a digital computer based upon small- and medium-scale integrated circuits, programmable logic arrays, and gate arrays. Design includes the architecture and instruction set at the computer, as well as software. Design reviews and documentation are required. Prereq., ECEN 4593.

**ECEN 4703-3. Switching and Finite Automata.** Upper-division course in switching and logical design, assuming a basic course in logic circuits. Emphasizes formal characterization of combinatorial functions and sequential machines. Covers fault diagnosis and finite state automata. Prereqs., ECEN 2100 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, queuing 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, 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. 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. Prereq., ECEN 2220, CSCI 3155, 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 covered 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, 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. Prereq., CSCI 3155 or equivalent.

**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 using a network analyzer; 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 5124-3. Computer-Aided Microstrip Antenna Design.** Modeling, analysis, and computer-aided design of microstrip patch antennas and arrays, including circular polarized and active antennas. Emphasizes use of design software developed at CU for practical microstrip antennas and their feed networks. Prereq., ECEN 3140 or equivalent.

**ECEN 5134-3. Electromagnetic Radiation and Antennas.** 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 5154-3. **Computational Electromagnetics.** Computational study of microwave circuits and antennas, utilizing finite-difference, finite-element, and moment methods. Students are required to develop algorithms, write and execute programs, and prepare reports analyzing results. Circuits include waveguides, microstrip lines, and center-fed dipole antennas. Prereq., ECEN 3140.

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 3140 and 3310, or instructor consent.

ECEN 5264-3. **Propagation Effects on Satellite and Deep-Space Telecommunications.** 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 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. Prereq., ECEN 3130.

ECEN 4375-3 **Microstructures Laboratory.** 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. Includes design project. Prereq., ECEN 3320.

ECEN 4645-3. **Introduction to Optical Electronics.** Introduces lasers, Gaussian optics, modulators, nonlinear optics, optical detectors, and other related devices. Prereq., ECEN 3140.

ECEN 5345-3. **Introduction to Solid State.**

ECEN 5355-3. **Principles of Electronic Devices 1.** 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., ECEN 3320 or instructor consent.

ECEN 5365-3. **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 3120, and ECEN 4345 or 5345.

ECEN 5375-3. **Microstructures Laboratory.**

ECEN 5385-3. **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, 5345, or PHYS 4340, or equivalent.

ECEN 5645-3. **Introduction to Optical Electronics.**

ECEN 6355-3. **Principles of Electronic Devices 2.** Advanced topics related to electronic devices. Semiconductor device aspects of heterojunction and optoelectronic devices. Includes abrupt and graded hetero-interfaces, photodiodes, LEDs, semiconductor laser diodes, HBTs, and hetero field-effect transistors. For both advance circuit and device engineers. Prereq., ECEN 5355 or instructor consent.

ECEN 6365-3. **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. Prereq., ECEN 5365 or instructor consent.

### *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 4606-3. **Optics Laboratory.** The optics laboratory has experiments in imaging, holography, fiber optics, sources and detectors of optical radiation, polarization, optical components, and Fourier optics. This broad range of experiments provides students with an experiential understanding of modern optics. Prereq., ECEN 3130.

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.

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 4645 or 5645, 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; poisson and related processes; thermal and shot noise. Direct and heterodyne detection; analog and digital transmission; signal-to-noise ratios; error probabilities. System optimization. Prereqs., ECEN 3140 and 4242, or instructor consent.

ECEN 5696-3. **Fourier Optics and Holography.** 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, Kirchhoff'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.

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 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 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. Prereq., ECEN 3170.

**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 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 4618-2. Advanced Electronics Laboratory.** Includes experimental work with logic gates, oscillators, 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 4138 and PHYS 1110.

**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 5129-3. Simulation Tools for VLSI Systems.** Develops foundations of VLSI simulation—numerical analysis, linear algebra, data structures, language theory, and digital and analog circuits. Student teams write simulation packages. Covers simulation from the switch level to the behavioral level, including fault simulation. Prereq., instructor consent.

**ECEN 5139-3. 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 6139-3. 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 5129, 5139, and CSCI 5454.

### Engineering Management

**EMEN 4030-3. Project Management Systems.** Acquaints the student with multidisciplinary aspects of project management, including the relationship between schedule, project cost, and performance. Qualitative and quantitative tools facilitate project management.

**EMEN 4040-3. Planning for Quality Improvement and Value Creation.** Quality improvement and value creation result from understanding existing and emerging customer needs, designing products to meet those needs, and designing processes that result in that product. Overview of philosophies, principles, and methodologies for quality improvement.

**EMEN 4100-3. Business Methods and Economics for Engineers.** Covers cost concepts and economic environment; concepts and methods of analysis of the time value of money; analysis of alternatives; depreciation and depletion; impact of taxes on alternative analysis; cash flows; use of spreadsheets in analysis; inflation and price changes; uncertainty; replacement analysis; capital finance; and multiattribute decisions.

**EMEN 4820-3. Engineering Entrepreneurship.** Analyzes organizational elements of the entrepreneurial corporation and gives some understanding of how such an organization functions, including the relationship between products of the corporation and the corporation itself, interaction between the engineering functions and other organizational elements of the corporation, how the product development activity is impacted by various functions of the corporation, and an introduction to various financial statements used in business. A multi-phase student team project illustrates the concepts covered.

**EMEN 4825-3. Entrepreneurial Business Plan Preparation.** Students learn the necessary elements of a business plan and how to prepare a complete well-written plan for an entrepreneurial business venture. Students work in interdisciplinary business-engineering five-person teams.

**EMEN 4830-3. Special Topics.**

**EMEN 5010-3. Introduction to Engineering Management.** 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. Finance and Accounting for Engineers.** Familiarizes the engineer with basic financial statements used in business. Discusses investment analysis, modeling of the enterprise, financial structures, and the effects of taxation and inflation.

**EMEN 5030-3. Project-Management Systems.** Presents basic tools required to manage a wide variety of programs—product development, software development, process development, and government projects. Systems engineering concepts and computer decision aids are included. Students apply tools to a representative project. Topics include production planning, scheduling and control techniques, work structures, CPM/PERT, resource allocation, cost control, and earned value systems.

**EMEN 5040-3. Quality and Productivity 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 5042-3. Methods of Process Management.** In today's business environments, processes are the source of productivity and the unit of analysis. This course will overview methods for process analysis, improvement and ongoing management, and illustrate application to core-business processes such as New Product Development. Prereq., EMEN 5040.

**EMEN 5050-3. Leadership and Management.** The fifth core EMEN course. Gives working engineers background in leadership and management theory and enables them to develop practical skills in leading and managing. Topics include managerial styles, organizational factors, ethics, management of change, and conflict resolution.

**EMEN 5300-3. Management of Research and Development.** Explores how research and development contribute to technological innovation and how research and development are conducted and managed in American universities, government laboratories, and industry. Topics include research and development strategies; innovation and creativity concepts; the research and development process; management of research and development organizations and personnel.

**EMEN 5825-3. Entrepreneurial Business Plan Preparation.** Same as EMEN 4825.

**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 1300-3. Introduction to Engineering Computing.** Introduces 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 1350-1. Calculus 1 Work Group.** This course provides problem solving assistance to students enrolled in APPM 1350. Student groups work in collaborative learning environment. Student participation is essential. Grading under pass/fail option only; this course cannot be used to meet engineering degree requirements. Coreq., APPM 1350 or MATH 1300.

**GEEN 1360-1. Calculus 2 Work Group.** Provides problem solving assistance for students enrolled in APPM 1360. This course is conducted in a collaborative learning environment.

Student work groups solve calculus problems with assistance of facilitator. Grading under the pass/fail option only; course cannot be used to meet engineering degree requirements. Coreq., APPM 1360 or MATH 2300.

**GEEN 1400-3. Engineering Projects.** Provides undergraduate engineering students with opportunity to apply mathematical and scientific skills in interdisciplinary engineering projects. Students work in teams on engineering projects under guidance of engineering faculty.

**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 1520-1. Self Management and Leadership Principles 2.** Continuation of GEEN 1510. Prereq., GEEN 1510 and approval of the MEP office.

**GEEN 2850 (1-3). Independent Study.**

**GEEN 3000-3. Professional Communications for Engineers.** Develops an understanding of the professional communications requirements of the engineer through the development of written and oral skills in a technical environment. The importance of skillful communications to technical and non-technical audiences is emphasized.

**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 4850 (1-3). Independent Study.**

## Humanities in Engineering

**HUEN 1100-3. History of Technology.** Places engineering and technology in a cultural, social, and historical context. Examines development of technology as a key to history of civilization in a comparative perspective. Technical innovation is made intelligible in terms of intellectual traditions, as a response to economic and political demands, and as a determinant of social change.

**HUEN 1125-3. Exploring the Humanities.** Offers coherent introduction to modes of thought found within humanities and social sciences. Course instructors come from academic disciplines in the College of Arts and Sciences and challenge engineering students to think from a variety of frames of reference.

**HUEN 3100-3. Humanities for Engineers 1.** First course in four-semester sequence of Herbst Humanities Program for engineering students. Culturally and historically significant readings are discussed in small group seminars. Prereq., junior standing and program approval.

**HUEN 3200-3. Humanities for Engineers 2.** Continuation of HUEN 3100. Culturally and historically significant readings are discussed in small-group seminars. Prereq., HUEN 3100.

**HUEN 4100-3. Humanities for Engineers 3.** Continuation of HUEN 3100 and 3200. Focuses on humanities themes or texts of increased complexity, often in comparative perspective, including nonliterary works. Prereq., HUEN 3100 and 3200.

**HUEN 4200-3. Humanities for Engineers 4.** Continuation of HUEN 4100. Provides opportunity to pursue a variety of humanistic themes related to Herbst Humanities Program. Prereq., HUEN 4100.

**HUEN 4600-3. Engineering Ethics.** This class has three elements: moral and sociological foundations of professional ethics; exercises in moral reasoning; and case studies from engineering practice to prepare future practitioners for real-life dilemmas.

**HUEN 4800-1. Leadership Seminar.** 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 1000-1. Introduction to Mechanical Engineering.** Introduces facets of mechanical engineering including history of the profession, mechanical engineering curriculum, industries in which mechanical engineers practice, and expectations and tools for academic success. Students participate in hands-on experiences, visit industry, make oral presentations, meet faculty and practicing professionals, and develop a goals statement.

**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. Same as GEEN 1300.

**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; eigen value problems. Addresses both theory and applications. Prereq., APPM 2360.

**MCEN 3030-3. Computational Methods.** Numerical techniques for solution of commonly encountered engineering problems. Methods for solving algebraic, ordinary, and partial differential equations; curve fitting; numerical integration; optimization. Course involves extensive computer use. 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 correlates 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 correlates 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 I—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. Prereqs., 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 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. 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 equations governing 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 transport of heat by radiation.

MCEN 7122-3. 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.

### 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, polymers, ceramics, and their composites. Structure-property relationships; use of primary and secondary processing steps to control material behavior; influence of environment on in-service performance. Prereq., MCEN 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, 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 6184-3. Structure and Properties of Polymers. Emphasizes the relationship between molecular structure and macroscopic properties. Structural aspects include chain conformation, configuration, and the crystalline and amorphous states. Physical and mechanical properties are discussed with a focus on solution and phase behavior, transitions of bulk polymers; and rubber and viscoelastic behavior. Prereq., graduate standing and MCEN 5024, 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 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 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, 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 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 5066-3. Principles and Practices of World Class Manufacturing. Introduction to manufacturing principles and practices that are essential to competing successfully in a global environment. Topics covered include manufacturing as a competitive tool, total quality management, process control, benchmarking, total productive maintenance, just in time, design of experiments, flexible manufacturing and case studies.

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 six 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, APM 2360, and PHYS 1120.

MCEN 4027-3. Mechanical Engineering Laboratory. One lect. and six 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. Credit hours 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. Credit hours 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 5106-3. International Telecommunications Policy. The ultimate use of technology depends upon a number of variables, other than the purely technical. Political factors must also be considered. Investigates the institutions that affect the use of telecommunications. Some time will be devoted to the various parts of the federal government such as the Department of Commerce, the FCC, and the Department of State. The major thrust of the seminar, however, will be toward the role of international institutions, including the ITU, UNESCO, and various satellite organizations such as INTEL-SAT. Crosslisted with PSCI 5106.

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 modeling, and heuristic and analytic techniques used in strategic planning for telecommunications products and services. Case studies emphasize practical aspects of planning and management while case projects allow practice of these techniques.

TLEN 5300-3. Telecommunications Theory and Applications. Mathematical and physical theory of telecommunications. Deals with the fundamentals related to a wide range of topics including physical units, trigonometric functions, sine waves, logarithms, indices, decibels, complex numbers, elementary calculus, elementary probability, power and circuit analysis. Provides technical overview and scope of telecommunications technology.

TLEN 5310-3. Telecommunications Systems. Core class required of all telecommunications degree students. Examines current, future, and basic technical concepts and related telecommunications operations; provides an in-depth look at basic telecommunications technology and terminology; and introduces voice and data networks, signaling and modulation/multiplexing. Topics include spectral analysis of signals, signaling, modulation (AM, FM, PM, and PCM), digital coding/modulation, line coding, multiplexing, transmission and switching systems, OSI model, and traffic analysis. Prereq., TLEN 5300 or equivalent.

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 that support the interconnection and transmission of digital information. These segments include analog, digital, networks, and protocols. Prereq., TLEN 5310.

TLEN 5340-3. Digital Telecommunication Networks. Reviews digital networks providing voice and data communications over a wide area. Topics include: digital transmission, digital switching, signaling, and digital loops. ISDN is reviewed in detail. Concludes with signaling systems No. 7, SONET, asynchronous transfer mode (ATM), and Broadband ISDN. Prereq., TLEN 5310.



**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. Prereq., TLEN 5310.

**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. Presents Key Systems, PBXs, and modern inside wiring schemes. Prereq., TLEN 5310.

**TLEN 5400-3. Traffic and Queuing Theory.** Provides analysis and methods of determining equipment requirements for telecommunications systems. Designed to provide the student with a fundamental understanding of traffic engineering concepts and an introduction to engineering data networks. Emphasizes practical application of mathematical models for determining telecommunications equipment requirements and expected blocking and/or delays. Prereq., TLEN 5310.

**TLEN 5420-3. Optical Communications.** Addresses the engineering and cost benefits of optical fiber systems. Discusses and defines important engineering parameters and applies parameters to typical systems. Gives attention 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. Prereq., TLEN 5310.

**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 communications protection. For more technically inclined students. Normally follows TLEN 5330. Prereq., TLEN 5310.

**TLEN 5460-3. Telecommunication Systems Laboratory.** Hands-on experience in speech, hearing, analog voice channels and copper wire drops, circuit and packet switched asynchronous data, quantizing and coding of analog signals, digital transmission systems, digital private branch exchange switching systems, Local Area Network installation and management, video teleconference and computer screen sharing, fiber optic splicing and transmission, and Integrated Services Digital Networks. Experiments demonstrate the relevance of such concepts as bandwidth, noise interference, channel capacity, computer communications and digital network switching and transmission. Prereq., TLEN 5310.

**TLEN 5470-3. Data and Computer Networks.** Maintains a real-world approach to networking

computers and other data communications devices in use today or have been used in the past. Guest speakers from Colorado companies discuss the nature, history, rationale, and performance of networks used by their companies. Includes both transport networks and 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.** In-depth and interdisciplinary survey and analysis of the cable industry from the perspectives of society, policy, business/economics, and technology. Examines from an historical, current, and future viewpoint the roles, responsibilities, and impacts of cable on entertainment, education, business, and society as a whole. Further investigates other growing forms of video outside today's largely entertainment-oriented systems. Scientific visualization, CAD/CAM, Virtual Reality, Image Processing, and interactive video systems are included. Prereq., TLEN 5310.

**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 radio systems, and personal communications networks (PCNs). Prereq., TLEN 5310.

**TLEN 5600-1. Telecommunications Seminar.** A series of weekly lectures with questions and discussion. Many of the speakers are nationally known experts in telecommunications. Fall and spring seminars are for 1-credit hour each, and attendance is required.

**TLEN 5920-3. Independent Study—Advanced Telecommunications Laboratory.** Students 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 5190-3. Special Topics: 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 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. Normally follows TLEN 5330. Prereq., TLEN 5310.

**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, super-computer data relays, tele-work, tele-health, tele-education, the tele-city, tele-robotics, and mobile communications. 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 Economics.** Engineering and business projects, commonly measured in terms of financial efficiency, seldom achieve maximum success unless they are properly planned and operated with respect to technical, social, and financial requirements. The engineer or telecommunications manager is frequently called on to study technical and financial details of a project and thus provide analysis for a sound managerial decision. Economic analysis, primarily involving engineering, and technical projects includes the time value of money (interest), decision among alternatives, depreciation, capital budgeting, replacement analysis, tax considerations, and the effect 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 applicable in other environments.

**TLEN 5835-3. Economics/Policy/Management Aspects of Telecommunications.** Core curriculum course addresses key nontechnical aspects of telecommunications. Includes aspects of deregulation, common carriers, tariffs, basic standards, and management.

**TLEN 5836-3. Special Topics: Law and Regulation.** While technology is a necessary antecedent 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 range 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 (Pricing). Addresses the foundation of economics as applied to the telecommunications industry. In particular, pricing and costing methods and practices and their impact on specific telecommunications policies are examined. Concepts are integrated with a discussion of the economic history of the industry.

TLEN 5839-3. Special Topics: Advanced Topics in Telecommunications Economics (Regulatory). Addresses alternative means of regulating the telecommunications industry including rate base, rate of return regulation, and a variety of incentive regulations, from both the theoretical and applied aspects. The privatization section addresses when telecommunications entities should remain under government ownership or be privatized and if privatized, how regulated. The UK and Japan cases are examined in detail.

### Cross-Listed

TLEN 5106-3. International Telecommunications Policy. See PSCI 5106.

## FACULTY

### Aerospace Engineering Sciences

A. RICHARD SEEBASS, III, Department Chair; Professor. B.S.E., M.S.E., Princeton University; Ph.D., Cornell University.

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### Chemical Engineering

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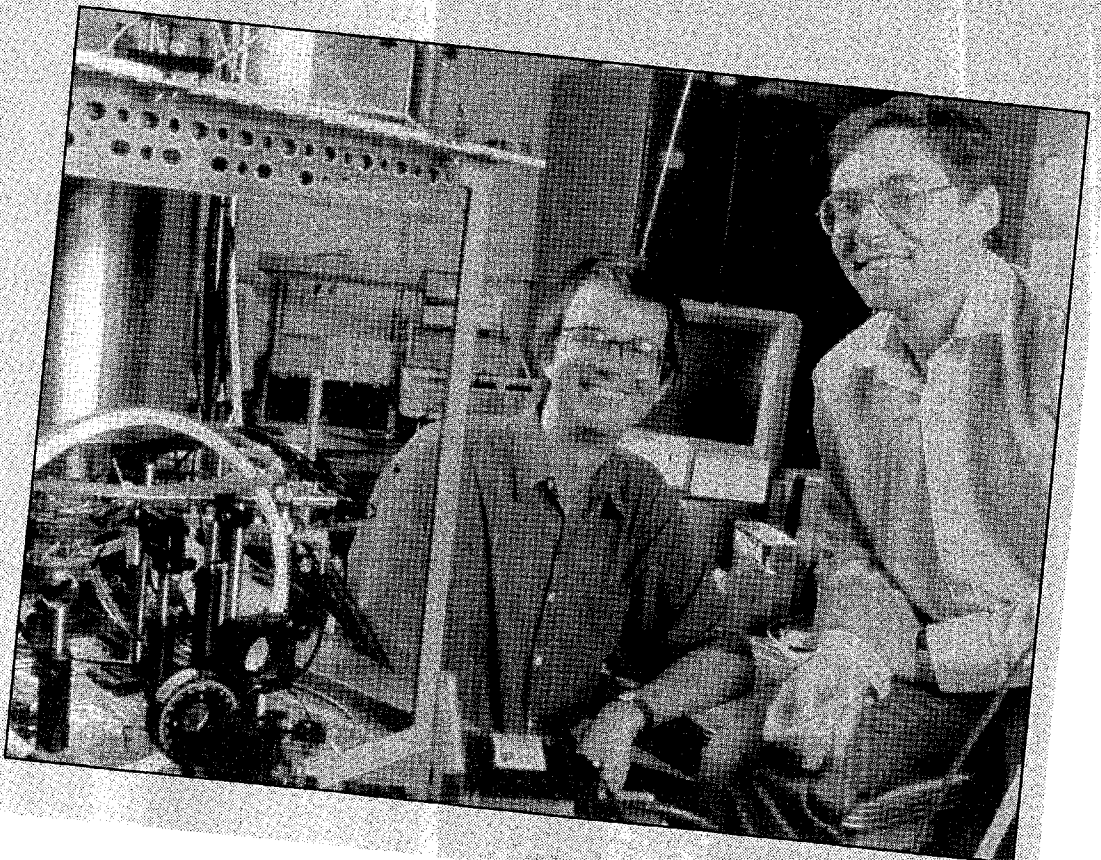
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*Eric Cornell and Carl Wieman of the Department of Physics were part of a team that discovered an entirely new form of matter. Named the Bose-Einstein condensate, the matter was achieved at a temperature lower than any produced before.*



# GRADUATE SCHOOL

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- master of engineering (M.E.)
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- master of music (M.Mus.)
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- doctor of philosophy (Ph.D.)

M.A. degree programs include:

- Anthropology
- Classics
- Communication
- Communication Disorders and Speech Science
- Comparative Literature
- East Asian Languages and Literatures
- Economics
- Education
- English
- Environmental, Population, and Organismic Biology
- Fine Arts
  - Art Education
  - Art History
- French
- Geography
- German
- History
- Journalism
- Linguistics
- Mathematics
- Molecular, Cellular, and Developmental Biology
- Philosophy
- Political Science
- Psychology
- Religious Studies
- Sociology

Spanish  
Theatre

M.B.S. degree program is in Museum and Field Studies

M.E. degree programs include:

- Aerospace Engineering Sciences
- Chemical Engineering
- Civil Engineering
- Computer Science
- Electrical Engineering
- Mechanical Engineering
- Telecommunications

M.F.A. degree programs are in Dance and Fine Arts

M.Mus.

M.Mus.Ed.

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
- Geological Sciences
- Kinesiology
- Mechanical Engineering
- Physics
- Telecommunications

D.Mus.A. degree program is in Music

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
- Geological Sciences
- Geophysics
- History
- Journalism (through Communication track)
- Linguistics
- Mathematical Physics
- Mathematics
- Mechanical Engineering
- Molecular, Cellular, and Developmental Biology
- Music
- 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 *University of Colorado at Boulder Directory* for campus addresses).

## ACADEMIC EXCELLENCE

### Scholarships and Fellowships

The University of Colorado administers various forms of financial assistance for graduate students: fellowships, traineeships, scholarships, research and teaching assistantships, and awards from outside agencies.

The Graduate School offers University of Colorado fellowships, protected class fellowships, Chancellor's Graduate Fellowships, nonresident tuition differential fellowships, and Colorado graduate need and work-study grants.

University of Colorado fellowships are awarded to entering and continuing regular degree graduate students on the basis of academic promise or 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.

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 under-

represented. GRE scores are not required for applicants.

The Chancellor's Graduate Fellowship Program, instituted in 1984-85, attracts outstanding students for graduate study at the University of Colorado. Selected students receive a stipend of \$16,500 for two years and a full waiver of all tuition and fees. Recipients must be entering master's or doctoral degree students and be nominated by their department.

Nonresident tuition differential fellowships are awarded to selected entering out-of-state and foreign students to encourage enrollment in graduate programs at the University. More than 90 of these fellowships, equal to the difference between Colorado resident and nonresident tuition, are awarded by the Graduate School to students nominated by their department.

Enrollment enhancement fellowships provide resident or nonresident students with a fellowship equal to \$4,000 to cover resident tuition, fees, and insurance. These awards are offered to encourage enrollment in selected departments.

Additional fellowships are available from private sources or supplemental funds. Fellowships, traineeships, and scholarships are also offered by some departments. Applications for financial support are due in the departments by the announced deadlines; most departments must receive applications by January 15.

For information about assistantships, see the section on Financial Aid for Graduate Study on page 353.

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 understanding 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. or D.M.A., a course mark below *B-* is unsatisfactory and does not count toward fulfilling the minimum requirements for the degree. For a master's degree, a course mark below *C* is unsatisfac-

tory and does not count 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 of the student's department.

## ADMISSION AND ENROLLMENT POLICIES

### Admission Requirements

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 recommendation, 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 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.** 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 no 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 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 for 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 admission, provisional degree students are required to maintain a 3.25 grade point average or higher during each semester or summer session for all work, 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 in two semesters.

### Admission to Candidacy

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 required for the degree sought. Generally, an application for admission to candidacy is made after the majority of course work for the degree is completed.

### 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, 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.

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.

Career Services administers the GRE and other graduate and professional qualifying examinations; however, the departments set examination 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 picked up at the west entrance of Willard Administrative Center. Problems or special requests must be handled by Educational Testing Service, Box 995, Princeton, NJ 08541; telephone (609) 921-9000.

Information on waiving the GRE fee is available through the Office of Financial Aid.

### Other Graduate Qualifying Examinations

Students entering professional schools and special programs may obtain examination application and registration materials for law school (LSAT), business school (GMAT), medical school (MCAT), and dental school (DAT) examinations, as well as for National Teacher Examinations (NTE) and Miller Analogies Test (MAT) at the west entrance 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 recommendation.
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 on page 14.

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. Most departments require a much earlier application deadline.

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 has 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 Registration in the General Information chapter 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 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 late registration is held (see Registration in the General Information chapter of this catalog).

### Limitations on Registration

A graduate student is considered to be carrying a full load if registered for not fewer than 5 semester hours in course work num-



bered 5000 or above, or 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 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 semester hours per 5-week term and 10 semester hours per 10-week summer session.

### University Employees

Full-time employees of the University may take up to 6 semester hours of course work per semester. Part-time employees, including assistants, may take such work as 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 taken before a student is admitted into a graduate program are considered transfer hours. All transfer of credit limitations apply.

#### Grading System

Students should refer to the uniform grading system described under Academic Records in the General Information chapter of this catalog and note the following:

1. Work receiving a grade below *C* may not be counted toward a master's 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 *NW* or *IF* has been given.
3. Should a student enter the armed forces before completing a course and an *NW* 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.

#### Probation

Any graduate student whose cumulative GPA falls below 3.00 will be placed on probation. Failure to raise the cumulative GPA within two semesters will result in the student's immediate suspension.

#### 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 received when a course is repeated will substitute for the previous 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 be completed within five years of the final degree requirement 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 depends upon the master's degree sought, as noted below:

Degree	Semester Hours
M.A., M.E., or M.S.	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.) 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 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 depart-

ment 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 doctoral degree 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 *Registration Handbook and Schedule of Courses* (the student should pay particular attention to refund policies). 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 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, (303) 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 is an attainment of major importance.

Each department judges the qualifications of its advanced students in the use of English. Reports, examinations, and speech may be used 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 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. Forms are available in the Graduate School.

#### **FINANCIAL AID FOR GRADUATE STUDY**

The University of Colorado offers several types of financial assistance for graduate students who demonstrate financial need. Students apply for assistance by submitting a financial aid application as soon as possible after January 1.

The Colorado Graduate Grant Program is open to graduate students who are Colorado residents. Nonresidents are eligible for student fee grants. To receive assistance, students must be nominated by their departments.

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. Work-study eligibility also requires nomination by a department.

#### **GRADUATE ASSISTANTSHIPS**

##### **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 they are not required to have previous experience. GPTIs and TAs must have a cumulative GPA of at least 3.00. Students are compensated for teaching 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 only for their first-year appointment, with the exception of foreign students. Exceptions beyond the first year must be approved in advance by the dean.

##### **Research Assistants**

In many departments, research activities provide opportunities for graduate students to work part-time as research assistants. All research assistants must maintain a cumulative GPA of at least 3.00. Students are compensated and receive tuition credits based on the percentage of time they work. General fund research assistants are eligible to receive the nonresident tuition differential for only one year. Research assistants must be full-time regularly enrolled graduate students.

##### **Graduate Teacher Program**

The Graduate Teacher Program (GTP) 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 and workshops 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, ethics, and professional development. A special cultural intensive is conducted for foreign teaching assistants that focuses on issues involved in teaching American students. The GTP also offers a graduate teacher certificate for students who complete training requirements including workshop attendance, videotape consultation, and evaluation.

The GTP provides discipline specific teacher training through the Lead Graduate Teacher Program. Lead graduate teachers design and implement TA training activities for their home departments.

## REQUIREMENTS FOR ADVANCED DEGREES

### Master of Arts and Master of Science

A graduate student is responsible for becoming informed about and observing all regulations and procedures required by the program pursued. Each student must be familiar with the graduate sections of the catalog that outline general regulations and requirements, specific degree program requirements, and major department requirements. Ignorance of a rule does not constitute a basis for waiving that rule. Any exceptions to the policies stated in this catalog must be approved by the dean of the Graduate School.

After being admitted to the Graduate School, but before registering, students should consult the graduate advisor in the major department concerning courses and degree requirements, deficiencies, and special departmental regulations.

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 students who have a thorough preparation for their proposed field of study and whose graduate work is of high quality attain the degree with the minimum amount of work. All courses used to meet the minimum requirements for the degree must be of graduate rank. Courses have graduate rank only if they are taught by members of the graduate 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). 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 will be found in separate department announcements. Any department may make further regulations consistent with the general rules.

Students planning to graduate should obtain current deadline dates in the Graduate School. *The graduate student and the department are responsible for seeing 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 for graduate students. The student is responsible for ascertaining and meeting these requirements.

### 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. A candidate for the master's degree may 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.

Independent study courses cannot exceed 25 percent of the course work required by the department.

### Master's Thesis

A thesis, which may be a research or 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. Focus on a definite topic related to the major field.
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

Foreign language requirements for master's degrees are specified by individual departments.

### 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. Participation in the Time Out Program does not extend the student's time limit. 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 on page 351 for requirements for full residence credit during the summer). Students deficient in 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 apply to the comprehensive-final examination:

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 given by a committee of three graduate faculty members appointed by the department 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, and 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 fields of study in this University.

6. A student must have an affirmative vote from the majority of the committee members to pass. 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 and Doctor of Musical Arts

The doctor of philosophy (Ph.D.) and the doctor of musical arts (D.M.A.) are the highest academic degrees conferred by the University. Students who receive these degrees must demonstrate that they are proficient in a broad subject of learning and that they can critically evaluate work in their field; further, they must show the ability to work independently in their field and must make an original, significant contribution to the advancement of knowledge. The requirements stated below are minimal requirements for all candidates for the Ph.D. degree; additional conditions may be found in department

announcements. Additional requirements for the doctor of musical arts are available from the College of Music.

Studies leading to the Ph.D. degree must contribute to special competence and a high order of scholarship in a broad field of knowledge. A student must develop an organized program of study and research within one department or in two or more closely related departments.

Students planning to graduate should obtain current deadline dates from the Graduate School. The graduate student and the department are responsible for seeing that all requirements and deadlines are met (e.g., changing of *TW* 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 and meeting such deadlines.

### Minimum Course Requirement

A minimum of 30 semester hours of courses numbered 5000 or above is required for the doctoral degree, but the number of course hours ordinarily exceeds 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 doctoral degree. Students 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 doctoral 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 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 course work or dissertation hours. 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 advisory 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*

When the field of specialization has been chosen, the candidate will ask a faculty member 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. The advisory committee (beyond guiding the student throughout graduate study) ensures against too narrow specialization. The student shall obtain the signature of the chair of the committee (thereby signifying the chair's willingness to serve) 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*

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. Students must be properly registered to earn full-time 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.

For employed students, those 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 employed more than one-fourth time and less than three-fourths time in work that does not contribute directly to the degree may not earn 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 University.

### *Preliminary Examination*

Each department will satisfy itself (by examination or other means) that students who wish to study for the doctoral degree are qualified. 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 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 doctoral degree are specified by individual departments. A campuswide foreign language requirement 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 formal course work. The oral part is open to members of the faculty. Students must be registered on the Boulder campus as regular degree-seeking students when they attempt the comprehensive examination.

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 must have a regular or tenured graduate faculty appointment. Successful candidates must receive affirmative votes from a majority of the members of their examination board. A candidate who fails the examination may attempt it once more after a period of time determined by the examining board.

### *Application for Admission to Candidacy*

A student must formally apply for admission to candidacy for the doctoral degree on forms supplied by the Graduate School at least two weeks before attempting the comprehensive examination.

Before being admitted to candidacy, 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.

### *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 exempted from this requirement, students not using 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 doctoral student shall write a dissertation based upon original investigation and showing mature scholarship and critical judgment as well as familiarity with tools and methods of research. The subject must be approved by the student's major department. This dissertation should be a worthwhile contribution to knowledge in the student's special field. It must be submitted in acceptable 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 student takes the final examination.

All dissertations must comply 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 and on the student's transcript.

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 department shall determine what constitutes an adequate abstract.

All dissertations must be signed by no fewer than two members of the major department staff 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 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.

A student who fails the final exam may attempt it 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 the student's faculty advisor. 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 of the Graduate School.

#### *Sequestration of Dissertations*

Dissertations approved by the departments and the Graduate School are released to University Microfilms Inc. and placed in Norlin Library, where they are kept on file.

Occasionally, the primary academic advisor, after consultation with the student, may find it necessary to sequester his or her student's dissertation to protect university rights to intellectual property. The University accepts the obligation to protect potentially patentable subject matter from premature public disclosure so as to preserve entitlement to patent protection while the technology is being evaluated. This sequestration should take place only when it is absolutely required and only for the minimum time necessary.

With just cause, the primary academic advisor may request that the Graduate School sequester his or her student's dissertation for one month. Any longer period will be only the minimum time necessary to protect University intellectual property rights under patent policy or to comply with the terms of grants and contracts. Normally this period will not exceed six months. The Graduate School shall pro-

vide an explanation to the student for the decision to sequester consistent with other university policies.

## INTERDISCIPLINARY PROGRAMS

Descriptions of graduate programs are provided in the departmental listings in the college and school chapters of this catalog.

The following interdisciplinary programs are offered at CU-Boulder.

### **Atmospheric and Oceanic Sciences**

The graduate program in atmospheric and oceanic sciences (PAOS) provides an educational and research environment in which to study the dynamical, physical, and chemical structures of the atmosphere and the ocean and their interactions. A major theme is the establishment of a physical basis for climate and global change.

Graduate students, research staff, and faculty work together on a wide range of research topics, including large-scale dynamics of ocean and atmosphere; ocean-atmosphere interaction; remote sensing of ocean and atmosphere; geophysical fluid dynamics from theoretical, numerical, and laboratory modeling perspectives; meteorology and physical structure of polar regions; sea-ice and arctic cloudiness; chemical structure of the troposphere, stratosphere, and mesosphere; and extended weather prediction and boundary-layer measurement and modeling.

PAOS offers both master's and doctoral degrees through the affiliated departments and a graduate certificate in atmospheric and oceanic sciences in cooperation with the departments of astrophysical, planetary, and atmospheric sciences (APAS), aerospace engineering sciences, chemistry and biochemistry, electrical and computer engineering, and geography.

To take part in the certificate program in atmospheric and oceanic sciences, a student must be admitted as a graduate student in one of the five affiliated departments. The student's course background must include mathematics through differential equations and four semesters of undergraduate physics (two semesters of which can include physical chemistry and/or courses in atmospheric and oceanic sciences). After satisfactorily completing one core course, a student may petition the PAOS graduate committee to be considered as a PAOS student.

All students in the certificate program must take at least three core courses and one elective. The approved graduate core courses include:

ATOC 5050 Physical Processes of the Atmosphere and Ocean  
 ATOC 5060 Dynamics of the Atmosphere and Ocean  
 ASTR/ATOC 5560 Radiative Processes in Planetary Atmosphere  
 ASEN 5225 Thermodynamics of the Atmosphere and Ocean  
 ASEN 5519 Remote Sensing of the Atmosphere and Ocean  
 CHEM 5151 Atmospheric Chemistry

The approved electives include 18 courses from the affiliated departments.

The certificate in atmospheric sciences is awarded upon recommendation of the PAOS graduate committee and successful completion of the following requirements:

*Master's degree level:* completion with a grade of B or better of a total of three core courses and one approved elective course.

*Doctoral degree level:* completion with a B or better of a total of three core courses and one approved elective course and completion of a Ph.D. thesis on a topic related to atmospheric and oceanic sciences, including the successful defense of the thesis before a Ph.D. committee including at least two PAOS fellows.

For additional information about the certificate, contact the University of Colorado at Boulder, Program in Atmospheric and Oceanic Sciences, Campus Box 311, Boulder, CO 80309-0311, (303) 492-7167.

### Behavioral Genetics

The Institute for Behavioral Genetics (IBG) offers a training program in behavioral genetics. 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.

The training program requires completion of six of the following nine courses (at least three of the courses must be from the first four listed): behavioral genetics, genetics, quantitative genetics, molecular genetics and behavior, biometrical methods in behavioral genetics, graduate-level statistics course, concepts in behavioral genetics, research in behavioral genetics, and a seminar in behavioral genetics.

Each trainee works as a teaching assistant for one semester in a course relevant to their

professional specialty. An IBG trainee's doctoral dissertation research must be conducted on a topic directly relevant to animal or human behavioral genetics.

A student in the interdisciplinary certificate program must have an IBG faculty member as an advisor and an advisory committee composed of faculty from both IBG and the academic department. The advisory committee evaluates the student's progress and may impose additional requirements.

Further information about the IBG interdisciplinary certificate program may be obtained by contacting the University of Colorado, Institute of Behavioral Genetics, Campus Box 447, Boulder, CO 80309-0447; (303) 492-7362; fax (303) 492-8063.

### Biotechnology

The graduate certificate program in biotechnology provides integrated, interdisciplinary training that encompasses both modern biological sciences and biochemical engineering. The goal of the program is to help students acquire the skills and credentials to undertake crossdisciplinary research in modern industrial, academic, and government biotechnology research laboratories and the perspective to serve as leaders in the advancement of beneficial applications of modern biotechnology.

The graduate biotechnology program is offered cooperatively by the Departments of Chemical Engineering, Chemistry and Biochemistry, and Molecular, Cellular, and Developmental Biology. The program awards a certificate, not a separate degree; each student enrolls in a participating department and meets the degree requirements for that department.

The biotechnology program coordinating committee selects participants from those already admitted into the graduate program in one of the participating departments.

A student must take 6 semester credit hours of graduate biotechnology courses outside the home department. For students entering the program in fall 1993 and after, the required biotechnology core curriculum includes two courses: CHEN 5830 Introduction to Modern Biotechnology and CHEN 5831 Biotechnology Case Studies.

For the remaining credits, bioscience graduate students pick from the bioengineering (CHEN) courses, and bioengineering students pick from bioscience (CHEM and MCDB) courses.

During their first year, students take three laboratory rotations of 15 to 20 hours

per week for 10 weeks in each of three participating faculty laboratories. At least one laboratory rotation must be outside the student's home department. Students receive up to 7 semester credit hours of independent study or laboratory-methods credit for these rotations.

All students are expected to undertake internships with local biotechnology companies. These internships usually take place during the summer after the first year of graduate study.

For further information on the biotechnology certificate program, contact University of Colorado at Boulder, Professor Robert Davis, Department of Chemical Engineering, Campus Box 424, Boulder, CO 80309-0424, or call (303) 492-7314.

### Chemical Physics

The interdepartmental doctoral program in chemical physics prepares students for research in such interdisciplinary fields as atomic and molecular radiative processes, spectroscopy, laser chemistry and physics, atmospheric chemistry, molecular quantum mechanics, statistical mechanics, kinetics, chemistry and physics of the surface and condensed phase, semiconductors, and nanoscale processes.

Students wishing to pursue graduate work leading to the doctoral 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.

Entering students take a qualifying examination in the area of their undergraduate major. The comprehensive examination tests their knowledge of both chemistry and physics. Certain requirements associated with the regular doctoral 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.

The program is administered by an interdepartmental committee. For further information, contact the graduate secretary in either the Department of Chemistry and Biochemistry or the Department of Physics.

### Cognitive Science

The graduate certificate program in cognitive science provides broad, in-depth training in the cognitive sciences. The program is administered by the Curriculum Committee of the Institute of Cognitive Science (ICS) of the University of Colorado at Boulder. Graduate students in cognitive

science are admitted to graduate programs in participating departments that have cognitive science faculty and must meet the requirements for admission and degree completion in their home department.

Students wishing to attain a certificate in cognitive science must formally apply to the Curriculum Committee of ICS. To be admitted they must be a student affiliate of ICS, which requires being a graduate student in good standing in a member department, and they must be sponsored by an ICS faculty member. Students who enter the Graduate School without a master's degree may be admitted to the program upon completion of their first year of study; students with a master's degree may be admitted during their first year.

To qualify for the certificate in cognitive science, students must demonstrate acceptable performance in four courses: one interdisciplinary course; one survey course in each of two different departments; and one advanced course in a third department. The courses must be offered by the departments of computer science, education, linguistics, philosophy, or another department in which there is an ICS faculty member. The three departments for the survey and advanced courses may not include the student's home department. The interdisciplinary course may be taken in any department. Courses for less than 2 credit hours do not count toward the certificate.

There are no additional research requirements for the certificate beyond the departmental Ph.D. requirements.

For further information, contact the University of Colorado at Boulder, Institute of Cognitive Science, Campus Box 344, Boulder, CO 80309-0344; (303) 492-5063.

### Environmental Policy

The graduate certificate program in environmental policy provides an interdisciplinary specialization for students in regular master's and doctoral programs. Environmental issues—water policy, wilderness preservation, air quality, energy development, and global change—transcend ordinary academic boundaries. Policy analysis that deals with these problems must integrate insights and information from many disciplines.

The program draws on courses in anthropology, economics, geography, philosophy, political science, psychology, sociology, the School of Architecture and Planning, the College of Engineering and Applied Science, the School of Journalism and Mass Communication, and the School of Law. Two team-taught capstone seminars are

offered each year—Environmental and Natural Resource 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 Professor Charles Lester, Director, or Luzie Mason, Program Assistant, Department of Political Science, University of Colorado at Boulder, Campus Box 333, Boulder, CO 80309-0333; (303) 492-7149 or (303) 492-8586; FAX (303) 492-0978.

### Geophysics

The interdisciplinary doctoral program in geophysics encourages 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. Students specialize in one of the subfields of geophysics while gaining a broad, general background in the discipline and in-depth education in the relevant aspects of the parent fields of geology, physics, and engineering. Beginning in 1993, the geophysics interdisciplinary program offers a Ph.D. track in hydrology.

Students enter the program by applying for admission to 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. Upon satisfactory performance on the doctoral preliminary examination given by the home department, the student may formally apply

for admission to the geophysics doctoral 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 required course work is as follows:

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 highly recommended courses for the 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.

For further information, call or write any of the participating departments listed above or write to the University of Colorado at Boulder, CIRES, Campus Box 449, Boulder, CO 80309-0449; (303) 492-1143.

### Master of Basic Science: Museum and Field Studies Program

The interdisciplinary museum and field studies program leading to a master of basic science degree (M.B.S.) is administered by the University Museum, in conjunction with the Departments of Anthropology, Environmental, Population, and Organismic Biology, and Geological Sciences, as well as other departments. The program provides a strong background in a chosen field as well as theoretical and practical grounding in museology.

Classes and seminars are taught by university faculty, with contributions from museum practitioners and specialists from throughout the region.

Internships are offered at a variety of museums in the region, including natural history, history, and art museums. Students completing the M.B.S. are trained as collection managers, curatorial assistants, registrars, museum educators, exhibit technicians, and administrators.



### **Program Tracks**

The two-year program enables students to develop competency in a discipline and in an aspect of museum work, as well as professional knowledge in other areas of the museum. Two tracks are available: a collection/field track and an administrative/public track.

1. The collection/field track offers training for students interested in the curatorial and research aspects of museum work, such as floristic or faunistic studies of the past and present, material culture of the past and present, biological inventory, and historical demography. The curriculum gives students academic training as well as experience in all areas of museum work. Field experience is offered through the curatorial and field practica.

2. The administrative/public track offers education for students interested in the public aspects of the museum such as program development and evaluation, exhibition planning and design, and the organization and management of museums. The curriculum offers both academic training in a discipline and hands-on experience with all aspects of the public museum.

### **Admission**

Students must meet all University requirements for admission to graduate school and have a baccalaureate degree and at least a *B* (3.00) grade-point average in previous academic work to be admitted as a regular graduate student. The baccalaureate degree should be in anthropology, biology, geology, geography, history (including archival studies), classics, fine arts, or education, although other majors will be considered. Acceptance to the program is decided by the admissions committee of the University Museum in consultation with the student's department. The student must be accepted by an advisor in his or her discipline.

### **Requirements**

The master of basic science program in museum and field studies is a two-year program requiring a total of 36 credit hours. The student may choose either the thesis or nonthesis plan. Depending on the track and plan, the student completes from 9 to 15 credit hours in a department and from 13 to 22 credit hours in museum core courses. Nine credit hours of practica and internships are required: the student must take at least one practica and one internship and either a practica or an internship outside the discipline. The thesis plan requires the completion and successful defense of a thesis; the nonthesis plan requires the completion of a paper or a project.

For current course information, consult the Museum section under the College of Arts and Sciences chapter in this catalog. For new course or admissions information, please write the University of Colorado at Boulder, University Museum, Campus Box 218, Boulder, CO 80309-0218, or call (303) 492-5437.

### **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 academic work are the same as those for the master of science degree awarded in the College of Engineering and Applied Science.

Unlike the master of science degree, the master of engineering degree permits greater flexibility in course selection. It meets the needs of practicing engineers working full time outside the University. It 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.

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 without driving to campus. These courses are also available by videotape to sites outside the signal range. Each year, CATECS offers over 100 graduate courses to approximately 1400 students at 250 industrial sites.

A prospective student is required to present a well-defined objective to be admitted to the program. Once accepted, a student selects or is assigned to a faculty advisor with whom an academic program is developed.

### **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 taken 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 does not apply toward degree requirements.

Requirements relating to the following are the same as those for the master of science degree awarded in the College of Engineering and Applied Science: admission to the 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 master of science program. An advisor 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 is completed and a copy placed on record with the department office. Changes in the plan must be approved by the advisor and reported to the department's graduate office.

An advisory committee consisting of the advisor and two other faculty members 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 led to 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.

The Departments of Mathematics and Physics offer an interdisciplinary doctoral program in mathematical physics. The program prepares students for research in modern mathematical physics and the relevant mathematics and promotes collabora-

tion and cooperation between the Departments of Mathematics and Physics.

A small number of students are involved in the program, so that the steering committee may follow their progress closely. This individual attention does not necessitate a rigid set of requirements and regulation.

#### *Administration of the Program*

The mathematical physics program is guided by a steering committee composed of members of the Departments of Mathematics and Physics.

#### *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 study in the other. The steering committee accepts students into the program on the basis of their preparation and academic promise. Satisfaction of the second requirement is evaluated individually on the basis of the student's transcript and 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, the examination 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 they choose their field of specialization, ask the faculty member with whom they wish to work to serve 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 Departments of Mathematics and Physics. The program of study

must be approved by the advisory committee and should 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 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 courses are in addition to such subjects as ordinary and partial differential equations, linear algebra, and complex variables, which are 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). 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 or out of the program at any time. Formal acceptance into the program is usually deferred until the student has passed the second-year examination, but any student interested in the program who has an appropriate background is urged to apply as soon as possible.

#### *Master's Degree*

Master's degrees in mathematical physics are not awarded. Students who 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.

#### *Neuroscience and Behavior*

The graduate certificate program in neuroscience and behavior focuses on the understanding of the nervous system and its relationship to disease and behavior. This understanding encompasses the molecular, cellular, and behavioral aspects of neuroscience.

Students come from such graduate programs as environmental, population, and organismic biology; behavioral genetics; molecular, cellular, and developmental biology; psychology; and kinesiology. They receive a Ph.D. in their department and a certificate in neuroscience.

The neuroscience core curriculum includes courses in the following areas: neuroscience methods laboratory, neuroanatomy (PSYC 5263), neurochemistry or neuropharmacology (e.g., PSYC 5062, PSYC 5132), neurophysiology or systems neuroscience (e.g., PSYC 5042, EPOB 5190), behavioral neuroscience or animal behavior (e.g., EPOB 5240, KINE 5610, PSYC—to be developed), molecular neuroscience or molecular genetics or developmental neuroscience (e.g., PSYC 5232, EPOB 5200, MCDB—to be developed).

Students are required to attend a weekly journal club or discussion group and neuroscience colloquia.

#### *Population Studies*

The graduate certificate program in population studies, offered through the population program of the Institute of Behavioral Science, recognizes master's and doctoral degree students 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 develop 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 University of Colorado at Boulder, Population Program, Institute of Behavioral Science, Campus Box 484, Boulder, CO 80309-0484; (303) 492-7986.

### Telecommunications

The graduate interdisciplinary program in telecommunications provides the opportunity for study in the field of technology, planning, and management of telecommunications systems. Students may pursue studies toward the master of science (M.S.) in telecommunications or the master of engineering (M.E.). The program also offers a graduate certificate in interdisciplinary telecommunications studies.

The program involves a number of University units or programs, including journalism and mass communication, computer science, electrical and computer engineering, business, and political science. The program offers courses on technology of existing and future telecommunications systems, their cost effectiveness, their capacity for expansion, and 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 financing of the telecommunications industry and sociocultural impact of modern telecommunications.

Both mid-career professionals and entry-level students participate in the program. Students are expected to have career interests in telecommunications even though their undergraduate study may have been in such fields as political science, business, economics, journalism, or engineering.

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 proficiencies as part of their curriculum.

### Master's Degree Programs

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. The M.E. degree has no residency requirement; course work may be completed via CATECS or the National Technological University satellite delivery system. Students must complete 30 credit hours of course work, submit 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 are expected to pursue a 16-24 month curriculum to enhance their background as well as gain a strong grasp of the various issues in telecommunications. For the M.S. degree, 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 33 hours, including 3 hours for a project are required. M.E. degree students work with their advisor to integrate three electrical and computer engineering graduate courses into their course work.

### Certificate Program

The certificate program in telecommunications studies is offered to encourage graduate students to develop an interdisciplinary perspective on telecommunications that informs both their research and practice. Departments participating in the program include business, communication, economics, electrical and computer engineering, journalism and mass communication, sociology, and philosophy. The certificate is awarded on completion of three courses: TLEN 6305: Telecommunication Technology; TELS 6001: Telecommunication Policy or TELS 6002: Telecommunication and Society. A third course selected by the student from an approved list.

A student must formally apply to the telecommunication studies curriculum committee for admission to the certificate program. The student must be in good standing in a member department and be sponsored by a faculty member on the steering committee. Students without a master's degree may be admitted to the

program after their first year of study. Students who have a master's degree may be admitted during their first year.

### RESEARCH SUPPORT

The University of Colorado at Boulder takes an active part in research in a wide variety of fields.

More than \$134 million in sponsored research and programs was generated in 1995-96. Research and training grants and contracts awarded by various agencies of the federal government are the principal sources of these funds. The University of Colorado's research activity is also supported by appropriations from the state of Colorado, private foundations, and private donors.

### 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 almost 500 faculty, students, and staff from a variety of disciplines. Academic departments represented in CIRES are astrophysical, planetary, and atmospheric sciences; 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 among environmental scientists from Boulder and throughout the world. A visiting fellowship program enables scientists from other institutions to spend time at CIRES.

CIRES research programs involve field investigations conducted in the mountains of Colorado, 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, understanding climate change, and earthquake prediction.

Current CIRES research programs, in which approximately 90 graduate students participate, can be 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, aerosol chemistry, and leaching of toxic wastes from mining. Studies of atmospheric and climate dynamics include air-sea interactions, dynamics of

the atmospheric boundary layer, ocean dynamics, ice nucleation physics, cryosphere-climate interactions, ice sheet dynamics, and contemporary and paleo-climatology.

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.

The Cryospheric and Polar Processes division is a national leader in the study of polar processes. Its research emphasizes studies in high latitude regions, using numerical techniques and satellite remote sensing. Research activities are supported by the World Center-A for Glaciology, the National Snow and Ice Data Center, and the Snow and Ice Distributed Active Archive Center.

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*. Faculty from environmental, population, and organismic biology, geological sciences, geography, anthropology, and other departments are associated with the institute, as are about 50 graduate students.

Disciplines within INSTAAR include plant and animal ecology, paleoecology, palynology, geochronology, climatology, glaciology, and glacial geology. The Center for Geochronological Research is involved in amino acid, fission-track, thermoluminescence and potassium/argon dating, stable isotope geochemistry, dendrochronology, and dendroclimatology. The Joint Facility for Regional Ecosystem Analysis includes a major geographic information system facility. INSTAAR also administers the National Ice Core Laboratory, housed in Denver.

The Mountain Research Station, located at 2,900 m (9,500 feet) in the Front Range of the Rocky Mountains 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 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 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 for new projects.

The Institute for Behavioral Genetics (IBG) is an organized research unit whose personnel conduct research on the genetic bases of individual differences in behavior and provide 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. In addition, IBS now includes a Center for the Study and Prevention of Violence and a Center for Research and Information on Natural Hazards.

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.

Since its founding in 1962, JILA (formerly the Joint Institute for Laboratory Astrophysics) has played an international role in research and education in the physical sciences and technology. The institute offers training for academic researchers and industry scientists, facilitates research in the physical sciences, and fosters the invention of applications for other research laboratories as well as commercial companies. Academic disciplines span theoretical and experimental physics, chemical physics, stellar and galactic astronomy, atomic physics, geophysics, and measurement science. Specific strengths include laser technology, optoelectronics, precision metrology, state-of-the-art electronic and optical feedback control of dynamical systems, chemistry and physics of materials and processes, ultra-high precision spectroscopy and optics, and high-performance computing and image processing.

Applied technical contributions include laser wavemeters, uniquely precise mirror mounts, laser intensity stabilization technology, high-precision gravimeters, and vibration isolation techniques, as well as software that delivers international time standards over Internet. Scientists trained at JILA have joined such firms as Boeing, DuPont, Ford, General Electric, numerous entrepreneurial companies; Massachusetts Institute of Technology's Lincoln Laboratory, Oak Ridge National Laboratory, and other major laboratories; and universities throughout the country, including the University of California, Georgia Institute of Technology, University of Wisconsin, and Yale University.

The senior technical staff comprises scientists from the National Institute of Standards and Technology (NIST) and the University of Colorado. The Departments of Physics, Chemistry and Biochemistry, and Astrophysical, Planetary, and Atmospheric Sciences are affiliated with JILA. The institute offers a rich mix of research and educational experience that makes graduate study at JILA a distinctly interdisciplinary endeavor. Each year, the institute attracts numerous scientific visitors and seminar speakers. In addition, graduate students attend in-house seminars to enhance their skills in laboratory electronics, instrument making, computing, and technical writing.

The JILA building centers around a 10-story tower containing offices for scientific

and administrative support staff, a 128-seat auditorium, and a laboratory wing with an isolated, underground research bay. A new four-story south wing contains some of JILA's computing systems, laboratories for advanced laser studies and experiments, a reading room, meeting rooms, and private offices. Research and education are supported by expert, professionally staffed electronics and instrument shops; computing, networking, and administrative services; and by a Scientific Reports Office.

A brochure describing JILA is available by writing the University of Colorado at Boulder, JILA Chairman, Campus Box 440, Boulder, CO 80309-0440, or by calling (303) 492-6787. Information about JILA is also available on the World-Wide Web (<http://www.boulder.nist.gov/jila/jilahome.html>).

**The Laboratory for Atmospheric and Space Physics (LASP)** is a center for basic theoretical and experimental research in planetary, atmospheric, solar, and space physics. LASP scientists also explore the potential uses and development of space operations and information systems, as well as 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 pursue their research interests under the auspices of the laboratory. LASP has experiments on several NASA spacecraft including the Voyager mission to Jupiter, Saturn, Uranus, and Neptune; and the Pioneer mission to Venus. LASP scientists are using the Hubble Space Telescope to study the surface and atmospheric changes on Mars, and are taking part in the SOLSTICE mission to study the Sun's influence on the Earth's atmosphere. LASP has developed a data handling system for use with its space experiments.

Data analysis is proceeding on the ultraviolet spectrometer and extreme ultraviolet spectrometer for the Galileo mission that will reach Jupiter in 1995. Analysis continues on data from the Solar, Anomalous, and Magnetospheric Particle Explorer (SAMPEX) launched in July 1992 and on data from the Clementine spacecraft launched in January 1994. Flight software is being developed and final calibration analysis underway for the CEPPAD and CMMICE instruments to be launched on NASA's POLAR spacecraft in November 1995.

New study missions include the Venus composition probe and the Hermes global orbiter, both Discovery-class missions; the Pluto Fast Flyby, and the TONE ultraviolet

spectrometer. Launch of the Cassini UVIS experiment to Saturn is scheduled for October 1997.

LASP scientists are studying the application of spacecraft operations and data management concepts to several NASA missions, including the space station. Laboratory experiments, such as developing sensitive photoelectric array detectors for ground-based and space astronomical observations, are also being pursued. Active sounding rocket programs complement the research in planetary atmospheres, atmospheric processes, and solar physics.

### Research Centers

**The Business Research Division** performs contract research and provides the Colorado business community with information and special studies on the state's economy and business problems. The division is also responsible for the organized research activities of the College of Business and Administration, which are conducted through four 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 CU Business Advancement Center** and the **Rocky Mountain Trade Adjustment Assistance Center** provide management assistance, business information, and consulting services to small- and medium-sized businesses in the region. **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 College of Engineering oversees 16 interdisciplinary research centers whose programs augment discipline-based research in traditional academic fields. These research centers have a wide variety of research focuses such as the commercial development of space (**BioServe**); decision support for water and environmental systems (**CADSWES**); manufacturing and packaging microwave, optical, and digital electronics (**CAMPMODE**); applied parallel processing (**CAPP**); telecommunication technologies and applications (**CART**); computer simulations in aerospace structures (**CAS**); astrodynamics research (**CCAR**); combustion research (**CCR**); life-long learning and design (**L<sup>3</sup>D**); low gravity fluid mechanics and transport phenomena (**CLgFT**); space construction (**CSC**); complex software systems (**CSSS**); separations using thin films (**CSTF**); energy management (**JCEM**); space environmental health (**NSCORT**); and optoelectronics in computing systems (**OCS**).

A number of research centers are affiliated with other academic departments, schools or colleges, or other programs, such as the museum. The following centers are briefly described to provide examples of the many areas of expertise encompassed in the CU-Boulder research enterprise.

**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. Staff members carry out research involving x-ray, far-UV, optical, infrared, radio satellite and ground-based facilities with national and international collaboration.

CASA scientists play leading roles in data analysis for NASA astronomy missions such as the Hubble Space Telescope, and CASA instrumentalists manage an active sounding rocket research program and will build the primary spectrograph for the upcoming Far Ultraviolet Spectroscopic Explorer (FUSE) mission. Other CASA programs include laboratory experimentation on molecules of astrophysical interest, space-based and ground-based observational astronomy in all wavelength bands from x-ray to radio, participation in the NASA-sponsored astrophysical theory program, and development of instrumentation for and participation in the Center for Astronomical Research in Antarctica, which places CASA personnel and instruments at the South Pole.

**The Center for British Studies** 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. 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 continues to develop the research base. The center 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 to further knowledge about the nature and behavior of economic variables, to develop and refine research methodology, and to provide decision makers in 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 analysis 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 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 activities focus on theoretical and observational aspects of the Earth's atmosphere, encompassing a broad spectrum of phenomena, such as planetary wave propagation, tropical circulations and convection, gravity 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 superminicomputer, 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 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.

### Laboratories and Special Equipment

Laboratories, special classrooms, and specialized equipment are essential to graduate training and research. Some of the facilities at the University of Colorado are described in the following paragraphs.

Aerospace engineering sciences laboratories have the following facilities for instruction and research: two 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; laboratories in structural dynamics and controls; a guidance and control laboratory; an orbital systems and global positioning system; 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 and Planetary 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 thermo-nuclear 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, such as the Hubble Space Telescope. Teaching and research are conducted in collaboration with the Laboratory for Atmospheric and Space Physics, JILA, the National Center for Atmospheric Research (including the High Altitude Observatory), National Oceanic and Atmo-



spheric 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 micro-computer 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 two Auger spectrometers, an X-ray photoelectron spectrometer (XPS, ESCA), a low-energy electron diffraction (LEED) system, three mass spectrometers, a scanning tunneling microscope, and associated surface analysis tools. Two systems have attached atmospheric pressure chambers for sample preparation and reaction on well-defined surfaces. All systems are interfaced to computers. Heterogeneous catalysis experiments on supported metal and oxide catalysts also use reactor systems equipped with six gas chromatographs, and two additional quadruple mass spectrometer. Both transient and steady-state reaction studies can be carried out in this equipment.

Research in chemical process control makes extensive use of an array of real-time computer systems. Experimental units studied include two chemical reactors, a heat exchanger, a distillation column, and an evaporator pilot plant.

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 Coulter multisizer, a quasi-elastic light scattering device, a microvideo and image analysis system, 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. Oil shale leaching experiments simultaneously measure dynamic leaching and porous media properties. A porosimeter is used to determine pore size distributions.

Membrane studies use casting machines for fabricating flat sheet and hollow fiber membranes. Several types of equipment are used for studying the membrane-casting process in real time: a microbalance with a computer interface for gravimetric studies; an infrared thermographic imaging camera for surface temperature measurements;

light reflection and scattering probes for determining phase separation; and laser interferometry and ultrasonic time-domain reflectometry apparatuses for tracking phase boundaries. A pendant drop tensiometer is used to study membrane formation via interfacial polymerization. A high pressure flow loop is available for measuring the permeation characteristics of flat sheet membranes. A differential scanning calorimeter is used for determining the glass-transition and crystallization temperatures as well as other properties of polymeric membrane materials. National Science Foundation specialized engineering research equipment grants have enabled the purchase of a high resolution scanning electron microscope equipped with a cryostage and both energy and wavelength dispersive x-ray spectrometers as well as both sputtering and evaporative coating equipment for sample preparation. This equipment is used for characterizing the structure and elemental composition of polymeric as well as other materials.

The biotechnology research laboratories are equipped with 10 highly instrumented and controlled fermenters in sizes ranging from 1 to 20 liters, two high-performance liquid chromatographs, a flow cytometer, an ELISA plate reader, a UV-vis scanning spectrophotometer, two laminar flow hoods, an electron paramagnetic resonance spectrometer, three autoclaves, an automatic glucose and lactate analyzer, a biofreezer, three shaking incubators, a CO<sub>2</sub> incubator, a sonicator, a phosphorescence imager, centrifuges, and other standard equipment for conducting enzymatic transcription of RNA and fermentation research on bacterial, yeast, mycelial, and mammalian cell cultures.

The bioengineering laboratory is equipped for biophysical measurements and high altitude research. This equipment includes a variety of optical instruments, a phase contrast and polarizing microscope, a microscope video camera, a hyperbaric chamber, a Cary spectrophotometer, a plant growth chamber, autoclave, and a sterile room.

In the polymer laboratory, the latest Perkin-Elmer differential scanning calorimeter (DSC 7), equipped with a photo accessory (DPA 7) and thermal analysis system, is used to study photopolymerization reactions and phase transitions. Nonlinear optical polymeric materials are characterized on an optical bench equipped with a Neodymium/YAG laser and photo detection system. The optical apparatus is interfaced to a computer. The laboratory is also equipped with a Hewlett Packard UV-

visible spectrophotometer and facilities to perform photopolymerizations to produce membranes and polymer films. Additionally, an inductively coupled plasma spectrometer in the Department of Geology is used for elemental analyses in the polymeric membranes research.

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, tunneling, 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 includes 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 are well prepared for the job market.

Terminals, graphics terminals, line printers, plotters, and letter quality laser are 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 are 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, mechanical, and electronic systems. Typical areas of study include heat transfer, fluid and solid mechanics, mechanical behavior of materials, combustion, prosthetic device performance, electronic packaging and manufacturing, and design optimization.

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 materials laboratory is well equipped for the measurement of the physical and mechanical properties of polymers, metals, ceramics, and composites. Major facilities include a pressure dilatometer with capabilities to 200 MPa and 450°C for determination of solid and melt equations of state, a forced-oscillation dynamic mechanical analyzer as well as a large capacity torsion pendulum for measurement of modulus and damping behavior, a modern servohydraulic mechanical test sys-

tem for the analysis of tensile and relaxation properties, and an acoustic 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 packaging laboratory is equipped with a quick prototyping workcell for semicustom multichip modules, two fluxless solder reflow chambers, a thermosonic flip-chip bonding machine and a thermal-chip testing system. The electronic manufacturing laboratory houses a mock-up chemical vapor deposition reactor, a condensation soldering set-up, a wind-tunnel for testing various high performance heat sinks, and a Czochralski crystal growth simulator. This equipment supports work on novel packaging and process control techniques including artificial neural networks and fuzzy logic. The recently constructed mechatronics laboratory has been designed to provide a hands-on environment for studying the interactions among mechanics, electronics and control as a single unit and at a system level.

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, includ-

ing 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 servomechanisms, modeling presses, and fabrication equipment for plastics technology; modular analog computer units; high-speed photographic equipment; a precision microscope for grain examination and film reading; time-sharing computer terminals; a servo-analyzer; an 8-track instrumentation tape recorder; and special equipment for bio-engineering studies of skeletal systems and prosthetic devices.

The Nuclear Physics Laboratory, of the Department of Physics, conducts theoretical and experimental research in nuclear physics. Theoretical work is directed primarily to the studies of the structure and interactions of strongly interacting particles. Experimental work is focused on intermediate and high energy electron and meson beam interactions with nucleons and with complex nuclei. The laboratory is well equipped with shop, laboratory, and computing facilities for the preparation of experimental equipment and for the analysis of data.

Graduate students and faculty of the laboratory carry out experiments at CEBAF, Brookhaven National Laboratory, TRIUMF (in Vancouver, Canada), DESY (in Hamburg, Germany), and elsewhere. Support for the research program comes from the U.S. Department of Energy. Research assistantships are available in both theoretical and experimental studies.

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. Established in 1940, HAO 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.

*These two students are part of "News Team Boulder," a class that produces newscasts for Boulder Cable Channel 53.*



# SCHOOL OF JOURNALISM AND MASS COMMUNICATION

WILLARD D. ROWLAND, JR., DEAN

Formal instruction in journalism began at the University of Colorado at Boulder 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, with which the school assists. 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 Environmental Journalism.** The center seeks to enrich and elevate the quality, range, and significance of media coverage of environmental issues. The CEJ's activities involve three interrelated areas: student education, including a master's degree with an emphasis in environmental journalism; professional development for working journalists; and communication with scientists and the public.

**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, broadcast news, broadcast production management, media studies, and news-editorial. 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, in conjunction 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 over 35 countries worldwide. Information and application forms are available at the University of Colorado at Boulder, Office of International Education, Campus Box 123, 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, the American Advertising Federation, and the Radio and Television News Directors Association.

## 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 Memorial Fund, provided for student loans  
Nonie Lann Endowed Scholarship  
Lehman Communications Corporation Endowment Fund, scholarships for students in under-represented ethnic groups  
Winton Lemen Scholarship  
William M. Long Memorial Fund, provided for student loans  
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  
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 Communication and will be notified in writing.

Scholastic records will be reviewed as soon as possible after each semester, and students will be informed in writing if they are to be placed on probation or suspension.

The normal period of suspension is two regular semesters (one academic year,

excluding summer sessions). The period of suspension will be stated in the suspension notice to the student. A student suspended a second time will be reinstated only on the basis of unusual circumstances, which the student should state in a petition to the dean of the school.

### 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. See Undergraduate Admission in the General Information chapter of this catalog for admission standards for transfer students.

### *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 toward completing 60 semester hours with a grade point average of at least 2.25. 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 core areas of study requirements in the College of Arts and Sciences. Students must complete two journalism classes (JOUR 1001 and 2001) with a GPA of at least 2.50 before applying. JOUR 2001 requires at least average competency in typing.

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. See Undergraduate Admission in the General Information chapter of this catalog for transfer student admission standards.

### 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. A student who does not attend any of the first week's sessions of a class during a term may 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. For additional information on transfer of credit policies, please see Transfer of College-Level Credit on page 12.

### 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 May graduation and February 15 for August and December 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 in order 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 39 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 other relevant areas.

### 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.

A fifth area, Media Studies, is available for students interested in the relationships among mass media, culture, society, criticism, and policy.

### Advertising

Advertising is designed to prepare students for careers with newspapers, magazines, radio, television, and advertising and public relations firms.

#### Required Courses

Required Courses	Semester Hours
JOUR 1001 Contemporary Mass Media	3
JOUR 2001 Mass Media Writing	3
JOUR 2403 Principles of Advertising	3
JOUR 3453 Advertising Copy and Layout	3
JOUR 3463 Advertising Media	3
JOUR 3473 Advertising Research	3
JOUR 3771 Mass Communication History	3
JOUR 4403 Advertising Campaigns	4
JOUR 4931 Internship or JOUR 3913 Advertising Practicum	3
Journalism electives	0-6
ECON 2020 Principles of Macroeconomics	4
BCOR 2050 Adding Value with Management and Marketing I	3
MKTG 3250 Buyer Behavior	3



## Broadcast News

Broadcast news is designed to prepare students as news directors, reporters, editors, and writers for television or radio stations.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media .....	3
JOUR 2001 Mass Media Writing .....	3
JOUR 3001 Reporting of Public Affairs .....	3
JOUR 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 Mass Communication History .....	3
JOUR 4624 News Team .....	3
JOUR 4651 Mass Communication Law .....	3
Journalism electives .....	1-7

## Broadcast Production Management

Broadcast production management is designed to prepare students for other careers in radio or television, including positions in programming, advertising, promotion, and management.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media .....	3
JOUR 2001 Mass Media Writing .....	3
JOUR 2403 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 Mass Communication History .....	3
JOUR 4644 Electronic Media Management .....	3
Journalism electives .....	1-7

## Media Studies

Media studies is designed to prepare students for government and private industry careers evaluating and critically analyzing the impact of the media on society and culture, as well as evaluating and establishing mass media policy.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media .....	3
JOUR 2001 Mass Media Writing .....	3
JOUR 2403 Principles of Advertising .....	3
JOUR 4791 Mass Communication and Public Opinion .....	3
JOUR 3771 Mass Communication History .....	3
JOUR 4651 Mass Communication Law .....	3
JOUR 4711 Mass Media and Culture .....	3
JOUR 4301 Media Ethics and Professional Practice .....	3
JOUR 4311 Mass Media Criticism .....	3
JOUR 4321 Media Institutions and Economics .....	3
Journalism electives .....	3-9

## News-Editorial

News-editorial is designed to prepare students for positions as reporters, editors, and writers

for newspapers, news services, magazines, trade and technical publications, company publications, and government.

<i>Required Courses</i>	<i>Semester Hours</i>
JOUR 1001 Contemporary Mass Media .....	3
JOUR 2001 Mass Media Writing .....	3
JOUR 3001 Reporting of Public Affairs .....	3
JOUR 3473 Advertising Research or JOUR 4791 Mass Communication and Public Opinion ...	3
JOUR 3552 News Editing .....	3
JOUR 3771 Mass Communication History .....	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 an 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 offers a mass communication research program and professional programs in news and integrated marketing communications.

Graduate students should read carefully requirements for advanced degrees in the Graduate School chapter of this 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 and environmental policy programs (see the Graduate School Interdisciplinary Programs section of this catalog).

### Requirements

The master's program in news provides students with the knowledge and skills needed to enter the print or broadcast media. Students concentrate on in-depth reporting in either print or broadcast, although they are enrolled together in both required and elective courses. Students are advised and encouraged to develop an area of reporting specialization to combine with their professional skills training. Such specialties might include education, business, the environment, science, politics, or the arts. The program culminates with a professional project. Students complete a minimum of 30 graduate semester hours and should be able to finish the degree in three semesters plus a summer. Students who enter

the master's program in news are not expected to have a background in journalism.

The integrated marketing communication (IMC) master's degree is a marketing communication management program that concentrates on a variety of functional areas, including advertising, public relations, direct response, sales promotion, and packaging. The program's focus is on strategic planning. Students complete a balanced curriculum that includes both theory and practice. Students are required to do an oral defense of their work in the IMC program. In addition, students must complete an on-site audit of an organization's marketing communication program. Three undergraduate prerequisites and 41 graduate credit hours are required for the IMC program, which students should be able to complete in 16 months.

The M.A. program in mass communication research is designed for students who seek to pursue media studies or enhance an undergraduate or professional background. The curriculum concentrates on theories of mass communication, research methods, and concepts in law, history, politics, public opinion, international mass communication, and ethics. The degree requires a thesis. Students must complete a minimum of 28 graduate semester hours, including a thesis. They can complete the degree in three semesters plus a summer.

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 programs write to the University of Colorado at Boulder, Coordinator of Master's Programs, School of Journalism and Mass Communication, Campus Box 287, 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 University of Colorado at Boulder, Director of the Doctoral Program, School of Journalism and Mass Communication, Campus Box 287, 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 *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

### 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 3771-3. Mass Communication History.

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 4301-3. Media Ethics and Professional Practice.

Provides a theoretical framework within which to spot and analyze ethical issues in the mass media. It will awaken students to ethical issues; allow students to question the profession's conventional wisdom; and teach students how to change those conventions.

#### JOUR 4311-3. Mass Communication Criticism.

Designed to introduce students to the critical perspectives most often employed in qualitative media analysis: semiology, structuralism, Marxism, psychoanalytical criticism, sociological criticism, etc. Students work with texts from contemporary print and broadcast media.

#### JOUR 4321-3. Media Institutions and Economics.

An introduction to the institutions and practices of the media industries. Surveys the histories, structures and activities of these organizations and the contemporary issues surrounding them.

#### JOUR 4331-3. Women and Popular Culture.

The study of how women are portrayed in mass media, particularly advertising, television, film and contemporary popular literature. Critical methods will be utilized with a focus on producing responsible viewers and readers.

#### 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 4711-3. Mass Media and Culture.

Examines culture in the form of discourse, symbols, and texts transmitted through mass media. Explores the relationship between such mediated culture and social myth and ideology.

#### JOUR 4791-3. Mass Communication and Public Opinion.

Topics include opinion-shaping role of the mass media, theories of public opinion and propaganda, polling, communication 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 Topics.

#### 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 5201-3. International Mass Communication.

Same as JOUR 4201.

#### JOUR 5301-3. Media Ethics and Professional Practice.

Same as JOUR 4301.

#### JOUR 5321-3. Media Institutions and Economics.

Same as JOUR 4321.

#### JOUR 5331-3. Women and Popular Culture.

Same as JOUR 4331.

#### JOUR 5511-3. Newsgathering 1.

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 5521-3. Precision Journalism.

Computer-assisted reporting including a knowledge of electronic mail, bulletin boards, commercial databases, and global information networks such as Internet as well as the use of spreadsheets to analyze census data and the like.

#### JOUR 5651-3. Mass Communication Law.

Same as JOUR 4651.

#### JOUR 5661-3. Newspaper Management.

Same as JOUR 4661.

#### JOUR 5711-3. Media and Culture.

Examines how various communication channels such as television, advertising, film, newspapers, magazines and popular music interact with culture. Looks at media not only as conduits of cultural values, but also as industries, and at the audiences and the role they play in creating meaning from media texts.

#### 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 5861-3. Visual Communication.

Focuses on the perceptual foundations of visual communication and applies these principles to specific practices in mass communication.

#### JOUR 5871 (1-3). Special Topics.

#### JOUR 5931 (1-3). Internship.

#### 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 simi-

larities 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 6301-3. Communication, Media, and Concepts of the Public.** Introduces students to the advanced study of historical and contemporary uses of fundamental concepts in research and theory about media institutions, particularly public, community, mass, publicity, public space, public opinion, public interest, and the public sphere.

**JOUR 6311-3. Seminar: Freedom of Expression.** Studies free-speech issues in the context of current and historical philosophical foundations for freedom of expression.

**JOUR 6321-3. Literary Journalism.** Analyzes the work of journalists who became some of the greatest fiction writers of the 19th and 20th centuries, and examines the increasingly indistinct lines between journalism and narrative fiction.

**JOUR 6551-3. Telecommunication Policy.** Surveys historical and contemporary developments in telecommunications policy, emphasizing social and cultural dimensions, and focusing primarily on the context of the United States.

**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 6721-3. Message Effectiveness.** Investigates such areas as information processing and its relationship to message objectives. Students investigate such areas as how messages design decisions, and the effects of various types of communication efforts.

**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 6940-3. Master's Degree Candidate.**

**JOUR 6951 (1-6). Master's Thesis.**

**JOUR 7011-3. Proseminar in Communication Theory I.** 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 7061-3. Quantitative Research Methods in Mass Communication.** Examines various methods of quantitative data gathering methods and analysis in the mass media context.

**JOUR 7871-3. Special Topics.**

**JOUR 7951 (1-10). Doctoral Thesis.**

### *News Editorial*

**JOUR 3102-3. Press Photography.** Covers the camera as a reporting tool; training in the use of cameras; composition; and 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 6 credit 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 (1-3). 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 Compu-graphic computer equipment.

**JOUR 4562-3. Electronic Journalism.** Study and writing about existing electronic publications and on-line publishing policies. Students will learn the methods on electronic journalism from simple text to the more sophisticated graphics, photos, movies, sound and text presentations.

**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 and Feature 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 5502-3. Advanced Reporting.** Same as JOUR 4502.

**JOUR 5512-3. Investigative Reporting.** Shows how to dig beneath the surface of issues and events. Focuses on research, interviewing, and writing.

**JOUR 5552-3. News Editing.** Same as JOUR 3552.

**JOUR 5562-3. Electronic Journalism.** Same as JOUR 4562.

**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 and Feature 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.

**JOUR 5822-3. Reporting on the Environment.** Students report and write about the environment by taking into account the scientific, technological, political, economic, and cultural dimensions of environmental subjects.

**JOUR 5872-3. Special Topics—Print.**

### *Advertising*

**JOUR 2403-3. 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 2403.

**JOUR 3463-3. Advertising Media.** Studies media, markets, and audiences, and their relationships to advertising messages. Prereq., JOUR 2403.

**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 6 credit hours.

**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 5413-4. IMC Principles and Practices.** This foundation IMC course reviews the functional marketing communication areas such as advertising, PR, sales promotion, and direct response in terms of their strengths and weaknesses in an integrated program. Focuses on strategy and planning, with students concentrating on integrating targets, timing, and message strategies. Looks at both U.S. and global marketing communication practices.

**JOUR 5423-3. IMC Cases.** A course in IMC management that uses the case method to analyze and evaluate IMC strategy and planning. Uses real-life examples, both domestic and international, from service marketing, industrial marketing, consumer products, and nonprofit organizations to give students a chance to analyze and critique the use of IMC strategies and practices.

**JOUR 5433-4. IMC—Creative Strategy.** Focuses on strategic thinking and critical skills in the development of a variety of marketing communication messages. Students will learn to develop strategy, evaluate creative work, and how to maintain strategic and executional continuity across media. Students will also position products in terms of the competitive situation, the circumstances of use, and the cultural environment.

**JOUR 5453-3. Advertising and Society.** Same as JOUR 4453.

**JOUR 5513-3. International Marketing Communication.** Examines integrated marketing communications from a global perspective, such as how to build stakeholder relationships and corporate reputation across borders.

**JOUR 5523. IMC Campaigns.** As the capstone IMC course, students prepare for an integrated marketing communications campaign for a selected business. The campaign involves primary research, prioritizing stakeholders and contact points, determining communication objectives and strategies, producing copy and layouts, and budgeting.

**JOUR 5873-3. Special Topics—Advertising.**

### 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 Boulder." Students also do porta-pak projects to sharpen their writing, video production, and editing skills. Prereq., JOUR 3644.

**JOUR 4344-3. TV Documentary.** Designed to give advanced broadcast students the opportunity to create through research, writing, videotaping, and editing a long-form, nonfiction television program.

**JOUR 4354-3. TV Reporting.** Covers basic broadcast reporting skills, where to find news and

how to cover it, and how to analyze and organize news stories. These skills will be linked with advanced concepts of shooting and editing videotape in order to produce news stories on deadline.

**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. News Team.** Emphasizes visualization. Covers special advantages and limitations of broadcasting news and public affairs. Students also participate in "News Team Boulder" by preparing newscasts for Boulder Cable Channel 53. 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. Electronic Media Management.** 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, and commercials.

**JOUR 5344-3. TV Documentary.** Same as JOUR 4344.

**JOUR 5514-3. Newsgathering for Television.** Covers principles and techniques involved in the preparation of news for broadcasting. Introduces the use of television equipment.

**JOUR 5524-3. Television Investigative Reporting.** Covers how to produce quality, substantive, in-depth stories for television. Students will go over the basics of investigative reporting, research, and working with sources.

**JOUR 5624-3. News Team.** 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.

**JOUR 5874-3. Special Topics—Electronic Media.**

### FACULTY

**WILLARD D. ROWLAND, JR.,** Dean; Professor. B.A., Stanford University; M.A., University of Pennsylvania; Ph.D., University of Illinois.

**LEN ACKLAND,** Associate Professor. B.A., University of Colorado; M.A., Johns Hopkins School of Advanced International Studies.

**SAMUEL J. ARCHIBALD,** Professor Emeritus.

**JOANNE EASLEY ARNOLD,** Professor Emerita.

**JAMES E. BRINTON,** Professor Emeritus.

**ANDREW CALABRESE,** Associate Professor. B.A., Denison University; M.A., Ph.D., Ohio State University.

**WILLIAM CELIS III,** Associate Professor. B.A., Howard Payne University; M.S., Columbia University Graduate School of Journalism.

**RAMON CHAVEZ,** Associate Professor. B.A., Texas Tech University; M.A., University of Washington.

**ROSLYN DAUBER,** Assistant Professor. A.B., University of California, Berkeley; M.A., George Washington University; M.A., Annenberg School of Communications; University of Southern California.

**MALCOLM A. DEANS,** Senior Instructor Emeritus.

**THOMAS R. DUNCAN,** Associate Professor. B.S., Northwestern University; M.A., Northwestern University; Ph.D., University of Iowa.

**SHU-LING C. EVERETT,** Assistant Professor. B.A., Fu-Zen University; M.S., Southern Illinois University; Ph.D., University of Tennessee.

**ANDERS GRONSTEDT,** Assistant Professor. B.A., M.B.A., Stockholm School of Business Administration; Ph.D., University of Wisconsin-Madison.

**BRUCE HENDERSON,** Instructor. B.A., University of Wisconsin, Milwaukee; M.A., University of Wisconsin, Madison.

**HAROLD E. HILL,** Professor Emeritus.

**STEWART HOOVER,** Professor. B.A., McPherson College; M.A., Ph.D., Annenberg School of Communications, University of Pennsylvania.

**STEPHEN B. JONES,** Assistant Dean, Instructor. B.A., M.A., West Virginia University; Ph.D., University of Utah.

**FRANK L. KAPLAN,** Associate Professor. B.A., M.A., University of Southern California; Ph.D., University of Wisconsin.

**SAM KUCZUN,** Professor Emeritus.

**POLLY E. McLEAN,** Associate Professor. B.A., Richmond College, City University of New York; M.S., Columbia University; Ph.D., University of Texas.

**WILLIAM I. McREYNOLDS,** Professor Emeritus.

**SANDRA E. MORIARTY,** Professor. B.J., University of Missouri; M.S., Ph.D., Kansas State University.

**MARGUERITE J. MORITZ,** Associate Professor. B.S., M.S., Ph.D., Northwestern University.

**JANICE A. PECK,** Associate Professor. B.A., University of Utah; M.A., University of Washington; Ph.D., Simon Fraser University.

**PATRICIA RAYBON,** Associate Professor. B.A., Ohio State University; M.A., University of Colorado.

**ROBERT B. RHODE,** Professor Emeritus.

**DONALD RIDGWAY,** Instructor. B.J., University of Missouri; B.A., Washburn University.

**BRETT ROBBS,** Associate Professor. B.A., Rhodes College; M.A., Ph.D., Vanderbilt University.

**DON S. SOMERVILLE,** Professor Emeritus.

**MICHAEL TRACEY,** Professor. B.A., University of Exeter; Ph.D., University of Leicester.

**ROBERT TRAGER,** Professor. B.A., San Francisco State College; M.A., Ph.D., University of Minnesota; J.D., Stanford University.

**LAWRENCE R. WEISBERG,** Associate Professor. B.A., M.B.A., Columbia University.

**JAN WHITT,** Assistant Professor. B.A., M.A., Baylor University; Ph.D., University of Denver.

**THOMAS YULSMAN,** Associate Professor. B.A., Harpur College, State University of New York at Binghamton; M.S., Columbia University Graduate School of Journalism.



*As part of a class,  
students in their  
second or third  
year of study  
compete through  
several rounds of  
competition to  
reach the level of  
Moot Court,  
where an actual  
judge or attorney  
sits on the bench.*



# SCHOOL OF LAW

HAROLD H. DRUFF, 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 485 and a favorable faculty-student ratio produce classes of a size that encourages discussion. Classes normally consist of no more than about 80 students, and many are much smaller. In addition, faculty are readily available for informal conferences with individual students.

Courses are offered in a wide range of law-related subject matter (see course descriptions). Students are free to take almost all second- and third-year courses as electives after a required first-year curriculum. Special emphases are available in areas of particular curricular strength at the School of Law such as natural resources, environmental law, American Indian law, constitutional law and jurisprudence. 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, Indian Law 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 current student body of 485.

The law library contains one of the premier legal reference collections in the western United States. The collection con-

sists of over 350,000 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 other foreign languages as well as international law holdings provide a basis for comparative law studies.

The Law Library offers a full range of electronic resources to law students and faculty, including access to on-line databases, Internet and World Wide Web sites, and CD-ROM products. Computer labs and workstations are provided for student use, and instruction is provided for both book and electronic materials.

## Career Services

The school's Office of Career Services offers a broad range of services to students and alumni. Career counseling 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. The office also serves 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 that describe the practice of law in large and small private firms, corporations, public and community legal agencies, and government agencies at all levels.

The Office of Career Services sponsors an on-campus interview program, providing students with the opportunity to interview with numerous legal employers who recruit at the School of Law each year. In addition, the Office of Career Services sponsors 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. The staff provides personalized assistance to students and

alumni in the preparation of resumes and cover letters and in interview techniques and job search strategies.

## Lectureships

In 1955, a trust fund was established in memory of John R. Coen to bring to the School of Law each year a prominent jurist, scholar, or other public figure to deliver a lecture to the students and faculty of the School of Law. Recent lecturers in the series have included Vincent A. Blasi, the Corliss Lamont Professor of Civil Liberties at Columbia University School of Law; Susan Rose-Ackerman, the Ely Professor of Law and Political Economy at Yale Law School; Martha Minow, Harvard Law School Professor; Akhil Amar, Yale Law School Professor; and John C. Coffee, Jr., Adolph A. Berle Professor at Columbia University School of Law.

The Austin W. Scott, Jr. Lecture Series was established in 1973. Lectures in this series are given by members of the faculty of the School of Law, generally on research in progress. Although the topics vary with the interests of the lecturer, lectures are always topical and stimulating. Recent lectures have included Professor Pierre Schlag, who lectured on legal philosophy, Professor Clyde O. Martz, who lectured on the future of the legal profession, Professor David H. Gerches, who lectured on water policy, and Professor Stephen D. Smith, who lectured on religious freedom.

## Clinical and Extern 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 Appellate Advocacy Clinic is taught at the School of Law by a member of the Appellate Division of the Colorado State Public Defender's Office or the Office of the Attorney General. Each student, under direct supervision of the instructor, is responsible for completing an appellate brief for a criminal case pending in the Colorado Supreme Court or the Colorado Court of Appeals. In addition, students meet to discuss appellate procedure, issue identification, appellate writing, and oral advocacy.



The Indian Law Clinic is a hands-on course in which students who have taken the basic Indian law course can participate in the representation and advocacy of Indian causes. The clinic's clients are Native American people in the Denver metropolitan area, tribal courts and/or Indian litigants, and other Indian groups or tribal agencies that would otherwise be unable to afford legal assistance.

The clinic gives priority to cases with a uniquely Indian law dimension—land or water claims, Indian religious freedom, Indian Child Welfare Act litigation, job or other discrimination based on race, and issues implicating tribal sovereignty. The clinic does some legal aid work on behalf of low-income Indian people otherwise unable to access counsel.

Students meet individually with the supervising attorney, and collectively in a weekly two-hour seminar. The focus of the seminar is on Indian law and policy issues of current topical significance, and includes presentations by practitioners and experts on Indian law and culture.

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 representing 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, and in the process, 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, Carrigan Cup Competition, 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 the legal and policy implications of 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 Ageless, 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, Christian Legal Society, Environmental Law Society, Federalist Society for Law and Public Policy Studies, Health Care Law Society, Hispanic Law Students' Association, Native American Law Students Association, Public Interest Student Association, Nicholas R. Doman Society of International Law, Women's Law Caucus, Student Trial Lawyers Association, 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 75 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 that 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 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	=	59 or below

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 50 (*F*) and 71 (*C-*) which the instructor determines to be appropriate.

## 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 1996 had a median GPA of 3.52 and a median Law School Admission Test (LSAT) score of 162.

Admission decisions are based heavily on undergraduate grade point averages and LSAT scores. Other indicators of ability and motivation are also considered in the admissions process. Because the School of Law

believes student body diversity will contribute to everyone's educational experience, a class of students with a mixture of backgrounds, experiences, interests, goals, and talents is the goal of the Admissions Committee. Thus, as important as the results of the Law School Admissions Test and the applicant's undergraduate record are, they are not the only factors considered. The School of Law takes affirmative action to increase ethnic, cultural, and other diversity of its student body. Colorado residency is also given special consideration, since the University is a state-supported school.

Due to the large number of applicants seeking admission, 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.

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. A catalog and application can be requested by writing to the University of Colorado at Boulder, School of Law, Campus Box 403, Boulder, CO 80309-0403, or by calling the 24-hour catalog request line, (303) 493-5706.

2. Students must return a completed application for admission and a nonrefundable application fee of \$45 by February 15. 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 Free Application for Federal Student Aid instructions, available in the Office of Financial Aid.

#### *Admissions Process*

Beginning in January, completed applications are considered by the Admissions Committee. Applicants will be notified in writing of their decision from mid-January until the class is filled, usually late in May. Files are reviewed at the discretion of the Admissions Committee, and in general those with the strongest credentials are

reviewed first. If the committee is unable to reach a decision to admit or deny a particular candidate, the application may be placed in a "hold" category to be reviewed again after the application deadline has passed and other applications have received initial consideration. In these cases, an applicant will not be notified until further action has been taken.

When all places in the class have been filled—usually in May—a waitlist will be established and those who are included on the waitlist will be notified of this decision and asked to confirm their acceptance of a place on the waitlist.

Upon acceptance for admission, an applicant is required to send a confirmation form and a \$200 enrollment deposit to the School of Law by a date specified in the letter notifying the applicant of admission. Each admitted student will be asked to respond within two weeks of receipt of the letter (but not earlier than April 1).

#### *Transfer and Visiting Students*

Transfer students must have completed at least one full year of study at a law school accredited by the American Bar Association and 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 undertaken; (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; and (3) class rank or a normal grade distribution for the law school attended.

A limited number of 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.

The School of Law may admit one or more visiting students who may study at the school for a semester or a year, but who will receive their law degree from their school of origin. Admission as a visiting student is available only to applicants who have completed one or two years of high-quality work at another law school and who have demonstrated a compelling need to attend the University of Colorado School of Law.

Application procedures are the same as for transfer applicants. In addition, however, the dean of the school of origin must send a letter agreeing to accept work satis-

factorily completed at the University of Colorado School of Law for credit toward the student's law degree. Admission as a visiting student allows enrollment in courses on a space-available basis. As a rule, financial aid for a visiting student is handled by a consortium agreement between the School of Law and the degree-granting institution.

#### *Foreign Student Information*

The University of Colorado School of Law offers only the Juris Doctor degree. The School of Law does not offer the Master of Law degree (LL.M.). Foreign students will be considered within the following parameters: applicants must submit a completed application including a personal statement, transcripts showing completion of the equivalent of a bachelor's degree from a United States institution, a letter of recommendation, current LSAT scores, and the application fee in United States currency. All documents *must be in English*. The TOEFL is not required. However, a good command of English is crucial to success in law school and will be demonstrated by the LSAT, the personal statement, and other written communication required by the application process.

Applicants possessing a law degree from a foreign law school may apply for admission as transfer students by submitting a letter of good standing from the dean (or equivalent) of their previous law school, LSAT scores, official law school transcripts, and all documents mentioned in the previous paragraph. The CU-Boulder School of Law will accept a maximum of one year of credit from a foreign law school; most transfer students must complete the first-year curriculum at the School of Law.

The school has no scholarship or loan assistance available for foreign students. All foreign students must submit a financial affidavit after admission to the School of Law stating that they possess the financial resources to support themselves while attending school in the United States.

#### *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 eval-

uation. 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 can 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 30 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).

### Dropping Courses

Any first-year student who desires to drop a course must first obtain the permission of the dean. Clinical courses and waitlisted courses may be dropped until the sixth day of classes, and other upper-division courses may be dropped until the end of the sixth week of classes. After the applicable deadline, a course may be dropped for good cause and with the consent of the instructor and the dean. If a student drops a course after the applicable deadline without such consent, he or she will receive a failing grade in the course.

### Summer Session

A limited summer curriculum is offered at the School of Law. Any student who has completed at least one year in an ABA-accredited law school may register for courses offered during the summer session upon submission of a summer application form with a letter of good standing from his or her law school. A student may enroll in courses totaling no more than 8 semester hours without special permission from the dean's office.

A *Schedule of Summer Courses* with an application form may be obtained after March 1 by writing to the University of Colorado at Boulder, Office of Admis-

sions, School of Law, Campus Box 403, 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. Unofficial law school transcripts 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 \$4,502 in tuition and fees for the 1996-97 academic year; nonresidents paid \$15,260. 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 Academic Records in the General Information chapter of this catalog.

Living expenses, books, and incidental costs in the amount of approximately \$10,637 per year should be added to tuition figures in estimating yearly expenditures.

The *Free Application for Federal Student Aid* (FAFSA) is the only financial aid application that will be accepted for 1997-98. FAFSA forms will be available from local high schools, colleges, and universities after January 1, 1997. Law students are eligible for loans sponsored by the federal government or private sources. Applications for such loan programs as the William D. Ford Federal Direct Loan Program are available through the University. Alternative loans through Law Access and LAW LOANS are privately funded; applications may be obtained from the Law School or the Financial Aid Office.

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. (Note: Work Study is available only to second- and third-year students).

The status of financial aid applications submitted to CU-Boulder cannot be confirmed 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 priority date for financial aid is March 1. This means all financial aid applicants must have a complete file, consisting of student tax information and the FAFSA, by March 1. A completed file is essential for the Office of Financial Aid to process an award offer.

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 University of Colorado at Boulder, Director of Admissions and Financial Aid, School of Law, Campus Box 403, Boulder, CO 80309-0403, (303) 492-7203, or the University of Colorado at Boulder, Office of Financial Aid, Campus Box 106, 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. These include participation in appellate briefing and argument competitions 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. Law-related employment for a limited number of hours may actually enhance the educational experience of second- and third-year students, but 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 in obtaining part-time hourly and summer employment as well as permanent employment for graduates. 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 ability to analyze, argue, and evaluate endures.

### Graduation Requirements

The Juris Doctor (J.D.) degree is 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 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 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, 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, Evidence, Professional Responsibility, Trial Advocacy (or comparable trial experience in a clinical course), and a seminar. Eleven clinical hours are allowed to count toward the graduation requirement of 89 hours.

Students have the responsibility to plan their second- and third-year schedules to complete all required courses and to enroll for at least 10 credit hours 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 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)

<b>Business</b>	
LAWS 6281-3	Accounting Issues for Lawyers
LAWS 6201-3	Agency-Partnership and the LLC
LAWS 7201-3	Antitrust
LAWS 7021-3	Bankruptcy
LAWS 7211-3	Business Planning
LAWS 7601 (2-3)	Business Transactions
LAWS 7051-2	Commercial Drafting
LAWS 6001-4	Commercial Transactions
LAWS 7301-3	Copyright
LAWS 6211-3	Corporations
LAWS 6251-4	Corporations
LAWS 7011-3	Creditors' Remedies and Debtors' Protection
LAWS 7631-2	Doing Business with Mexico
LAWS 7541-3	Employ. Discrimination
LAWS 7611 (2-3)	International Business Transactions
LAWS 6501-3	Labor and Employment Law

LAWS 6511-3	Labor Law
LAWS 7411-3	Mergers, Acquisitions, and Reorganizations
LAWS 7311 (2-3)	Patent Law
LAWS 7024-3	Real Estate Planning
LAWS 7401-3	Securities Regulation
LAWS 8421-2	Seminar: Duties of the Professional Advisor
LAWS 7341-3	Trademark and Unfair Competition

### International and Perspective Courses

LAWS 7200-3	Anthropology of Law
LAWS 6210-3	Comparative Law
LAWS 7058-3	Conflict of Laws
LAWS 7631-2	Doing Business with Mexico
LAWS 7065-3	Immigration Law
LAWS 7611 (2-3)	International Business Transactions
LAWS 7300-2	International Litigation in U.S. Courts
LAWS 7300-3	International Litigation
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 8510-2	Seminar: International Environmental Law

### Jurisprudence and Perspective Courses

LAWS 6210-3	Comparative Law
LAWS 7058-3	Conflict of Laws
LAWS 6510-3	International Environmental Law
LAWS 7128-3	Jurisprudence
LAWS 7708-3	Law and Social Science
LAWS 6128-3	Legislation
LAWS 8628-2	Seminar: Law, Power, and Politics
LAWS 8528-2	Seminar: Modern Legal Theory
LAWS 8318-2	Seminar: Problems in Law and Economics
LAWS 8548-2	Seminar: Theory of Punishment
LAWS 8428-2	Seminar: Women in Law and Literature

### Natural Resources

LAWS 8725-2	Seminar: Advanced American Indian Law
LAWS 7725-3	American Indian Law
LAWS 7202-3	Pollution Law
LAWS 6112-3	Foundations of Natural Resource Law
LAWS 7402-2	Hazardous Waste and Toxic Torts
LAWS 7102 (2-3)	Oil and Gas
LAWS 6002-3	Public Land Law
LAWS 8112-3	Seminar: Advanced Natural Resources Law
LAWS 8302-2	Seminar: Advanced Water Resource Management
LAWS 7307-3	Taxation of Natural Resources
LAWS 6302-3	Water Resources

### Practice and Procedure

LAWS 7205-3	Administrative Law
LAWS 7303-3	Complex Civil Litigation
LAWS 7315-3	Criminal Justice and Practice
LAWS 6045-3	Criminal Procedure

LAWS 7045-3	Criminal Procedure: Adjudicative Process	LAWS 8015 (2-3)	Seminar: Constitutional Theory
LAWS 6353-3	Evidence (required course)	LAWS 8035-2	Seminar: Freedom of Speech Theory
LAWS 7003-3	Federal Courts	LAWS 8385-2	Seminar: Law and Religion
LAWS 7523-2	Juvenile Law	LAWS 8628-2	Seminar: Law, Power, and Politics
LAWS 7419-2	Legal Negotiation and Dispute Resolution	LAWS 8075-2	Seminar: Race, Racism, and American Law
LAWS 7255-3	Local Government	LAWS 8365-2	Seminar: Immigration and Immigrant Rights
LAWS 6103-2	Professional Responsibility (required course)	LAWS 8065-2	Seminar: White Collar Crime
LAWS 7433-3	Remedies		
Practice--Clinical		Research and Writing	
LAWS 7159-2	Advanced Trial Advocacy	LAWS 6856-2	Advanced Legal Research
LAWS 7309-3	American Indian Law Clinic	LAWS 7029-1	Appellate Advocacy Competition
LAWS 7029-3	Appellate Advocacy Clinic	LAWS 7846 (1-2)	Independent Legal Research
LAWS 7939 (2-4)	Extern Program	LAWS 7916-1	Independent Legal Research: <i>International Environmental Law Journal</i>
LAWS 7419-2	Legal Negotiation and Dispute Resolution	LAWS 7926-2	Independent Legal Research: <i>International Environmental Law Journal</i>
LAWS 6009-4	Legal Aid: Civil Practice I	LAWS 7896-1	Independent Legal Research: <i>Law Review</i>
LAWS 6019-3	Legal Aid: Civil Practice II	LAWS 7906-2	Independent Legal Research: <i>Law Review</i>
LAWS 6029-4	Legal Aid: Criminal Practice I	LAWS 7406-1	International Moot Court Competition
LAWS 6039-3	Legal Aid: Criminal Practice II	LAWS 7106-1	Rothgerber Moot Court Competition
LAWS 7169-2	Motions Advocacy	LAWS 7509-1	Trial Competition
LAWS 7209-3	Natural Resources Litigation Clinic	Taxation	
LAWS 6109-2	Trial Advocacy	LAWS 7211-3	Business Planning
LAWS 7509-1	Trial Competition	LAWS 6157-3	Corporate Taxation
LAWS 6179-2	Trial Practice	LAWS 7217-2	Estate Planning
Property		LAWS 7207-3	Federal Estate and Gift Tax
LAWS 7301-3	Copyright	LAWS 6007-4	Income Taxation
LAWS 7311 (2-3)	Patent Law	LAWS 7617-3	International Taxation
LAWS 7154-3	Land Use Planning	LAWS 7024-3	Real Estate Planning
LAWS 7024-3	Real Estate Planning	LAWS 8407-2	Seminar: Tax Policy
LAWS 6024-3	Real Property Security	LAWS 6107-3	Tax of Pass-Through Entities
LAWS 6104-3	Wills and Trusts	LAWS 7307-3	Taxation of Natural Resources
Public			
LAWS 7205-3	Administrative Law		
LAWS 8725-2	Seminar: Advanced American Indian Law		
LAWS 7475-3	Advanced Torts		
LAWS 7725-3	American Indian Law		
LAWS 7025-3	Civil Rights Legislation		
LAWS 6005-4	Constitutional Law (required course)		
LAWS 6045-3	Criminal Procedure		
LAWS 7045-3	Criminal Procedure: Adjudicative Process		
LAWS 7105-3	Domestic Relations		
LAWS 7055-3	Education Law		
LAWS 7003-3	Federal Courts		
LAWS 7015-3	First Amendment		
LAWS 7425 (2-3)	Health Law		
LAWS 7065-3	Immigration Law		
LAWS 7228-2	Intellectual Origin of the Constitution		
LAWS 7115-2	Legal Rights of Children		
LAWS 7255-3	Local Government		
LAWS 7005-3	Media Law		
LAWS 8445-2	Seminar: Alternative Dispute Resolution		
LAWS 8415-3	Seminar: Biotechnology and Law		
LAWS 8613-2	Seminar: Civil Liberties Litigation		
LAWS 8345-2	Seminar: Comparative Criminal Procedure		

### Dual-Degree Programs

The School of Law participates with the Graduate School of Business Administration in a dual-degree program through which qualified students may satisfy the requirements for both the J.D. and the M.B.A. degrees in a program of coordinated study at the two schools. The School of Law participates in a similar program with the Graduate School of Public Affairs on the Denver campus of the University of Colorado, under which law students may earn the Masters of Public Affairs degree together with the J.D. degree. Through these programs, each school will accept a specified number of hours of course work taken at the other school as part of the requirements for completion of its degree.

School of Law credit for work in the Graduate School of Business Administration or Public Affairs is conditioned upon completion of the M.B.A. or M.P.A. program, as the case may be. School of Law credit for work in the Graduate School of Business Administration or Public Affairs 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 either dual-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 dual-degree program at the time of initial application to both schools.

A student enrolled in a dual-degree program may commence studies under the program in either school. However, a student in either dual-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 requires that the first year of the M.B.A. program also be taken as a unit.

### Credit for Courses Taken

Subject to certain limitations set forth in the Rules of the School of Law, 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 dual-degree program student at the Graduate School of Business Administration or Public Affairs, as the case may be. A student must earn a grade of B or higher in such courses in order for the performance to be acceptable for School of Law credit.

The Graduate School of Business Administration grants up to 15 semester hours of credit for acceptable law school courses toward the master of business administration degree. The Graduate School of Public Affairs will grant credit toward the M.P.A. degree for up to 12 semester hours of acceptable performance in designated School of Law courses taken by a dual-degree program student.

To request further information on and an application for the M.B.A. program write to the University of Colorado at Boulder, Graduate School of Business Administration, Campus Box 419, Boulder, Colorado, 80309-0419, (303) 492-1831. For more information on the M.P.A. program write to the Graduate School of Public Affairs, 1445 Market St., Suite 350, Denver, CO 80202, (303) 820-5600.

### *Termination of Dual-Degree Enrollment or of Good Standing*

Students enrolled in a dual-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 dual-degree program will be required to meet the regular degree requirements (J.D., M.B.A., or M.P.A.) that were in effect when they entered the program for that degree.

### Certificate Programs

#### *Tax Emphasis Program*

The School of Law offers a program of law study that leads to a 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 legal employers, as well as employers in the accounting profession. The certificate signifies taxation law experience 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, Estate Planning, or Real Estate Planning); and Tax Policy if available at the School of Law or, if not offered, either the Tax Policy course at the Graduate School of Business Administration or Public Finance in the Department of Economics.

A sufficient additional number of elective credits to make up the minimum 18 hours may 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 law school credit under the Tax Emphasis Program are limited to 6 semes-

ter hours of credit and must have received prior approval for cross-listing.

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 law school 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 at least 73 semester hours of credit be earned 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 semester of their first year.

#### *Graduate Certificate in Environmental Policy*

Students at the University of Colorado School of Law may enroll in an interdisciplinary program in the Graduate School providing the Certificate in Environmental Policy. Environmental issues—such as water policy, wilderness preservation, air quality, energy development, and global climate change—transcend ordinary academic boundaries. Policy analyzes dealing with these problems must integrate insights and information from many disciplines. The program draws on courses in several departments in the College of Arts and Sciences, the College of Architecture and Planning, the College of Engineering, and the School of Law.

Two team-taught capstone seminars are offered each year: Environmental and Natural Resource 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 law students and students in any

regular graduate degree program. To qualify for the certificate, students must complete at least 18 hours from a list of eligible courses, including the two capstone seminars. At least 12 of the 18 hours must be in courses outside the law school. Up to 6 of these 12 hours may be applied toward the J.D. degree under certain circumstances.

The award of the certificate recognizes 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 University of Colorado at Boulder, Betsy Rieke, Natural Resources Law Center, Campus Box 401, Boulder, CO 80309-0401, (303) 492-1286, or to the University of Colorado at Boulder, Professor Charles Lester, Center for Public Policy Research, Campus Box 330, Boulder, CO 80309-0330, (303) 492-7149.

### 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 *Registration Handbook and 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 6210-3. 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. International Law.** Examines the nature and sources of international law, the relationship between international law and domestic U.S. law, the role of international organizations such as the United Nations, the methods of resolving international disputes, the bases of international jurisdiction, and select substantive areas of international law including the laws



governing the use of force and the protection of human rights.

**LAWS 7200-3. Anthropology of Law.** Offers a detailed review of the relationship between the social and cultural features of a society and the formal and informal legal institutions operating within them. Legal cases and materials from several different societies—Nigeria, Tanzania, Papua New Guinea, Turkey, and Tibet—are presented and compared to American cases. Considers the nature of social control and constraint, forms of judicial reasoning, fact-finding procedures, conciliation, mediation and arbitration modes, and the nature of legal discourse.

**LAWS 7300-2. International Litigation.** Examines the special issues that arise in litigation in U.S. courts when one or more of the parties is a foreign individual, corporation, or government, or when the subject of the litigation concerns events occurring wholly or partly outside of this country. These issues include personal jurisdiction over foreign defendants, extraterritorial service of process and evidence gathering, choice of forum, foreign sovereign immunity, the act of state doctrine extraterritorial application of U.S. law, and recognition and enforcement of foreign judgments. In addition to exploring these practical litigation issues, the course considers broader theoretical questions such as the relationship between international and domestic law, the relationship between public and private international law, the nature of international comity, the efficacy of interest-balancing as a judicial tool, and the federalism and separation of powers aspects of international law enforcement.

**LAWS 8510-2. Seminar: International Environmental Law.** Deals with selected issues in environmental law that involve the United States and one or more other countries. Students prepare research papers on topics dealing with transboundary pollution, extraterritorial application of federal watercourses, export or disposal of hazardous materials, regulation of foreign aid and investment affecting the environment, options for controlling global climate change, and the use of treaties to protect the environment.

### *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 the 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 and the LLC.** Covers the law of agency, partnership, and limited liability company forms of doing business (other forms of unincorporated business organizations are covered briefly). Agency issues are raised when one person acts on behalf of and subject to the control of another. These issues include apparent authority, inherent agency power, ratification, imputed knowledge, and the

undisclosed principal, among others. The law of partnership has undergone substantial legislative change in the last several years, including promulgation of LLP and LLLP statutes (making limited liability possible for partners) and the adoption of a lengthy new uniform partnership act. The limited liability company (LLC) is a new entity that enjoys widespread use and is now being challenged by the limited liability partnership.

**LAWS 6211-3 and LAWS 6251-4. Corporations.** Covers formation of corporations and their management; relations between shareholders, officers and directors; the impact of federal legislation on directors' duties; and the special problems of closed corporations.

**LAWS 6281-3. Accounting Issues for Lawyers.** 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 the financial affairs of business.

**LAWS 6501-3. Labor and Employment Law.** Decisions and statutes concerning the employment relationship, including issues such as employment-at-will; health and safety; drug testing; job security; and the rights of employers, unions, and employees under the National Labor Relations Act and related legislation.

**LAWS 6511-3. Labor Law.** Includes the subjects of evolution of labor relations laws; how a collective bargaining relationship is established; negotiation of the collective bargaining agreement; labor and the antitrust laws; and rights of the individual worker. Course materials frame the issue of how a developed or post-industrial democracy deals with the problems that arise out of the employment relationship: of the choices between laissez-faire, substantive regulation, and the private ordering of the employment relationship through the collective bargaining process.

**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, followed by 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 7051-2. Commercial Drafting.** Exposes third-year law students to legal drafting of techniques that will be useful in the private practice of law. Emphasizes adversarial drafting of commercial and real estate contracts and other non-litigation legal documentation.

**LAWS 7201-3. Antitrust.** Concerned with the law developed from the Sherman, Clayton, and Federal Trade Commission Acts.

**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.** Examines state and federal laws relating to the protection of works of authorship ranging from traditional works to computer programs. The 1976 Copyright Act as well as relevant earlier Acts are studied in detail. Some attention is given to state laws such as interference with contractual relations, the right of publicity, moral right, protection of ideas, and misappropriation of trade values, that supplement federal copyright.

**LAWS 7311 (2-3). Patent Law.** Covers selected topics such as patentable subject matter, patentability, and utilization of patent rights through licensing and infringement litigation. The Patent and Trademark Office will also be covered. (Alternate-year course.)

**LAWS 7341-3. Trademark and Unfair Competition Law.** Examines the subject matter of trademark protection, the interaction of trademark and unfair competition law with other intellectual property doctrines, the requirements for acquiring and retaining federal trademark rights, false advertising and other misrepresentations, the right of publicity and related claims, remedies for infringement, and international aspects of trademark protection.

**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 7411-3. Mergers, Acquisitions and Reorganizations.** Studies the planning of corporate mergers, acquisitions and reorganizations, examining the application and integration of state corporate law, federal securities law, accounting principles, tax law, labor law, products liability law, environmental law, ERISA, and antitrust law.

**LAWS 7541-3. Employment Discrimination.** Examines statutory and constitutional prohibitions of discrimination in employment on the basis of race, gender, age, religion, natural origin and disability.

**LAWS 7601 (2-3). Business Transactions.** Provides a practical understanding of how to apply the law in both transactional and litigation settings and gives the student an interdisciplinary look at how various areas of the law are brought together in common factual settings. Students negotiate, document, and close the acquisition of a business while covering corporate, contracts, real property, secured transactions, and bankruptcy law. The second half of the course tests, in a litigation setting, the decisions made during the acquisition stage. Students determine their positions, research and draft short briefs, and present their arguments in an abbreviated trial (adversary proceeding in bankruptcy court).

**LAWS 7611 (2-3). International Business Transactions.** Introduces students to issues involving international trade, licensing, and investments in developed, developing, and non-market economies through a problem-oriented approach. Covers case law in the areas of documentary sales, letter of credit, sovereign immu-

nity, foreign corrupt practices, and enforcement of foreign judgments, as well as international treaties such as the Convention on Contracts for the International Sale of Goods (CISG) and GATT.

**LAWS 7631-2. Doing Business with Mexico.** Explores the legal and practical difficulties for U.S. companies seeking to do business in Mexico, including restrictions on foreign investment, tax problems, environmental concerns, etc. Implications of NAFTA will also be studied.

**LAWS 8421-2. Seminar: Duties of the Professional Advisor.** Studies ethical and legal regulation of lawyers, auditors, and investment bankers who have been described as "gatekeepers" to the investment markets. The massive S & L, junk bond, insurance, and banking frauds of recent years have made clear that many professionals have "looked the other way" when their clients bilked investors and taxpayers. The focus is on what changes in ethical and legal regulation should be adopted in order to restore a sense of integrity for these professionals. Student papers may address any aspect of this topic and may range from endorsing the status quo to recommending radical cures.

### *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 6112-3. Foundations of Natural Resources Law and Policy.** Examines the historical, political, and intellectual influences that created and shaped major areas of law governing land and natural resources development and conservation, especially in the American West. Readings include books and articles by leading writers as well as the landmark court decisions. Enables students with a passing interest in natural resources to take a single course in the field. Allows students going on to take other natural resource courses a more advanced treatment of the subject matter. Strongly recommended for students to complete before taking LAWS 6002 Public Land Law, LAWS 7122 Mining Law, LAWS 7202 Environmental Law, LAWS 6302 Water Resources, LAWS 7725 American Indian Law, or seminars in natural resources 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 (2-3). 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 7122-2. Mining Law.** Federal law governing access to and development of hard rock minerals on public lands; location of claims; issues of discovery; assessment work; patents; and environmental regulation.

**LAWS 7202-3. Pollution Law.** Examination and analysis of important federal pollution control statutes, including the National Environmental Policy Act, the Clean Air Act, Clean Water Act, Solid Waste Act, and Superfund. Related economic theory and policy issues are considered.

**LAWS 7402-2. Hazardous Waste and Toxic Torts.** Examines statutorily-imposed responsibility and common-law tort and product liability exposure. These are discussed in relation to the growing problem of the handling and disposal of toxic substances and hazardous waste as they impact public health and the environment. Focuses on federal law and that of several states, regulating chemicals and toxic substances, hazardous waste disposal, and cleanup of contaminated sites.

**LAWS 8112-3. Seminar: Advanced Natural Resources Law.** 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 8302-2. Seminar: Advanced Water Resource Management.** Explores the use of watersheds as geographic and political entities for addressing water-related issues. Introduces the nature of watersheds and their historical treatment, and looks at the ways in which laws and institutions facilitate or impede watershed-based problem solving or decision making. Students prepare and present major research papers focusing on a particular water issue and explore solutions in the context of the entire watershed with its related problems and multiple, interconnected interests.

### *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, upper-class 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 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 7523-2. Juvenile Law.** Takes a critical look at the juvenile justice system and how it responds to the needs of juveniles who are either delinquents or victims of abuse. Discusses the rights and responsibilities of parents; parental responsibility programs; delinquents; and the future of our juvenile 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 regula-

tion 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 6005-4. Constitutional Law.** Studies constitutional structure: judicial review, federalism, and separation of powers, as well as constitutional rights of due process and equal protection.

**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 7005-3. Media Law.** Surveys common, statutory, and regulatory law as applied to the mass media. Focuses primarily on law as it affects the gathering and publishing of news. Also examines the regulation of the electronic media.

**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; and the relationships between free exercise of religion and the separation of church and state.

**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 7045-3. Criminal Procedure: Adjudicative Process.** Focuses primarily on criminal procedure at and after trial. Treats such topics as bail, prosecutorial discretion, discovery, plea bargaining, speedy trial, jury trial, the right to counsel at trial, double jeopardy, appeal, and federal habeas corpus.

**LAWS 7055-3. Education Law.** Considers a variety of issues raised by the interaction of law and education. Issues may include the legitimacy of compulsory schooling; alternatives to public schools; socialization and discipline in the schools; and questions of equal educational opportunities.

**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. Approaches these topics from various perspectives: constitutional law, statutory interpretation, planning, ethics, history, and policy.

**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 7115-2. Legal Rights of Children.** Covers a wide array of issues dealing with the legal rights of the unborn, children, and juveniles. Among topics covered are the legal status of parent-child abuse, delinquency and crime, and emancipation.

**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 7425 (2-3). Health Law.** Acquaints students with the issues arising at the interface between law and medicine through analysis of cases and other materials. Critically analyzes the methods used by courts and legislatures to address medical and legal problems in an effort to determine whether the legal resolution was reasonable and appropriate in light of medical, social, and political considerations.

**LAWS 7475-2. Advanced Torts.** Studies selected tort actions and theories. Topics covered may include "dignitary torts" (e.g., defamation, privacy, etc.), business torts, and product liability.

**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 8015 (2-3). Seminar: Constitutional Theory.** Examines the role of courts and other branches of government in defining and enforcing constitutional values. Relevant readings are from philosophy, social sciences, and legal scholarship, as well as cases.

**LAWS 8035-2. Seminar: Freedom of Speech Theory.** Examines the role and the significance of traditional theories of freedom of speech in light of contemporary thinking about the character of speech, rationality, and language. Readings are drawn from philosophy and social sciences as well as legal scholarship.

**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.** 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 6045.

**LAWS 8365-2. Seminar: Immigration and Immigrants' Rights.** Covers the law and policy governing the admission of refugees to this country and the granting of asylum. Prereq., LAWS 7065.

**LAWS 8385-2. Seminar: Law and Religion.** Explores significant aspects of the relationship between law and religion through the use of judicial decisions as well as historical and theoretical materials. The religion clauses of the first amendment will be a central but not exclusive subject of study.

**LAWS 8415-3. Seminar: Biotechnology and Law.** Legal, moral, and economic analysis of problems posed or soon to be posed 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. Discusses problems in distributive justice posed by limited availability of biotechnological commodities, as well as issues arising from enforced treatment.

**LAWS 8445-2. Seminar: Alternative Dispute Resolution.** A study of alternative dispute resolution (ADR) theory, its application in specific contexts (e.g., civil rights), procedural approaches to ADR, advantages and disadvantages of using ADR, and the attorney's roles in ADR processes.

**LAWS 8725-2. Seminar: Advanced American Indian Law.** Examines Alaskan 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.

### *Research and Writing*

**LAWS 5226-2. Legal Writing.** Provides an intensive introduction to the resources available for legal research. Students also prepare written material of various kinds designed to develop research skills, legal writing style, and analysis of legal problems.

**LAWS 6856-2. Advanced Legal Research.** Covers research methodologies that include the use of legislative materials and compilation of federal legislative histories; identification and use of federal and state executive and administrative materials; advanced research in topical areas such as international law, securities, taxation, and environmental law; advanced and topical use of WESTLAW and LEXIS; and use of non-legal databases and emerging technologies. Students will have a series of assignments and prepare an in-depth research bibliography.

**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. Independent Legal Research.** Independent study and preparation of a research paper 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. Tax of Pass-Through Entities.** Examines the federal income tax treatment of pass-through entities and their participants. Approaches the examination of these entities and their participants through analyzing the income tax consequences of certain typical transactions that occur during the life of a pass-through entity such as formation, operation, sale of an interest, distribution, redemptions, and dissolution. Includes general partnerships, limited liability partnerships, limited partnerships, limited liability limited partnerships, limited liability companies, and subchapter S corporations. If time permits, specialized pass-through entities such as real estate investment trusts and real estate mortgage investment conduits may be considered. Prereq. or coreq., LAWS 6157.

**LAWS 6157-3. Corporate Taxation.** Introductory corporate taxation course dealing with most pertinent aspects of regular "C" corporation federal income taxation. Covers corporate income tax classification; personal services corporations; nominee corporations; formation; operations; non-liquidating distributions; redemptions; stock dividends; liquidations; taxable acquisitions; personal holding companies; accumulated earnings tax; and collapsible corporations. For students taking a full range of tax courses, the recommended sequence is to take this course after or with LAWS 6107.

**LAWS 7207-3. Federal Estate and Gift Tax.** Analysis of federal estate and gift taxation of inter vivos and testamentary transfers; introduction to the income taxation of estates and trusts; elementary estate planning.

**LAWS 7217-2. Estate Planning.** Discusses problems and solutions for owners of various sized estates and different types of assets including jointly held property and stock in closely held corporations and farms. Analyzes federal taxation of generation-skipping transfers in trust; covers post-mortem estate planning and drafting of trusts and wills. Prereq., LAWS 7207. Recommended prereq., LAWS 6104.

**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. (Alternate-year course).

### Jurisprudence and Perspective Courses

**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 7708-3. Law and Social Science.** Introduces some of the major thinkers and traditions of scholarship in the area of law and society, focusing on the actual and potential uses of social-science research in the American legal process. Topics include methods of asking for, gathering, and interpreting information for Brandeis briefs and the role of social-science data in cases of discrimination in education, obscenity, civil rights, and other areas.

**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 8528-2. 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: Theory of Punishment.** Explores the various justifications that philosophers have developed to explain why we have the right to punish. 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.

**LAWS 8628-2. Seminar: Law, Power, and Politics.** Draws upon various works of political theory, social theory, and jurisprudence to examine various conceptualizations of politics, power, law, and their relations.

### 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. In conjunction with this course, students will be assigned civil cases related to the course material. The course 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 6109-2. Trial Advocacy.** Student exercises focus on voir dire, opening statement, direct examination of witnesses, and cross examination.

**LAWS 6179-2. Trial Practice.** See LAWS 6353, Evidence and Trial Practice.

**LAWS 7029-3. Appellate Advocacy Clinic.** Enables students to work on briefs of criminal cases being handled by the Appellate Division of the Public Defender.

**LAWS 7159-2. Advanced Trial Advocacy.** Advanced course covering trial practice elements. Open only to students who have taken LAWS 6109.

**LAWS 7169-2. Motions Advocacy.** Provides practical training in preparing and arguing pre-trial, 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 7309-3. American Indian Law Clinic.** Clinical education course. Students work on cases arising in the Denver metropolitan area under the Indian Child Welfare Act and other laws unique to Native Americans. The clinic also accepts cases originating on Indian reservations throughout the West that implicate Indian natural resources and/or tribal sovereignty. Prereq., LAWS 7735.

**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 adjudication.

**LAWS 7509-1. Trial Competition.** Student teams further develop trial and advocacy skills in a competitive mock trial format involving two or more rounds of trials. Preparation of trial briefs and drafting of other court pleadings and documents is required. Credit limited to the top two teams (six students). Student finalists may continue involvement in regional and national competitions.

**LAWS 7939 (2-4). Extern Program.** Extern credit may be earned for noncompensated work at a sponsoring institution that may be any agency of government or any private nonprofit institution that is approved by the Curriculum Committee. Work is done under the direction of a field instructor, who shall be a lawyer or judge at the sponsoring institution and a member of the law faculty. A substantial writing component is required. A minimum of 50 hours of working time per credit hour is required. A maximum of 4 credit hours may be earned. Classified as clinical credit.

## FACULTY

**HAROLD H. BRUFF, Dean.** B.A., Williams College; J.D., Harvard Law School.

**NORMAN F. AARONSON, Clinical Professor of Law, Legal Aid and Defender Program.** B.A., Brandeis University; J.D., Boston University Law School.

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**CLIFFORD J. CALHOUN, Professor.** A.B., Harvard College; LL.B., Harvard Law School.

**EMILY M. CALHOUN, Professor.** B.A., M.A., Texas Tech University; J.D., University of Texas School of Law.

**PAUL F. CAMPOS, Director, Baron White Center for Constitutional Law; Associate Professor.** A.B., A.M., University of Michigan; J.D., University of Michigan Law School.

**HOMER H. CLARK, JR., Moses Lasky Professor Emeritus.**

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**HOWARD C. KLEMME, Professor Emeritus.**

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*Every year, students from the College of Music participate in Music Day, where music of all sorts is performed throughout the campus.*



# COLLEGE OF MUSIC

DANIEL P. SHER, DEAN

The College of Music provides specialized training designed to prepare students for a variety of careers in music. The college offers three undergraduate degrees, two certificate programs, and four graduate degrees; numerous performance opportunities are also available. Established by the Regents of the University of Colorado in 1920, the College of Music is a fully accredited member of the National Association of Schools of Music.

The mission of the College of Music at CU-Boulder is excellence in music through distinguished instruction in performance, composition, musicology, theory, and teacher preparation for our graduate and undergraduate students, and to provide opportunities for performance, creative activities, research and scholarship, and teaching experiences.

The college is dedicated to:

- providing music majors and nonmajors the opportunity to develop their knowledge, understanding, and ability in the various aspects of music at a level appropriate to their needs and interests;
- preparing students for careers as performers, composers, scholars, teachers, administrators, and other professionals in the field of music;
- broadening and deepening the knowledge and understanding of music through research, teaching, creative activities, and publication; and
- enriching the lives of students and faculty as well as the community, state, nation, and the world with performances of a wide variety of music presentations and publications.

The College of Music is an academic community committed to maintaining a climate of mutual respect and collegiality. The members of this community:

- share a spirit of cooperation and helpful, constructive, and friendly consideration for each other's activities;
- maintain open communication in both formal and informal contexts;
- defend academic freedom;
- encourage an environment of safety and well-being; and
- show respect for a diversity of musical cultures and individual backgrounds.

The widely varied functions of music in the world today present many challenging and interesting opportunities for 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 college maintains a ratio of one faculty member for every six students. This enables our students to benefit from dynamic, personal interaction with their professors. The college also provides students with regular academic advising and an annual degree audit to ensure that they complete their degrees without unnecessary delay.

In addition to training in the various professions of music, the college provides general music studies and activities for the non-major; broad cultural programs (concerts, recitals, lectures) for the University and Boulder communities; favorable conditions for research in music; and service activities to the state and nation.

## Major Fields and Degrees

Undergraduate degrees include the bachelor of music (B.Mus.), the bachelor of arts in music (B.A.), and the bachelor of music education (B.Mus.Ed.); students may also elect to earn a certificate in Jazz Studies or Music Technology in conjunction with their degree. 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 semester credit 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 degrees include the master of music (M.Mus.), the 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 in music literature provides training in musicology and music theory. 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 chapter of this catalog as well as in the curricula listed later in this chapter. Correspondence regarding details not included in this publication should be directed to the Associate Dean for Graduate Studies, College of Music.

## Facilities

The College of Music has several beautiful performance halls, including the 2,000-seat Macky Auditorium, the 500-seat Grusin Music Hall, the 250-seat Music Theatre, and the 120-seat Chamber Hall. The college is located in the Imig Music Building, a large complex containing 84 practice rooms, 54 faculty studios, offices, ensemble rehearsal areas, seminar facilities, and classrooms.

The college's outstanding Music Library is considered to be among the nation's most comprehensive. The library contains over 150,000 volumes, scores, recordings, and periodicals. Computerized facilities are provided for listening to recordings and practicing ear training. Computer terminals are available for computer-based refer-

ence searching. The Music Library houses the American Music Research Center, a unique facility dedicated to the discovery of new information about American music. The center sponsors concerts and scholarly activities and serves as an archive for several extensive collections of American music.

The college also features extensive facilities for music technology and electronic music study. The Computer Assisted Music Laboratory is a multi-purpose lab designed primarily for classroom instruction. It features numerous workstations, each with a Musical Instrument Digital Interface, sampling keyboard, and a computer. The Film Scoring Lab is equipped with complete pre- and post-production equipment that allows students to learn by creating professional quality sound tracks for film and video. The Class Piano Laboratory provides a positive environment in which to learn and practice keyboard skills. The lab is equipped with Kurzweil Mark IV Ensemble Grand digital pianos, each connected to a Macintosh Centris 650 computer.

### Performances

Each year the College of Music presents over 400 exciting concerts by talented students and faculty. In addition to individual musical pursuits, students at all levels have the opportunity to perform in a variety of outstanding ensembles including orchestras, choirs, bands, chamber and early music groups, jazz ensembles and combos, opera productions, and musicals. Many of these groups have been invited to perform at prestigious national and international events. Recitals by students and faculty are supplemented by visits from world-class guest artists, all of which provide the Boulder community with the chance to hear some of the finest music being performed today. The vast majority of these excellent performances are free and open to the public.

### International Study

The college encourages the educational breadth that comes with study abroad. For instance, the program in Regensburg, Germany, offers study in music history and performance. This program is coordinated in conjunction with the Office of International Education, which may be contacted for further information.

### 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:

Nancy and Ted Anderson Music Awards  
Applied Music Scholarships  
Virginia Becker Scholarship Fund  
Darrell and Lauren Boyle Music Theatre Scholarship Fund  
Carrol and Lois Butts Instrumental Music Scholarship  
Charles A. Byers Choral Music Education Scholarship  
John Carter Graduate Scholarship in Clarinet  
William Clendennin Music History Scholarship  
Berton Coffin Graduate Scholarships in Voice  
Viola Vestal Coulter Foundation Voice Scholarship in honor of Harold A. Norblom  
Wilma and Perry Louis Cunningham Graduate Voice Scholarship  
Dean's Honor Awards  
Denver Lyric Opera Guild Graduate Scholarship  
Cecil Effinger Graduate Theory/Composition Memorial Scholarship  
Robert R. Fink Theory Scholarship  
Wallace F. Fiske Performance Awards  
Gordon Getty Voice Scholarship  
James M. Grossi Composition Scholarship  
Jessie and Albert Henry Memorial Scholarships  
Honors String Quartet Awards  
Warner Imig Graduate Choral Conducting Scholarship  
Denés Koromzay String Chamber Music Award  
Vera McWharter Memorial Graduate Voice Scholarship  
Trudi Mielziner Graduate Opera Memorial Scholarship  
Mile High Band Music Education Scholarship

Music History Academic Achievement Award  
Harold A. Norblom Scholarship (sponsored by the Coulter Foundation)  
Noris Graduate Piano Fellowships  
Noris Graduate Voice Scholarships  
Phyllis and Paul Parmelee Memorial Piano Scholarship  
Percy-Roth Memorial Scholarship  
Theodore Presser Award  
Dorothy and Anthony Riddle Lyric Theatre Performance Prize  
Walter Orr Roberts Music Scholarship  
Robin Sawhill Graduate Award for Piano Performance  
Galen and Ada Belle Files Spencer Fellowship in Voice  
Frank "Crick" Streamer Memorial Scholarship  
Louise Touhy Graduate Choral Conducting Scholarship  
Howard B. Waltz Music Scholarship  
Judith Richardson Waterman Choral Music Education Scholarship  
Betty M. Weir Memorial Voice Scholarship  
Lynn Whitten Graduate Fellowship in Choral Conducting  
Brownlow V. Wilson Scholarship in Music Education

## 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 preparation 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 will result.

Undergraduate students who have a cumulative or semester grade point average of 1.00 or below will automatically be suspended. Suspended students must attend a summer

term or continuing education classes 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 summer.

Graduate students should see "Quality of Graduate Work" under the Graduate School chapter 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 Undergraduate Admission in the General Information chapter, 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. Please see Undergraduate Admission in the General Information chapter of this catalog for specific requirements.

### Auditions

An audition is required for all entering undergraduate music majors. Undergraduate auditions are held in Boulder during the month of February. Prospective students who cannot attend may substitute a high-quality cassette tape. The college must receive tapes by February 15 in order for students to be considered for financial assistance. Students should prepare a 10-20 minute audition program in accordance with the guidelines stated below. This list is

intended to serve only as an example of suggested repertoire for undergraduate admission. Specific audition information for each instrument is available upon request or as part of the admission packet. Graduate auditions are arranged by appointment; please contact the Graduate Office for further information.

**Keyboard:** Three contrasting selections (highly recommended: one composition by J.S. Bach).

**Guitar:** Three selections from different historical periods.

**Strings:** One work at least at the level of a Mozart Concerto, and one contrasting solo.

**Woodwind:** Two contrasting works.

**Brass:** Two contrasting works.

**Percussion:** Demonstrate performance ability on Snare Drum, Mallets, and Tympani.

**Voice:** Two contrasting songs, at least one from the classical repertoire. All songs must be memorized. In the event of off-campus auditions, all auditionees must submit a high-quality audio cassette. Video tapes are not acceptable.

**Composition:** Submit scores and tapes of at least two original works, and audition on one of the performance instruments listed above.

### 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. Please see Undergraduate Admission in the General Information chapter of this catalog for specific requirements.

### 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 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 need be in only one ensemble at a time. University ensembles that meet ensemble requirements are Concert Band, Marching Band, Symphonic Band, Symphony Orchestra, Wind Ensemble, University Choir, University Singers, Women's Chorus (limit two years), Opera Production (limit two semesters), Collegiate Chorale, Early Music Ensemble, and Piano Chamber Music/Accompanying. Waivers in degree requirements for ensembles, or substitutions, will be awarded only through petition to the dean.

### Course Load

The normal academic load for an undergraduate student in the College of Music is 16 to 18 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 chapter 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 three 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 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, the last 56 credits 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.

Students who cannot meet the proficiency requirements after two semesters of private 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.

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 musical 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 courses that will permit them to pursue special interests, and even some graduate study, the primary emphasis is on the development of basic musicianship, an ability to perform music, and a broad knowledge of the foundations and principles of music as an art.

The strength of the Bachelor of Arts in Music resides in the three options that are available within this degree:

1. Students may take courses as listed below, selecting a range of electives outside of music from many different areas, thus achieving a nonprofessional degree in music within the context of a liberal arts education;
2. Students may use the 32 non-music electives to take a second major in another college (students have been successful using this plan to complete the B.A. in Music with additional majors in broadcasting, business, dance, musical theatre, elementary teacher education, and other fields); or
3. Students may use the 32 non-music electives plus additional course work to fulfill requirements in a second degree program (students have used this option to receive a second undergraduate degree, for example, in engineering, business, and journalism).

For options 2 and 3 above, students are reminded that the second major and second degree can only be completed with the advisement and approval of the second major or degree-granting department, school, or college. Some of these double

majors, and most of the double degrees, will take an additional (fifth) year to complete.

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 non-music 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 two semesters of ensemble and may elect 2 additional semester 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 musicology 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 musicology 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 uni-

versity 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 59).

### 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 (lessons 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 Introduction to Music 1.....	3
English language or literature.....	3
Foreign language.....	3
Electives in liberal arts.....	9

##### Sophomore Year

CONV 1990 Convocation (two semesters).....	0
Applied instruction (lessons and literature class).....	2
MUSC 2101, 2111 Semester 3 and 4	
Theory.....	4
MUSC 2121, 2131 Aural Skills 3 and 4.....	2
MUSC 2987 Introduction to Music	
Research.....	1
Electives in liberal arts.....	22

##### Junior Year

CONV 1990 Convocation (two semesters).....	0
MUSC 3802, 3812 History of Music	
1 and 2.....	6
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
Non-Western music history at 2000/4000 level.....	3
Requirements and electives in liberal arts.....	17
Free elective.....	6

## 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.

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.

### English Composition

Students pursuing the bachelor of music degree will be required to take one three-hour course in English composition through the English Department or the University Writing Program. Courses such as the Freshman Writing Seminar, Introduction to Creative Writing, or Introduction to Expository Writing fulfill the requirement. Scoring 3 or higher on an AP English test in high school or passing the arts and sciences placement test also fulfills this requirement. The credit hours will be applied in the liberal arts electives category. Students are strongly encouraged to complete this requirement by the end of their sophomore year.

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	
(lessons and literature classes).....	8
Class minor in performance.....	2
University ensemble.....	2



MUSC 1101, 1111 Semester 1 and 2	
Theory .....	4
MUSC 1121, 1131 Aural Skills 1 and 2 .....	2
MUSC 1802 Introduction to Music 1 .....	3
English composition .....	3
Electives in liberal arts .....	6

*Sophomore Year*

CONV 1990 Convocation (two semesters) .....	0
PMUS 2616 Applied Organ Instruction (lessons and literature classes) .....	8
University ensemble .....	2
MUSC 2101, 2111 Semester 3 and 4	
Theory .....	4
MUSC 2121, 2131 Aural Skills 3 and 4 .....	2
MUSC 2265 Service Playing Techniques .....	2
MUSC 3176, 3186 Conducting 1 and 2 .....	4
Electives in liberal arts .....	9
Free electives .....	6

*Junior Year*

CONV 1990 Convocation (two semesters) .....	0
PMUS 3616 Applied Organ Instruction (lessons and literature classes) .....	8
University ensemble .....	2
MUSC 3802, 3812 History of Music .....	6
MUSC 4011 Sixteenth-Century Counterpoint .....	2
MUSC 4265, 4275 Improvisation .....	4
Electives in liberal arts .....	9

*Senior Year*

PMUS 4616 Applied Organ Instruction (lessons and literature classes) .....	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 (lessons and literature classes) .....	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 and 2 .....	2
MUSC 1802 Introduction to Music 1 .....	3
English composition .....	3
Electives in liberal arts .....	6

*Sophomore Year*

CONV 1990 Convocation (two semesters) .....	0
Applied instruction (lessons and literature classes) .....	4
University ensemble .....	2
PMUS 2526 Composition (and Composition Seminar) .....	4
MUSC 2071 Instrumentation .....	2
MUSC 2101, 2111 Semester 3 and 4	
Theory .....	4
MUSC 2121, 2131 Aural Skills 3 and 4 .....	2
Electives in liberal arts .....	16

*Junior Year*

CONV 1990 Convocation (two semesters) .....	0
Applied instruction (lessons and literature classes) .....	4
University ensemble .....	2
PMUS 3526 Composition (and Composition Seminar) .....	6
MUSC 3802, 3812 History of Music .....	6
MUSC 4001 Contemporary Theory .....	2
MUSC 4011, 4021 Sixteenth-, Eighteenth- Century Counterpoint .....	4
Electives in liberal arts .....	5
Non-Western music history at the 2000/4000 level .....	3

*Senior Year*

Applied instruction (lessons and literature classes) .....	4
University ensemble .....	2
PMUS 4526 Composition (and Composition Seminar) .....	6
MUSC 3176 Conducting 1 .....	2
MUSC 4041 Orchestration .....	2
MUSC 4061, 4071 Analysis 1 and 2 .....	4
MUSC 4957 Senior Thesis .....	0
Free electives .....	12

**Guitar Performance Concentration Area***Semester Hours**Freshman Year*

CONV 1990 Convocation (two semesters) .....	0
PMUS 1105 Keyboard Musicianship Class .....	2
PMUS 1566 Applied Guitar Instruction (lessons and literature classes) .....	8
MUSC 1101, 1111 Semester 1 and 2 Theory .....	4
MUSC 1121, 1131 Aural Skills 1 and 2 .....	2
MUSC 1326 Guitar Sight Reading .....	1
MUSC 1802 Introduction to Music 1 .....	3
MUSC 2365 Introduction to Accompanying .....	2
English composition .....	3
Electives in liberal arts .....	6

*Sophomore Year*

CONV 1990 Convocation (two semesters) .....	0
PMUS 2105 Keyboard Musicianship .....	2
PMUS 2566 Applied Guitar Instruction (lessons and literature classes) .....	8
University ensemble .....	2
MUSC 2101, 2111 Semester 3 and 4 Theory .....	4
MUSC 2121, 2131 Aural Skills 3 and 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 (lessons and literature classes) .....	7
MUSC 3802, 3812 History of Music .....	6
MUSC 3997 Junior Recital .....	1
University ensemble .....	2
Elective in theory .....	2
Electives in liberal arts .....	4
Electives in music .....	6
Non-Western musicology at the 2000/4000 level .....	3

*Senior Year*

PMUS 4566 Applied Guitar Instruction (lessons and literature classes) .....	7
MUSC 4061 Analysis 1 .....	2
MUSC 4106 Guitar Literature .....	2
MUSC 4997 Senior Recital .....	1
University ensemble .....	2
Electives in liberal arts .....	3
Free electives .....	12

**Musicology 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 (lessons and literature classes) .....	4
University ensemble .....	2
MUSC 1101, 1111 Semester 1 and 2	
Theory .....	4
MUSC 1121, 1131 Aural Skills 1 and 2 .....	2
MUSC 1802 Introduction to Music 1 .....	3
English composition electives .....	6
Foreign language .....	8
Electives in liberal arts .....	3

*Sophomore Year*

CONV 1990 Convocation (two semesters) .....	0
Applied instruction (lessons and literature classes) .....	4
PMUS 1105 Keyboard Musicianship .....	2
University ensemble .....	2
MUSC 2101, 2111 Semester 3 and 4	
Theory .....	4
MUSC 2121, 2131 Aural Skills 3 and 4 .....	2
MUSC 3802, 3812 History of Music .....	6
History of Western Civilization 1 and 2 .....	6
Foreign language .....	8
Non-Western music history at the 2000/4000 level .....	3

*Junior Year*

CONV 1990 Convocation (two semesters) .....	0
Applied instruction (lessons and literature classes) .....	4
University ensemble .....	2
Period and topical courses in musicology (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 and 2 .....	4
Free electives .....	6

*Senior Year*

Applied instruction (lessons and literature classes) .....	4
University ensemble .....	2
Period and topical courses in musicology (4000 level) .....	8
MUSC 3176 Conducting 1 .....	2
MUSC 4957 Senior Thesis .....	4
Free electives .....	8

## Organ Performance Concentration Area

	<i>Semester Hours</i>
<i>Freshman Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 1616 Applied Organ Instruction (lessons and literature classes).....	8
Class minor in performance.....	2
University ensemble.....	2
MUSC 1101, 1111 Semester 1 and 2 Theory.....	4
MUSC 1121, 1131 Aural Skills 1 and 2.....	2
MUSC 1802 Introduction to Music 1 and 2.....	6
English composition.....	3
Elective in liberal arts.....	3

<i>Sophomore Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 2616 Applied Organ Instruction (lessons and literature classes).....	8
Class minor in performance.....	2
University ensemble.....	2
MUSC 2101, 2111 Semester 3 and 4 Theory.....	4
MUSC 2121, 2131 Aural Skills 3 and 4.....	2
MUSC 2265 Service Playing Techniques.....	2
MUSC 3176 Conducting 1.....	2
Electives in liberal arts.....	12
Free elective.....	3

<i>Junior Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 3616 Applied Organ Instruction (lessons and literature classes).....	7
University ensemble.....	2
MUSC 3802, 3812 History of Music.....	6
MUSC 3997 Junior Recital.....	1
MUSC 4011, 4021 Sixteenth, Eighteenth- Century Counterpoint.....	4
MUSC 4265, 4275 Improvisation.....	4
MUSC 4285, 4295 Organ Survey.....	6

<i>Senior Year</i>	
PMUS 4616 Applied Organ Instruction (lessons and literature classes).....	7
MUSC 4997 Senior Recital.....	1
University ensemble.....	2
Electives in liberal arts.....	9
Free electives.....	9
Non-Western musicology at the 2000/4000 level.....	3

## Piano Performance Concentration Area

	<i>Semester Hours</i>
<i>Freshman Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 1636 Applied Piano Instruction (lessons and literature classes).....	8
Class minor in performance.....	2
MUSC 1101, 1111 Semester 1 and 2 Theory.....	4
MUSC 1121, 1131 Aural Skills 1 and 2.....	2
MUSC 1325 Sight Reading for Piano.....	1
MUSC 1802 Introduction to Music 1.....	3
Chamber music.....	2
PHIL 1100 Ethics or PHIL 1440 Introductory Logic.....	3

English composition.....	3
Elective in liberal arts.....	3

<i>Sophomore Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 2636 Applied Piano Instruction (lessons and literature classes).....	8
Class minor in performance.....	2
MUSC 2101, 2111 Semester 3 and 4 Theory.....	4
MUSC 2121, 2131 Aural Skills 3 and 4.....	2
MUSC 2325 Applied Harmony for the Keyboard.....	2
Chamber music.....	2
Electives in liberal arts.....	12

<i>Junior Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 3636 Applied Piano Instruction (lessons and literature classes).....	7
Band, orchestra, or choir.....	2
MUSC 3176 Conducting 1.....	2
MUSC 3345, 3355 Piano Pedagogy 1 and 2.....	4
MUSC 3802, 3812 History of Music.....	6
MUSC 3997 Junior Recital.....	1
Elective in theory.....	2
Electives in liberal arts.....	9

<i>Senior Year</i>	
PMUS 4636 Applied Piano Instruction (lessons and literature classes).....	7
Chamber music.....	1
MUSC 4061 or 4071 Analysis 1 or 2.....	2
MUSC 4325 Piano Literature.....	2
MUSC 4997 Senior Recital.....	1
Free electives.....	12
Non-Western musicology at the 2000/4000 level.....	3

## String Performance Concentration Area: Harp, String Bass, Viola, Violin, and Violoncello

	<i>Semester Hours</i>
<i>Freshman Year</i>	
CONV 1990 Convocation (two semesters).....	0
Applied string instruction (lessons and literature classes).....	8
PMUS 1105, 1205 Keyboard Musicianship.....	2
PMUS 1327 Orchestra.....	2
MUSC 1101, 1111 Semester 1 and 2 Theory.....	4
MUSC 1121, 1131 Aural Skills 1 and 2.....	2
MUSC 1802 Introduction to Music 1.....	3
English composition.....	3
Electives in liberal arts.....	6
Free electives.....	2

<i>Sophomore Year</i>	
CONV 1990 Convocation (two semesters).....	0
Applied string instruction (lessons and literature classes).....	8
PMUS 2105, 2205 Keyboard Musicianship.....	2
PMUS 1327 Orchestra.....	2
MUSC 2101, 2111 Semester 3 and 4 Theory.....	4
MUSC 2121, 2131 Aural Skills 3 and 4.....	2
MUSC 3273 String Pedagogy.....	2
Electives in liberal arts.....	9
Free electives.....	3

<i>Junior Year</i>	
CONV 1990 Convocation (two semesters).....	0
Applied string instruction (lessons and literature classes).....	7
Chamber music.....	1
Instrumentation.....	2
Conducting.....	2
PMUS 3327 Orchestra.....	2
PMUS 4517 Orchestral Repertoire.....	2
MUSC 3802, 3812 History of Music.....	6
MUSC 3997 Junior Recital.....	1
Electives in liberal arts.....	6
Free electives.....	3

<i>Senior Year</i>	
Applied string instruction (lessons and literature classes).....	7
Chamber music.....	2
EMUS 3327 Orchestra.....	2
MUSC 4997 Senior Recital.....	1
Elective in theory or musicology at the 4000 level.....	2-3
Electives in liberal arts.....	6
Free electives.....	4
Non-Western musicology at the 2000/4000 level.....	3

## Voice Performance Concentration Area

One year of study at the university level of each of two languages is required of vocal performance majors.

	<i>Semester Hours</i>
<i>Freshman Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 1105 Keyboard Musicianship.....	2
PMUS 1726 Applied Voice Instruction (lessons and literature classes).....	8
Choir.....	2
MUSC 1101, 1111 Semester 1 and 2 Theory.....	4
MUSC 1121, 1131 Aural Skills 1 and 2.....	2
MUSC 1444 Italian/English Diction and Repertoire.....	2
MUSC 1802 Introduction to Music 1.....	3
English composition.....	3
Elective in liberal arts (including foreign language, ballet).....	5
Free elective.....	3

<i>Sophomore Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 2105 Keyboard Musicianship 2.....	2
PMUS 2726 Applied Voice Instruction (lessons and literature classes).....	8
Choir.....	2
MUSC 2101, 2111 Semester 3 and 4 Theory.....	4
MUSC 2121, 2131 Aural Skills 3 and 4.....	2
Electives in liberal arts (including foreign language).....	10
Free electives.....	6

<i>Junior Year</i>	
CONV 1990 Convocation (two semesters).....	0
PMUS 3726 Applied Voice Instruction (lessons and literature classes).....	7
Choir.....	2

MUSC 3176 Conducting 1	2
MUSC 3193 Pedagogy for Young Voices	2
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)	8
Free electives	1

*Senior Year*

PMUS 4726 Applied Voice Instruction (lessons and literature classes)	7
Choir	1
PMUS 4134, 4144 Opera Theatre	3
MUSC 4997 Senior Recital	1
Non-Western musicology at the 2000/4000 level	3
Electives in liberal arts	7
Free electives	2

### Voice Performance with Elective Studies in Music Theatre Concentration Area

*Semester Hours**Freshman Year*

CONV 1990 Convocation (two semesters)	0
PMUS 1105 Keyboard Musicianship	2
PMUS 1726 Applied Voice Instruction (lessons and literature classes)	6
Choir	2
MUSC 1101, 1111 Semester 1 and 2 Theory	4
MUSC 1121, 1131 Aural Skills 1 and 2	2
MUSC 1444 Italian/English Diction and Repertoire	2
MUSC 1802 Introduction to Music 1	3
English composition	3
Theatre/dance elective (to include ballet)	1
Electives in liberal arts	6

*Sophomore Year*

CONV 1990 Convocation (two semesters)	0
PMUS 2105 Keyboard Musicianship 2	2
PMUS 2726 Applied Voice Instruction (lessons and literature classes)	6
Choir	2
MUSC 2101, 2111 Semester 3 and 4 Theory	4
MUSC 2121, 2131 Aural Skills 3 and 4	2
THTR 2013 Performance of Literature	3
Beginning ballet	1
Electives in liberal arts	12

*Junior Year*

CONV 1990 Convocation (two semesters)	0
PMUS 3167 Stagecraft	3
PMUS 3726 Applied Voice Instruction (lessons and literature classes)	6
PMUS 4138 Opera Theatre	4
PMUS 4167 Theatre Lab	1
MUSC 3176 Conducting	2
MUSC 3802, 3812 History of Music	6
THTR 2003 Acting: Beginning	3

THTR 2023 Acting: Intermediate	3
Electives in liberal arts	5
Elective in theory	2

*Senior Year*

PMUS 4148 Opera Theatre	1
PMUS 4167 Theatre Lab	2
PMUS 4726 Applied Voice Instruction (lessons and literature classes)	6
MUSC 4997 Senior Project (or major role, or design or direction of a major production)	0
THTR 2095 History of Fashion 2	3
Elective in theatre and dance	1
Free electives	12
Non-Western musicology	3

### Wind/Percussion Instruments Performance Concentration Area

*Semester Hours**Freshman Year*

CONV 1990 Convocation (two semesters)	0
Applied wind/percussion instruction (lessons and literature classes)	8
PMUS 1105 Keyboard Musicianship	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
Class minor in performance	2
Band or orchestra	2
English composition	3
Elective in liberal arts	3

*Sophomore Year*

CONV 1990 Convocation (two semesters)	0
Applied wind/percussion instruction (lessons and literature classes)	8
Class minor in performance	2
Chamber music	2
Band or orchestra	2
MUSC 2071 Instrumentation	2
MUSC 2101, 2111 Semester 3 and 4 Theory	4
MUSC 2121, 2131 Aural Skills 3 and 4	2
Electives in liberal arts	12

*Junior Year*

CONV 1990 Convocation (two semesters)	0
Applied wind/percussion instruction (lessons and literature classes)	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 (lessons and literature classes)	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 128 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 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 Education 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 education 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 certain education courses and student teaching until they are admitted to the teacher education program.*

Requirements for recommended admission to the teacher education 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 state-mandated admission 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 education program.

### Student Teaching

Students wishing to receive a student teaching assignment must complete an application and submit it 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 education 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

Students must take keyboard or voice as the primary applied experience. 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 (lessons and literature class).....	6
Piano/voice class.....	2
University ensemble.....	2
MUSC 1101, 1111 Semester 1 and 2	
Theory.....	4
MUSC 1121, 1131 Aural Skills 1 and 2.....	2
MUSC 1802 Introduction to Music 1.....	3
English composition.....	3
Electives in liberal arts.....	12

##### Sophomore Year

CONV 1990 Convocation (two semesters).....	0
Applied instruction (lessons and literature class).....	6
Piano/voice class.....	2
University ensemble.....	2
Choral methods elective.....	2
MUSC 2101, 2111 Semester 3 and 4	
Theory.....	4
MUSC 2103 Introduction to Music Education (fall).....	3
MUSC 2121, 2131 Aural Skills 3 and 4.....	2
MUSC 3023 Woodwind Class (spring).....	1
MUSC 3113 Introduction to the Arts (spring).....	3
MUSC 3193 Vocal Pedagogy and Literature for Young Voices.....	2
EDUC 3013 Proseminar I (fall).....	4
Electives in liberal arts.....	6

##### Junior Year (Formal Admission to Teacher Education)

CONV 1990 Convocation (two semesters).....	0
Applied instruction (lessons and literature class).....	5
University ensemble.....	2
Choral music elective (spring).....	2
MUSC 3023 Woodwind Class.....	2
MUSC 3133 Teaching General Music 1.....	2
MUSC 3176, 3186 Conducting 1 and 2.....	4
MUSC 3802, 3812 History of Music.....	6
MUSC 3997 Junior Recital.....	1
MUSC 4732 Music Methods Practicum.....	1
EDUC 4112 Educational Psychology/Adolescent Development (fall).....	3
Theory elective (4000 level).....	2

##### Senior Year

Applied instruction (lessons and literature class).....	3
University ensemble.....	1
General music elective.....	2
MUSC 3013, 3033 String/Bass classes.....	2
MUSC 3123 Teaching Choral Music.....	3
MUSC 4103 Introduction to Student Teaching.....	1
MUSC 4113 Teaching General Music 2.....	3
MUSC 4193 Student Teaching Seminar.....	1
EDUC 4112 Educational Psychology.....	3
EDUC 4732 Student Teaching.....	8
EDUC 3023 Proseminar II (fall).....	4
Non-Western musicology at the 2000/4000 level.....	3

### General Music Emphasis

Students must take keyboard or voice as the primary applied experience. 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 (lessons and literature class).....	6
Piano/voice class.....	2
University ensemble.....	2
MUSC 1101, 1111 Semester 1 and 2	
Theory.....	4
MUSC 1121, 1131 Aural Skills 1 and 2.....	2
MUSC 1802 Introduction to Music 1.....	3
English composition.....	3
Electives in liberal arts.....	12

##### Sophomore Year

CONV 1990 Convocation (two semesters).....	0
Applied instruction (lessons and literature class).....	6
Piano/voice class.....	2
University ensemble.....	2
Choral methods elective.....	2
MUSC 2101, 2111 Semester 3 and 4	
Theory.....	4
MUSC 2103 Introduction to Music Education (fall).....	3
MUSC 2121, 2131 Aural Skills 3 and 4.....	2
MUSC 3023 Woodwind class.....	1
MUSC 3193 Vocal Pedagogy and Literature for Young Voices (spring).....	2
Non-Western music history at the 2000/4000 level (spring).....	3
CDSS 2500 Voice and Diction (or proficiency).....	3
Electives in liberal arts.....	6

##### Junior Year (Formal Admission to Teacher Education)

CONV 1990 Convocation (two semesters).....	0
Applied instruction (lessons and literature class).....	5
University ensemble.....	2
MUSC 3013, 3033 String/Brass Classes.....	2
MUSC 3113 Introduction to the Arts.....	3
MUSC 3133 Teaching General Music 1.....	2
MUSC 3176, 3186 Conducting 1 and 2.....	4
MUSC 3802, 3812 History of Music.....	6
MUSC 3997 Junior Recital.....	1
MUSC 4113 Teaching General Music 2.....	3
MUSC 4732 Music Methods Practicum.....	1
EDUC 3013 Proseminar I.....	4
Theory elective.....	2

##### Senior Year

Applied instruction (lessons and literature class).....	3
University ensemble.....	1
General music elective.....	2
MUSC 3123 Teaching Choral Music (fall).....	3
MUSC 4103 Introduction to Student Teaching.....	1
MUSC 4193 Student Teaching Seminar.....	1

EDUC 3023 Proseminar II (fall).....	4
EDUC 4112 Educational Psychology/Adolescent Development (spring).....	2
EDUC 4122 Principles and Methods of Secondary Education (fall).....	2
EDUC 4732 Student Teaching (spring).....	8
General methods elective.....	2

### Instrumental Music Emphasis

The required hours in a 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 (lessons and literature class).....	6
Keyboard musicianship.....	2
University ensemble.....	2
MUSC 1101, 1111 Semester 1 and 2	
Theory.....	4
MUSC 1121, 1131 Aural Skills 1 and 2.....	2
MUSC 1802 Introduction to Music 1.....	3
English composition.....	3
Electives in liberal arts.....	12

#### Sophomore Year

CONV 1990 Convocation (two semesters)....	0
Applied instruction (lessons and literature class).....	6
University ensemble.....	2
MUSC 2101, 2111 Semester 3 and 4	
Theory.....	4
MUSC 2103 Introduction to Music Education (fall).....	3
MUSC 2121, 2131 Aural Skills 3 and 4.....	2
MUSC 3133 Teaching General Music 1.....	2
MUSC 3153 Teaching Woodwind Instruments (spring).....	2
MUSC 3243 Marching Band/Jazz Pedagogy/String Pedagogy.....	2
EDUC 3013 Proseminar I.....	4
Non-Western musicology at the 2000/4000 level.....	3
Electives in liberal arts.....	6

#### Junior Year (Formal Admission to Teacher Education)

CONV 1990 Convocation (two semesters)....	0
Applied instruction (lessons and literature class).....	5
University ensemble.....	2
MUSC 3133 Teaching General Music 1.....	2
MUSC 3143 Teaching Instrumental Music.....	3
MUSC 3163 Teaching String Instruments.....	2
MUSC 3176, 3186 Conducting 1 and 2.....	4
MUSC 3193 Vocal Pedagogy and Literature for Young Voices.....	2
MUSC 3223 Teaching Brass Instruments.....	2
MUSC 3243 Marching Band/Jazz Band/String Techniques (fall).....	2
MUSC 3802 History of Music (fall).....	3
MUSC 3997 Junior Recital.....	1

MUSC 4153 Percussion Class.....	1
MUSC 4732 Music Methods Practicum.....	1
EDUC 4112 Educational Psychology.....	3

#### Senior Year

Applied instruction (lessons and literature class).....	3
University ensemble.....	1
MUSC 3812 History of Music.....	3
MUSC 4103 Introduction to Student Teaching.....	1
MUSC 4193 Student Teaching Seminar.....	1
EDUC 3023 Proseminar II.....	4
EDUC 4732 Student Teaching.....	8
EMUS 1184 Voice.....	1
Elective in theory.....	2

## 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

chapter 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 chapter; 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 general (verbal, quantitative, analytical) and subject (music) portions of the Graduate Record Examination (GRE). GRE scores are required as part of the application to the Ph.D. in music program and the M.Mus. (Lit.) program, and are recommended for the D.Mus.A.

### Preliminary Examinations

Just before the beginning of their first semester of work toward a master's or doctoral degree, students will be given placement exams covering the major field, several areas of music theory—written theory, aural perception, counterpoint, and analysis—and music history and literature.

Any deficiencies demonstrated by the placement examination scores must be removed early in the degree program. Application for candidacy and required examinations can not be approved until 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 chapter, the College of Music grants graduate assistantships and part-time instructorships to approximately 50 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, organ, harpsichord, string instruments (including guitar), harp, voice, or woodwind/brass/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 musicology and two thesis projects 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, voice, and woodwind/brass/percussion 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 chapter, 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 a list of completed compositions; music-literature majors must submit GRE scores (the general test and one subject test in music) and 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 master of music (M.Mus.) degree, which the Graduate School considers a plan II program, requires a minimum of 30 semester hours of graduate 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. Students may elect a secondary emphasis consisting of at least 10 hours in another area of music, and may then elect 10 additional hours. 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 outside the major area. During the second month of the second 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 chapter 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 sev-

eral 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. Three courses are required in this area: Foundations of Music Education, Topics in Music Education, and Research in Teaching Music. Elective courses within professional music education will complete study in this area. Examples of 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 student and an advisor, based on the student's interests and abilities. Concentration may be in the traditional areas of choral, general, or instrumental music. Other options include the related arts, e.g., music and dance, musical theatre, music and fine arts, etc., or a more individualized area relating to the student's professional interests.

An important aspect of the master of music education degree is the culminating paper. This paper will be completed and reported 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 or in four 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, literature and performance of choral music, performance, and performance and pedagogy. Performance concentration areas are organ, piano, and string instruments. Performance and pedagogy concentration areas are piano, string instruments, voice, and woodwinds/brass/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 chapter and in the introductory section of Graduate Degree Programs in this College of Music chapter. 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. If a student has enrolled in all required dissertation courses but has still to complete the work, he or she will enroll in TMUS 8019 Precandidate for Doctor of Musical Arts Degree, or TMUS 8029 Candidate for Doctor of Musical Arts Degree, until the degree is completed. This continuous registration requirement 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 third month 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 disserta-

tion 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 course work, of which 18 hours are dissertation projects. Two doctoral seminars, one each in musicology and music theory, are required; prerequisites include 3 hours of bibliography and 6 hours each of graduate-level musicology and music 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 preliminary examinations and GRE scores show satisfactory preparation for doctoral studies, the student 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 (computer music seminar)
- TMUS 8249 Dissertation Project 4 (computer music project)
- TMUS 8259 Dissertation Project 5 (research-lecture)
- TMUS 8269 Dissertation Project 6 (research project)
- 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

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  
 TMUS 8329 Document/Pedagogy Project

### Performance and Pedagogy: Woodwinds/Brass/Percussion

TMUS 8219 Dissertation Project 1 (recital)  
 TMUS 8229 Dissertation Project 2 (recital)  
 TMUS 8239 Dissertation Project 3 (recital; for winds can be recital or third research lecture)  
 TMUS 8249 Dissertation Project 4 (Pedagogy Practicum)  
 TMUS 8259 Dissertation Project 5 (Research-Lecture)  
 TMUS 8279 Dissertation Document 1  
 TMUS 8289 Dissertation Document 2  
 TMUS 8299 Dissertation Document 3  
 TMUS 8329 Major Document

### 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 Dissertation Project 4 (performance document)  
 TMUS 8269 Dissertation Project 5 (a project on vocal literature or performance)  
 TMUS 8329 Dissertation Project 6 (major pedagogical document)

## 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 two principal areas of study are music education and musicology. See the Ph.D. description found in the Graduate School chapter 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 GRE (the general test and the subject test in music) should be 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 is required. Information about specific requirements is available from the music education and musicology faculty chairs and from the Office of the Associate Dean for Graduate Studies.

### Dissertation

See thesis requirements related to the doctor of philosophy degree in the Graduate School chapter 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 each semester's *Registration Handbook and Schedule of Courses*.

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. *Offered in fall and spring.*

**EMUS 1115-1. Piano Class 1.** Introduction to the keyboard and music reading for nonmusic majors with no prior keyboard experience. Study of very easy classical and pop repertoire.

**EMUS 1123-2. Piano Class 2.** Continuation of EMUS 1115. Focuses on development of music reading. Studies technical patterns, easy classical and pop repertoire, and improvisation. For non-music majors who have had EMUS 1115 or instructor's consent.

**EMUS 1184-2. Voice Class.** Basic vocal technique and easy solo repertoire taught through a group medium, for beginner and intermediate-level students.

**EMUS 1832-3. Appreciation of Music.** Basic knowledge of music literature and development of discriminating listening habits. *Offered in fall and spring.*

**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. *Offered in spring 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. *Offered in fall and spring.*

**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. *Offered in fall only.*

**EMUS 2772-3. World Musics.** Musics outside Western art tradition, using current ethnomusicological materials. The spring semester focuses on musical cultures of the Americas, Africa, and Europe; the fall semester focuses on musical cultures of Asia and Oceania.

**EMUS 3642-3. History of Jazz.** Study of origins, development, and current trends. *Offered in fall and spring.*

**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. *Offered in fall only.*

**EMUS 3822-3. Music Literature 1.** Study of music literature from choral, orchestra, chamber music, and operatic repertoire. For nonmusic majors only. *Offered in fall only.*

**EMUS 3832-3. Music Literature 2.** Continuation of MUSC 3820. *Offered in spring only.*

**EMUS 4012. African Music.** Studies the musics, dances, and cultures of various peoples of Africa. African diaspora music and "Afro-pop" will be included. *Offered in fall only.*

**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. *Offered in spring only.*

## Music Ensembles

A variety of both large and small ensembles is offered both fall and spring semesters for 1 semester hour of credit. All 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, University Choir, University Singers, Women's Chorus, and Men's Chorus.

**Orchestras:** Chamber Orchestra, Symphony Orchestra.

**Ensembles:** Bell, Early Music Ensemble, Electronic Music Ensemble, Guitar, Jazz, New Music, Percussion, World Music.

**Chamber Music:** Brass, Piano, String, Woodwind.

**Opera:** Opera Practicum, Opera Theatre.

## Music

### Theory and Composition

**MUSC 1051-2. Elementary Composition.** A course for noncomposition majors. Introduction to the craft of musical composition with analysis and writing in various styles. *Offered in spring only.*

**MUSC 1081-3. Basic Music Theory for Music Majors.** Introduction to tools used in notating, performing, creating, and listening to music. Open to music majors only. *Offered in fall only.*

**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. *Offered in fall only.*

**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. *Offered in fall only.*

**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. *Offered in spring only.*

**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. *Offered in fall only.*

**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. *Offered in spring only.*

**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. Provides structural analysis of musical excerpts. Prereq., MUSC 1111. *Offered in fall only.*

**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, jazz, "motivic" music (set theory), and twelfth-tone theory. Prereq., MUSC 2101. *Offered in spring only.*

**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. *Offered in fall only.*

**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. *Offered in spring only.*

**MUSC 2071-2. Instrumentation.** Introductory study of the instruments of the orchestra, and problems of scoring for diverse choirs and full orchestra. Prereq., MUSC 2101 and 2121. *Offered in spring only.*

**MUSC 3031-2. Aural Foundations of Jazz.** Melodic, harmonic, and rhythmic dictation in a jazz vocabulary; improvisation; transcribing of recorded jazz solos. Coreq., MUSC 3091. Prereq., MUSC 2121. *Offered in fall only.*

**MUSC 3071-3. Jazz Improvisation.** Offers assistance and guidance for the student acquiring necessary skills and gaining insights for achieving creative musical results. Prereq., MUSC 2101. *Offered in spring only.*

**MUSC 3091-1. Jazz Theory.** Chord construction, nomenclature, chord/scale relationship in a jazz vocabulary; analysis of jazz repertoire. Coreq., MUSC 3031. Prereq., MUSC 2101. *Offered in fall only.*

**MUSC 4001-2. New Musical Styles and Practices.** Studies current styles of composition and the theories that underlie them. Students write (and perform, if possible) short representative exercises in recent musical idioms. Prereqs., MUSC 2111 and 2131. *Offered in fall only.*

**MUSC 4011-2. Sixteenth-Century Counterpoint.** Studies the style of Palestrina and his contemporaries through analysis and written examples. Prereq., MUSC 2101. *Offered in spring only.*

**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. Prereq., MUSC 2101. *Offered in fall only.*

**MUSC 4031-2. Scoring and Arranging.** Practical problems, creative arranging, and scoring for various choral and instrumental groups. Prereq., MUSC 2111 and 2131. *Offered in spring only.*

**MUSC 4041-2. Orchestration.** Study of advanced orchestration techniques through score analysis and student projects. Prereq., MUSC 2071. Offered in fall only.

**MUSC 4061-2. Analysis 1.** Survey of tonal analytical techniques. Selected works through the eighteenth century. Prereq., MUSC 2111 and 2131. Offered in fall only.

**MUSC 4071. Analysis 2.** Introduces twentieth-century analysis by looking at selected works. Prereq., MUSC 2111 and 2131. Offered in spring only.

**MUSC 4081-3. Introduction to Music Technology.** A beginning course in music technology. Topics include: basic synthesis, musical instrument digital interface (M.I.D.I.) sequencing, and music notation by computer. Prereq., MUSC 2111. Offered in fall and spring.

**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. Offered in fall only.

**MUSC 4111-2. Advanced Sound Synthesis.** An in-depth exploration of the principal sound synthesis techniques available to contemporary musicians.

**MUSC 4121-3. Intermediate Music Technology.** Explores more sophisticated uses for technology in composing, arranging, and performance. Topics include: advanced sequencing techniques, Finale music processing software, alternative M.I.D.I. performance devices, SMPTE, and multi-track recording.

**MUSC 4131-2. Computer Programming for Musicians.** Designed for musicians with no prior programming knowledge. Covers basic and intermediate programming techniques. Students will design software such as a simple M.I.D.I. sequencer, computer-aided instruction program, and interactive performance software.

**MUSC 4181-8. Technology in Music and Visual Media.** Investigates various aesthetics and techniques of composing for film and dance. Students will learn by composing short scores for prerecorded video and dance using a wide variety of methods.

**MUSC 5051-3. History of Theory.** Study of important theoretical writings from ancient Greece to the present.

**MUSC 5061-3. Advanced Analysis 1.** Survey of tonal analytical techniques. For graduate students. Offered in fall only.

**MUSC 5071-3. Advanced Analysis 2.** Survey of analytical techniques applicable to twentieth-century music. For graduate students. Offered in spring only.

**MUSC 5081-3. Applications in Music Technology.** Presents advanced strategies for applying computer technology in several musical disciplines. Emphasizes the use of technology in composition, music theory, and music education. Offered in fall and spring.

**MUSC 5101-3. Advanced Counterpoint.**

**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.

### Musicology

**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 repertoire. Offered in fall only.

**MUSC 3802-3, 3812-3. History of Music.** Survey of western art music with stylistic analysis of representative works from all major periods.

**MUSC 4012. African Music.** Studies the musics, dances, and cultures of various peoples of Africa. African diaspora music and "Afro-pop" will be included. Offered in fall only.

**MUSC 4112. Ethnomusicology.** Examines the definition, scope, and methods of ethnomusicology, the discipline that focuses on approaches to the study of music theory, history, and performance practices of world cultures.

**MUSC 4142. American Indian Music.** Studies Native North American musical cultures, with an emphasis on music as an integral part of religious expression and community life.

**MUSC 4712-3. Renaissance Music.** Repertory and analysis of polyphonic music circa 1400-1600. Offered in fall only.

**MUSC 4752. Women Composers in Western Culture.** Examines the historical contributions of women composers, principally in the Western tradition. Investigates the reception of women's work by historians, critics, audiences, performers, and patrons. Offered in spring only.

**MUSC 4762-3. History of Choral Literature.** Survey of ensemble vocal music from chant to the present. Offered in fall only.

**MUSC 4772-3. History of Opera.** Survey of operatic literature from early Baroque to contemporary productions. Offered in fall only.

**MUSC 4792-3. Twentieth-Century Music.** Major trends and developments are explored while focusing on specific compositions of important composers. Offered in fall only.

**MUSC 4802-3. Studies in Twentieth-Century Music.** Intensified work in history of Western concert music in the twentieth century. Topics vary from year to year.

**MUSC 4812-3. Symphonic Literature.** Study of literature for orchestra, band, and other symphonic ensembles: preclassical, Classical, 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. Offered in fall only.

**MUSC 4832-3. Studies in American Music.** Intensified work in folk, popular, and art music of the United States. Offered in spring only.

**MUSC 4852-3. Seventeenth- and Early Eighteenth-Century Music.** Style and repertory of music from 1580 to 1750. Offered in spring only.

**MUSC 4872. Late Eighteenth- and Nineteenth-Century Music.** Examines music and writings about music during the Classic and Romantic eras of the Western tradition, 1750-1900. Emphasizes historical and stylistic analysis and current musicological research. Offered in fall only.

**MUSC 4882-3. 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 5112. Ethnomusicology.** Provides an examination of the definition, scope, and methods of ethnomusicology, the discipline which focuses on approaches to the study of music theory, history, and performance practices of world cultures.

**MUSC 5142. American Indian Music.** Studies Native North American musical cultures, with an emphasis on music as an integral part of religious expression and community life.

**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 5752. Women Composers in Western Culture.** Examines the historical contributions of women composers, principally in the Western tradition. Investigates the reception of women's work by historians, critics, audiences, performers, and patrons. Offered in spring only.

**MUSC 5762 (2-4). History of Choral Literature.** Seminar in analysis of musical style, chant to present. Those wishing review of literature and repertory may enroll for 4 hours credit.

**MUSC 5772-3. History of Opera.** Survey of operatic literature from early Baroque to contemporary productions.

**MUSC 5792-3. Twentieth-Century Music.** Major trends and developments explored while focusing on specific compositions of important composers.

**MUSC 5802-3. Studies in Twentieth-Century Music.** Intensified work in history of Western concert music in the twentieth century. Topics vary from year to year.

**MUSC 5812-3. Symphonic Literature.** Study of literature for orchestra, band, and other symphonic ensembles: preclassical, Classical, 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.** Same as MUSC 4872. Offered in fall only.

**MUSC 5882-3. 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.** 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. Offered in fall only.

**MUSC 3013-1. String Class.** Required course for music education majors with choral/general emphasis. Students gain substantial technique on violin, viola, cello, and double bass. Pedagogical skills developed, using most recent methods as they relate to school teaching. Offered in fall only.

**MUSC 3023-1. Woodwind Class.** Presents techniques of playing and teaching woodwind instruments as well as selection of methods and equipment for use with students of woodwind instruments. Offered in spring only.

**MUSC 3033-1. Brass Class.** Presents techniques of playing and teaching brass instruments, as well as selection of methods and equipment for use with students of brass instruments. Offered in fall only.

**MUSC 3113-3. Introduction to the Arts.** 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. Offered in spring only.

**MUSC 3123-3. Teaching Choral Music.** Music materials, pedagogical techniques, and administrative procedures used in choral music programs for junior and senior high school students. Offered in fall of odd-numbered years.

**MUSC 3133-2. Teaching General Music 1.** An overview of curriculum (knowledge, skills, and attitudes) and materials appropriate for preschool through high school ages in general music. Emphasis on the process of education in students' musical development. Basic skills for using classroom instruments in general music. Offered in spring only.

**MUSC 3153-2. Teaching Woodwind Instruments.** Instruction in playing and teaching all woodwind instruments. Students perform in heterogeneous and homogeneous groupings. Offered in spring only.

**MUSC 3163-2. Teaching String Instruments.** Instruction in playing and teaching all string instruments. Students perform in heterogeneous and homogeneous groupings. Offered in fall only.

**MUSC 3193-2. Vocal Pedagogy and Literature for Young Voices.** Presents an overview of how the singing voice functions. Additional areas of study include health care of the voice, group teaching techniques, and corrective ideas for vocal problems commonly encountered in the studio and choral rehearsal. Both solo and ensemble repertoire for junior and senior high school singers are explored. Provides instrumentalists with knowledge and skills needed to work with singers in both private studio and public school choral settings. Offered in spring only.

**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.** Instruction in playing and teaching all brass instruments. Students perform in heterogeneous and homogeneous groupings. Offered in fall only.

**MUSC 3243-2. Marching Band/Jazz Band/String Techniques.** Techniques of charting and arranging for marching band, techniques and literature of the jazz ensemble, or alternative string ensemble techniques. Offered in spring only.

**MUSC 4103-1. Introduction to Student Teaching.** Instructional aide experiences in the schools. First half of the professional year.

**MUSC 4113-3. General Music 2.** 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. Offered in fall only.

**MUSC 4123-3, 4133-3. Student Teaching Practicum.** Practice teaching of music under the tutelage of a master music teacher.

**MUSC 4143-3. Teaching Instrumental Music.** Basic course covering broad principles for organizing, administering, and teaching instrumental music programs in public schools. Offered in spring only.

**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 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, and nonparametric procedures.

**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 through Performance.** Application of structural and analytical principles of music to teaching, conducting, and performing music for musician-teachers in schools.

**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 Music Education.**

**MUSC 7833-3. Seminar in Music Education.**

### *Voice*

**MUSC 1444-2. Italian/English Diction and Repertoire.** Phonetics of Italian and English, and coaching of classic arias and art songs. Offered in fall only.

**MUSC 3484-1. Music Theatre Stage Lab.** Practical laboratory for learning aspects of administrative and 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 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: The Young Voice—Physiology, Technique, Repertoire.** Study of the solo repertoire needs of young voices, the physiological aspects of mutational

voices, techniques of vocalizing young voices, and class voice procedure.

**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 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.

**MUSC 5564-2. German Song Literature.** Extensive analytical and historical discussion of German song literature styles, from the middle ages through the twentieth century.

### 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. Offered in fall only.

**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. Offered in spring only.

**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. Offered in fall only every other year.

**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. Offered in fall only every other year.

**MUSC 4325-2. Piano Literature 1.** Survey from eighteenth century to Debussy. Offered in fall only.

**MUSC 4335-2. Piano Literature 2.** Survey from Debussy to present. Offered in spring only.

**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. Offered in spring only.

**MUSC 4405-2. Basso-continuo Accompaniment.** Brief history, theory and practice of Basso-continuo accompaniment. Practical instruction in realizing harmony from a given bass line (figured or unfigured), projecting affect, and creating dynamics. Emphasis on individual cognition and creativity. Periodic practical experience in an ensemble. Same as MUSC 5405.

**MUSC 5305-3. Group Techniques.** Materials and techniques for teaching beginning piano students, especially adults in class settings.

**MUSC 5315-3. Intermediate Piano Literature.** Survey of repertoire for intermediate-level piano students and discussion of teaching techniques.

**MUSC 5325-2. Piano Literature 1.** Keyboard music from earliest known examples through Debussy.

**MUSC 5335-2. Piano Literature 2.** Study of specific contributions to piano literature by major twentieth-century composers.

**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 5405-2. Basso-continuo Accompaniment.** Same as MUSC 4405.

**MUSC 6325-2. Seminar in Piano Literature.** Intensive study of a selected area of repertoire or history. Offered in fall only.

### Instrumental

**MUSC 1326-1. Guitar Sight Reading.** Studies nineteenth- and twentieth-century approaches to improving sight reading, including practical applications and exercises.

**MUSC 3176-2, 3186-2. Conducting I, 2.** Introduction to conducting and rehearsal tech-

niques. Coreq., performance participation in the appropriate ensemble (band, choir, or orchestra). MUSC 3176 offered in fall only; 3186 offered in spring only.

**MUSC 4106-2. Guitar Literature.** An analytical and historical study of guitar literature from the Middle Ages through the twentieth century.

**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.** Stylistic-historical survey in various genres from Baroque era to present. Offered every other spring.

### Theses and Recitals

**MUSC 2987-1. Introduction to Music Research.** Introduces music research and writing skills to provide tools necessary for successful composition of formal research papers. Applies interests and curricular goals to specific topics of students' choice.

**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 5158-2. Symposium in Choral Music.** Advanced study of choral repertoire by style period. Required of all choral graduate students for a minimum of two 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 literature class are required. Undergraduate performance majors carry 4 credit hours per semester; music education majors, 3 hours per semester (1 hour recitation); bachelor of arts in



music majors, 2 or 4 hours per semester; minors, 2 hours 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

**DANIEL SHER, Dean; Professor (Piano).** B.Mus., Obedin College Conservatory of Music; M.S., Juilliard School of Music; Ed.D., Columbia University.

**PHILIP AAHOLM, Professor (Clarinet).** B.A., M.M., University of Wisconsin; D.M.A., University of Arizona.

**MICHAEL ALLEN, Instructor (Tuba).** B.M., University of Denver.

**JAMES R. AUSTIN, Associate Professor.** B.M.Ed., University of North Dakota; M.A.Ed., Ph.D. in Music Ed., University of Iowa.

**FRANK BAIRD, Professor Emeritus.**

**GRETCHEN HIERONYMUS BEALL, Professor Emerita.**

**GIORA BERNSTEIN, Professor Emeritus.**

**JAMES BRODY, Associate Professor (Oboe).** B.M., Ohio State University; M.M., Indiana University.

**STEVEN M. BRUNS, Associate Professor (Theory, Composition).** B.M.E., Northern State College, Aberdeen, SD; M.M., Ph.D., University of Wisconsin-Madison.

**STORM BULL, Professor Emeritus.**

**CHARLES BYERS, Professor Emeritus.**

**THOMAS CANEVA, Associate Director of Bands, Instructor.** B.Mus.Ed., University of Illinois; M.Mus., University of Texas; D.M.A., University of Colorado at Boulder.

**GREGORY A. CARROLL, Instructor (Percussion), Director for Jazz Ensembles.** B.M.Ed., Instrumental, University of Northern Colorado.

**ANGELA CHENG, Assistant Professor (Piano).** B.Mus., The Juilliard School; M.Mus., Indiana University.

**ALVIN CHOW, Assistant Professor (Piano).** B.Mus., University of Maryland; M.Mus., The Juilliard School.

**WALTER COLLINS, Professor Emeritus.**

**JOAN CATONI CONLON, Professor (Choral).** B.A., M.A., and D.M.A., University of Washington.

**JOHN DRUMHELLER, Instructor (Theory and Composition).** B.M.Ed., Montana State University; M.M., D.M.A., University of Colorado at Boulder.

**GUY DUCKWORTH, Professor Emeritus.**

**GREGORY DYES, Assistant Professor (Jazz Piano).** B.M.E., M.M., Northwestern University; D.M.A., University of Colorado at Boulder.

**CHARLES EAKIN, Professor Emeritus.**

**ERIKA ECKERT, Assistant Professor (Viola).** B.M., Eastman School of Music.

**OLIVER ELLSWORTH, Professor (History and Literature).** B.A., M.A., Ph.D., University of California, Berkeley.

**PAUL ERHARD, Assistant Professor (Double Bass).** B.M., Eastman School of Music; M.M., D.M.A., The Juilliard School.

**ELIZABETH FARR, Assistant Professor (Organ, Harpsichord).** B.M., Stetson University; M.M., The Juilliard School; D.M.A., University of Michigan-Ann Arbor.

**ROBERT FINK, Dean Emeritus and Professor Emeritus.**

**JOHN GALM, Associate Professor (History, Percussion).** B.Mus., M.Mus., Performer's Certificate, Eastman School of Music.

**TANYA GILLE, Associate Professor (Piano).** B.Mus., M.Mus., Indiana University; D.M.A., Eastman School of Music.

**SUSAN GLASER, Assistant Professor (Flute).** B.S., Indiana University; M.M., Northwestern University; D.M.A., The Juilliard School.

**JUDITH GLYDE, Associate Professor (Cello).** B.M., Hartt College of Music; M.M., Manhattan School of Music.

**LUIS GONZALEZ, Professor (Theory and Composition).** M.M., D.M.A., Peabody Conservatory.

**LARRY GRAHAM, Professor (Piano).** B.M., M.S., The Juilliard School.

**ROBERT HARRISON**, Associate Professor (Voice). B.A., Milton College; M.M., University of Wisconsin; D.M.A., University of Arizona.

**DEBORAH HAYES**, Associate Dean of Graduate Studies and Professor (History and Literature). A.B., Oberlin College; M.A., Ph.D., Stanford University.

**WILLIE L. HILL, JR.**, Assistant Dean; Associate Professor (Music Education). B.S., Grambling State University; M.M.Ed., Ph.D., University of Colorado at Boulder.

**EVERETT HILTY**, Professor Emeritus.

**WARNER HIGGINS**, Dean Emeritus and Professor Emeritus.

**YOSHIYUKI ISHIKAWA**, Professor (Bassoon). B.M.E., M.M., Northwestern University; D.M.A., University of Michigan.

**DENNIS JACKSON**, Professor (Voice). B.A., Texas Wesleyan College; M.M., Wichita State University; D.M.A., University of Michigan.

**LAWRENCE KAPTEIN**, Associate 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.

**THEODORE KUCHAR**, Associate Professor (Viola). B.M., Cleveland Institute of Music.

**DORIS PRIDONOFF LEHNERT**, 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**, Instructor (Theory and Composition). B.M., Eastman School of Music; M.M., University of Michigan.

**CHRISTINA LYNN-CRAIG**, Instructor (Voice). B.A., Loretto Heights College; M.M., Temple University; D.M.A., University of Colorado at Boulder.

**PATRICK MASON**, Assistant Professor (Voice). B.Mus., Peabody Conservatory of Music; M.Mus., University of Nebraska-Lincoln.

**KEVIN McCARTHY**, Associate Dean for Undergraduate Studies, Associate Professor (Music Education). B.Mus.Ed., University of Notre Dame; M.M., Michigan State University; Ph.D., Case Western Reserve University.

**ALDEN MCKINLEY**, Professor Emeritus.

**ALLAN McMURRAY**, Director of Bands, Professor (Trumpet). B.A., California State University, Long Beach; M.M., University of Wisconsin. Additional study, University of Michigan.

**JANET MONTGOMERY**, Associate Professor (Music Education). B.Mus.Ed., M.M.Ed., Wichita State University; Ph.D., University of Wisconsin-Madison.

**MUTSUMI MOTEKI**, Assistant Professor (Vocal Coach/Accompanist). B.A., Kunitachi College of Music; M.M., Westminster Choir College; D.M.A., University of Michigan.

**TOM MYER**, Assistant Professor (Saxophone). B.S., University of Wisconsin-LaCrosse; M.M., North Texas State University.

**LAURA OKUNIEWSKI**, Lecturer (Harp). B.M., Cleveland Institute of Music; M.M., Cleveland State University.

**PATTI PETERSON**, Assistant Professor (Voice). B.M., Salem College; M.M., D.M.A., University of Colorado at Boulder.

**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.

**THOMAS RIIS**, Professor (Music History). B.A., Oberlin College; M.A., Ph.D., University of Michigan.

**BRENDA ROMERO**, Assistant Professor (History and Literature, Ethnomusicology). B.M., M.M., University of New Mexico; Ph.D., University of California-Los Angeles.

**BARBARA KINSEY SABLE**, Professor Emerita.

**GORDON SANDFORD**, Professor (History and Literature). A.B., San Jose State College; A.M., University of Redlands; Ph.D., University of Southern California.

**TERRY SAWCHUK**, Associate 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.M., University of Illinois.

**ROBERT SPILLMAN**, Professor (Piano). B.M., M.M., Eastman School of Music.

**WILLIAM STANLEY**, Assistant Professor (Trombone). B.Mus.Ed., University of Kansas; M.M., D.M.A., 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.M., D.M.A., University of Michigan.

**YAYOI UNO**, Assistant Professor (Theory and Composition). B.A., Lewis and Clark College; M.A., SUNY Stony Brook; Ph.D., Eastman School of Music.

**DON VOLLSTEDT**, Professor Emeritus.

**KEITH WALLINGFORD**, Professor Emeritus.

**DOUGLAS WALTER**, Associate Professor (Percussion). B.M., University of North Texas; M.M., University of Michigan; D.M.A., Temple University.

**HOWARD WALTZ**, Professor Emeritus.

**KEITH WATERS**, Instructor (Theory and Composition). B.M., University of North Carolina-Greensboro; M.M., New England Conservatory of Music.

**LYNN WHITTEN**, Professor Emeritus.

**CHARLES WOLZIEN**, Associate Professor (Guitar). B.Mus., San Francisco Conservatory; M.M., D.M.A., University of Colorado at Boulder.

### *Takacs Quartet*

**EDWARD DUSINBERRE**, Associate Professor (Violin). Graduate, London Royal College of Music.

**ANDRAS FEJER**, Associate Professor (Cello). Graduate, Franz Liszt Academy of Music, Budapest.

**KAROLY SCHRANZ**, Associate Professor (Violin). Graduate, Franz Liszt Academy of Music, Budapest.

**ROGER TAPPING**, Associate Professor (Viola). B.A., Queen Mary's 6th Form College; M.A., Cambridge University; Honorary Doctorate, Nottingham University.

OTHER ACADEMIC PROGRAMS

*Admission to the two-year Presidents Leadership Class (PLC) is a competitive process and a high honor awarded to incoming CU-Boulder students. These PLC students are shown during an outdoor retreat.*



# OTHER ACADEMIC PROGRAMS

## PREPROFESSIONAL PROGRAMS

Preprofessional programs have been developed at CU-Boulder to prepare undergraduate students for later study at professional schools. None of Boulder's preprofessional programs offers an undergraduate degree, and completion of any of the programs does not guarantee later admission to a professional school. However, these programs are linked to professional schools within Colorado, and completion of a preprofessional program can prepare a student well for later professional study.

Preprofessional programs include:

- Pre-Health Sciences
- Pre-Child Health Associate
- Pre-Dental Hygiene
- Pre-Dentistry
- Pre-Medical Technology
- Pre-Nursing
- Pre-Pharmacy
- Pre-Medicine
- Pre-Veterinary Medicine
- Pre-Journalism
- Pre-Law

Students can prepare to enter undergraduate professional health science programs at the University of Colorado Health Sciences Center in Denver in the areas of child health associate, dental hygiene, medical technology, nursing, pharmacy, and physical therapy by taking classes on the Boulder campus.

Students whose goals include entering the medical, dentistry, or physical therapy schools at the University of Colorado Health Sciences Center in Denver, or the veterinary medicine program at Colorado State University in Fort Collins, can complete any undergraduate major at CU-Boulder. In most cases, these students are required to complete a baccalaureate degree before entering professional school.

CU-Boulder houses the School of Journalism and Mass Communication, to which students can apply after completing the requisite course work, and the School of Law. Students typically earn an undergraduate degree before entering law school.

Advising for preprofessional study in the health sciences and law is conducted through the Office of Preprofessional Advising in the Advising Resource Center, Willard 226, (303) 492-8811. Students can

receive information about course requirements, test deadlines, and enrollment limitations, and discuss other concerns about professional study. For more information, refer to the Office of Undergraduate Academic Affairs.

## Pre-Health Sciences

Preprofessional students interested in pursuing a career in a health field should complete prerequisite courses that are included in the prehealth programs at CU-Boulder. Prerequisite courses are determined by the different professional schools and programs at the University of Colorado Health Sciences Center. Most professional schools and programs require applicants to complete all prerequisite courses before applying to that professional school or program.

*Transfer students who have completed the necessary prerequisites should apply for admission directly to the desired school or program.*

There is no specific prehealth degree, and completion of any of the prehealth programs does not guarantee later admission into a professional school.

The Advising Resource Center, located within the Office of Undergraduate Academic Affairs (OUAA), provides an academic advising service for prehealth students on the CU-Boulder campus. The prehealth programs office within OUAA also includes a preprofessional file service, a preprofessional library, a premedical preceptor program, a prehealth e-mail list, and other services. All prehealth students are strongly encouraged to take advantage of the services offered through the prehealth programs office.

Students interested in applying to medical, dental, physician assistant, and physical therapy schools and programs should complete all prerequisite courses while pursuing a bachelor's degree at CU-Boulder. Students interested in these schools or programs may major in any area. For example, premedical students may be found majoring in both science and non-science departments in the College of Arts and Sciences, as well as in such colleges as engineering, business, and music. Generally, there is no advantage of one college or academic department over another in gaining admission to a professional school or program. All students are urged to consult with advisors in their major department and the prehealth advisor for more information.

Students interested in applying to nursing, medical laboratory sciences, pharmacy, and dental hygiene schools have the option of completing prerequisite courses only, or completing the prerequisite courses while pursuing a bachelor's degree on the CU-Boulder campus before entering a professional school or program.

It is important that students interested in these professional schools and programs protect themselves by satisfying requirements for an undergraduate degree at CU-Boulder. Many of the required prerequisite courses overlap with core and major requirements, so students are advised to take care in selecting courses. For example, CHEM 1051 and CHEM 1071 fulfill part of the natural sciences content area in the arts and sciences core curriculum.

At the time of application to a professional school, students are judged on several factors, including performance in undergraduate courses. For this reason, *no required course may be taken on a pass/fail basis*. Some fields require specific preprofessional examinations before application. For most fields, interviews are an essential part of the application process. In all cases, admission committees are concerned with students' compassion, coping, and decision-making abilities, intellectual capabilities, realistic self-appraisal, sensitivity in interpersonal relations, and staying power (physical and motivational). In addition to formal course work, students should have experience in people-related activities (especially those related to their field of choice), so they can be more certain of their motivation for health careers.

Some of the professional programs at the University of Colorado Health Sciences Center give preference to Colorado residents and residents of WICHE (Western Interstate Commission on Higher Education) states; interested students should check with individual programs for specific policies. Students from other states usually can obtain at CU-Boulder the preprofessional courses required by their state schools, but should check with those schools in advance. Students are encouraged to apply both to their state school and to private professional schools to increase their chances of gaining acceptance to the professional program of their choice.



During the preprofessional years, personal intellectual development leads many students to change professional goals. Since there are usually more applicants for these programs than there are spaces available, many students need to pursue alternative goals. Under these circumstances, students should plan college programs to give themselves the greatest flexibility in considering other vocations.

For information about other health-related fields not available at the University of Colorado, check with the preprofessional advising or career services offices.

A summary of current preprofessional health science requirements follows.

The following information is subject to change without notice. For current information, keep in contact with the prehealth advisor.

### Two-Year Prehealth Programs

The following are programs that require approximately two years of undergraduate study *prior* to entrance into the professional school or program.

#### Dental Hygiene

The two-year professional program at the University of Colorado Health Sciences Center leads to a bachelor of science degree in dental hygiene.

Students normally apply at the beginning of their sophomore year. A minimum of 60 semester hours is required for acceptance. ACT scores are also required.

<i>Required Courses</i>	<i>Semester Hours</i>
Biology (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1150 and 1151, 2150 and 2151) (Note 1)	8
Chemistry, with laboratory (CHEM 1111 and 1131)	10
English composition (ENGL 1191 and 2021 or 2051 or 3152)	3
Speech (COMM 1300)	3
SOCY 1001	3
PSYC 1001	3

#### Curriculum Note

1. MCDB 1150 and 2150 provide a strong foundation for advanced MCDB courses, but do not cover all of "general biology." Students who require this information for the Dental Admission Test, the Medical College Admission Test, or other reasons should consider taking EPOB 1220 as an elective.

#### Nursing

The two-year program at the University of Colorado Health Sciences Center leads to the bachelor of science degree in nursing.

A minimum of 60 semester hours is required for admission (CU-Boulder hours may exceed minimum requirements shown).

Students should check periodically for possible changes in requirements.

<i>Required Courses</i>	<i>Semester Hours</i>
Biology, general, as a prerequisite for microbiology and physiology (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1150 and 1151, 2150 and 2151) (Note 1)	8
Microbiology (EPOB 3400)	4
Human anatomy (EPOB 3420)	5
Chemistry (CHEM 1051 and 1071, or CHEM 1111 and 1071)	8-9
Physiology (EPOB 3430)	5
Sociology, general (SOCY 1001)	3
General psychology (PSYC 1001)	4
Developmental psychology (PSYC 2643, plus KINE 4480 or PSYC 2303)	6
Cultural-based anthropology or any multicultural studies course (not including literature)	3
English composition	3
Statistics	3
Art (literature, art, music, dance, fine arts, or theatre)	3
Philosophy	3
Nutrition (KINE 3420 or PSYC 2062)	3
Required elective (political science, history, or economics)	3
Algebra (MATH 1000, 1010, or 1020)	1

Other courses may be selected from any academic discipline with the exception of commercial and vocational courses and doctrinal courses in religion. Because of the number of science prerequisite courses, the beginning pre-nursing student has two choices: take both chemistry and biology during the freshman year, or take one of these courses, preferably biology, during the summer session either preceding or following the freshman year.

#### Curriculum Note

1. MCDB 1150 and 2150 provide a strong foundation for advanced MCDB courses, but do not cover all of "general biology." Students who require this information for the Dental Admission Test, the Medical College Admission Test, or other reasons should consider taking EPOB 1220 as an elective.

#### Pharmacy

The three-year program at the University of Colorado Health Sciences Center leads to the bachelor of science degree in pharmacy.

Students normally apply during their sophomore year. A minimum of 60 semester hours is required for admission.

<i>Required Courses</i>	<i>Semester Hours</i>
Biology, with laboratory (one year of general zoology or a combination of general zoology and botany) (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1150 and 1151, 2150 and 2151) (Note 1)	8
Microbiology (EPOB 3400)	4
Chemistry, general, with laboratory (CHEM 1111 and 1131)	10
Chemistry, organic, with laboratory (CHEM 3311, 3321, 3331, and 3341)	8
Calculus (MATH 1300)	5
English composition	6

Communication (COMM 2000)	3
General education (electives may include accounting, computer science, business, economics, financial management, foreign language, geography, humanities, physics, political science, statistics)	14
Social sciences (cultural anthropology, history, psychology, sociology)	6

#### Curriculum Note

1. MCDB 1150 and 2150 provide a strong foundation for advanced MCDB courses, but do not cover all of "general biology." Students who require this information for the Dental Admission Test, the Medical College Admission Test, or other reasons should consider taking EPOB 1220 as an elective.

### Three-Year Prehealth Programs

The following are programs that require approximately three years of undergraduate study *prior* to entrance into the professional school or program.

#### Child Health Associate

The professional program at the University of Colorado Health Sciences Center requires three years in addition to three years of preprofessional work at CU-Boulder. A B.S. degree may be obtained at the end of the first year of professional study. At that time students may apply for acceptance into the M.S. degree program, which can be completed by the end of the third professional year.

A minimum of 90 semester hours is required for admission as well as completion of the Graduate Record Examination (GRE). Many applicants have more than minimal college requirements.

<i>Required Courses</i>	<i>Semester Hours</i>
Biology (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1150 and 1151, 2150 and 2151) (Note 1)	8
Chemistry, general (CHEM 1111 and 1131)	10
Psychology (may include behavioral and child psychology)	6
Humanities (cultural anthropology, English, sociology, or Spanish)	12
Statistics	3
Genetics (EPOB 3200 or MCDB 2150 and 2151)	3-4

The following requirements have been added to apply to the Child Health Associate Program: Two of the following courses: EPOB 3420 (Introduction to Human Anatomy), EPOB 3430 (Human Physiology), or CHEM 4711 (General Biochemistry I).....8-10

#### Curriculum Note

1. MCDB 1150 and 2150 provide a strong foundation for advanced MCDB courses, but do not cover all of "general biology." Students who require this information for the Dental Admission Test, the Medical College Admission Test, or other reasons should consider taking EPOB 1220 as an elective.

### Medical Technology

This one-year program at the University of Colorado Health Sciences Center leads to the bachelor of science degree in medical technology, program certification, and eligibility to sit for national certification exams.

Students normally apply during the fall of their junior year. Colorado residents have priority for admission. A minimum of 80 semester hours is required for admission (CU-Boulder hours may exceed minimum requirements shown).

<i>Required Courses</i>	<i>Semester Hours</i>
Biology, with laboratory. Must include microbiology and immunology (EPOB 3400). Remaining credits from general biology (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1150 and 1151, 2150 and 2151), physiology, or anatomy.....	16
Chemistry, with laboratory, usually general chemistry (CHEM 1111, 1131) and organic (CHEM 3311 and 3331), and biochemistry (CHEM 4711 and 4731).....	16
Courses in statistics, computer science, and physics are recommended. Suggested general curriculum electives include English, speech or communication, social sciences, physical education, and modern language (German, Russian, French, or Spanish).	

### Four-Year Prehealth Programs

The following are programs that require approximately four years of undergraduate study *prior* to entrance into the professional school or program.

#### Dentistry

The University of Colorado Health Sciences Center offers a four-year program leading to the doctor of dental surgery (D.D.S.).

Students normally apply between their junior and senior years for entry into the dentistry program after they have earned their bachelor's degree. Students planning to enter with 90 hours can also apply, between their sophomore and junior years, and have the option of earning a bachelor's degree *and* a dental degree. This double-degree program takes seven years. Students can satisfy all course requirements for the bachelor's degree by counting hours from the dental curriculum.

The Dental Admission Test (DAT) is required for admission.

<i>Required Courses</i>	<i>Semester Hours</i>
Biology (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1150 and 1151, 2150 and 2151) (Note 1).....	8
Chemistry, general (CHEM 1111 and 1131, or CHEM 1151 and 1171).....	10-12
Chemistry, organic (CHEM 3311 and 3321, 3331 and 3341, or CHEM 3351 and 3361, 3371 and 3381).....	8-10

Physics, general, with laboratory.....	9-10
Literature.....	6
English composition (UWRP 1150 or 3020)....	3

#### Curriculum Note

1. MCDB 1150 and 2150 provide a strong foundation for advanced MCDB courses, but do not cover all of "general biology." Students who require this information for the Dental Admission Test, the Medical College Admission Test, or other reasons should consider taking EPOB 1220 as an elective.

### Medicine

The School of Medicine at the University of Colorado Health Sciences Center offers a four-year program leading to the doctor of medicine (M.D.) degree.

Students normally apply between their junior and senior years. The Medical College Admission Test (MCAT) is usually taken in the spring of the junior year; science requirements are also completed at that time. Admission preference is given to Colorado, Alaska, Wyoming, and Montana residents and to a few other applicants from other states who have high GPAs and high MCAT scores.

Most applicants enter med. school with a baccalaureate degree or at least 120 hours.

<i>Required Courses</i>	<i>Semester Hours</i>
Biology, general (EPOB 1210 and 1230, 1220 and 1240, or MCDB 1150 and 1151, 2150 and 2151) (Note 1).....	8
Chemistry, general (CHEM 1111 and 1131, or CHEM 1151 and 1171).....	10-12
Chemistry, organic (CHEM 3311 and 3321, 3331 and 3341, or CHEM 3351 and 3361, 3371 and 3381).....	8-10
Physics, general, with laboratory.....	9-10
Mathematics (minimum college algebra and trigonometry).....	6
Literature.....	6
English composition.....	3

#### Curriculum Note

1. MCDB 1150 and 2150 provide a strong foundation for advanced MCDB courses, but do not cover all of "general biology." Students who require this information for the Dental Admission Test, the Medical College Admission Test, or other reasons should consider taking EPOB 1220 as an elective.

### Physical Therapy

The program at the University of Colorado Health Sciences Center leads to a master of science degree in physical therapy.

The minimum GPA is 3.00, and the Graduate Record Examination (GRE) is required. A baccalaureate degree is required (CU-Boulder hours may exceed minimum requirements shown).

The program also requires that a student has a certain amount of physical therapy experience. See the prehealth advisor for current information.

<i>Required Courses</i>	<i>Semester Hours</i>
Biology, general (EPOB 1210 and 1230, 1220 and 1240).....	8
Anatomy, human preferred (EPOB 3420; prerequisite, one year of biology).....	5
Physiology, human preferred (EPOB 3430; prerequisite, one year of chemistry and one year of biology).....	5
Chemistry, general, with laboratory (CHEM 1111 and 1131).....	10
Exercise physiology (KINE 4650).....	3
Kinesiology (KINE 4540; this course will no longer be required for the application deadline in November, 1997 and matriculation June, 1988.).....	4
Physics, general (recommended content to include mechanics, heat, electricity, magnetism, sound, heat, and labs, usually PHYS 2010 and 2020).....	minimum 8
Psychology (PSYC 1001, 4303, and 4684).....	7
Statistics.....	3
English composition.....	3
Human and social science electives.....	15
Math (MATH 1300 or higher).....	5

### Veterinary Medicine

The Colorado State University School of Veterinary Medicine offers a four-year program leading to the doctor of veterinary medicine (D.V.M.).

A minimum of 68 semester hours, including the following courses, is required for acceptance into the program. Most accepted applicants already have a bachelor's degree, although it is not necessary for admission.

Pre-veterinary students are encouraged to follow the required courses of an EPOB or MCDB major, since the courses listed below are most consistent with those areas of study. Other majors will require additional course work.

It is strongly advised that students take science courses beyond those required.

Courses in areas such as cell biology, microbiology, developmental biology, nutrition, and computer science are recommended.

Receiving Advanced Placement (AP) credit for any of the required courses normally requires taking a higher level course in the same subject area. In some cases this can be waived; check with the CSU Veterinary School.

CSU requires that all applicants take the Graduate Record Examination (GRE), morning tests only, by October of the year in which they apply.

Colorado residents are eligible to apply for entry into veterinary schools other than CSU. These schools usually have requirements other than those listed below.

For more information, to check on additional courses that meet the requirements below, or to find out about other veterinary schools, contact Professor Anne Bekoff, the



CU-Boulder pre-veterinary advisor in EPOB, Ramaley N379, (303) 492-5114, or e-mail at [vetadvis@stripe.colorado.edu](mailto:vetadvis@stripe.colorado.edu).

<i>Required Courses</i>	<i>Semester Hours</i>
Genetics (EPOB 3200 or MCDB 2150 and 2151) (Note 1).....	3-4
Biochemistry (CHEM 4711)(Note 2).....	3
Physics, with laboratory (PHYS 2010 and 2020, or PHYS 1110, 1120, and 1140).....	9-10
Statistics (PSYC 2101, EPOB 4410, EDUC 5716, ECON 3818, OPMG 2010, APPM 3570, MCEN 4120, MATH 2510, or MATH 4520).....	3-4
English composition (UWRP or any writing course).....	3
Humanities and social science electives.....	12

#### Curriculum Notes

1. A prerequisite for genetics is general biology with laboratory. At CU-Boulder this prerequisite can be met by taking either EPOB 1210 and 1230, 1220 and 1240, or MCDB 1150 and 1151. If prerequisites are taken elsewhere, CSU requires a laboratory associated with a biological science course.
2. Prerequisites for biochemistry are general chemistry with laboratory, and organic chemistry with laboratory. At CU-Boulder these prerequisites can be met by taking CHEM 1111 and 1131 and CHEM 3311 and 3321, 3331 and 3341.

#### Pre-Journalism

A specific pre-journalism and mass communication major is offered at CU-Boulder in the College of Arts and Sciences. Students complete two specific courses while working toward arts and sciences core curriculum requirements. See page 370 for more specific information.

#### 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, and that can serve as the basis for an alternative career should they elect not to apply to law school or should they not be accepted. Pre-law students should seek a rigorous and broad-based education that will ensure them a fundamental understanding of American society and its institutions as well as an appreciation for other cultures. They need to become familiar with mathematical analysis and scientific reasoning and to develop excellent oral and written communication skills.

Advising and support services are available through the preprofessional advisor in the Advising Resource Center. In addition, the associate dean of the College of Arts and Sciences serves as chair of a panel of faculty

advisors who have special interest and expertise in the theoretical and practical aspects of the law and judicial systems. These faculty advisors are available for consultation with all undergraduates on the Boulder campus. Contact the Advising Resource Center for more information.

## 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 inter-disciplinary, 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 as a part of their regular course work.

The Presidents Leadership Class is a program of the Student Leadership Institute and is overseen by a 35-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 demonstrated 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 University of Colorado at Boulder, Student Leadership Institute Executive Director, Campus Box 363, 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, as University of Colorado at Boulder Leadership Forum staff members, or as administrative staff members. Staff mem-

bers continue to receive merit-based scholarships during their tenure in the Presidents Leadership Class. Additional courses for juniors and seniors may also be available.

#### 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 capacity to inspire a shared vision.

Fundamental intellectual 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 skills.

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, a student-run high school leadership conference, and other community service projects.

Sophomore-year courses focus on global issues in leadership and change (such as environmental issues, economics, and politics) and multilevel analyses of leadership areas (issues originating at the organizational level that carry community and global implications). Experiential programs include Outward Bound activities, a monthly lecture 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 institution from the local area.

#### 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 FirstBank Colorado 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.** Introduces 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 challenges to leadership at the community level 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 change and 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 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 upon receipt of at least a baccalaureate degree.

#### Standard Four-Year Program

This standard program is designed for incoming freshmen, or any student with four years remaining until degree completion. It consists of three parts: the General

Military Course (GMC) for lower-division (normally freshman and sophomore) students; the Professional Officer Course (POC) for upper-division students (normally juniors and seniors); and Leadership Laboratory (LLAB) attended by all cadets. Completion of a four-week summer training course is required prior to commissioning.

#### Modified Two-Year Program

All undergraduate and graduate students are eligible for this program. It is offered to full-time, regularly enrolled degree students and requires at least two years of full-time college work (undergraduate or graduate level, or a combination). Those selected for this program must complete a six-week field training program during the summer months as a prerequisite for entry into the Professional Officer Course the following fall semester.

#### Leadership Lab

All AFROTC cadets must attend Leadership Lab (one and one-half hour per week). The laboratory involves a study of Air Force customs and courtesies, drill and ceremonies, career opportunities, and the life and work of an Air Force junior officer.

#### Other Air Force ROTC Programs

Other programs are frequently available based on current Air Force needs. There are currently one-year programs for nursing and electrical engineering. Any AFROTC-staff member in Boulder (492-8351) can discuss best alternatives. Interested students should make initial contact as early as possible to create the best selection opportunity, as selection is on a competitive basis. There is no obligation until a formal contract is entered.

#### Air Force College Scholarship Program

A scholarship board is held at the end of each semester for students that have at least one semester of full-time college credit. Minority students and those in technical degrees may be submitted for scholarship at any time during the year. Prior participation in AFROTC is not required to compete for these scholarships. Students selected for this program are placed on scholarships that pay tuition, book allowance, nonrefundable educational fees, and subsistence of \$150 per month, tax-free. All cadets enrolled in the Professional Officer Course receive \$150 per month subsistence during the regular academic year. These scholarships are available in all academic disciplines and are two to three years in length.

#### Flight Opportunities

Prior to entering the fourth 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 the Flight Screening Program (FSP) near San Antonio, Texas. All cadets are eligible to fly with the Civil Air Patrol while enrolled in AFROTC.

#### USAF Medical Programs

Qualified pre-med or nursing students can compete for medical or nursing scholarships. These scholarships can lead to a career as an Air Force officer, serving as a doctor or nurse. The pre-health scholarship pays for an undergraduate degree and medical school.

#### Air Force ROTC Course Credit

AFROTC credit for graduation varies with each college. Students should contact the appropriate college for credit determination.

#### Registration

CU-Boulder students who wish to register for AFROTC classes sign up for them through the normal course registration process. AFROTC classes begin with the AIRR prefix.

### 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 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 two- and three-year scholarships is open to all University of Colorado students, whether or not they are currently enrolled in ROTC. Scholarship students receive tuition assistance, laboratory fees, a book allowance, and an allowance of \$150 per month for each academic year. Students interested in the scholarship program should contact the scholarship officer 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 may participate with a Reserve or National Guard unit as an officer trainee. Students participating in this program earn \$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 90-minute periods are an integral part of all military science courses. The laboratory periods concentrate on tasks that 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 liter-

acy, 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.

**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-, three-, 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 \$150 per month subsistence allowance. College program students receive a \$150 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 semester of American military affairs or national security policy, and one semester of computer science. Students should check with their naval science instructor to determine specific course offerings that 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, aviation, and special warfare) and staff corps (nursing) 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 *Registration Handbook and 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. The Air Force Today 1.** One 1-hour lecture and one 1 1/2-hour lab per week. This course deals with the Air Force in the contemporary world through a study of the total force structure, strategic offensive and defensive forces, general purpose forces, aerospace support forces, and the development of communicative skills.

**AIRR 1020-1. The Air Force Today 2.** A continuation of AIRR 1010-1. One 1-hour lecture and one 1 1/2-hour lab per week.

**AIRR 2010-1. Development of Air Power 1.** One 1-hour lecture and one 1 1/2-hour lab per week. This course is a study of air power from balloons and dirigibles through the jet age; a historical review of air power employment in military and nonmilitary operations in support of national objectives; a look at the evolution of air power concepts and doctrine; and an introduction to the development of communicative skills.

**AIRR 2020-1. Development of Air Power 2.** A continuation of AIRR 2010. One 1-hour lecture 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. An integrated management course emphasizing concepts and skills required by the successful manager and leader. The curriculum includes individual motivational and behavioral processes, leadership, communication, and the group dynamics, providing the foundation for the development of the junior officer's professional skills (officership). Course material on the fundamentals of management emphasizes decision making and the use of analytic aids in planning, organizing, and controlling in a changing environment. Organizational and personal values (ethics), management of change, organizational power, politics, managerial strategy, and tactics are discussed within the context of military organization. Actual

Air Force case studies are used throughout the course to enhance the learning and communication process.

**AIRR 3020-3. Air Force Management and Leadership 2.** Two 1 1/2-hour seminars and 1 1/2-hour lab per week. A continuation of AIRR 3010. Basic managerial processes are emphasized, while group discussions, case studies, and role playing as learning devices are employed. Emphasis on communicative skills development is continued.

**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. This course is a study of U.S. National Security Policy which examines the formulation, organization, and implementation of national security policy; context of national security; evolution of strategy; management of conflict; and civil-military interaction. It also includes blocks of instruction on the military profession/officership, the military justice system and communicative skills. This course is designed to provide future Air Force officers with the background of U.S. National Security Policy so they can effectively function in today's Air Force.

**AIRR 4020-3. National Security Forces in Contemporary American Society 2.** Two 1 1/2-hour seminars and one 1 1/2-hour lab per week. A continuation of AIRR 4010. Special themes include defense strategy and conflict management, formulation/implementation of U.S. defense policy, and organizational factors and case studies in policy making, military law, uniform code of military justice, and communicative skills.

### *Military Science (U.S. Army)*

**MILR 1011-2. Adventures in Leadership I.** Introduction to the fundamentals of leadership, including an examination of developing leadership styles in many functional areas applicable to the Army. Covers selected military subjects. Written and oral presentation required. \$35 lab fee.

**MILR 1021-2. Adventures in Leadership II.** Continues the investigation of developing leadership styles. Examines the implementation of leadership for small organizations. Covers selected military subjects. Written and oral presentation required. \$35 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 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 lab fee.

**MILR 3052-3. Military Operations and Training 1.** Examines the organization and operations of tactical U.S. Army units with a focus at the platoon level. Various leadership styles and techniques are studied as they relate to small unit tactics. Basic military skills are introduced and students become familiar with actual military equipment. Potential hands-on training with military systems. \$35 lab fee.

**MILR 3062-3. Military Operations and Training 2.** Focuses on the military decision-making process and the operations order. Exposes the student to tactical small unit leadership in a variety of environments. Covers advanced tactics and small unit weapons systems. \$35 lab fee.

**MILR 4072-3. Officer Leadership and Development 1.** Examines management and leadership functions within organizations of the U.S. Army. Focuses on variables such as information flow, leadership, morale, decision-making processes, correspondence formats, and presentations. \$35 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 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, leadership, 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. 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; professional ethics, 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*

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**TED M. TENNISON**, Captain, USAF; Assistant Professor of Aerospace Studies. B.S., M.A., Central Missouri State University.

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**STEVEN J. CINCOTTA**, Lieutenant, USN; Assistant Professor of Naval Science. B.S., University of Maine. Nuclear Propulsion Plant Engineer Qualified.

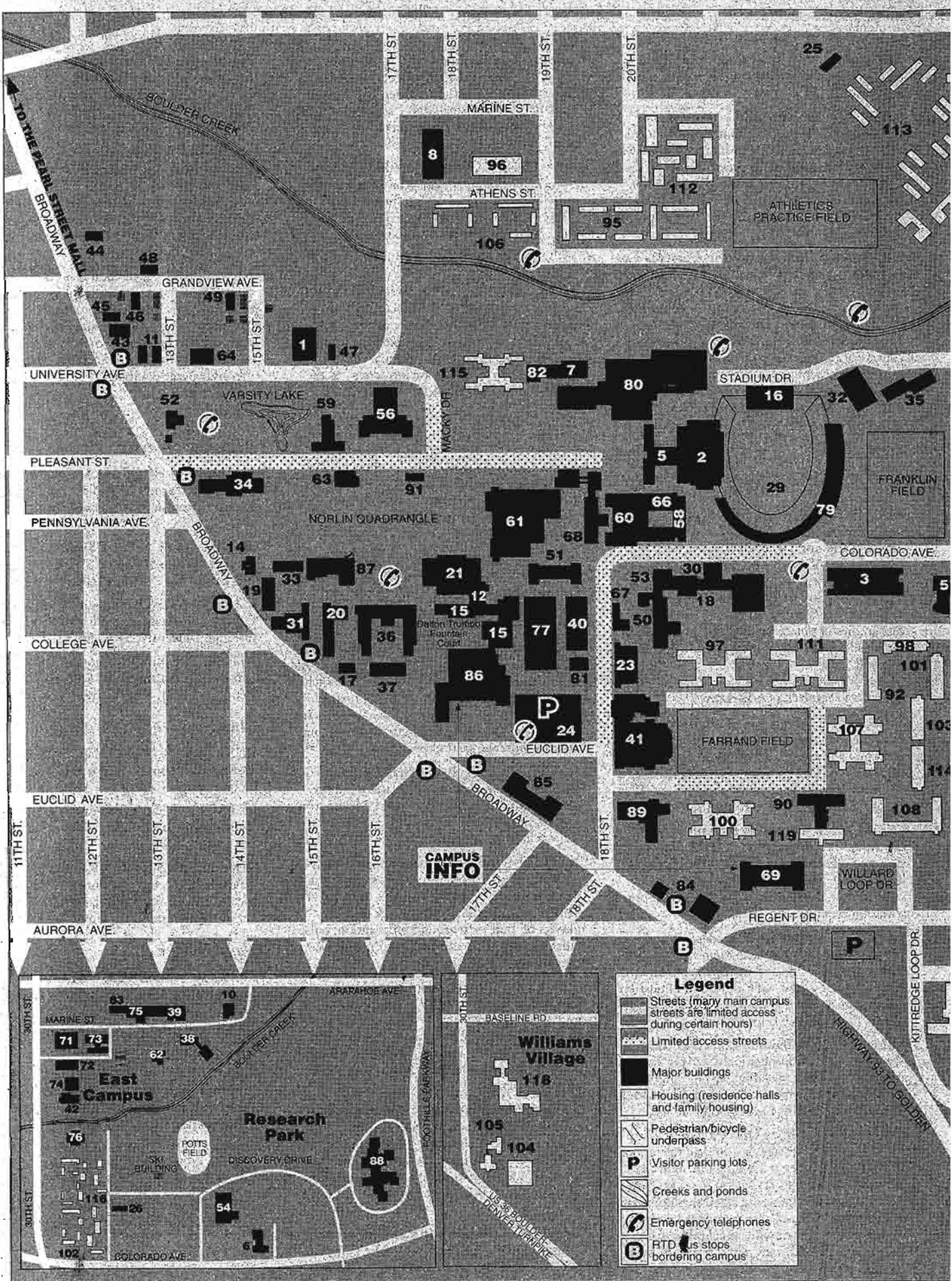
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**RICHARD G. STEWART**, Commander, USN; Instructor. B.S., University of Virginia.



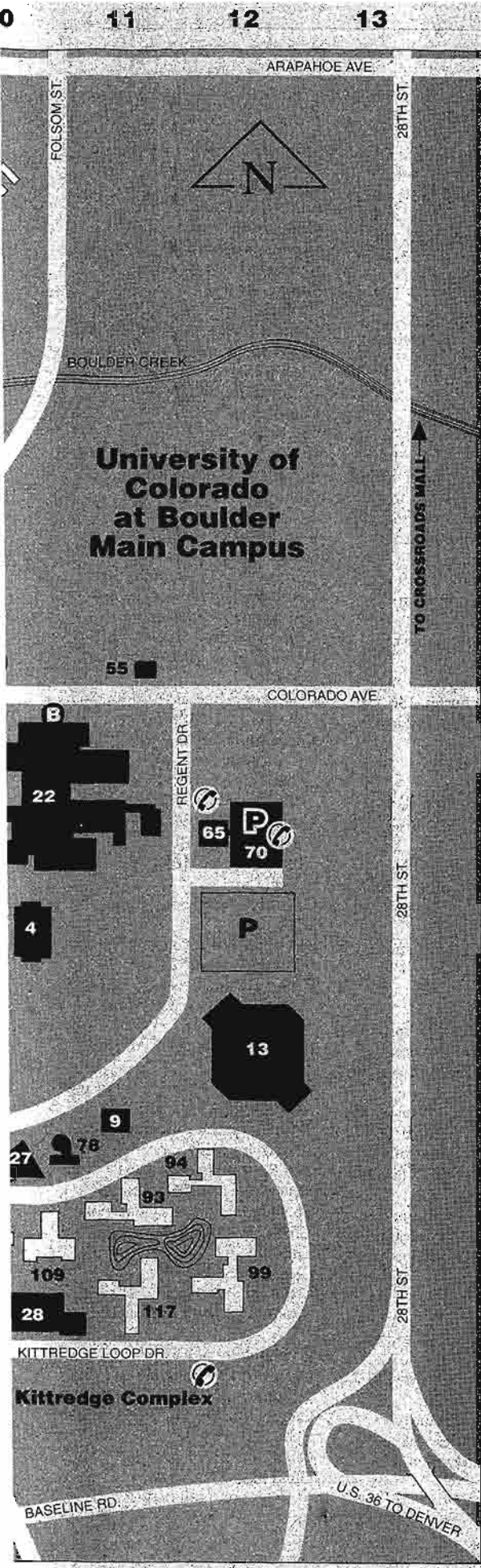
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**Legend**

- Streets (many main campus streets are limited access during certain hours)
- Limited access streets
- Major buildings
- Housing (residence halls and family housing)
- Pedestrian/bicycle underpass
- Visitor parking lots
- Creeks and ponds
- Emergency telephones
- RTD bus stops bordering campus



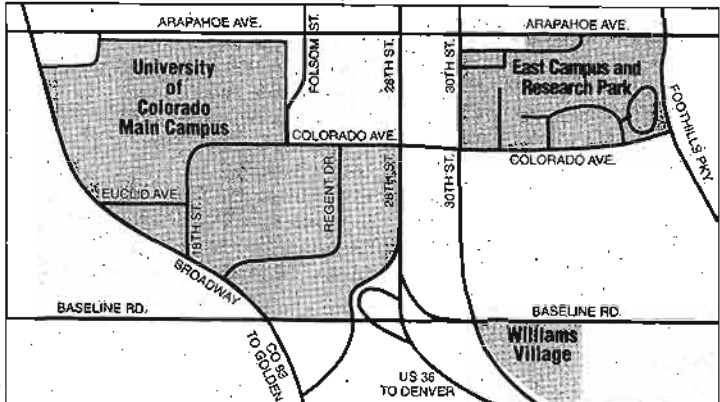
**University Buildings**

1. Armory (D-4)
2. Balch Fieldhouse (E-7)
3. Benson Earth Sciences Building (F-9)
4. Business (H-10)
5. Carlson Gymnasium (E-7)
6. Center for Astrophysics and Space Astronomy (L-3)
7. Clare Small Arts and Sciences (D-6)
8. College Inn Conference Center (B-5)
9. Communication Disorders and Speech Science (I-11)
10. Computing Center (J-3)
11. Continuing Education (D-2)
12. Cooperative Institute for Research in Environmental Sciences (CIRES) (F-5)
13. Coors Events/Conference Center (I-12)
14. Cottage No. 1 (F-3)
15. Cristol Chemistry (G-5)
16. Dai Ward Athletic Center (D-8)
17. Denison Laboratory (G-4)
- \* Duane Physical Laboratories (F-7). See Duane Physics and Astrophysics, Gamow Tower, Laboratory for Atmospheric and Space Physics, and Joint Institute for Laboratory Astrophysics.
18. Duane Physics and Astrophysics (F-7)
19. Economics (F-3)
20. Education (G-4)
21. Ekeley Sciences (F-5)
22. Engineering Center (F/G-10/11)
23. Environmental Design (G-7)
24. Euclid Avenue Autopark (G-6)
25. Family Housing Children's Center—Main Offices (A-9)
26. Family Housing Children's Center—Colorado Court (L-2)
27. Fiske Planetarium and Science Center (J-10)
28. Fleming Law (K-10)
29. Folsom Stadium (E-8)
30. Gamow Tower (F-7)
31. Geology (G-3)
32. Grounds and Service Center (D-9)
33. Guggenheim Geography (F-3)
34. Hale Science (E-3)
35. Health Physics Laboratory (D-9)
36. Helms Arts and Sciences/Mary Rippon Theatre (G-4)
37. Henderson Museum (G-4)
38. Housing System Maintenance Center (K-2)
39. Housing System Service Center (J-2)
40. Hunter Science (F-8)
41. Imig Music (H-7)
42. Institute for Behavioral Genetics (K-1)
43. Institute of Behavioral Science (IBS) No. 1 (D-2)
44. IBS No. 2 (C-2)
45. IBS No. 3 (D-2)
46. IBS No. 4 (D-2)
47. IBS No. 5 (D-4)
48. IBS No. 6 (C-2)
49. International English Center (C-3)
50. Joint Institute for Laboratory Astrophysics (G-7)
51. Ketchum Arts and Sciences (F-6)
52. Koenig Alumni Center (E-2)
53. Laboratory for Atmospheric and Space Physics (LASP) (F-7)
54. LASP Space Technology Center (L-3)
55. Lesser House (F-11)
- \* Life Sciences Laboratories Complex (E-7). See Muenzinger Psychology, Porter Biosciences, and Ramaley Biology.
56. Macky Auditorium (D-4)
57. Mathematics Building (F-10)
58. MCDB expansion (E-7)
59. McKenna Languages (E-4)
60. Muenzinger Psychology (E-7)
61. Norlin Library (E-6)
62. Nuclear Physics Laboratory (K-2)
63. Old Main (E-4)
64. Page Foundation Center (D-3)
65. Police and Parking Services (G-12)
66. Porter Biosciences (E-7)
67. Power House (F-6)
68. Ramaley Biology (E-6)
69. Regent Administrative Center (I-8)
70. Regent Drive Autopark (G-12)
71. Research Laboratory No. 1 (J-1)
72. Research Laboratory No. 2—WICHE (K-1)
73. Research Laboratory No. 3—(J-2)
74. Research Laboratory No. 4 (K-1)
75. Research Laboratory No. 6 (Marine Street Science Center) (J-2)
76. Research Park Greenhouse (K-1)
77. Sibell Wolfe Fine Arts (G-6)
78. Sommers-Bausch Observatory (I-11)
79. Stadium Offices (E-8)
80. Student Recreation Center (D-6/7)

81. Telecommunications Building (G-6)
82. Temporary Building No. 1 (D-6)
83. Transportation Center (J-2)
84. University Administrative Center and Annex (I-7)
85. University Club (H-6)
86. University Memorial Center (UMC) (G-5)
87. University Theatre (including Charlotte York Ivey Studios) (F-4)
88. US West Research Park (L-4)
89. Wardenburg Student Health Center (H-7)
90. Willard Administrative Center—North Wing (H-8)
91. Woodbury Arts and Sciences (E-5)

**University Housing**

92. Aden Hall (G-9)
93. Andrews Hall—Kittredge Complex (J-11)
94. Arnett Hall—Kittredge Complex (J-12)
95. Athens Court (B/C-6/7)
96. Athens North Court (B-6)
97. Baker Hall (G-7)
98. Brackett Hall (G-9)
99. Buckingham Hall—Kittredge Complex (K-12)
100. Cheyenne Arapaho Hall (H-7)
101. Cockerell Hall (G-10)
102. Colorado Court (L-1)
103. Crosman Hall (G-10)
104. Darley Commons—Williams Village (L-6)
105. Darley Towers—Williams Village (K-5)
106. Faculty-Staff Court (B-5)
107. Farrand Hall (H-9)
108. Hallett Hall (H-9)
109. Kittredge Commons—Kittredge Complex (J-10)
- \* Kittredge Complex. See Kittredge Commons, and Andrews, Arnett, Buckingham, Kittredge West, and Smith Halls.
110. Kittredge West Hall—Kittredge Complex (J-10)
111. Libby Hall (G-8)
112. Marine Court (B-7)
113. Newton Court (B/C-9/10)
114. Reed Hall (H-10)
115. Sewall Hall (D-5)
116. Smiley Court (L-1)
117. Smith Hall—Kittredge Complex (K-11)
118. Stearns Towers—Williams Village (K-6)
119. Willard Hall—South Wing (H-8)
- \* Williams Village. See Darley Commons, Darley Towers, and Stearns Towers.





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